Empirical Studies on Bank Liquidity Creation:
Implications for Regulation, Credit Ratings and Ethics

George Kladakis

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Abstract

This thesis investigates the influential factors of bank liquidity creation. Creating liquidity for depositors and borrowers is one of banks' main functions in the economy that promotes economic growth but also increases risk in the banking sector since illiquid loans are funded with liquid deposits. The thesis spans across three empirical chapters with novel findings that can assist both regulators and bank managers. First, banks are found to create more liquidity in countries with greater official supervisory power and more actions taken to curtail moral hazard, while they create less liquidity in countries with tighter capital regulations, more activity restrictions and stronger private monitoring. Second, purchasing multiple credit ratings is negatively associated with bank liquidity creation. Regulators increasingly rely on credit rating agencies for the assessment of banks' creditworthiness, but it appears that this is not beneficial for liquidity creation. A supplementary study also shows that the deterioration of bank asset quality increases the probability of wider rating disagreements. Finally, ethical bank disclosures and liquidity creation are found to be positively associated, indicating that banks strategically use their disclosures to earn their customers' trust. These empirical results are robust to numerous tests that address concerns such as endogeneity, among others.

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[1] In first-name alphabetical order. Most recent affiliation in parenthesis.

Letters for useful comments that led to the publication of two of this thesis' empirical studies. I am also thankful to numerous anonymous reviewers and participants of conferences for their useful comments. Any mistakes remaining in the thesis are mine.

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Declaration

I, the author, confirm that the Thesis is my own work. I am aware of the University's Guidance on the Use of Unfair Means (www.sheffield.ac.uk/ssid/unfair-means). This work has not previously been presented for an award at this, or any other, university.

A paper based on Chapter 4.1: Multiple Credit Ratings and Liquidity Creation has been accepted for publication by *Finance Research Letters*, while a paper based on Chapter 4.2: Bank Asset and Informational Quality has been published by the *Journal of International Financial Markets, Institutions and Money* in the November 2020 issue.

Chapter 1: Introduction

The operations of banks are wide-ranging and complex, but regulators use a simple definition to decide whether a financial intermediary must be subject to their prudential regulations: "*a bank is an institution whose current operations consist in granting loans and receiving deposits from the public*" (Freixas & Rochet 2008, p. 1). This very common and broad definition of banks emphasizes the unique services that they offer to the public through creating loans and receiving deposits. This key role of banks in the economy is now widely referred to as *liquidity creation* in the literature and it is the main element under investigation in this thesis.

In the traditional financial intermediation literature, liquidity creation is defined as the ability of banks to fund illiquid assets such as business loans with liquid liabilities such as transactions deposits (e.g. Bryant 1980; Diamond & Dybvig 1983). Early seminal liquidity creation models pay more attention on the liability side of banks' balance sheets in which key liquidity is created by allowing depositors to withdraw their deposits on demand, while they deem the creation of liquidity on the asset side as a passive action of banks which simply invest in projects to receive a pay-off. However, more recent studies, such as the one by Donaldson, Piacentino and Thakor (2018), highlight the importance of creating liquidity on both the asset and the liability sides. Generally, all modern studies on bank liquidity creation acknowledge the simultaneous creation of liquidity for both depositors and borrowers and so does this thesis.

Bank liquidity creation is essential for the proper functioning and growth of the economy. Creating loans plays an important role for economic output through the bank lending channel of monetary policy, especially for the smaller banks that service small and opaque private borrowers (Kashyap & Stein 2000; Berger & Bouwman 2017). The other key component of liquidity creation, liquid deposits are also essential to a well-functioning economy as they facilitate liquidity and payments services (Kashyap, Rajan & Stein 2002). Recent evidence in the literature documents a strong positive relationship between bank liquidity creation and real economic output (Berger & Sedunov 2017; Beck et al. 2020), suggesting that policymakers should consider encouraging liquidity creation within a robust banking sector.

However, liquidity creation comes with a great risk on both sides of the balance sheet. On the asset side, creating liquidity (i.e. illiquid loans) increases the risk of non-payment by the borrowers. Should the likelihood of payment by the borrower of the loan drop, the bank must absorb this loan loss with its own money to honour its commitment of paying back the depositors. If many borrowers fail to deliver their promises to the bank, the latter might not be able to pay back its depositors, which in turn might lead to seeking government support or eventually to the termination of the bank's operations. The dangers associated with non-paying borrowers can be increased when illiquid loans are funded with more liquid deposits, thus increasing the vulnerability to runs by depositors. In the absence of a deposit insurance scheme, worries about the condition of the bank would automatically alert depositors who would run on the bank to withdraw their deposits. Although most jurisdictions implement a deposit insurance scheme to some extent, systemic or idiosyncratic runs have been observed because of depositors' concerns about the quality and resilience of the banking system. In such cases, even if the quality of bank loans is perfectly healthy, bank runs can lead even the healthiest banks into insolvency. Several recent studies show that high liquidity creation can predict financial crises (Berger & Bouwman 2017; Chatterjee 2018), contribute to systemic risk (DeYoung et al. 2021; Zhang et al. 2021) and enhance the systemic connection of banks to severe shocks in the financial system (Davydov, Vähämaa & Yasar 2021).

The consequences of the aforementioned risks associated with the main function of banks to create liquidity became evident throughout all banking crises in modern history,[2] including the global financial crisis of 2007-2009 that found banks over-leveraged and deregulated. Also known as the subprime mortgage crisis, it was triggered by a significant reduction in house prices following the burst of the housing bubble. This led to mortgage delinquencies, foreclosures, and the devaluation of securities that were valued based on the underlying housing market assets. Berger and Bouwman (2017) show that this crisis (and others) was preceded by high levels of liquidity creation, leaving banks further vulnerable to liquidity risk. A major cause for the turbulence brought by the burst of the housing bubble was the securitization of mortgages.[3] The securitization of illiquid assets into liquid funds played a significant role in the liquidity risk exposures of banks that largely disrupted the entire financial system (e.g. Loutskina 2011). Occurring significant losses on the asset side due to the massive drops in value of mortgages and other assets, many major financial institutions collapsed in September 2008, including Lehman

[2] These banking crises date as back as the 1700s. In 1763, a banking crisis took place in Amsterdam, Netherlands. Because of the sharply falling prices of several commodities such as grain, the value of collateral goods decreased, thereby drying up the supply of credit. As banks were interconnected with complex financial instruments and over-leveraged, they were severely hit by the sudden shock in credit availability. The liquidity problems that the Amsterdam banks were facing led to the failure of a large Dutch bank (De Neufville) and the consequences were later mitigated with the provision of liquidity by the Bank of Amsterdam (Quinn & Roberds 2015). To a much greater extent, the Great Depression that started in October 1929 from the collapse of the US stock market affected the ability of borrowers to pay back the banks as their debt remained unchanged and their income had fallen significantly. Hence, the illiquid loans that banks had created on the asset-side of their balance sheet were not performing and consequently banks were not able to meet their promises to their creditors. This led to a total of approximately 9000 bank failures during the 1930s which hindered economic growth worldwide as in the face of non-performing loans and deteriorating prospects, the surviving banks became even more reluctant to lend (Richardson & Troost 2009).

[3] The US housing growth was largely financed with mortgage-backed securities (MBSs) and collateralized debt obligations (CDOs) which offered greater returns than government securities, while rating agencies were substantively underestimating the risk associated with these securities.

Brothers, then the fourth-largest investment bank in the US, while others were more fortunate to be refinanced by governments.

As the banking system collapsed and the global economy was in a downward spiral entering a severe global recession, regulators reacted by restructuring the rules that banks need to follow not only to help the economy recover, but also to increase banks' resilience to future crises. The financial crisis of 2007-2009 motivated regulators to introduce a series of stricter requirements and raised the attention paid over the stability of the global banking system. For instance, in 2010, the members of the Basel Committee on Banking Supervision agreed upon the Basel III, a global voluntary regulatory framework that addresses the vulnerabilities of banks exposed during the crisis. Basel III aims to strengthen bank stability on several areas such as increasing capital adequacy to better anticipate unexpected losses, increasing liquidity buffers as well as enhancing transparency in the banking sector.

But how can regulators not only increase bank stability, but also promote liquidity creation? How can banks support the real economy without taking too much risk? This thesis adds to the literature on the bank- and country-level factors that influence liquidity creation. Better understanding of which factors promote or hinder the creation of liquidity by banks can not only advance banking theory, but also help regulators make better-informed policy decisions that nurture economic growth powered by a stable banking system.

This thesis intends to address the above issues by answering the following research questions: First, Chapter 3 investigates how five major indexes of country-level bank regulation and supervision affect bank liquidity creation. The results indicate that banks create more liquidity in countries with greater official supervisory power and more actions taken to curtail moral hazard, while they create less liquidity in countries with tighter capital regulations, more activity restrictions and stronger private monitoring.

Second, Chapter 4 focuses on whether the credit rating agencies (CRAs) are related to bank liquidity creation, considering that regulations increasingly rely on CRAs for the assessment of banks' creditworthiness. The chapter is split into two subchapters. Subchapter 4.1 posits and documents a negative relationship between the purchase of multiple credit ratings and liquidity creation, while subchapter 4.2 shows that the deterioration of bank asset quality increases the probability of wider rating disagreements.

Finally, Chapter 5 investigates whether ethical bank disclosures affect liquidity creation. A growing body of the literature looks into how bank governance and ethics can influence the operations of banks, especially after the global financial crisis of 2007-2009. This thesis aims to increase our knowledge on the implications of bank ethics for liquidity creation. The chapter documents a positive relationship, suggesting that banks strategically use their disclosures to gain their customers' trust.

Chapter 2: Literature Review on Bank Liquidity Creation

Before Berger and Bouwman (2009) published their work on the empirical measurement of bank liquidity creation, literature was examining liquidity creation mostly through theoretical models which shaped the foundations for the empirical research that followed. This chapter reviews the most prominent liquidity creation theoretical models, as well as the empirical literature that uses the Berger and Bouwman method. Particular attention is paid to highly cited seminal papers that influenced the research on liquidity creation.

2.1 Seminal Theoretical Models on Bank Liquidity Creation and Financial Intermediation

2.1.1 Early Recognition of the Liquidity Creation Function in the Financial Intermediation Literature

This subsection discusses the implications and findings of the most important theoretical studies on liquidity creation. Starting from Bryant (1980), the author models a bank with illiquid loans and bonds supported by withdrawable deposits to examine the role of deposit insurance in bank runs. The author suggests that the inefficiency of first come first serve structure of demand deposits increases the risk for banks which hold illiquid loans and bonds and thus, deposit insurance becomes a possibility. Bryant argues that deposit insurance does not necessarily prevent a bank run from taking place but can even cause a more complex redistribution of risk. Diamond and Dybvig (1983) are the first to present a model in which banks have an explicit economic role to perform: the transformation of illiquid assets into liquid liabilities. They show that uninsured demand deposit contracts can provide liquidity to depositors but at the same time, they leave banks vulnerable to runs. Diamond and Dybvig argue that this vulnerability stems from the existence of multiple equilibria with different levels of confidence. Overall, their model highlights three important issues in the liquidity provision role of banks. First, banks that issue demand deposits can enhance a competitive market by offering improved risk sharing among people whose consumption needs occur at different random times. Second, although the demand deposit contract offers this improvement in the market, it has an unfavourable equilibrium: the bank run. During the bank run, in response to panic, all depositors withdraw their money immediately, including those who would rather leave their deposits in the bank should they not have concerns about a potential failure of the bank. Finally, bank runs can lead to significant economic problems because even healthy banks may fail and cause the unnecessary liquidation of healthy assets and the termination of the support of productive investment.

Diamond (1984) also acknowledges the peculiar structure of financial intermediaries that hold illiquid assets funded by liquid liabilities to study the implications of delegating borrower monitoring to banks. Diamond argues that the illiquidity of assets is an important implication because banks are delegated to observing private information about the loan which however is usually confidential to the borrower. The harder it is for banks to conduct thorough monitoring on the loan because of limited information, the more illiquid the loan becomes which obligates the bank to enforce the contract instead of selling it.[4] In this way, Diamond argues that financial fragility promotes bank liquidity creation.

During the late 1990s some theoretical models on financial intermediation started highlighting more the liquidity creation function of banks. Holmstrom and Tirole (1998) focus on the demand for liquidity by firms. In their model, there are three ways with which firms can meet their future liquidity needs, i.e. issuing debt, obtaining credit from a financial intermediary or holding claims on other firms. They argue that in terms of credit rationing, net worth constrains capital formation which then reduces market liquidity and limits the financing options of market participants. Allen and Santomero (1997) take a different approach to financial intermediation by observing that during the 1990s, transaction costs and information asymmetries started decreasing significantly. As up to then, traditional financial intermediation theories were based on transaction costs and information asymmetries, these reductions imposed new implications. More importantly, the authors argue that since lower transaction costs and greater transparency were not accompanied by a reduction in financial intermediation activity but rather by a significant increase, this increases the risk of modern financial intermediaries. Especially for banks that used to receive deposits to create loans and they discovered that there are plenty possibilities for securitizing loans without needing to keep all their loan origination activity on their balance sheet.

[4] This happens because selling the loan and transferring the monitoring to someone else would increase the costs of monitoring as the new acquirer would have to incur the costs too, duplicating the first intermediary's efforts in addition to any physical costs occurred during the ownership transfer. This is an important implication for this fragile asset-liability structure of banks because it shows that banks have the proper incentives to monitor their borrowers and commit to paying back their depositors. Although this function of banks comes at the cost of bank runs, Diamond shows that diversification is an important factor that reduces these costs or risk. With a large number of loans to entrepreneurs that have independent returns, the costs of delegating monitoring to the bank is close to zero, thereby making financial intermediation viable.

2.1.2 Liquidity Creation Models

Diamond and Rajan are the first ones to refer more explicitly to the liquidity creation function of banks in their seminal papers published in 2000 and 2001. In their 2000 paper, they argue that capital adversely affects bank liquidity creation, while also that the ability of banks to create liquidity largely stems from the fragility of deposits and the fact that the latter increase the vulnerability of banks to runs. Thus, they suggest that capital requirements restrict banks' creation of loans. With more capital in place, it is more likely that banks will exercise their liquidation threats on borrowers immediately. Diamond and Rajan (2000) argue that this happens because bankers' horizon shortens under tighter capital requirements which then can have different effects on borrowers depending on how much cash they hold. A borrower without a lot of cash will be liquidated. A borrower with moderate cash is likely to pay more since future promises from the borrower are less valuable under tighter capital requirements. Finally, a borrower without any cash shortage values more a future liquidation threat than an immediate one and will pay less. Therefore, tighter capital requirements can cause a "credit crunch" for cash-poor borrowers while they can possibly alleviate the debt burden of cash rich borrowers.

Diamond and Rajan extend the discussion on these implications in their 2001 paper *Liquidity Risk, Liquidity Creation, and Financial Fragility: A Theory of Banking*. First, they discuss the illiquidity of loans which occurs when the lender needs relationship-specific skills to effectively monitor its borrowers. However, as the lender operates under funding risk, he might need funds and therefore might demand an early liquidation or ask for higher premium to lend. At the same time, it is also difficult for the borrower to obtain funding due to the illiquidity of loans. Diamond and Rajan (2001) stress again that a fragile capital structure helps to deal with this risk that exists for both the lender and the borrower. Financial fragility commits banks to create liquidity by allowing depositor withdrawals and using liquid deposits to fund illiquid loans. Although this seems paradoxical, the mechanism is relatively simple. If the lender threatens to withdraw the special collection skills to get a higher return, this will trigger a run by depositors and the lender will fail and receive zero return. Under this fear, the lender will avoid demanding a return premium due to illiquidity and will not easily attempt to liquidate a borrower during a liquidity shock. Therefore, under financial fragility the bank can attract deposits for the full amount of its illiquid loans, while it commits to creating and monitoring illiquid loans.

Kashyap, Rajan and Stein (2002) make another attempt to explain what ties together the traditional commercial banking functions of deposit-taking and lending which makes banks liquidity providers in the economy. They argue that although deposits and loans are different manifestations, they are of the same function which is the provision of liquidity on demand. This can be better illustrated if we think of extending a line of credit as a demand deposit account with a negative balance. Therefore, they suggest that since loan commitments and demand deposits are similar products, the bank can exploit potential synergies when offering both. Similar to Diamond and Rajan (2000, 2001), they emphasize that this unusual structure of banks motivates them to focus on commitment-based lending and increase the maturity of loans which increases the provision of liquidity in the economy.

More recently, Acharya and Thakor (2016) discuss the implications of liquidity creation for systemic risk. They argue that using more equity reduces ex-ante bank liquidity, while using more debt increases the probability of inefficient bank liquidation. However, banks' privately-optimal capital structure can trade off these two costs. When greater uncertainty exists about aggregate risk, bank creditors are informed about the situation from the liquidations of other banks and this can lead to contagious liquidations which are entirely inefficient for healthy banks. Yet, Acharya and Thakor argue that this negative externality is largely ignored in privately-optimal bank capital structures. Therefore, since banks choose excessive leverage compared to the socially optimal level when the conditions allow it, minimum capital requirements are a rational strategy by regulators. The authors suggest that if regulators can generate their own aggregate risk information instead of relying on market signals, they can intervene selectively to restore both efficiency and market discipline.

Leiva and Mendizabal (2019) support the hypothesis of Diamond and Dybvig (1983) about the equivalence between the lender of last resort function of central banks and deposit insurance. However, the model of Leiva and Mendizabal shows that nominal deposits do not contribute to the efficient allocation which was usually found in the literature. They argue that this happens because with nominal deposits, banks are unable to commit to support the future liquidity needs of their depositors. They show that while the debt holder opts for demand deposits, liquidity risk-sharing is not optimal. This has important policy implications as it underlines the need for an effective refinancing rate by the central bank. The authors argue that in both bank-specific and system-wide shocks, if the central bank manages to provide liquidity at proper rates, depositors will expect the banking system to be solvent and the illiquidity of banks will not indicate their potential bankruptcy in the eyes of depositors.

2.2 Empirical Research on Liquidity Creation

2.2.1 Factors Affecting Liquidity Creation

2.2.1.1 The Effect of Capital on Liquidity Creation

The effect of capital on liquidity creation is the most thoroughly empirically examined subject about liquidity creation. This has been motivated by two factors. First, the seminal work by Diamond and Rajan (2000, 2001) makes an important theoretical prediction that more capital hinders banks' capacity to create liquidity and that financial fragility is actually beneficial for increasing market discipline in the banking sector. Therefore, it is important to test empirically whether this theory stands. Second, the measurement method of liquidity creation by Berger and Bouwman (2009) was introduced to the literature right after the financial crisis of 2007-2009, in a period when international regulatory bodies were introducing tighter capital requirements for banks to increase their resilience to risks. Hence, it is also important to understand how the new capital requirements affect the liquidity creation function of banks. The methodology developed by Berger and Bouwman (2009) is widely adopted in the literature and it is the one used throughout this thesis to measure bank liquidity creation. The method is discussed in detail in section 3.4.

Understanding the need for empirical evidence on this relationship, Berger and Bouwman (2009) dedicated their first paper on bank liquidity creation on examining the effect of capital on liquidity creation. They use a large sample of virtually all US commercial banks with quarterly data in the period of 1993 to 2003. They use the simple equity ratio for bank capital and construct four liquidity creation measures two of which contain off-balance sheet items. They develop their theoretical framework on the relationship between bank capital and liquidity creation based on two contrasting theories. First, the financial fragility/crowding out effect suggests the existence of a negative relationship. This happens either because a fragile capital structure increases market discipline which encourages banks to monitor their borrowers and extend their lending as previously put forward by Diamond and Rajan (2000, 2001), or because capital substitutes (crowds out) the role of deposits on the balance sheet. Second, the risk absorption effect suggests the existence of a positive relationship. This is based on the notion that more capital helps banks to absorb the risk that is associated with liquidity creation and thus, with more capital banks can create more liquidity. These two contrasting theories have been used extensively by the rest of the literature to describe the results on this relationship. Berger and Bouwman find supporting evidence for both theories. More specifically, they find that capital affects the ability of banks to create liquidity negatively for small banks and positively for large banks, while they do not find a significant relationship for medium-sized banks. They argue that the positive relationship that is observed for large banks is due to their off-balance sheet exposures and the power of capital to absorb such risks.

Distinguin, Roulet and Tarazi (2013) study the reverse relationship, that is how banks adjust their capital structure to illiquidity measured by liquidity creation. More specifically, they examine whether banks preserve or strengthen their regulatory capital buffers in response to lower liquidity. They use a sample of US and European banks from 2000 to 2006 and deliberately exclude the crisis years of 2007 and 2008. Their results show that banks reduce their regulatory capital when they create more liquidity and when they face greater illiquidity measured by the Net Stable Funding Ratio. However, by using an alternative liquidity ratio, they find that small US banks actually increase their regulatory capital buffers when facing higher illiquidity.

Based on the literature that suggests that bank liquidity creation and capital may be simultaneously affecting each other, Horváth, Seidler and Weill (2014) examine this possibly reverse relationship. They use an exhaustive dataset of small Czech banks with quarterly observations ranging from 2000 to 2010 and perform Granger causality tests in a dynamic GMM panel estimator framework. They find that capital and liquidity creation negatively Granger cause each other for these small banks. They argue that these results suggest a negative effect of tighter capital requirements on liquidity creation, while more liquidity creation can also limit banks' solvency. Therefore, these findings indicate the existence of a trade-off between creating liquidity in the economy and enhancing the stability of the banking system.

Two more studies conduct similar analyses on the interplay between capital and liquidity creation. Fu, Lin and Molyneux (2016) use a sample of commercial banks in 14 Asia-Pacific countries from 2005 to 2012. By using a simultaneous equations model with a GMM estimator, they find similar results to Horváth, Seidler and Weill (2014). More specifically, they also document a negative bi-causal relationship between regulatory capital and liquidity creation for all banks in the sample regardless of size and economic region. Tran, Lin and Nguyen (2016) also contribute to this strand of literature by examining this reverse causality. They use quarterly data from 1996 to 2013 on US banks provided by Christa H.S. Bowman as an extended dataset of the one used in Berger and Bouwman (2009). They conduct a panel vector autoregression (VAR) analysis by considering endogenous variables capital, liquidity creation and profitability. Their results suggest that after controlling for profitability, capital and liquidity creation share a positive bi-causal relationship. This is of course contradictory to the findings presented in other investigations. They also show that profitability has a positive effect on liquidity creation, but liquidity creation hinders profitability.

Using a large dataset containing all Russian banks, Fungáčová, Weill and Zhou (2017) examine how the introduction of deposit insurance affects the relationship between bank capital and liquidity creation. First, consistent with most of existing findings, they find that capital negatively affects liquidity creation. Second, the introduction of a deposit insurance scheme in Russia offered to the authors the opportunity for a natural experiment to empirically investigate how deposit insurance affects this relationship. Using the difference-in-difference approach, their findings suggest that the introduction of the deposit insurance scheme in Russia has different effects on the relationship between capital and bank liquidity creation depending on the type of banks. More specifically, the authors find that banks that rely more household deposits are most affected by the introduction of deposit insurance scheme. For such banks, deposit insurance mitigates the negative effect of capital on liquidity creation.

Finally, Casu, Di Pietro and Trujillo-Ponce (2019) study again the bi-causal relationship between capital and liquidity creation. They use a sample of 1367 European banks from 17 countries in the Eurozone from 1999 to 2013. They use both simple equity ratios as well as regulatory capital ratios as defined by Basel III. Consistent with evidence from previous studies, they show that all measures of capital have a negative effect on liquidity creation, while liquidity creation has a negative effect on all forms of bank capital. This is again further evidence of the existence of a trade-off between financial stability through greater capitalization and economic growth through liquidity creation.

2.2.1.2 Governance, Trust and Liquidity Creation

An evolving strand of the literature examines how soft factors such as bank governance and trust influence bank liquidity creation. Diaz and Huang (2017) investigate the effect of internal bank governance on bank liquidity creation for US bank holding companies in three periods, namely before, during and after the financial crisis of 2007–2009. They measure internal bank governance with a comprehensive index comprised by 50 different governance factors. They posit that well-governed banks create more liquidity due to superior risk management associated with governance. They find that this effect is positive and significant only for the larger bank holding companies. Furthermore, they show that some of the specific factors of internal governance (ownership, progressive practices, CEO education and compensation structure) have a greater impact on liquidity creation although they observe this effect mostly during the crisis period for the largest banks.

Bertrand et al. (2021) examine the role of trust in the bank environment on liquidity creation after conflicting hypotheses in earlier theoretical literature. The authors use quarterly data US banks from 1986 to 2016 and measure people’s trust in the banking industry using the Gallup surveys. The study documents a strong positive relationship between trust in banks and liquidity creation. The authors argue that a positive trust environment can foster liquidity creation, through strengthening banks’ deposit stability, lowering the costs of liquidity mismatch, reducing the risk of runs, and enabling banks to take further risks.

2.2.1.3 Other Factors Affecting Liquidity Creation

Chatterjee (2015) examines whether asset market liquidity explains bank liquidity creation. The author uses the US quarterly data from 1984 to 2010 as other important studies and highlights four key findings. First, asset market liquidity and credit-spreads influence aggregate bank liquidity creation which is mainly driven by large banks. Second, stock market liquidity has a greater impact on aggregate liquidity creation than credit-spreads and the Treasury bond market liquidity do. Third, although stock market liquidity influences off-balance sheet liquidity creation better than other market liquidity measures, short-term Treasury bond liquidity has a large effect on on-balance sheet liquidity creation. Finally, using the Federal Funds Rate as a proxy for monetary policy, Chatterjee finds that monetary policy affects the liquidity creation levels of small banks more than the liquidity creation of large banks.

Berger et al. (2016) use a unique dataset of German banks to examine the effects of regulatory interventions and capital support (bailouts) by the German authorities on bank liquidity creation. Their main findings are that regulatory interventions reduce liquidity creation and capital support does not have an effect on liquidity creation. Moreover, they show that although regulatory interventions do not affect the asset side of liquidity creation, they affect the liability side of liquidity creation as well as off-balance sheet liquidity creation. On the other hand, while bailouts do not affect off-balance sheet liquidity creation, they have a negative effect on liabilities and a positive effect on assets which therefore cancel the total effect of capital support on liquidity creation. They also show that regulatory interventions do not affect lending, but bailouts can reduce lending. Finally, both regulatory interventions and capital support mitigate bank risk taking which is expected considering that governmental intervention and support come with certain conditions.

Berger et al. (2017) use the economic policy uncertainty (EPU) indexes developed by Baker, Bloom and Davis (2016)[5] to examine how it affects bank liquidity creation in the US. The measures of EPU are based on textual analysis of newspaper articles as well as a collection of policy uncertainty connected to government spending, inflation risk, and tax code expiration. The authors find that EPU has a negative effect on total side bank liquidity creation which is driven by the effects on the asset-side and off-balance sheet-side of liquidity creation and partially offset by a positive effect on the liability-side of liquidity creation. Berger et al. (2017) argue that this negative effect harms the economy because although more funds flow into the banking system, it limits

[5] The data on EPU indexes are available at: http://www.policyuncertainty.com/

banks' ability to transform them into illiquid assets such as corporate loans that support productivity and economic growth. Although their findings are robust across all bank size classes, they are weaker during times of crises possibly because governments treat banks favourably to shield them from the dangers of economic policy uncertainty during crises.[6]

Huang, Chen and Chen (2018) use the US dataset from 1993 to 2014 to examine the relationship between CEO optimism and bank liquidity creation. They posit that since CEO optimism (mainly measured by how much CEOs overestimate the returns of investment projects) has been documented to influence various corporate decisions, it might influence liquidity creation too. Optimistic CEOs are more likely to overestimate the potential value/profit generated by creating more liquidity and underestimate the risks that it is associated with. They find that indeed banks with more optimistic CEOs create more liquidity during the entire period in the sample. Moreover, they document that this effect was greater during the financial crisis of 2007-2009, especially for well-capitalized and large banks.

Considering the growing importance of Islamic banks compared to conventional banks after the financial crisis, Berger et al. (2019) examine the differences between the two in terms of liquidity creation and financial stability using data from 24 countries over the period of 2000–2014. First, they find that Islamic banks create more liquidity (relative to assets) than conventional banks in total liquidity creation which is mainly driven by creating more liquidity on the asset side, while Islamic banks create less liquidity off the balance sheet than conventional banks. Second, they show that conventional banks' liquidity creation increases national financial stability in high-income countries, and it has no effect in low-income countries. On the contrary, Islamic banks'

[6] The authors later published the paper as Berger et al. (2020) by focusing on a new measure of bank liquidity hoarding instead of liquidity creation. Yet, the essence of the findings remains the same.

liquidity creation not only it does affect the financial stability of high-income nations, but also it significantly enhances stability for low-income nations.

Jiang, Levine and Lin (2019) examine how regulatory-induced competition affects liquidity creation. They use a US sample from 1984 to 2006 and employ different measures of regulatory-induced competition in the banking industry, such as the first year that a state gave permission to banks from any other state to acquire or establish subsidiaries (also called interstate bank deregulation). While theory does not predict a clear relationship between competition and liquidity creation, the authors find that competition reduces liquidity creation. Consistent with models suggesting that banks getting closer toward insolvency are more careful and reduce risk-taking activities, the authors show that the negative effect of regulatory-induced competition on liquidity creation is greater for banks with less risk-absorbing capacity such as banks with lower profitability.

2.2.2 The Consequences of Liquidity Creation

2.2.2.1 Bank Liquidity Creation and Economic Growth

Another stream on liquidity creation attempts to estimate liquidity creation at the country level and to investigate whether the aggregate level of liquidity creation promotes economic growth. Berger and Sedunov (2017) add up the liquidity created by all commercial banks in each US state to calculate the aggregate liquidity created before normalizing it by each state's population to develop the liquidity creation per capita measure for the regression purposes. They find that liquidity creation per capita is positively associated with real economic output (GDP per capita) and that this relation is statistically and economically significant. They also show that liquidity created by small banks produces more GDP per dollar than liquidity created by large banks. However, liquidity created by large banks is more important because it is of significantly greater size in aggregate terms. A more recent study by Beck et al. (2020) conducts a similar analysis. The authors escape from the single country analysis and rather work on a very large global sample with 100 countries in the period of 1999-2014. They provide both theoretical and empirical evidence that aggregate bank liquidity creation can support economic growth. However, there is an important implication which is that liquidity creation promotes the investment in tangible assets through overcoming market frictions but not the investment in more innovative industries that rely more on intangible assets. Another similar study by Fidrmuc, Fungáčová and Weill (2015) examines whether liquidity creation promotes economic growth in Russia. They use annual data for the period 2004-2012 and break the data into 83 Russian regions to reorganize the observations as panel data. They find some evidence that bank liquidity creation promotes economic growth. More specifically, their analysis shows that liquidity creation calculated based on the maturity classification of assets and liabilities is positively associated with economic growth. Moreover, they document that the financial crisis did not affect this relationship.

Davydov, Fungáčová and Weill (2018) examine whether bank liquidity creation is procyclical which can have implications such as amplifying business cycle fluctuations. Using the Russian banking industry for this investigation, they unearth two main findings. First, they show that bank liquidity creation is procyclical, that is business cycle changes are positively related to liquidity creation. They also show that liquidity creation is more procyclical than lending. Second, they find that the procyclical behaviour of liquidity creation is more or less the same for state-owned, foreign and domestic private banks with no significant differences among them. Thus, as previous research has shown that liquidity creation has a positive effect on economic growth, liquidity creation behaviour can contribute to the increase of business cycle fluctuations.

2.2.2.2 The Effect of Bank Liquidity Creation on Financial Crises, Risk and Stability

Since liquidity creation is associated with more risk, a couple of important papers attempt to investigate whether high levels of liquidity creation can lead to or predict financial crises and economic recessions. First, Berger and Bouwman (2017) use a large dataset of all US commercial banks with quarterly data from 1984 to 2008. This period contains five financial crises which are the stock market crash of 1987, the credit crunch in the early 1990s, the 1998 Russian debt crisis and LTCM collapse, the dot.com bubble and the 9/11 terrorist attack of the early 2000s, and the subprime crisis of 2007-2008. Their findings show that when banks create high levels of liquidity relative to the trend, financial crises occur which is mainly driven by the off-balance sheet component of liquidity creation. As their analysis incorporates monetary policy, they show that it only has an economically small effect on liquidity creation and only during normal times. Adding to this important study, Chatterjee (2018) uses a similar sample to examine the same issue by augmenting the term spread model of Estrella and Hardouvelis (1991) with the Berger and Bouwman bank liquidity creation measures. Using the NBER recession quarters, the author shows that bank liquidity creation and especially the on-balance sheet component of liquidity creation holds as much information about future recessions as up to four quarters into the future. More specifically, it is lower on-balance sheet liquidity creation that predicts recession rather than higher off-balance sheet liquidity creation found by Berger and Bouwman (2017). Also, Chatterjee's findings suggest that both on- and off-balance sheet liquidity creation continue to decline during and up to five quarters after recessions, while the liquidity creation levels of large banks hold more information about future recessions than the liquidity creation levels of small banks.

Drechsler, Moreira and Savov (2018) study the relationship between liquidity creation and volatility risk using a US sample of daily returns from 2011 to 2016. They show both theoretically and empirically that liquidity creation can expose banks to volatility risk. As the asset-side of liquidity creation involves taking positions that can be exploited by privately informed counterparties, this access of counterparties to superior information makes banks' payoff look like a straddle (a combination of a call and a put option). As liquidity creators, banks take the other side of the straddle which means that they can suffer significant losses in times of high volatility. They also show empirically that short-term reversal strategies, which imitate liquidity creation by buying falling stocks and selling rising stocks, can lead to a great adverse exposure to volatility shocks. The authors argue that the combination of this exposure and the large premium that investors demand for carrying this volatility risk can explain why liquidity creation produces premium returns, why these premium returns are strongly increasing with high volatility, as well as why during times of volatility spikes like the 2007-2009 financial crisis liquidity contracts.

Zheng and Cronje (2019) study the moderating role of bank capital on the relationship between liquidity creation and failure risk. They use a sample of US commercial banks from 2003 to 2014. First, they find that liquidity creation (including both on- and off-balance sheet activities) reduces bank failure risk (increase the z-score). Second, they show that capital moderates this effect by strengthening it. This is in line with the risk absorption effect suggesting that capital can absorb the liquidity risk induced by creating more liquidity. Therefore, by increasing their capitalization, banks are more likely to avoid failure when they create more liquidity in the economy.

Finally, an important strand of the literature with recent studies examines the contribution of liquidity creation to systemic risk. Zhang et al. (2021) use a sample of Chinese listed banks in the period of 2011-2016 and measure systemic risk in various ways including conditional value at risk, marginal expected shortfall and capital shortfall. The findings show that excessive levels of liquidity creation increase systemic risk and that the relationship is “U shaped”. This means that an adequate level of liquidity creation helps the bank generate sustainable profit, but excessive liquidity creation increases banks’ illiquidity, leading to higher contribution to systemic risk and risk exposure. The authors also separate internal and external liquidity creation and that the external component that relates to the spillover effect of liquidity creation to the economy has a greater impact on systemic risk than the internal component. DeYoung and Huang (2021) use a sample of large US banks from 1994 to 2016 and show that CEO pay-performance incentives can have a negative effect on both negative systemic risk externalities and positive liquidity creation externalities. In other words, their findings suggest that the Federal Reserve guidelines that promote reliance on long-term equity-based compensation lead to a trade-off between reducing systemic risk and promoting system-wide liquidity creation. This indicates that liquidity creation and systemic risk are positively related. On the other hand, Davydov, Vähämaa and Yasar (2021) find that liquidity creation reduces systemic risk at the individual bank level. However, the authors differentiate between bank-specific tail risk and systemic linkage and show that liquidity creation strengthens the systemic link between individual banks and severe shocks in the financial system.

2.2.3 Summary of Empirical Research on Liquidity Creation and Contributions of the Thesis

So far, the literature has focused significantly on the effect of capital requirements on bank liquidity creation. It appears that researchers and policymakers where particularly interested in understanding how the regulatory frameworks such as Basel II and III affect the main function of banks in the economy. The majority of the extant studies show that capital requirements impede bank liquidity creation through the financial fragility effect. However, authorities have introduced other regulatory guidelines as well such as activity restrictions, new deposit insurance schemes, reduced reliance on credit ratings or promoting the adoption of a code of ethics. The effects of these policies on liquidity creation are largely neglected.

More specifically, the literature overlooks the effect of national-level regulations on bank liquidity creation (with the exceptions of Berger et al. (2016) and Jiang, Levine and Lin (2019) who examine country-level regulations but not for multiple countries). Although the Basel frameworks are internationally agreed, in many cases, governments have significant space for modifications to adjust the international frameworks to their own banking system more effectively. Chapter 3 addresses this literature gap by examining the relationship between five national-level regulatory indexes and liquidity creation. Also, the extant literature on the influential factors of liquidity creation has not paid attention to the implications that credit ratings and the CRA market in general might have. Regulatory certification driven by Basel II and III requirements encourages banks to purchase more than one ratings and Chapter 4 addresses this issue by examining the relationship between multiple credit ratings and liquidity creation.

Another strand of the literature investigates how bank governance may play a role in the level of liquidity created by banks. The extant literature appears to document a positive effect of governance factors on liquidity creation which is mostly attributed to the strategic preferences of banks. Chapter 5 contributes to this limited literature by investigating the relationship between ethical disclosures and liquidity creation.

With respect to the consequences of liquidity creation, the literature seems to be largely concerned with the contributions to economic growth and different forms of risk, suggesting that there is a clear positive link with economic growth but at the expense of increased chances of crisis and deteriorated systemic risk levels. This thesis avoids these areas because of the difficulties associated with measuring country-level liquidity creation for a global sample and the complexities involving the measurement of systemic risk.

2.3 Measurement of Liquidity Creation

The empirical investigation of liquidity creation requires the existence of comprehensive measures. Until Berger and Bouwman's (2009), no widely accepted measure of liquidity creation existed. A measure in the spirit of the Berger and Bouwman method was first developed by Deep and Schaefer (2004) which they call "LT gap" and apply to data on the 200 largest US banks from 1997 to 2001. They define LT gap as the difference between liquid liabilities and liquid assets normalized by total assets. They consider all loans with a short-term maturity (one year or less) as liquid, while they exclude all off-balance sheet activities due to their contingent nature. They show that the LT gap for US commercial banks is surprisingly low (about 20% of total assets). Also, their findings suggest that deposit insurance does very little to promote the LT gap because insured deposits replace uninsured liabilities instead of increasing the deposit base or lending. Finally, they find that liquidity transformation is greatly discouraged by the credit risk of loan portfolios.

Berger and Bouwman (2009) develop a more comprehensive method for measuring liquidity creation which has been widely used by researchers since then. This is also the adopted method in this thesis with minor modifications due to the availability of data. Their method follows a three-step procedure outlined in the following paragraphs.

In the first step, all balance sheet items are classified as liquid, semiliquid, or illiquid. For assets, this depends on the ease, cost, and time for banks to liquidate their obligations to meet depositors' liquidity demands. For liabilities and equity, this depends on the ease, cost, and time for depositors to obtain liquid funds from the bank. As Berger and Bouwman argue, ideally, researchers would use both dimensions of maturity and category of balance sheet items to classify them. For instance, corporate loans are usually more illiquid than mortgage and consumer loans because the latter are easier to be securitized and sold to meet the bank's liquidity needs. However, inside each category, the items with shorter maturity are more liquid than items with longer maturity. Yet, this is subject to the availability of data as especially for loans and deposits most databases have not made the combination of the two dimensions available up to today. Thus, most of the time, items are classified by category or maturity and not by the combination of the two.

In the second step, Berger and Bouwman assign weights to the items classified as liquid, semiliquid, or illiquid in step 1 based on liquidity creation theory. On the balance sheet, banks create liquidity when they transform illiquid assets into liquid liabilities. In other words, they hold illiquid assets to offer liquidity to borrowers and give liquidity to depositors with demand deposits. Hence, Berger and Bouwman assign positive weights to illiquid assets and liquid liabilities. In this way, for instance, when transactions deposits (liquid liabilities) are used to fund corporate loans (illiquid assets) banks create liquidity. Similarly, liquid assets, illiquid liabilities and equity are assigned negative weights because when the bank holds these it withdraws liquidity from the economy. For technical considerations discussed later in the thesis, the weights are 1/2 for the items with a positive weight and -1/2 fir the items with a negative weight. Semiliquid assets and liabilities are assigned an intermediate weight of 0 because they are considered to be halfway between liquid and illiquid activities.

Finally, in the third step, Berger and Bouwman combine the classification and weighting of balance sheet items in steps 1 and 2 to create different liquidity creation measures. Based on this method, liquidity creation measures can differ in the type of loans or deposits used and in whether off-balance sheet items are included in the measure. For instance, a liquidity creation may include corporate loans or long-term loans are illiquid loans and transactions and term deposits or short-term deposits as liquid deposits. Berger and Bouwman have access to off-balance sheet data which allows them (and other researchers) to include it in the calculation by following the same three-step method as with on-balance sheet items.

The same steps are followed for the calculation of the four liquidity creation measures used in this thesis. Table 2.1 presents the liquidity classification of bank activities using the comprehensive data by S&P Global Market Intelligence. All balance sheet items are classified as liquid, semiliquid, or illiquid based on Berger and Bouwman (2009) and other studies that have used items more closely related to the ones available by S&P Global Market Intelligence. More specifically, illiquid assets (i.e. illiquid loans, fixed, intangible and other assets) and liquid liabilities (i.e. liquid deposits and trading liabilities) receive a weight of 1/2, while liquid assets (i.e. cash and cash balances, total securities and trading assets), illiquid liabilities (i.e. total subordinated debt and other liabilities) and equity receive a weight of -1/2. After adding up all weighted items, the final measures are normalized by total assets.

Because two types of illiquid loans (corporate loans and long-term loans) and two types of liquid deposits (short-term deposits and transaction and savings deposits) are available, four liquidity measures are constructed based on all possible combinations. LC1 contains corporate loans and short-term deposits, LC2 contains corporate loans and transaction and savings deposits, LC3 contains long-term loans and short-term deposits and LC4 contains long-term loans and transaction and savings deposits. The remaining items are the same across all measures.

Table 2.1 Liquidity Classification of Bank Activities.

Assets		
Illiquid Assets (weight = 1/2)	**Semi-Liquid Assets (weight = 0)**	**Liquid Assets (weight = -1/2)**
Corporate Loans (Loans with Maturity > 1 year)	Mortgage and Retail Loans (Loans with Maturity <= 1 year)	Cash and Cash Balances
Fixed Assets		Total Securities
Intangible Assets		Trading Assets
Other Assets		
Liabilities & Equity		
Liquid Liabilities (weight = 1/2)	**Semi-Liquid Liabilities (weight = 0)**	**Illiquid Liabilities & Equity (weight = -1/2)**
Deposits with Maturity <= 1 year (Transaction and Savings Deposits)	Deposits with Maturity > 1 year (Time Deposits)	Total Subordinated Debt
Trading Liabilities		Other Liabilities
		Equity

This table illustrates the liquidity classification of bank balance sheet items and the weight assigned to each item.

$$LC1_{i,t} = \Big(\tfrac{1}{2}\boldsymbol{Corporate\ Loans}_{i,t} + \tfrac{1}{2}Fixed\ Assets_{i,t} + \tfrac{1}{2}Intangible\ Assets_{i,t} + \tfrac{1}{2}Other\ Assets_{i,t} + \tfrac{1}{2}\boldsymbol{Short\ Term\ Deposits}_{i,t} + \tfrac{1}{2}Trading\ Liabilities_{i,t} - \tfrac{1}{2}Cash\ and\ Cash\ Balances_{i,t} - \tfrac{1}{2}Total\ Securities_{i,t} - \tfrac{1}{2}Trading\ Assets_{i,t} - \tfrac{1}{2}Total\ Subordinated\ Debt_{i,t} - \tfrac{1}{2}Other\ Liabilities_{i,t} - \tfrac{1}{2}Equity_{i,t}\Big) / Total\ Assets_{i,t} \quad (2.1)$$

$$LC2_{i,t} = \Big(\tfrac{1}{2}\boldsymbol{Corporate\ Loans}_{i,t} + \tfrac{1}{2}Fixed\ Assets_{i,t} + \tfrac{1}{2}Intangible\ Assets_{i,t} + \tfrac{1}{2}Other\ Assets_{i,t} + \tfrac{1}{2}\boldsymbol{Transaction\ and\ Savings\ Deposits}_{i,t} + \tfrac{1}{2}Trading\ Liabilities_{i,t} - \tfrac{1}{2}Cash\ and\ Cash\ Balances_{i,t} - \tfrac{1}{2}Total\ Securities_{i,t} - \tfrac{1}{2}Trading\ Assets_{i,t} - \tfrac{1}{2}Total\ Subordinated\ Debt_{i,t} - \tfrac{1}{2}Other\ Liabilities_{i,t} - \tfrac{1}{2}Equity_{i,t}\Big) / Total\ Assets_{i,t} \quad (2.2)$$

$$LC3_{i,t} = \Big(\tfrac{1}{2}\boldsymbol{Long\ Term\ Loans}_{i,t} + \tfrac{1}{2}Fixed\ Assets_{i,t} + \tfrac{1}{2}Intangible\ Assets_{i,t} + \tfrac{1}{2}Other\ Assets_{i,t} + \tfrac{1}{2}\boldsymbol{Short\ Term\ Deposits}_{i,t} + \tfrac{1}{2}Trading\ Liabilities_{i,t} - \tfrac{1}{2}Cash\ and\ Cash\ Balances_{i,t} - \tfrac{1}{2}Total\ Securities_{i,t} - \tfrac{1}{2}Trading\ Assets_{i,t} - \tfrac{1}{2}Total\ Subordinated\ Debt_{i,t} - \tfrac{1}{2}Other\ Liabilities_{i,t} - \tfrac{1}{2}Equity_{i,t}\Big) / Total\ Assets_{i,t} \quad (2.3)$$

$$LC4_{i,t} = \Big(\tfrac{1}{2}\boldsymbol{Long\ Term\ Loans}_{i,t} + \tfrac{1}{2}Fixed\ Assets_{i,t} + \tfrac{1}{2}Intangible\ Assets_{i,t} + \tfrac{1}{2}Other\ Assets_{i,t} + \tfrac{1}{2}\boldsymbol{Transaction\ and\ Savings\ Deposits}_{i,t} + \tfrac{1}{2}Trading\ Liabilities_{i,t} - \tfrac{1}{2}Cash\ and\ Cash\ Balances_{i,t} - \tfrac{1}{2}Total\ Securities_{i,t} - \tfrac{1}{2}Trading\ Assets_{i,t} - \tfrac{1}{2}Total\ Subordinated\ Debt_{i,t} - \tfrac{1}{2}Other\ Liabilities_{i,t} - \tfrac{1}{2}Equity_{i,t}\Big) / Total\ Assets_{i,t} \quad (2.4)$$

Chapter 3: Bank Regulation, Supervision and Liquidity Creation

3.1 Introduction

The global financial crisis of 2007-2009 exposed the ineffective regulation and supervision of the banking sector. Multiple bank failures and bank refinancing with taxpayer money led to increasing calls for bank regulation reforms to eliminate similar problems in the future. Many jurisdictions have been gradually implementing new regulatory requirements such as tighter capital adequacy, bank activity restrictions and increased transparency among others. However, the extant empirical literature does not provide clear evidence on whether bank regulation and supervision are effective in controlling bank performance and risk-taking, indicating that regulatory tightening is not always beneficial (e.g. Barth et al. 2013; Li, Liu & Veld 2019). Therefore, it is essential to further evaluate the effectiveness of regulatory reforms and whether they can enable the functions of banks (Barth et al. 2013). This empirical chapter investigates the effects of bank regulation and supervision at the national level on bank liquidity creation. Using the most recent available world-wide survey on bank regulation and supervision, new empirical evidence is provided on whether several regulatory and supervisory requirements enhance or impede the ability of banks to create liquidity in the economy with important policy implications regarding the efficiency of the regulatory requirements that followed the 2007-2009 crisis.

The empirical literature on the regulatory effects on liquidity creation has mainly focused on the effect of bank-specific capital requirements with few exceptions. This chapter aims to add to this strand of the literature by examining the country-level governance and supervision influence on bank liquidity creation. Although international institutions such as the BCBS are attempting to implement the new regulatory requirements in the same way across many jurisdictions and centralized bank supervision is gradually emerging (e.g. Avignone et al. 2021; Beck, Silva Buston & Wagner 2021), more empirical evidence is needed to evaluate whether the banking system is enhanced or impeded by bank regulation and supervision (Barth et al. 2013). Up to now, empirical evidence on the effects of national regulations on liquidity creation remains largely limited. To the best of the author's knowledge, this chapter examines for the first time the effects of a variety of country-level regulatory and supervisory policies on bank liquidity creation with significant implications for policy makers. A few closely related studies investigate the effects of regulatory interventions (Berger et al. 2016) and regulatory-induced competition (Jiang, Levine & Lin 2019) on bank liquidity creation. However, the work undergone in this chapter offers empirical evidence on the relationship between several country-level regulations and liquidity creation for a diversified group of countries using the latest information about their implementation of bank regulation and supervision.

Informing policy decisions with novel empirical evidence on the effects of bank regulation and supervision is particularly important because it is difficult make predictions using only theory. There are two opposing theoretical predictions on whether stricter regulatory frameworks enable or prevent the functions of banks, namely, the public and private interest views (Barth, Caprio & Levine 2008). On the one hand, adherents of the public interest view argue that supervisors act in the interest of the public by introducing regulations that prevent market failures, thus enhancing the efficiency of the banking system. A safer and more efficient bank is more likely to have a greater capacity to perform its functions, thus attract more deposits, issue more loans and create more liquidity overall. On the other hand, proponents of the private interest view argue that supervisors act in their own interest or in the interest of the few and not of the public which may impede the efficiency of the banking system. For example, when regulatory authorities can influence or control the distribution of lending, this may foster political interests and corruption to adversely shape the allocation of bank credit (Beck, Demirgüç-Kunt & Levine 2006). Because of these conflicting theoretical predictions, the two possible opposing effects of each regulatory policy on bank liquidity creation are later discussed.

To test the hypotheses on the effects of bank regulation on liquidity creation, the database previously developed by Barth, Caprio and Levine (2013) is updated with the latest global survey published by the World Bank in 2019 and covers the period of 2011-2016. After updating five of the most important indexes, the results show that banks create more liquidity in countries that have greater supervisory power and take more actions to curtail moral hazard (e.g. limiting the extent of deposit insurance), while they create less liquidity in countries with more activity restrictions, tighter capital regulations and stronger private monitoring. These results are robust to a battery of tests. These findings offer novel empirical evidence on the relationship between bank regulations and bank output and assist official authorities to make sounder decisions since the effectiveness of bank regulations is still debated (e.g. capital requirements, activity restrictions etc.). The results also offer further significant regulation and supervision insights. For example, the analysis indicates that while mitigating moral hazard and increasing private monitoring both enhance market monitoring in general, the former enables the creation of liquidity, but the latter impedes it.

3.2 Literature Review on Bank Regulation and Supervision

This section describes the five types of regulations (i.e. activity restrictions, official supervisory power, capital regulations, private monitoring and actions taken to curtail moral hazard) under investigation in this chapter and reviews the literature on the effects of these regulations on important aspects of banking. This literature review can form the basis of the theoretical predictions on the effects of these regulations on liquidity creation.

3.2.1 Activity Restrictions

3.2.1.1 The Rationale of Restrictions on Bank Activities

The traditional activities of banks essentially involve creating liquidity by receiving deposits and making loans as well as providing payment services. These activities constitute the plumbing of a well-functioning economy. During the past several decades, many large and complex institutions have managed to extend their operations by combining traditional banking with several nonbank activities. Bankers are tempted to offer services beyond the core bank activities because they increase the revenue sources and diversify more efficiently both their revenue stream and asset portfolio.

However, steering banks’ focus towards other activities may increase bank risk. Indeed, many of the banks that experienced troubles during the financial crisis of 2007-2009 were large institutions that had expanded their structure beyond traditional banking (Flannery, Kwan & Nimalendran 2013). Engaging in nonbank activities makes banks riskier by increasing their complexity to a level that it is difficult for internal management and external market participants and regulators to assess, monitor and control the risk of the banking institutions. Should large banks increase their complexity through engaging in nonbank activities, this will endanger the stability of the entire financial system and the health of the economy.

Due to the importance of maintaining stability across the global banking system, many jurisdictions have restricted several bank activities which has influenced to a great extent the current structure of banks. Barth, Caprio and Levine (2004) argue that there are five key theoretical reasons for introducing restrictions on bank activities. First, when banks engage in a diverse set of activities, conflicts of interest may be developed. For instance, banks with a wide range of activities may try to “dump” unwanted securities on uninformed investors to facilitate the outstanding loans of other firms. Second, since moral hazard encourages managers’ risky decisions, bank managers will have more options to increase risk-taking if they are permitted to engage in more activities (Boyd, Chang & Smith 1998). Third, it is more challenging for bank supervisors to monitor banks with more complex portfolios. Fourth, complex banks can gain significant political and economic power that they become “too big to discipline”. Finally, large and complex financial corporations can have negative effects on competition and efficiency. Based on these five arguments, bank activity restrictions can improve the functioning of the banking system.

One of the main arguments in supporting activity restrictions is that new bank activities are risky and difficult to monitor. Nonbanking activities are not riskier than traditionally banking activities. All financial activities are inherently associated with some level of risk. However, considering the systemic importance of banks in the economy, it is essential that they can manage all their activities appropriately and avoid holding unnecessary exposures that might threaten financial stability. While some nonbanking activities can be managed by banks effectively, others are more difficult to manage and can increase the complexity of banks. Increasing bank complexity has serious consequences for market discipline as external market participants find it more difficult to assess the risk and creditworthiness of banks, while it can make internal management more challenging too.

Morris (2011) analyses five areas in which engaging in nonbank activities can be problematic for banks and the financial system overall. First, nonbank activities can make banks less transparent which reduces market discipline. Literature has provided plenty of evidence that banks are inherently more opaque than nonfinancial firms (e.g. Morgan 2002; Iannotta 2006) due to the greater risk associated with financial assets such as loans. However, it is also evident that banks that engage in non-traditional banking activities such as trading, market making, or private equity can be even less transparent because the successful implementation of these investments depends largely on maintaining a certain level of confidentiality about their positions. Second, the additional risk contained in nonbanking activities and increase the complexity of banks' risk management. Simply, the more different types of activities a bank has to manage, the more difficult it is to understand them. To appropriately understand any nonbank activity, banks need to obtain specialized knowledge on its different business lines, possess the relevant information systems as well as be able to allocate and price capital in the activity. Such failures due to engaging in nonbanking activities took place in several institutions during the financial crisis of 2007-2009. Third, nonbank activities can increase supervisory complexity. Bank supervision comprises monitoring several aspects of banks such as their risk management, lending and capital among others. However, bank supervision takes place only in a periodic frequency and supervisors get only a snapshot of the condition of the banking system. Consequently, the snapshots are even more blurry and ineffective for supervisors when banks engage in non-traditional activities because these activities can increase their risk exposures very quickly in the short-term, when supervisors are not looking at them. For instance, trading and market making are fulfilled daily through a series of transactions that are difficult to monitor. Fourth, in a similar way, a large variety of bank activities increases regulation complexity. The risk-based capital requirements of the Basel accords are a good example of how many activities can make bank regulation more difficult. To take into account the risks of each bank activity, the regulatory capital ratios assign different weights to assets that capture their relative riskiness. However, assigning the risk weights through regulation is prone to mispricing as the requirements are the same for all banks, while allowing banks to create their own measures will lead to risk under-pricing. Finally, when banks engage in more activities, they are more difficult to be bailed-out, increasing resolution complexity. A good example of resolution complexity is the collapse of Lehman Brothers. The bank had numerous complex transactions and interconnections with other institutions that increased the difficulty of potential buyers to conclude in the bank's value quickly.

On the other hand, there are reasonable foundations for reducing activity restrictions and allowing banks to engage in a wider set of activities. Barth et al. (2013) argue that there are three potential benefits of reducing activity restrictions. First, having less restrictions allows the utilization of economies of scale and scope. Second, engaging in more activities can increase the franchise value of banks which in turn might incentivize banks to be more prudent. Finally, allowing banks to engage in a wider set of activities offers them the opportunity to diversify their income streams and increase their stability. Liu, Norden and Spargoli (2020) show that banks that engage in more unique activities exhibit increased profitability and lower risk.

3.2.1.2 History of Restrictions on Bank Activities

Bank activities restrictions by national authorities can be traced as back as at the National Banking Act of 1864 which created a system of national banks and established the United States National Banking System. This federal banking act limited national banks to allocating their funds to short-term and highly liquid loans so that they support more the financing of the production and exchange of goods. However, during the early 1920s, national banks discovered that they could take advantage of their affiliated companies to expand their operations with investment banking and securities activities. The combination of the increased bank securities affiliates and the inflated stock prices during the 1920s contributed significantly to the stock market crash of 1929 and led the authorities to take action. The Banking Act of 1933 which included the Glass-Steagall Act made a distinction between commercial and investment banking as it prohibited affiliations (Benston 1994). More specifically, commercial banks were not allowed anymore to affiliate with companies that were engaging in securities activities such as underwriting and dealing, while securities companies were not allowed to receive deposits. Overall, the objective of the Glass-Steagall Act was to protect the stability of the banking system by limiting the exposure of commercial banks to risk-taking activities and by preventing their direct competition with investment banks.

Except for making an important distinction between commercial and investment banking, the Banking Act of 1933 also introduced restrictions on the interest rates that banks could offer to depositors (Benston 1994). More specifically, banks were no longer allowed to offer interest on demand deposits, while the Fed had the authority to impose limits on the interest rates offered for time and savings deposits. These restrictions were designed and implemented to mitigate the deposit-rate competition among banks. Regulators were concerned that deposit-rate competition was causing reductions in bank profitability which in turn could hurt the stability of the banking system. In some cases, state authorities would put limits on loan rates too (especially on consumer loan rates) to reduce bank competition.

Finally, the Banking Act of 1933 imposed geographic restrictions on banks regarding the locations they could operate in and the number of offices they were permitted to have in each location (Benston 1994). State authorities decided whether a bank established in another state could have branches in their state and if so, how many and in which counties. Also, state authorities were regulating how many banks a bank holding company (BHCs) could own in their state. Moreover, the McFadden Act of 1927 had restricted the branches and locations of national banks. This Act did not allow national banks to hold branches outside of their home state, while it allowed them to hold branches in their state with the same conditions as state banks to encourage fair competition. All these restrictions in deposit-rates, branches and locations eventually limited competition in the banking sector.

In July 2010, the US government introduced the Wall Street Reform and Consumer Protection Act which is most commonly known as the Dodd-Frank Act. The Dodd-Frank Act was written in the follow-up of the financial crisis of 2007-2009 and it is considered to be the most significant set of financial reforms to be introduced since the Great Depression. The Dodd-Frank Act consists of major changes in the rules followed by financial institutions and it is a substantial attempt to mitigate the probability of future financial crises (Krainer 2012). To accomplish that, the Act introduced strict restrictions on the activities that financial institutions can engage in and improved the protection for consumers (Acharya et al. 2010).

The Dodd-Frank Act comprises several major components and while some of them are still being implemented, as of 2020 most measures have been adopted by the US banking system. These new rules impose many activity restrictions on banks. One of the most significant and controversial new regulations is the Volcker Rule (Bao, O’Hara & Zhou 2018). The Volcker Rule aims to prohibit commercial banks from engaging in speculative activities such as proprietary trading for profit and investments in hedge funds and private equity funds. However, not all trading activities are prohibited. Because some activities are necessary for the proper functioning of the financial markets, the Volcker Rule explicitly permits a set of activities such as market making. More specifically, dealers are allowed to trade securities to facilitate client-driven transactions, but they are not allowed to engage in speculative trading of these securities so that they profit from their prices' appreciation. This measure ended up being very controversial as it received both criticism and support. Critics of the Volcker Rule argue that it would lead to reduced bond market liquidity since banks would not engage so much in market-making activities (e.g. Duffie 2012). On the other hand, proponents of the rule suggest that the dealers who are not affected by the new restrictions can compensate for any liquidity missed from banks' market-making activities. Bao, O'Hara and Zhou (2018) show that the Volcker Rule has significantly deteriorated the liquidity levels of the corporate bond market.

Both in the US and EU, prior to the financial crisis of 2007-2009, geographic restrictions on banks were removed to a great extent. It took more than a century for the US authorities to replace a system in which banking groups and their regulators were fragmented across states with a system in which banks can operate in any state and all banks are subject to centralized supervision. The fact that the transition took so long shows that some parties were benefited by the state-level constraints. More specifically, such restrictions protected the small banks from fierce competition and also kept local borrowers in distress safe from misallocation of capital (Morris 2011). Eventually, technological advancements facilitated competition between geographically distant banks and helped the geographically constrained banks to improve the diversification of their overall portfolio.

In the EU, the central goal has been to develop a single market for goods and services to enhance the international competitiveness of EU firms. Although some cross-country banking has historically existed since the first founding years of the 1950s, cross-country banking was for a long time limited to wholesale banking. A first major step towards the development of a single banking market in the EU took place during the period of 1983 to 1992 when the Second Banking Directive was adopted. This directive created a “passport” for each banking entity to open branches and offer services to any other EU member state without any other authorization. While further steps were taken along the way, in 1999, the European Council introduced the Financial Services Action Plan aiming to fully integrate the EU banking system by 2005 (Moloney 2006).

However, the two systems differ as in the US, the banking system is fully centralized, while in the EU many of the supervision responsibilities still remain at the national level. This was reflected during the financial crisis when the US managed to achieve a well-coordinated response and resolve the problems of its banking system. On the contrary, in the EU, recapitalizing those banks that survived the crisis was a responsibility of national governments and many member states struggled to respond. These inconsistencies resulted in a banking-sovereign "negative loop" which significantly prolonged the recovery from the crisis for many EU countries’ banking systems (Nieto and Wall 2015).

3.2.1.3 Literature on the Effects of Activities Restrictions

A closely related study by Jiang, Levine and Lin (2019) reviewed in section 2.2.1.3 shows that regulatory-induced competition affects negatively liquidity creation. In their paper, regulatory-induced competition refers to the reduction of activities restrictions and more specifically to deregulated interstate banking with at least one other state. Other literature studies the effects of activity restrictions mainly by using the index provided by the World Bank database and no robust evidence on lending or liquidity creation appears to exist. This section reviews some of the most important studies about the effects of activities restrictions on other essential bank elements.

3.2.1.3.1 Effect on Bank Stability

Evidence in recent literature has not reached conclusive indications for the effects of activity restrictions on bank stability as some researchers find that more restrictions prevent stability, while others show that they enhance stability. Matutes and Vives (2000) build a theoretical model that suggests that restrictions on bank assets can limit risk-taking under intense competition and complement deposit insurance and capital requirements. Beck (2008) discusses that the activity restrictions imposed after the crisis of 1929 aimed to increase stability and reduce competition. Two studies find evidence of the positive effect. First, Agoraki, Delis and Pasiouras (2011) use a sample of 546 Central and Eastern European banks across the period of 1998–2005. They use the non-performing loans ratio and the ZSCORE as measures of bank stability find that activity restrictions have a positive effect on the ZSCORE. Second, a similar study by Bermpei, Kalyvas and Nguyen (2018) uses a sample of 1052 commercial banks from 69 emerging and developing economies in the period of 2004–2013. They also use the ZSCORE as a measure of bank stability and again find a positive effect.

On the other hand, another series of studies find that activity restrictions undermine bank stability. The key theoretical prediction for this negative relationship is that these restrictions can reduce the utility of owning a bank, which motivates the risk-taking by bank owners. First, Laeven and Levine (2009) use a sample of 251 banks from 46 countries and use the ZSCORE to proxy bank stability. They find a negative effect of activity restrictions on bank stability and that this effect is amplified when the bank's largest owner holds significant cash flow rights. Second, Ongena, Popov and Udell (2013) examine the relationship between bank regulation and cross-border spillover effects by using data on lending by 155 banks to 9,613 firms in 1,976 different locations in 16 countries. They find that stricter activity restrictions in the home country lead banks to reduce their lending standards abroad. This has important implications for bank stability as not only regulators fail to discipline the bank, but they might also increase risk for the banking system by promoting greater risky interconnections with foreign parties. Third, Shaddady and Moore (2019) examine the stability implications of regulation for 2210 banks from 47 European countries over the period 2000–2016. They use a CAMELS based index as a proxy for bank stability. They find a negative effect of activity restrictions on bank stability. Finally, Danisman and Demirel (2019) use a sample of 6936 banks from 25 developed countries over the period of 2007-2015 to investigate the effects of market power and regulations on bank risk-taking. They use 8 different measures of bank risk and find that tighter activity restrictions increase the risky behaviour of banks, but this effect is mitigated by bank market power.

3.2.1.3.2 Effect on Banking Crises

Another important strand of literature examines the effect of regulations including activity restrictions on financial and banking crises. Considering the complexity of financial assets, banks can be vulnerable to small shocks, which in a highly interconnected global financial system can quickly spread across industries and countries. Overall, restrictions on bank activities are expected to limit the extent of a financial crisis and the respective literature has documented the beneficial effects of activity restrictions for banking crises.

Angkinand (2009) uses a sample with 47 banking crisis episodes in 35 industrial and emerging market economies between 1970 and 2003 to examine the severity of banking crises under bank regulation and supervision. They show that fewer restrictions on bank activities can help mitigate the severity of a banking crisis, especially in the case of a systemic crisis. They argue that offering a wide range of activities allows banks to enhance their portfolio diversification and reduce their overall risk levels. Kim, Koo and Park (2013) investigate the contributions of bank regulations to the financial crisis of 2007-2009 with data on 105 countries. They show that in these countries, during the crisis, 144 shocks took place. In line with the finding of Angkinand (2009), they observe that activity restrictions reduced the probability of banking crises.

3.2.1.3.3 Effect on Bank Efficiency

Tighter regulation can affect the efficient operation of banks. When regulators impose new activity restrictions on banks, they affect the way banks conduct their business and the efficiency of bank operations. This happens because banks may try to respond to the new regulations by engaging in riskier activities or attempt to find ways to circumvent regulation (e.g. regulatory arbitrage). This may have important implications for economic activity and stability.

Chortareas, Girardone and Ventouri (2012) use a sample of banks operating in 22 EU countries over the period of 2000–2008. They proxy bank efficiency by using a Data Envelopment Analysis (DEA) technique and by employing two accounting ratios, namely the net interest margin (cost of intermediation) and the cost-to-income ratio (cost effectiveness). They show that activity restrictions have a negative effect on bank efficiency. Similarly, Barth et al. (2013) study virtually the same research topic. They use a global sample of 4053 banks operating in 72 countries over the period of 1999–2007. They also use Data Envelopment Analysis (DEA) technique to construct a bank efficiency score and document that activity restrictions have an adverse effect on bank efficiency.

3.2.1.3.4 Other Effects

Houston, Lin and Ma (2012) examine how regulatory differences across countries affect international bank flows. By exploiting several databases, they use a global sample over the decades of 1990s and 2000s. Their analysis provides strong evidence that banks opt to transfer their funds to less tightly regulated jurisdictions. More specifically, employing the current account as a proxy for aggregate capital outflows, they show that stricter activity restrictions are positively associated with aggregate capital outflows.

Hoque et al. (2015) investigate risk implications of bank regulations. More specifically, they examine distance to default, systemic risk, idiosyncratic risk, and systematic risk. They use a sample 378 global listed banks over the period of 2006-2011. First, they show that restrictions imposed on bank activities are negatively related to distance to default and thus, fail to enhance bank stability when crises break out. Second, they show that more activity restrictions are positively related to the Marginal Expected Shortfall (MES) measure of systemic risk (higher values indicate less systemic risk), suggesting that activity restrictions decrease individual banks' contribution towards overall systemic risk. Chen et al. (2021) also investigate the role of bank regulations on systemic risk. Their study uses a sample of banks from 65 countries in the period of 2001-2013 and measures systemic risk with the MES. Like Hoque et al. (2015), they show that activity restrictions are positively related to MES.

3.2.1.3.5 Summary of the Effects of Activity Restrictions

In summary, the literature has not provided consistent evidence on whether activity restrictions are beneficial or not for the banking industry. The extant studies show that while activity restrictions prevent financial crises, they impede bank efficiency. At the same time, although activity restrictions are shown to contribute to systemic risk, evidence on the effect on bank stability is conflicting and nonconclusive. These inconsistencies and the limited research that exists on the effect on liquidity creation highlight the need for further evidence on the effects of activity restrictions.

3.2.2 Official Supervisory Power

3.2.2.1 Background of Bank Supervision

The numerous cases of banking crises in jurisdictions around the world have led national and international policy makers to increase their focus on the critical role of banking supervision. One important development over the years has been the shift of policy makers' attention from regulation to supervision. Powerful supervision of banks can have beneficial effects for bank corporate governance, especially in an environment in which information and transactions costs as well as government policies influence the incentives of private agents to monitor banks (Stigler 1971). This view of supervisory power holds because private agents are often unable to effectively monitor powerful banks. As a result, a powerful supervisory authority that bears the responsibility to directly monitor and discipline banking institutions can improve bank corporate governance, mitigate bank lending corruption and overall enhance the intermediation role of banks in society. However, the supervisory power view assumes that official authorities not only have the expertise, but also the rightful incentives to prevent and provide effective solutions to market imperfections. Policy discussions are now focused on the most important problems that need to be addressed to enhance the effectiveness of supervision such as the structure of bank supervision.

3.2.2.2 Bank Supervision Structure

The structure of bank supervision plays an important role in supervisory power and vice-versa. Two main issues puzzle policy makers about the structure of bank supervision. First, whether there should be one single authority to supervise banks or whether there should be a group of several authorities collaborating for more efficient bank supervision. As centralized supervision becomes more popular, understanding its role for supervisory power (and vice-versa) is important. Beck, Silva Buston and Wagner (2021) argue that supranational supervision with cooperation of authorities improves bank stability, but this effect is largely dependent on institutional characteristics such as supervisory power. At the same time, centralized supervision may enhance or impede a local authority's supervisory power. There are numerous arguments for and against a single banking supervisory authority that Barth et al. (2003) split into three categories: 1) safety and soundness, 2) costs to supervisory authorities and 3) costs to market participants.

About the safety and soundness of the banking system, most arguments are for a single banking supervisory authority. First, the presence of different regulatory policies is likely to allow some loosely supervised banks to grow large and complex as no single authority bears the responsibility for the consolidated supervision of banking corporations across different countries and regions. Second, under multiple supervisory authorities, banks may be encouraged to engage in regulatory arbitrage and incentivize the supervisory authorities to compete for more relaxed regulations. Third, a single supervisory authority is better able to address potential conflicts among regulations it can make quicker decisions with less frictions. Fourth, a single authority is more transparent and accountable and it is less likely to put the blame for a mistake to another authority. Fifth, a single authority is more flexible to respond to sudden advancements in the financial markets and address problems. Finally, a single supervisory authority can facilitate the international collaboration on bank supervision as foreign supervisors will only have to communicate with one authority. On the other hand, multiple supervisory authorities can take advantage of a wider pool of approaches to supervision than a single authority that has limited resources, which can promote the stability of the banking system.

Another important issue regarding the number of supervisory authorities is the cost that authorities will need to pay to maintain more supervisory entities and whether this extra cost is efficient. A single authority may be cost efficient for three reasons. First, a larger single authority can take advantage of economies of scale, something that is more likely to occur in small countries with small financial systems. Second, a larger single authority will be more efficient in the allocation of resources (e.g. human resources) and it many countries where resources are limited this is an important advantage. Finally, a single authority is more efficient in monitoring the new activities of banks as it uses a centralized monitoring system. On the other hand, a large single authority can also become excessively bureaucratic and inefficient.

Finally, the question on the number of supervisory authorities also involves the costs occurred by market participants. On the one hand, a fragmented supervisory system can increase the regulatory costs for large and complex institutions that are subject to supervision by multiple authorities. A single authority is simpler for institutions and consumers to follow and understand. On the other hand, multiple supervisory authorities can respond faster on regulating financial innovations and help institutions utilize their new products and services more efficiently. Moreover, a single authority might turn too powerful, leading to implications about corruption that can be harmful for the banking system.

3.2.2.3 The Role of Central Banks

A second important issue regarding the structure of bank supervision authorities that affects supervisory power is whether central banks should be involved. Barth et al. (2003) argue that despite the lack of evidence on the effectiveness of the central bank being responsible for bank supervision, there are theoretical arguments for and against central bank's involvement.

There are several advantages for stability and cost-efficiency in the involvement of central banks in bank supervision (Doumpos, Gaganis & Pasiouras 2015). First, as the central bank is responsible for the monetary policy and movements of key interest rates, having a closer oversight of the condition of the banking sector will help the central bank to take more informed decisions, taking into consideration all implications. The same holds for the role of the central bank as a lender of last resort for which it needs an accurate picture of banks' liquidity and solvency condition, especially in times of crisis. Second, as central banks often enjoy a great level of independence, enforcement of actions will be easier. Finally, central banks are usually better able to hire more competent staff and thus, exert more effective supervision.

In contrast, assigning partial or sole supervision of the banking sector to the central bank can also entail disadvantages for stability. First, should the central bank have the responsibility for both banking supervision and monetary policy, it might choose a "too loose" monetary policy to protect banks' earnings and creditworthiness. Second, if the central bank is responsible for banking supervision and bank failures occur, it could damage its reputation and the credibility of its monetary policy. Third, while the central bank needs access to information about the condition of banks, provision of this information by other authorities and collaboration can be more efficient. Finally, if the central has multiple responsibilities it be subject to political pressure which might threaten the central bank's monetary policy independence.

3.2.2.4 Literature on the Effects of Supervisory Power

As with activities restrictions, the effects of official supervisory power have been mainly investigated by using the World Bank database, initiated by Barth et al. (2003) and later developed by Barth, Caprio and Levine (2013). Some other ex post evidence on the effects of regulatory interventions is provided by Berger et al. (2016) who document a significant reduction in liquidity creation levels following interventions (reviewed in Chapter 2). However, ex ante supervisory power to intervene could have different effects as in the presence of powerful supervisors who can intervene if a problem occurs, banks could display greater discipline and management of their intermediation role. This subsection reviews both theoretically and empirically literature on the effects of supervisory power.

3.2.2.4.1 Advantages and Disadvantages of Supervisory Power

Barth, Caprio and Levine (2004) argue that it is not clear whether bank supervisors should have more power to intervene or not. One view suggests that it is advantageous for the banking system for the following reasons. First, monitoring complex institutions such as banks is costly and difficult. This naturally leads to weak monitoring of banks and jeopardizes the stability of the banking system. Giving more power to supervisors alleviates this issue as even in the absence of strong monitoring, they can intervene and prevent bank failures. Second, due to informational asymmetries, banks are exposed to bank runs which can be dangerous for the bank itself and other systemically interconnected banks. In the presence of powerful supervisors, such asymmetries can be alleviated and reduce the likelihood of bank runs. Finally, the adoption of deposit insurance schemes creates some issues with respect to bank monitoring. More specifically, deposit insurance provides incentives to banks to take excessive risks, while it also reduces depositors' incentives to monitor the banks. Strong supervision can help mitigate these problems by preventing banks from engaging in unnecessary risk-taking.

On the other hand, supervisory power can have a negative influence on the banking system. Supervisors might forgo their main goal to maintain the stability of the banking system and use their powers to prevent runs and failures and instead, they might use their powers to favour their personal interests such as extract bribes or receive campaign donations (Shleifer & Vishny 1998; Djankov et al. 2002; Quintyn & Taylor 2002). These conditions imply that powerful supervision will not enhance bank development, performance and stability, but it will rather encourage corruption. Kane (1990) and Boot and Thakor (1993) offer a different perspective which focuses on the agency issues between bank supervisors and taxpayers. More specifically, in their theoretical model, Boot and Thakor (1993) examine the behaviour of a self-interested bank supervisor under uncertainty about the supervisor's ability to effectively monitor banks. They show that under these circumstances, bank supervisors are likely to opt for socially sub-optimal actions. Therefore, should bank supervisors be self-interested and taxpayers be unable to monitor banks, greater supervisory power may deter the operations of the banking system.

3.2.2.4.2 Effect on Bank Stability

Official supervisory power could affect bank stability either positively or negatively which is also reflected in the mixed existing evidence. Levine (2003) argues that powerful supervisors can improve bank governance and promote competition in the banking sector. Thus, strong and independent supervisors should be able to prevent banks from engaging in an excessive risk-taking behaviour by having the power to intervene and make corrections. However, a powerful supervisory authority may take advantage of its advantageous position to influence credit allocation to receive private gains (Beck, Demirgüç-Kunt & Levine 2006). Successively, poor allocation of lending may lead to inefficiencies and poor loan quality, compromising bank stability through corruption (Beltratti & Stulz 2012).

As with the theoretical predictions, empirical evidence is contrasting too. First, Agoraki, Delis and Pasiouras (2011) document a significant effect of supervisory power that is negative on credit risk (percentage of non-performing loans) and positive on bank stability (ZSCORE), consistent with the prediction that powerful supervisors can prevent excessive risk-taking. On the other hand, Bermpei, Kalyvas and Nguyen (2018), Danisman and Demirel (2019) and Shaddady and Moore (2019) document a negative effect of supervisory power on bank stability commonly measured by the ZSCORE. This is consistent with the argument on possible corruption and misallocation of credit driven by excess supervisory power. Finally, Ongena, Popov and Udell (2013) do not find any significant effect of supervisory power on bank stability.

3.2.2.4.3 Effect on Banking Crises

Should supervisory authority have great power to monitor and discipline banks, it can take such corrective actions to either punish banks for violating regulations and engaging in imprudent behaviour or attempt to prevent such behaviour. Greater supervisory power should therefore be able to contain banking crises (or at least contribute towards containing them) by limiting banks' risky behaviour (e.g. excess lending). However, some limited existing evidence on this effect of supervisory power on banking crises by Angkinand (2009) and Kim, Koo and Park (2013) does not unveil any significant contribution of supervisory power on the prevention of banking crises. Kim, Koo and Park (2013) only document that supervisory power contains currency crises.

3.2.2.4.4 Effect on Bank Efficiency

From a theoretical viewpoint, supervisory power can either enhance or impede bank efficiency. If bank supervisors have the incentive and expertise to prevent market failures because of imperfect information, stronger supervisory power should be beneficial for banks. Hence, a powerful supervisory authority which directly monitors and disciplines bank entities can improve bank governance and efficiency. On the other hand, supervisors might not have the prevention of market failures as their best interest and might seek to satisfy their personal interests instead. Therefore, if bank supervisors take advantage of their power against the public interest, supervisory power may impede bank efficiency. Some limited existing evidence supports that supervisory power enhances bank efficiency. More specifically, Chortareas, Girardone and Ventouri (2012) and Barth et al. (2013) provide empirical evidence that the strengthening of supervisory power is positively associated with the efficient operations of banks, although Barth et al. (2013) find that this holds only in countries with independent supervisory authorities.

3.2.2.4.5 Other Effects

Houston, Lin and Ma (2012) provide some interesting findings on how supervisory power and independence affect cross-country bank inflows and outflows. They show that banks move their capital from jurisdictions with powerful and independent supervisory authorities to jurisdictions with weaker and less independent authorities. Also, their findings suggest that strengthening the supervisory power of the authorities in the source country significantly increases the probability of a bank's foreign expansion, while strengthening the supervisory power of the authorities in the host country reduces the probability of a foreign bank's presence.

Hoque et al. (2015) who examine the risk and return implications of bank regulations also provide interesting insights. They show that banks which operate in countries with stronger supervisory power enjoy higher returns. Also, their findings show that more powerful supervisory authorities increased bank risk-taking during the credit crisis, consistent with negative view on supervisory power and the rent seeking behaviour of supervisors who may try to use their power to satisfy their private interests.

3.2.2.4.6 Summary of the Effects of Official Supervisory Power

In summary, the literature has provided limited and mostly mixed evidence on the effects of official supervisory power. More specifically, although a positive effect is unearthed for the effect on bank stability, no significant results have been found for the effect on bank efficiency and the extant evidence on the effect on bank stability is conflicting. The limited and mixed evidence on the effects of supervisory power emphasizes the need for further evidence.

3.2.3 Capital Regulations

The goal of imposing bank capital regulations (also referred to as bank solvency regulations) is to reduce systemic risk and other burdens associated with bank failures as well as to mitigate moral hazard issues. Imposing minimum capital adequacy requirements on banks is an important element of bank regulatory frameworks in most countries. Banks that fail to meet the minimum requirements can be subject to close supervision and monitoring by authorities and in extreme cases they might even be liquidated.

The simplest approach to imposing capital requirements is to ask from all banks to hold a minimum ratio of equity to assets. However, this approach has several important disadvantages as outlined by Gordy, Heitfield and Wu (2015). First, by not taking into consideration the risk level of assets, a simple equity ratio effectively benefits banks that hold riskier assets. With such a simplistic requirement, banks may choose a riskier portfolio tempted by higher future returns, however, without holding more capital to protect the solvency of the bank from the higher volatility of their investments. Hence, when capital requirements do not take into account asset risk, they encourage banks to take more risk. Second, using capital adequacy requirements based only on accounting leverage is easy for banks to evade. More specifically, sophisticated institutions can easily find alternative solutions to reduce the amount of assets that they hold and therefore increase a simple equity ratio. By securitizing assets, trading in derivatives or providing credit guarantees, banks can hide risky assets and remove them from the balance sheet. Due to these implications, bank regulators have been focusing on adjusting regulatory capital requirements so that they address the risk associated with banks' activities.

Since the global banking system is highly interconnected, numerous benefits arise from imposing risk-based capital regulations with international coordination (Gordy, Heitfield & Wu 2015; Engel 2016; Kara 2016). First, with globally accepted and implemented capital adequacy standards, individual governments are tempted to lower the requirements for their own banks. While all bank regulators prefer a stable and well-capitalized banking system that is resilient to systemic risks, a country's authorities might opt to loosen the rules for their banks in order to help them grow faster and compete more aggressively in the international financial markets. Therefore, in the absence of internationally agreed standards, countries might start competing with each other and gradually lower the average global capital requirements, putting the international banking system at a greater risk. Instead, when countries work together and adopt common rules, national banking authorities do face such a dilemma and apply commonly agreed safer capital adequacy standards. Second, international coordination reduces compliance costs that arise when internationally active institutions must comply with many different capital regulations across several jurisdictions. Third, internationally agreed standards promote transparency because they help the comparison of banks operating under different jurisdictions. Finally, internationally applied rules help the authorities smaller or less experienced countries to apply rigorous capital regulations as they may have limited access to technical expertise.

3.2.3.1 Basel Accords: 1988 to Today

In 1988, the Basel Committee on Banking Supervision published its first set of minimum capital requirements for banks based on international collaboration among several national banking authorities. The first Basel Committee accord is now referred to as Basel I for consistency with the subsequent versions. While the requirements in Basel accords do not carry any enforcement of the suggestions by law, the capital requirements of Basel I were practically implemented by the G-10 countries in 1992. Generally, the Basel Committee relies on the good will of governments to adopt its recommendations. Today, most countries with developed banking systems apply the Basel Committee capital adequacy standards.

While Basel I made an important breakthrough by establishing the use of risk-based capital ratios, it lacked important features and was criticised on several points (e.g. Wagster 1999; Jones 2000).[7] Due to these limitations in the design of the capital requirements of Basel I, regulators started making broad revisions to the first accord during the late 1990s. Following a process of public consultation and extensive amendments, in 2004, the Basel Committee published the new

[7] First, it offered limited differentiation of credit risk by using only four very broad risk weightings. Second, it was a static default risk measure, assuming that requiring from banks to hold a minimum of 8% capital would shield them from failures at all times, neglecting that default risk is changing its nature through time. Third, the Basel I capital adequacy ratio did not recognise the term-structure of credit risk as the capital charges for all credit exposures were set at the same level regardless of their maturity. Fourth, potential counterparty risk was poorly calculated with a simplistic method. More specifically, exposures to different currencies and macroeconomic risk were largely overlooked factors, assuming a common market for everyone which is not reflective of real market conditions. Finally, Basel I failed to take into consideration any portfolio diversification effects. Since banks hold a large variety of assets, the sum of all their individual risk exposures differs from the combined risk profile when these exposures are grouped into a portfolio because of potential diversification benefits. Thus, it was incorrect to sum up off the individual risk as this is very likely to result in misleading estimations of the risk weighted assets.

capital adequacy standards, while in 2005, it published the new regulations concerning the bank trading and risk mitigation activities. These new more detailed standards became known as Basel II, a revised framework of Basel I that national banking authorities needed to align their frameworks with and start implementing them.[8] European and Japanese banks started implementing these changes as early as in 2007, while the transition to Basel II in the US started later in 2008.

Basel II requires the same minimum risk-based capital ratio as Basel I at 8%. Also, Basel II only modestly updated the requirements for Tier 1 and Tier 2 capital (the sum of Tier 1 and Tier 2 capital is the numerator of the accord's capital ratio). On the contrary, the Basel II capital ratio contains dramatic changes in the calculation of risk-weighted assets, the denominator of the ratio, as Basel II uses a significantly more detailed method to estimate the risk-weighted assets than Basel I. More specifically, the capital standards set at Pillar I are designed to ensure that Tier 1 and Tier 2 capital can cover credit risk associated with banks' traditional lending portfolio, trading activities' market risk as well as operational risk arising from the failure of internal controls.

Despite the significant advancements in calculating more comprehensively the risk-weighted assets by the Basel Committee, the financial crisis of 2007-2009 that included severe failures in the banking industry raised criticism for the effectiveness of international banking regulations. The

[8] The main advantage of Basel II over its predecessor is that it contains a more comprehensive approach on capital regulation. The first Basel accord put forward a simple set of minimum capital standards, but Basel II introduced minimum capital standards in a wider framework of regulatory and market discipline. Basel II puts forth the new standards in three pillars that were designed to reinforce each other. Pillar I introduces minimum risk-based capital requirements aiming to increase the capital buffers to absorb credit, trading and operational risks that financial institutions face. Pillar II introduces new guidelines to assist supervisors in monitoring the internal risk management processes of banks as well as give more freedom to them to demand higher minimum capital requirements in order to cover these risks that are overlooked by Pillar I. Finally, Pillar 3 establishes new public disclosure standards in order to increase transparency on banks' risk-taking which will further increase the effectiveness of market discipline on bank capital adequacy. Decamps, Rochet and Roger (2004) construct a theoretical model of bank behaviour to examine the role of the new standards introduced by Basel II under moral hazard implications. They show that under the new standards, supervisors are enabled by market signals. Therefore, the effectiveness of the tightness of the Pillar I standards and the invasiveness of Pillar II monitoring depends on the quality of public disclosures under the Pillar III guidelines.

crisis revealed many weaknesses in the way that banks manage not only their idiosyncratic risks but most importantly the risks that arise from systemic financial and economic shocks. Regardless of the Basel accords and improvements in the capital standards, the crisis showed that banks were highly leveraged and any capital that they held was not sufficient to cover their loan and trading losses. At the same time, the big systemic institutions were largely interconnected. This led to procyclical deleveraging, while liquidity buffers plummeted since most institutions were facing the same types of risks simultaneously. The risk assessments of banks failed dramatically as many financial instruments exposed to credit risk had low levels of market liquidity and price transparency. Thus, although not fully implemented at the time, the Basel II capital standards did not succeed in covering the real risks faced by banks (Caprio, Demirgüç-Kunt & Kane 2010; Moosa 2010).

Following the systemic turmoil of the crisis, the Basel Committee introduced Basel III in 2011. Basel III aims to increase the effectiveness of the risk-based capital framework of the previous accords by enhancing the rules under the three Pillars of Basel II. More specifically, Basel III improvements focus on three major areas regarding regulatory capital requirements: 1) enhancing the estimations of risk-weighted assets, 2) increasing the quality, consistency and transparency of

Tier 1 and Tier 2 capital and 3) introducing new macroprudential dimensions on the minimum capital requirements.[9]

However, the implementation of Basel accords has been traditionally difficult, especially for advanced economies where the new rules have to be aligned with the domestic post-2009 regulatory reforms. Adding to the difficulties of Basel III implementation, the global financial turmoil caused by the COVID-19 pandemic alerted the Committee that published updates with the respect to the capital requirements, such as deferring the implementation of many currently outstanding Pillar I, II and III requirements from Basel III (Wass 2020).[10]

<u>3.2.3.2 The Effect of Capital Requirements on Liquidity Creation and Lending</u>

As tighter capital requirements are the main tool exercised by authorities to protect banks from future insolvency, a great part of empirical and theoretical literature has been dedicated to

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[9] Basel III focuses significantly on both the quality and the quantity of the capital base held by banks. During the financial crisis, it became evident that some types of bank capital were not able to adequately buffer against the losses incurred by banks. The capital resources that did a better job in absorbing losses and loan write-offs were mostly common equity and retained earnings. As a result, Basel II emphasizes that banks need to maintain greater levels of Common Equity Tier 1 (CET1) capital that primarily comprises common shares, retained earnings and accumulated other comprehensive income. More specifically, the minimum risk-based capital requirement for CET1 has increased from 2% to 4.5%, while and the minimum total Tier 1 ratio has been raised from 4% to 6%. As of 2020, under Basel III, the minimum capital adequacy ratio (Tier 1 and 2, including the capital conservation buffer) required from banks to hold is at 10.5% of their risk-weighted assets. To prevent banks from inflating their capital base with forms of capital that do not have a very strong absorbing capacity for losses during periods of crisis, Basel III removes Tier III capital from the numerator of the capital adequacy ratio and set prudential adjustments and other deductions. The new approach clarifies many of the obscurities that existed in the capital requirements of the previous accords. In line with this, the disclosure requirements of Pillar III have been extended to help the international coordination of the implementation of the new capital requirements.

[10] In particular, the Basel III standards finalised in December 2017 that were planned to be implemented in 1 January 2022, will now be implemented in 1 January 2023. The same holds for the revised market risk framework and the revised Pillar 3 disclosure requirements. These standards have a complementary role to the initial Basel III standards and the deferral of their implementation is not expected to affect the capitalization of the global banking system, but rather offer to banks and supervisors more space to respond quickly and effectively to the problems caused by COVID-19. The COVID-19 crisis is an example of a period during which most systemically important banks are likely to face significant losses and the post-2007-2009 crisis requirements are designed so that banks hold enough capital to absorb these losses. In line with the loss-absorbing capacity of capital, the European Central Bank has asked from the Eurozone banks to stop paying out dividends until at least January 2021 as well as to be as moderate as possible in paying staff bonuses as long as the pandemic is hurting the European economy. However, analysts argue that should this measure be prolonged, it might bring counterproductive results. More specifically, the measure penalizes the sector as a whole and raises the cost of equity for all banks, regardless of whether they can withstand the COVID-19 losses or not.

examining the effects of the new capital regulations. The effects of capital stringency on liquidity creation have received particular attention by researchers after the financial crisis and mainly after the introduction of the method to measure liquidity creation by Berger and Bouwman (2009). Various studies document a negative relationship between capital and liquidity creation, mainly for small banks with evidence from all over the world (i.e. US: Berger and Bouwman (2009), Czech Republic: Horváth, Seidler and Weill 2014 (2014), Asia-Pacific: Fu, Lin and Molyneux (2016), Russia: Fungáčová, Weill and Zhou (2017), Europe: Casu, Di Pietro and Trujillo-Ponce (2019)). This negative effect is attributed to the financial fragility associated with high leverage which however helps banks to commit to monitoring their borrowers and creating loans. On the other hand, only a few studies document a positive relationship. Berger and Bouwman (2009) find a positive effect for large banks and Tran, Lin and Nguyen (2016) find an overall positive effect using the same US sample but with a Panel VAR estimator.[11] This positive effect is attributed to the capacity of capital to absorb the risk inherently associated with liquidity creation.

Apart from the evidence on the relationship between bank capital and liquidity creation, another very closely related strand in the literature investigates the effects of capital requirements on lending, a major component of liquidity creation and a key aspect of policy making. This section reviews some of the most prominent studies in this strand of the literature.

First, a couple of studies that investigate the effects of the first Basel accord incorporate the role of monetary policy in their analysis. One of the goals of monetary policy is to stimulate bank lending when needed and capital requirements could impede the effectiveness of an expansionary monetary policy. Using a US sample, Thakor (1996) examines the effects of risk-based capital requirements on bank lending and the effectiveness of monetary policy under the new capital

[11] This literature is reviewed in detail in section 2.2.1.1.

standards. The author provides evidence through both a theoretical model and an empirical analysis and finds strong evidence that these capital requirements increase equilibrium credit rationing and lower aggregate lending. Additionally, it is shown that the Fed's efforts to increase the money supply not only fail to increase lending under capital requirements based on credit risk, but they might even lower lending. Kishan and Opiela (2000) conduct a similar analysis to investigate implications of capital requirements for monetary policy and bank lending. They divide the banks into six asset size classes and each size class into three capital classes. They find that the lending of small banks with low capitalization are most responsive to monetary policy, while the large time deposits of these banks are unresponsive. This shows that small undercapitalized banks cannot attract alternative financing to continue creating loans during contractionary policy and thus, bank capitalization should be used to assess the design of monetary policy before its implementation. Overall, these papers show that capital regulations are not just limiting banks' capacity to extend their lending, but they have severe implications for monetary policy too. Adding to these papers' findings, Gambacorta and Mistrulli (2004) examine the existence of cross-sectional differences in the effects of monetary policy and GDP shocks on bank lending due to differences in capitalization. They show that it is easier for well-capitalized banks to protect their lending from monetary policy shocks, since being higher capitalization offers them the opportunity to access non-deposit funding, consistent with the bank lending channel hypothesis. Moreover, they show that the bank capital effect is greater for banks that depend more on uninsured external financing, than for credit cooperatives. They also provide evidence for the bank capital channel (monetary policy affects lending through an indirect effect on capital, e.g. increasing banks' cost of capital) which is stronger for small banks with a wider maturity mismatch between assets and liabilities.

Bridges et al. (2014) examine the effect of microprudential regulatory capital requirements on bank lending with a sample of UK banks in the period of 1990–2011. First, they show that capital requirements indeed increase banks' capital ratios to meet the required minimum. Second, they find that capital requirements affect bank lending but with different effects depending on the sectors in the economy. Overall, in the year following a tightening of capital requirements, banks, on average, reduce their loan growth for commercial real estate companies, other corporates as well as household secured lending. However, the effect on unsecured household lending is smaller and largely insignificant for the first year after an increase in capital requirements. The authors also show that bank loan growth recovers after three years. Their results suggest that increasing capital requirements for undercapitalised banks might augment rather than reduce their lending.

Aiyar et al. (2014) investigate the effects of bank-specific capital requirements on cross-border lending using a dataset of 97 UK banks from 1999 to 2006. Because the recipient countries have multiple relationships with the UK-based banks, the authors can control for demand effects. Their findings show that increases in bank capital requirements have a negative and significant effect on the cross-border loan supply. Interestingly, they also show that UK banks tend to favour their most important countries and thus, the negative effect of capital on lending is stronger on their less important countries. Finally, they find evidence that banks cut their cross-border lending to other banks more than they do to firms and households (probably because wholesale lending is easier to withdraw).

Noss and Toffano (2016) study how future changes in aggregate regulatory capital requirements may affect the macroeconomy when the credit cycle is at an upswing. Such requirements my appear as macro-prudential policies and are important to understand. They use a quarterly dataset of UK banks from 1986 to 2010 and employ a VAR method to examine the response of other variables to a shock in capital ratios. Their analysis shows that a positive shock of 15 basis points in aggregate leverage-based bank capital ratios based in the UK leads to a median reduction of about 1.4% in the bank lending levels in the following 16 quarters.

Naceur, Marton and Roulet (2018) use a sample of bank holding companies from 23 countries (US and European Countries) for the period of 2008-2015 to investigate the effects of Basel III capital and liquidity requirements on lending. Their findings show that increasing capital ratios leads to significant and negative effects on bank retail- and other- lending growth for the big European banks. They also argue that in the setting of bank deleveraging and the credit crunch during the post-crisis period in Europe, capital requirements encourage the substitution of the retail- and other- loans with more risk-free assets such as more liquid government bond securities.

Fang et al. (2020) provide novel evidence on the relationship between bank capital requirements and lending for emerging economies which have been largely neglected in the literature and more specifically for the case of Peru. Their findings suggest that increasing capital requirements has only a temporary impact on lending. More specifically, a one percentage point increase in the required minimum can lead to a reduction in lending growth of about 4-6 percentage points over the next quarter. However, when examining the effects of capital requirements on lending growth over the period of six months and beyond, the authors do not find any significant differences between periods with and without capital increases.

3.2.4 Market Monitoring

Supervisory authorities often take actions to encourage market monitoring. This section focuses on two different sets of actions that promote market monitoring: private-sector monitoring encouraged through information disclosure and actions taken against the moral hazard issues associated with deposit insurance.

Barth, Caprio and Levine (2004) argue that there are different theoretical predictions about the role of market monitoring. Some are in favour of encouraging the private sector to monitor banks as official supervision may be subject to corruption and may promote inefficient policies. For example, Shleifer and Vishny (1998) argue that banks can put pressure on politicians who, in turn, may adversely influence supervisory oversight. Moreover, in several countries, supervisors are not paid so well as in other jurisdictions and may opt to be employed in the banking sector, leading to a situation filled with conflicts of interest and thus, fail to strictly enforce the official rules. Finally, as supervisors usually do not have invested their wealth in the banks they regulate, their incentives to monitor banks are very different than the ones of private creditors who can impose market discipline on financial institutions.

On the other hand, market monitoring is not supported by everyone. Adversaries of market monitoring argue that in countries in which the capital markets and financial institutions are not well-developed leaving bank monitoring to the market is not a credible solution. Also, even in the most developed countries with the most sophisticated banking systems, banks remain complex and opaque institutions and they are difficult for the private sector to monitor. Therefore, under bank opacity and reliance on market monitoring, banks may easily exploit depositors and eventually compromise bank stability.

3.2.4.1 Private-Sector Monitoring

Actions to promote private-sector monitoring can include a wide range of requirements such as requiring certified auditing, credit ratings provided by international rating agencies (e.g. the Big 3 S&P, Moody's and Fitch), the income statement to include accrued or unpaid interest or principal on non-performing loans, disclosure of off-balance sheet activities and risk management practices, whether subordinated debt is allowed/required as part of regulatory capital and whether there are mechanisms of cease and desist type orders. Such requirements from official bank supervisory authorities can enhance the power of private creditors and the public to monitor banks more closely and impose market discipline.

It is now evident that the lack of transparency of financial institutions contributed significantly to the severity of the global financial crisis of 2007-2009 (Flannery, Kwan & Nimalendran 2013). Banks were particularly opaque with their exposures to securitized instruments and off-balance sheet items. This alerted regulators who designed and introduced new disclosure requirements for banks. The Basel III capital requirements which incorporate the Pillar 3 that focuses on bank disclosure and market discipline are believed to be an important step forward in private-sector monitoring and bank stability (BIS 2018). Disclosure requirements such as Basel's Pillar 3 can help investors to have a clearer picture of banks' condition and subsequently incorporate the new information to asset prices, leading to a more efficient market. Banks are expected to respond to greater market monitoring by behaving more prudently and improving their risk management to prevent future problems.[12]

The analysis in this chapter considers private monitoring encouraged through the disclosure of off-balance sheet exposures, the inclusion of subordinated debt as part of regulatory capital and processes of cease-and-desist form orders that impose penalties on bank directors and managers for their prohibited actions. Basel's Pillar 3 requires detailed disclosure of both off-balance sheet exposures and subordinated debt which is included as part of Tier 2 capital. Moreover, several jurisdictions implement cease-and-desist form orders. For instance, for the implementation of the Basel III Interest rate risk in the banking book (IRRBB) requirements in the US, "*bank supervisors have statutory authority to use informal and formal enforcement powers to address interest rate risk deficiencies at institutions subject to the IRRBB guidelines. These powers can include informal Board Resolutions and Memorandums of Understanding as well as formal Cease and Desist Orders.*" (BIS 2019).

[12] Post-crisis disclosure requirements are introduced as complementary to capital requirements as the latter may limit banks' ability to extend their lending to the real economy and thus delay the recovery from the crisis. It is however widely argued that the complementary role of disclosure requirements can reduce the short-term economic costs arising from the tightening of capital requirements (Vauhkonen 2012). The last revision on the Pillar 3 disclosure requirements was published by the BCBS in December 2018 and it focuses on eight different areas that banks need to align their reporting with the new rules: credit risk, operational risk, leverage ratio, credit valuation adjustment (CVA), risk-weighted assets, risk management practices, asset encumbrance and capital distribution constraints. For credit risk, the Pillar 3 disclosure requirements put particular emphasis on clearly reporting non-performing and off-balance sheet exposures and require that banks break them down into their key components. For operational risk, banks should disclose their policies, frameworks and guidelines as well as their structure and organisation dedicated to operational risk management. For their leverage ratio, banks should disclose a series of 12 items that constitute the leverage ratio by making 11 adjustments to the total consolidated assets. For CVA risk, banks should disclose the methods used to identify, measure, monitor and control it. For RWA, banks must disclose a full standardized RWA according to the Basel framework and compare it with their modelled RWA for which they have supervisory approval to use. Banks must also disclose the exact risk management practices that they have followed to calculate the RWA as a denominator of the capital adequacy ratio. Moreover, banks should disclose the amount of their encumbered and unencumbered assets. Finally, banks must disclose their capital ratios and which capital distribution constraints may be triggered. The implementation deadlines for the members of the BCBS which cover the largest part of the global economy span from 2016 to 2022 depending on the requirement (BIS 2020).

3.2.4.2 Deposit Insurance and Mitigation of Moral Hazard

The numerous bank failures that occurred during the financial crisis of 2007-2009 illustrated the significance of effective depositor compensation/insurance schemes. The report issued by the BCBS and the International Association of Deposit Insurers on the Core Principles for Effective Deposit Insurance Systems highlights the need for authorities to agree on an international set of principles for effective deposit insurance schemes (BIS 2009).

A well-designed deposit insurance scheme contributes to the stability of the financial system by providing a powerful safety net. However, a poorly designed deposit insurance scheme can increase risk in the banking industry through moral hazard. Moral hazard refers to the incentive for excessive risk taking by banks which may attempt to exploit the benefits of protection. When depositors believe that their money is well-protected or that banks will not be allowed to fail, banks are essentially not threatened by deposit withdrawals and may engage in risky behaviour. Usually, actions to mitigate moral hazard are incorporated in the design of the deposit insurance schemes and include adjustments such as limiting the amounts insured, excluding some types of depositors from coverage and implementing risk-adjusted premium schemes.

Apart from addressing moral hazard in the design of the deposit insurance scheme, moral hazard should also be mitigated through other aspects in the financial system by developing and supporting the proper managerial incentives. This can be accomplished by requiring enhanced corporate governance, strong risk management processes, prudential regulation, supervision and other actions that promote prudent bank behaviour. The report stresses the importance of effectively mitigating moral hazard in several instances. First, for countries that move from a blanket guarantee (fully insured deposits) to a limited coverage deposit insurance scheme, the transition should as fast as the conditions allow it, because of the adverse effects moral hazard may have.

<u>3.2.4.3 Literature on the Effects of Market Monitoring</u>

The existing literature has mostly used the private monitoring indexes by the World Bank survey to examine the effects of market monitoring on various aspects of banking rather than the mitigation of moral hazard. This subsection presents the most relevant empirical evidence on the effects of market monitoring (through private monitoring and mitigation of moral hazard regulations) on bank stability, efficiency, crises and other elements of banking.

3.2.4.3.1 Effect on Bank Stability

Stronger regulatory induced market monitoring can have a beneficial contribution to bank stability as market discipline can reduce banks’ excess risk-taking and moral hazard issues (Anginer, Demirgüç-Kunt & Zhu 2014). On the contrary, requiring from banks to make more transparent disclosures can decrease the incentives of bank creditors to roll over their financing in the case of a negative signal (Huang & Ratnovski 2011). In response, banks may attempt to compensate for this by taking more risk.

Empirical literature has mostly yielded a positive effect of market monitoring on bank stability. First, private monitoring is found to improve bank stability by Agoraki, Delis and Pasiouras (2011) and Bermpei, Kalyvas and Nguyen (2018), while Shaddady and Moore (2019) find that private monitoring hurts bank stability. Bermpei, Kalyvas and Nguyen (2018) also find that the positive effect of private monitoring is reduced in the presence of stronger creditor rights. Moreover, the studies that use the deposit insurance index (greater values indicate less market monitoring) find that stronger deposit insurers have a negative effect on bank stability (Laeven & Levine 2009;

Shaddady & Moore 2019). Laeven and Levine (2009) also show that this effect holds only for banks that have a large owner (e.g. the large banks in Indonesia) and not for banks that are widely held (e.g. the large banks in the US). Thus, four of the five results indicatively shown here support that market monitoring in beneficial for bank stability.

3.2.4.3.2 Effect on Banking Crises

Relying on market monitoring is considered to be a more effective policy towards preventing and minimizing the effects of banking crises than official supervision which can be corrupt and influenced by the big banks. On the other hand, deposit insurance that reduces market discipline can also have beneficial effects on banking crises by preventing bank runs. Angkinand (2009) uses the private monitoring index and a comprehensive deposit insurance index constructed with data from World Bank survey. The author finds that private monitoring is not associated with banking crises. However, the comprehensive deposit insurance index (lower market discipline) is found to be negatively associated with banking crises. More specifically, this finding suggest that greater coverage of deposit insurance is related with smaller output losses of banking crises, suggesting that deposit insurance can prevent financial runs after a crisis occurs. Kim, Koo and Park (2013) also use the same private monitoring index fail to find a statistically significant relationship between private monitoring and banking or currency crises, although the coefficients that they report are negative as expected. Overall, the limited existing evidence on the effects of market monitoring on crises fails to show that private monitoring can contain crises, but rather suggests that deposit insurance, which limits market discipline, can ameliorate banking crises.

3.2.4.3.3 Effect on Bank Efficiency

Market monitoring is expected to have a beneficial effect on bank efficiency. The underlying reason is that official supervisors do not have private interests in the well-being of banks and may have suboptimal incentives to monitor and discipline banks. Also, large banks may be able to influence official authorities towards benefiting individual bank interests rather than promoting efficiency in the banking system. For these reasons, it is advocated that regulators should pay more attention to market discipline. Using four indexes proxying market monitoring that include disclosure requirements and deposit insurance coverage, Barth et al. (2013) find strong evidence that market monitoring improves bank efficiency (positive effect of higher disclosure variables and negative effect of the deposit insurance variable). On the contrary, Chortareas, Girardone and Ventouri (2012) find a strong negative effect of private monitoring on bank efficiency providing two possible explanations. First, disclosure requirements may have an adverse indirect effect on bank efficiency, as the effect largely depends on various factors such as the credibility of the published information. Second, the production of these disclosures comes at a cost which may be large enough to impede banks' efficiency.

3.2.4.3.4 Other Effects

Houston, Lin and Ma (2012) who examine the effect of bank regulation and supervision on international bank flows show that market monitoring plays an important role. More specifically, they use the Strength of External Audit and Financial Statement Transparency indexes to proxy market monitoring and report statistically and economically significant findings. The authors find that increasing the strength of external audit by one standard deviation in the source country increases the probability of a domestic bank's expansion by 7%, while increasing the strength of external audit by one standard deviation in the recipient country reduces the probability of a foreign bank's expansion to this country by 6%. Similar results for financial statement transparency requirements suggest that a one standard deviation increase in the index decreases bank inflows by 1.23% which is not a trivial percentage and respectively increases bank outflows, towards countries with more relaxed disclosure requirements.

Hoque et al. (2015) who investigate the effects of bank regulations on risk and return during crises also provide interesting information regarding private monitoring and deposit insurance. First, the authors posit that private monitoring and stronger deposit insurance reduce bank risk and increase banks' stock returns during financial crises. More specifically, they expect that private monitoring will enhance market discipline and help banks deal better with the crises, while deposit insurance schemes also help banks absorb crisis-related risk (although deposit insurance reduces market discipline). However, the authors find contrasting results, consistent with market discipline and moral hazard connection between the two regulations. They show that a stronger deposit insurance scheme increases moral hazard and the exposures of banks during crises, while private monitoring leads to lower bank risk due to increased market discipline.

3.2.4.3.5 Summary of the Effects of Market Monitoring

Overall, the literature has documented that promoting market monitoring is beneficial for the banking industry. Market monitoring is found to enhance bank stability and efficiency, while actions to mitigate moral hazard associated with deposit insurance can contain financial crises as well. However, evidence does not exist on the effect of market monitoring on bank liquidity creation.

3.3 Theoretical Framework and Hypotheses Development

3.3.1 The Public Vs Private Interest View

Any clear theoretical predictions on the effects of bank regulation and supervision are difficult to be made because regulations can either enhance or impede several aspects of bank functioning. The literature review discussed earlier highlighted in many cases that researchers have unearthed opposing results regarding the effects of regulations on important bank measures such as stability and efficiency. A strong theoretical framework that explains these opposing results and views has been comprehensively outlined by Barth, Caprio and Levine (2008). In their book titled “Rethinking Bank Regulation, Till Angels Govern”, the authors explain the arguments from the two opposing camps on banking regulation as they have evolved since the Great Depression. The Great Depression initiated a significant increase of regulatory intervention in banking, compared to other sectors, but the tightness of regulations has not been uniformly applied everywhere as some jurisdictions have opted to keep their rules looser than others. The two approaches to banking regulation explained below are known as the *public interest view* and the *private interest view*.

3.3.1.1 The Public Interest View

The public interest view suggests that authorities act in the best interest of the broader society, i.e. they regulate banks to facilitate the efficient operations of banks and prevent market failures. Efficiency in the banking sector in society’s interest would mean that all resources are optimally allocated. Unlike a Pareto optimum where no changes can lead to improvements, socially efficient bank regulation is one that helps the banking system to allocate resources so that output is maximized and variance is minimized and distributionally preferred (Mishan 1969). While the degree to which output is maximized and variance is minimized depends on the preferences of national governments, adherents of the public interest view advocate that bank regulations should maximize output and minimize needless exposures to risk. Banking crises constitute an important example of unnecessary economic risks as they are expensive (e.g. costly bailouts by governments) and they impede income distribution, their prevention is central in the objectives of bank regulation from the public interest view.

As Coase (1960) argues, markets will reach high efficiency levels when there are no transaction and information costs, governments' objective is to maximize social welfare and there are clear and applied property rights. However, if these attributes hold, bank regulation would have no practical purpose as any intervention would hurt social welfare rather than enhance it. The reason is that while bank regulation's goal is to prevent market failures, in an efficient economy, market failures do not exist. Some examples of unregulated banking periods exist such as the Scottish free banking era (1695-1864) and the US free banking era (mid-1800s), but historically, governments have acknowledged the lack of efficiency in the markets and enforced bank regulations.

3.3.1.2 The Private Interest View

The public interest view assumes that market failures exist and that governments have the incentives and skills to prevent them. While market failures have occurred multiple times in the past, the interests of official authorities in social welfare can be largely questioned. As a result, many economists have treated regulation like a product with demand and supply. In this case, governments do not regulate banks to maximize social welfare but rather to facilitate the funding of government expenditures, to allocate credit where it is more politically attractive, and generally to maximize politicians' welfare. In such a situation, bankers may enjoy large rents for financing government expenditures among other favours to politicians. As Figure 3.1 by Barth, Caprio and Levine (2008) shows, corruption can occur in both directions between official authorities and banks. Also, Barth, Caprio and Levine (2008) argue that the benefits of regulation are largely dispersed across the broader society but its effects are very concentrated in the industry and thus, industries have higher stakes in regulatory outcomes. Yet, regardless of who is affected the most, this view suggests that the private interests of the few are given priority over the public interests.

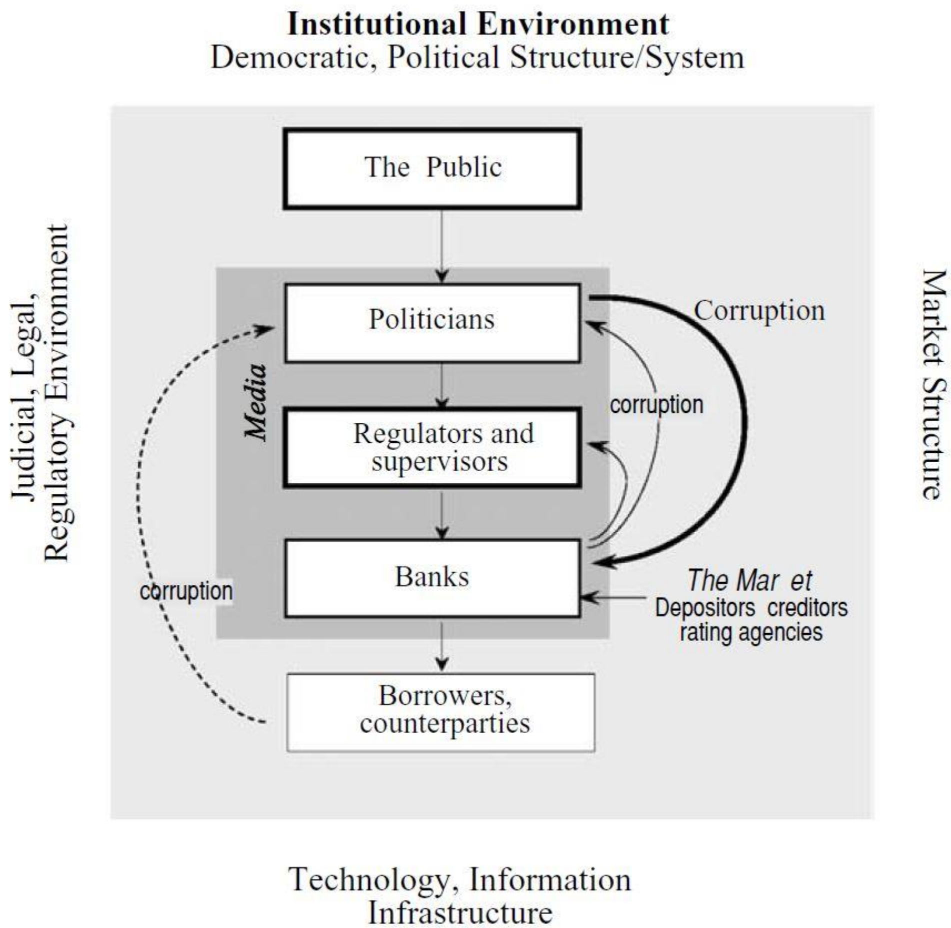

Figure 3.1 Framework for Bank Regulation (Barth, Caprio & Levine 2008, p. 6)

3.3.2 Activity Restrictions

Activity restrictions prohibit banks from engaging in risky suboptimal activities. Engaging in insurance and securities underwriting or real estate investments is largely irrelevant to the core business of the banking industry. However, are such restrictions beneficial or harmful for bank liquidity creation?

From the public interest view, regulators impose activity restrictions to help banks focus on their core business of receiving and protecting deposits and creating loans to businesses with sound investment projects. Hence, should banks focus on creating liquidity, it should increase with greater restrictions. Different perspectives on a potentially positive effect of activity restrictions on bank liquidity creation is provided by related studies in the literature. Ongena, Popov and Udell (2013) argue that under greater restrictions, banks have profitability incentives. More specifically, they show that to offset the negative impact of activity restrictions on profitability, banks loosen their lending standards and invest in more risky assets. This suggests that activity restrictions may have a positive effect on liquidity creation but with adverse consequences for the stability of the banking system. Moreover, Jiang, Levine and Lin (2019) examine whether regulatory-induced competition (mainly through loosening geographical restrictions) can affect liquidity creation, documenting a negative effect. In reverse, a tightening of such restrictions would enhance liquidity creation.

However, adherents of the private interest view may argue that regulators impose activity restrictions to exert private benefits and enhance their bargaining power for rent-seeking. Djankov et al. (2002) provide strong evidence for this behaviour. They use data on the regulation of entry of start-up firms from 85 countries and document significant official entry costs in most countries. More interestingly, they show that countries with tighter restrictions do not exhibit a better quality of public or private goods. On the contrary, they have much higher corruption levels and larger unofficial economies, while countries in which the government is more democratic and limited have lighter restrictions. Based on this poor function of activity restrictions, liquidity creation can be adversely affected. Barth, Caprio and Levine (2008) argue that activity restrictions may limit the extent to which banks diversify their portfolios and thus limit their ability to take advantage of synergies associated with complimentary activities. Such constraints prevent banks from exploiting all available opportunities in the market such as investing in alternative asset classes and reducing risk through diversification. At the same time, Barth et al. (2013) argue that activity restrictions can adversely affect economies of scope and scale of banks that can be used for collecting and processing valuable information about borrowers. Thus, restrictions may limit banks' capacity to extend their lending, especially to small private firms that are known to be informationally opaque and lending to them is contracted when the information channels are weakened. As a result, banks' capacity to create liquidity in an economy is reduced because both their funding sources and lending opportunities are limited.

In summary, activity restrictions may enable or undermine liquidity creation. On the one hand, they may encourage lending by limiting banks' access to other activities or control competition in a way that facilitates the creation of liquidity. On the other hand, misplaced activity restrictions can limit banks' freedom to efficiently diversify their portfolio and constrain their economies of scale in acquiring valuable information about their borrowers, that both can deteriorate banks' ability to create liquidity. Based on these conflicting theoretical predictions, the following opposing hypotheses are constructed:

H3.1a: In countries with greater activity restrictions, banks create more liquidity.

H3.1b: In countries with greater activity restrictions, banks create less liquidity.

3.3.3 Official Supervisory Power

The effects of official supervisory power (i.e. the extent to which supervisory authorities have the freedom and power to intervene and prevent important issues) relate very closely to the debate between the public and private interest view. On the one hand, adherents of the public interest view argue that bank supervisors should have the power to intervene because it is beneficial for the banking system. Beck, Demirgüç-Kunt and Levine (2006) suggest that supervisory authorities have the knowledge, expertise and incentives to alleviate information asymmetries. Also, Hoque et al. (2014) argue that because imperfect information is an important contributor to bank runs, strong supervisory power can enhance liquidity creation. This is due to the vulnerability of high liquidity creators to bank runs, as significant withdrawals of deposits may force banks to inefficiently liquidate a large portion of the assets (Diamond & Dybvig 1983). Fratzscher, König and Lambert (2016) document that a strengthening of supervisory independence contributed significantly to minimizing the decline in domestic credit and improving the stability of the banking system, especially for countries with relatively poor institutions during the financial crisis of 2007-2009. Therefore, in countries where supervisory authorities have more freedom to access bank information and intervene to avert failures or fraud, provision of credit is likely to be protected, while depositors can also be more confident about the stability of the banking system and the safety of their deposits. Hence, banks can create more liquidity in countries with strong supervisory power.

On the other hand, the private interest view suggests that authorities may use their power for facilitating their own personal interests. Beck, Demirgüç-Kunt and Levine (2006) argue that bank supervisors are likely to take advantage of their powerful position in disciplining noncompliant banks to benefit their private or political interests by directly or indirectly manipulating the allocation of bank credit. Therefore, should supervisors unduly misallocate credit, liquidity creation is likely to be contracted, since creating liquidity is largely dependent on efficient balance sheet management.[13] Moreover, should the public be aware that supervisory authorities are using their power in favour of their own interests and of the stability of the banking system, depositors' confidence in the safety of their deposits is likely to decline, reducing liquidity creation on the liability side.

In short, it is not clear whether supervisory power can enable liquidity creation or not. One can argue that powerful supervisors can prevent problems in the banking industry by intervening timely which can act as a risk-absorption effect that enables the creation of liquidity. However, if powerful supervisors prioritize their own private benefits, they might act in a way that unduly misallocates credit, impeding liquidity creation. Based on these two opposing views on the relationship between official supervisory power and liquidity creation, the following two competing hypotheses are constructed:

H3.2a: In countries with greater supervisory power, banks create more liquidity.

H3.2b: In countries with greater supervisory power, banks create less liquidity.

3.3.4 Capital Regulations

The literature that examines the relationship between bank capital and liquidity creation is reviewed in the introductory chapter in detail. In summary, two opposing hypotheses dominate the literature: the financial fragility/crowding out hypothesis and the risk absorption hypothesis. The financial fragility hypothesis suggests that a fragile capital structure encourages banks to monitor their borrowers more closely. As Diamond and Rajan (2001) explain, banks are unable to threaten

[13] It is also important to mention that with more corruption, liquidity creation can increase or simply continue to be created, especially if this serves the political interests of the supervisors.

their creditors by withdrawing their superior collection skills to earn a higher return because depositors have the power to run on the bank. Because liquidity creation makes banks illiquid, banks are prevented from demanding a premium and do not liquidate borrowers when liquidity drops. Therefore, with tighter market discipline by depositors, financial fragility can enable lending. On the other side of the balance sheet, the crowding-out hypothesis suggests that holding more capital may simply substitute the role of deposits on the balance sheet, a stable source of bank funding. Both the financial fragility and crowding out hypotheses imply a negative relationship between capital and liquidity creation.

On the contrary, the risk absorption hypothesis suggests that stronger capitalization helps banks absorb the risk that associated with liquidity creation. Banks that create more liquidity are exposed to liquidity risk either because of the possibility of a bank run or due to excessively risky exposures to poor quality assets. Holding more capital increases banks' risk-bearing capacity, especially for unexpected losses, and this may allow banks to manage risk better and create more liquidity. Adherents of the public interest view would argue in favour of holding more capital that shields banks from unexpected losses, while proponents of the private interest view would suggest that regulators may use capital requirements to favour their own interests and financial fragility is more beneficial.

In summary, tighter capital requirements might harm or enable liquidity creation. More specifically, the financial fragility effect suggests that a fragile capital structure commits banks to creating liquidity due to greater monitoring of borrowers, while the risk-absorption effect suggests that a stronger capital structure can absorb the risk associated with liquidity creation and enable it. Based on these conflicting theoretical predictions, the following opposing hypotheses are constructed:

H3.3a: In countries with tighter capital requirements, banks create more liquidity.

H3.3b: In countries with tighter capital requirements, banks create less liquidity.

3.3.5 Private Monitoring

The literature strongly advocates the enhancement of bank monitoring by private creditors such as depositors, debt holders and shareholders. As Bliss and Flannery (2002) argue, effective private monitoring (or market discipline) is based on two key elements: the ability of security holders to properly evaluate the condition of the firm as well as their ability to trigger changes in managerial behaviour. Beck, Demirgüç-Kunt and Levine (2006) argue that effective monitoring by private creditors is important in the banking industry because it alleviates the informational asymmetries that dominate the sector. For instance, wholesale financiers are one of the key types of bank creditors that are known for their monitoring powers as their funding is provided on a rollover basis (e.g. Huang & Ratnovski 2011). Compared with private creditors, official authorities do not have an ownership stake in financial institutions and thus lack the strong incentives to monitor and discipline banks. This is also because politicians can be significantly influenced by large banks and lose the monitoring ability of their official status, while private creditors have strong incentives to monitor banks' risk-taking and discipline them (Shleifer & Vishny 1998). Powerful monitoring by private creditors is therefore expected to help banks create more loans, consistent with the financial fragility hypothesis. Hence, we can anticipate that banks create more liquidity in countries that promote enhanced private monitoring.

On the other hand, enhancing private creditors to monitor the bank requires increased transparency which is not always efficient. Jungherr (2018) shows that although a proponent of the public interest view would choose to maximize transparency (instead of maximizing the market outcome), full transparency does not make the most of market discipline to increase the efficiency and stability of the financial system. Instead, some opacity allows banks to be protected from bank runs by their creditors who might be worried about banks' exposures. Bouvard, Chaigneau and Motta (2015) provide empirical evidence showing that transparency can be harmful for banks that rely more on short-term wholesale funding as it can signal a worsening of the fundamentals of the bank, leading to inefficient liquidations by private creditors. Therefore, we may also expect that increasing the monitoring power of private creditors through enhanced transparency can prevent the creation of loans.

Overall, one can expect different effects of private monitoring on liquidity creation. On the one hand, strong private monitoring by creditors can promote the creation of loans, consistent with the financial fragility hypothesis and the role of market discipline. On the other hand, strengthening private monitoring though increased transparency can expose banks to inefficient liquidations that impede liquidity creation. Based on these conflicting theoretical predictions, the following opposing hypotheses are constructed:

H3.4a: In countries with greater private monitoring, banks create more liquidity.

H3.4b: In countries with greater private monitoring, banks create less liquidity.

3.3.6 Mitigation of Moral Hazard

In most countries, the banking system is shielded by a deposit insurance scheme. For example, the EU member states are protected by the deposit guarantee schemes (DGS) which were developed to compensate depositors for deposits up to €100,000 lost due to a bank failure. Similar schemes exist in other parts of the world too, such as China where depositors are protected for up to ¥500,000. However, these schemes are not always efficient and effective and received a lot of attention in the aftermath of the global financial crisis of 2007-2009 by regulators who wanted to better protect depositors and increase the stability of the banking system.

The explicit design of these schemes is of significant importance for moral hazard. On the one hand, adherents of the public interest view may argue that a stronger deposit insurance scheme that insures a large amount of deposits facilitates the prevention bank runs. On the other hand, proponents of the private interest view can claim that deposit insurance can be used by banks to unduly increase their risk-taking to suboptimal levels. Indeed, the literature suggests that deposit insurance schemes can give rise to moral hazard incentives. This is because the more insured deposits are, the more they lose their disciplinary value since depositors have little incentives to run on the bank. With reduced market discipline on banks, borrower monitoring drops and banks may fail to honour their commitment towards depositors (Diamond & Rajan 2001). Because of this, regulators are keen to take actions to curtail the moral hazard problems of deposit insurance such as insuring only partially deposits, charging insurance fees to banks based on a risk assessment or requiring from banks to contribute to the reserves held for the event of the failure of a bank. For instance, DGSs are fully financed by banks and not by taxpayer money.

Mitigating the moral hazard problems of deposit insurance may have different effects on liquidity creation. First, actions to curtail moral hazard taken by governments can increase market discipline and offer incentives to banks to commit to strong borrower monitoring and enable liquidity creation. Second, in contrast, restricting the strength of a deposit insurance scheme may harm the risk absorption capacity of banks and lead to the contraction of liquidity creation. Based on these conflicting theoretical predictions, the following opposing hypotheses are constructed:

H3.5a: In countries where more actions are taken to mitigate the moral hazard problems of deposit insurance, banks create more liquidity.

H3.5b: In countries where more actions are taken to mitigate the moral hazard problems of deposit insurance, banks create less liquidity.

3.4 Data and Main Variables

3.4.1 Data and Sample

The sample used in this chapter contains 998 banks from 71 countries in the period of 2005-2019. However, due to high demands in variables for the construction of the liquidity creation variables, most observations are from the period of 2008-2017. Bank-level data is obtained from the S&P Global Market Intelligence database and country-level data from the International Monetary Fund, while the country-level regulation indexes are obtained from the last three Bank Regulation and Supervision Surveys conducted and published by the World Bank. Subsection 4.4.2 describes the calculation method of the regulation variables. Table 3.1 summarizes the definitions and sources for all variables used in this chapter, while Table 3.2 provides the variables' descriptive statistics. Table 3.3 presents how the liquidity creation observations are distributed across the 71 countries in the sample, indicating that the sample is dominated by European and Asian banks with the countries with the most observations being France, China, Italy and Germany.

Table 3.1 Variable Description.

Variable	**Definition**	**Source**
LC3	LC3 stands for liquidity creation 3 and its calculated as (0.5*illiquid assets + 0.5*liquid liabilities - 0.5*liquid assets - 0.5*illiquid liabilities - 0.5*Equity)/Total Assets LC3 uses transaction and savings deposits as liquid deposits. See Table 2.1 for the liquidity classification of all balance sheet items.	S&P Global Market Intelligence
LC4	LC4 stands for liquidity creation 4 and its calculated as (0.5*illiquid assets + 0.5*liquid liabilities - 0.5*liquid assets - 0.5*illiquid liabilities - 0.5*Equity)/Total Assets LC4 uses short-term deposits as liquid deposits. See Table 2.1 for the liquidity classification of all balance sheet items.	S&P Global Market Intelligence
ACT-RES	ACT-RES stands for activity restrictions and measures the degree to which authorities restrict banks' engagement in activities involving securities, insurance and real estate. The index ranges from 3 to 12 and higher values indicate greater restrictions.	World Bank: Bank Regulation and Supervision Survey 2007, 2011 and 2019
S-POWER	S-POWER stands for official supervisory power and measures the degree to which a country's supervisory authorities have the power to intervene and prevent problems. The index ranges from 0 to 14 and higher values indicate greater supervisory power.	World Bank: Bank Regulation and Supervision Survey 2007, 2011 and 2019
CAP-REG	CAP-REG stands for capital regulation and measures how much capital banks are required to hold and the stringency of regulatory capital requirements. The index ranges from 0 to 10 and higher values indicate more stringent capital regulation.	World Bank: Bank Regulation and Supervision Survey 2007, 2011 and 2019
PM	PM stands for private monitoring and measures the degree to which authorities encourage the private monitoring of banks by its creditors. The index ranges from 0 to 12 and higher values indicate greater encouragement of private monitoring.	World Bank: Bank Regulation and Supervision Survey 2007, 2011 and 2019
MH	MH stands for moral hazard and measures the degree to which authorities have taken actions to mitigate moral hazard issues related with deposit insurance. The index ranges from 0 to 3 and higher values indicate greater mitigation of moral hazard.	World Bank: Bank Regulation and Supervision Survey 2007, 2011 and 2019
LNZSCORE	LNZSCORE stands for bank risk and it is calculated as the natural logarithm of the bank's ZSCORE. ZSCORE is calculated as the sum of EQRAT and ROAA divided by the standard deviation of ROAA	S&P Global Market Intelligence
ROAA	ROAA stands for the return on average assets and it is calculated as: Net Income/Average Assets	S&P Global Market Intelligence
LLR	LLR stands for the loan loss reserves and it is calculated as total loan loss and allocated transfer risk reserves divided by total loans and leases, net of unearned income and gross of reserve	S&P Global Market Intelligence
EQRAT	EQRAT stands for the equity ratio and it is calculated as: Total Equity/ Total Assets	S&P Global Market Intelligence

Table 3.1 ***(Continued)***

NIM	NIM stands for net interest margin and it is calculated as: Net Interest Income/ Average Earning Assets	S&P Global Market Intelligence
AGE	AGE stands for bank age and it is calculated as the natural logarithm of the bank's current age (2019) in years	S&P Global Market Intelligence
LISTED	LISTED stands for the ownership status and it equals 1 if the bank is publicly traded and 0 otherwise	S&P Global Market Intelligence
GDPG	GDPG stands for real GDP growth and it is calculated as the annual percentage change of real GDP of the bank's country	International Monetary Fund
UNEMP	UNEMP stands for unemployment and it is calculated as the number of unemployed people as a percentage of the total labour force of the bank's host country	International Monetary Fund

Table 3.2 Descriptive Statistics

Variable	Obs.	Mean	Median	Std. Dev.	5th Perc.	95th Perc.
LC3	4883	0.152	0.153	0.190	-0.169	0.465
LC4	4883	0.252	0.278	0.187	-0.093	0.515
ACT-RES	4883	6.422	5.800	2.011	4.200	10.200
S-POWER	4883	10.710	10.900	1.833	7.000	13.250
CAP-REG	4883	6.897	7.000	1.150	5.250	8.250
PM	4883	8.285	8.500	0.983	6.400	9.800
MH	4883	1.579	1.733	0.459	0.733	2.000
LNZSCORE	4883	3.064	3.190	1.146	1.083	4.605
ROAA	4883	0.007	0.007	0.031	-0.008	0.023
LLR	4883	0.035	0.025	0.049	0.003	0.100
EQRAT	4883	0.089	0.081	0.044	0.032	0.162
NIM	4883	0.024	0.020	0.017	0.007	0.055
AGE	4883	4.054	3.912	1.172	2.565	6.304
LISTED	4883	0.825	1.000	0.380	0.000	1.000
GDPG	4883	0.027	0.023	0.036	-0.036	0.085
UNEMP	4883	0.077	0.068	0.044	0.032	0.172

Table 3.3 Distribution of LC4 observations across countries.

Country	LC4 Obs.	Country	LC4 Obs.
France	608	Slovakia	30
China	504	Norway	28
Italy	490	Bulgaria	26
Germany	263	Croatia	26
Spain	238	Malta	26
Malaysia	226	Switzerland	26
Hong Kong	213	Latvia	25
Indonesia	199	Philippines	25
Austria	174	Australia	23
Turkey	155	Cyprus	23
Poland	129	Lithuania	22
Russia	117	Nigeria	20
Netherlands	114	South Africa	20
United Kingdom	100	Dominican Republic	18
Portugal	92	Venezuela	16
Denmark	85	Bosnia & Herzegovina	14
Romania	65	Colombia	14
Saudi Arabia	65	Moldova	14
Brazil	49	Serbia	13
Finland	49	Estonia	12
Thailand	49	Iceland	12
Ireland	46	Morocco	12
Panama	46	Sri Lanka	12
Greece	42	Georgia	10
New Zealand	39	Singapore	8
Canada	38	Slovenia	8
Chile	36	Mexico	7
Ukraine	35	Bahrain	5
Czech Republic	34	Hungary	2
Belgium	32	Argentina	1
Luxembourg	32	Azerbaijan	1
Israel	31	Belarus	1
Peru	31		

3.4.2 Regulation Indexes

The Bank Regulation and Supervision Survey (BRSS) developed by Barth et al. (2013) under the World Bank auspices offers a rich dataset on how banks are regulated and supervised across 160 jurisdictions. Earlier literature has used this dataset extensively to provide evidence on country-level regulations may influence different aspects of banking. In late 2019, the World Bank published the last survey that covers the period of 2011-2016. This chapter uses the responses in this survey to update five regulatory indexes by pairing the questions of the last two surveys, thus ensuring consistency through the different surveys. Since the sample covers the period of 2005-2019, the results of the 2007 survey are assigned to the years 2005-2007, the results of the 2011 survey to the year 2008-2010 and the results of the 2019 survey to the years 2011-2019.

An important issue in the construction of the regulation variables is that the 2019 survey covers a very large period of 6 years compared to the previous surveys that cover only 2-3 years as they were more regularly updated. As a result, the sample depends significantly on the 2019 survey. At the same time, many index values have not changed through these surveys for several countries, making the final regulation and supervision variables almost time-invariant. Considering these limitations, the variables are transformed into entirely time-invariant by estimating the weighted average for every country from 2005 to 2019. The definitions of the regulation indexes are outlined in the following subsections. Each index is created using the quantitative transformation of the responses in the questionnaires of the BRSS.

3.4.2.1 Activity Restrictions

The index ACT-RES that stands for activity restrictions measures the degree to which bank supervisors restrict banks' involvement in activities related to securities, insurance, and real estate. Security activities refer to brokerage, underwriting and dealing, insurance activities include underwriting and selling insurance, and real estate activities incorporate real estate investment, management, and development. The ACT-RES index ranges from 3 to 12 and greater values refer to more restrictions imposed by authorities.

3.4.2.2 Official Supervisory Power

The S-POWER index that stands for official supervisory power measures the extent to which official authorities have the power to intervene when they identify problems in the banking sector and take action to prevent them. More specifically, the index is calculated by taking into account the degree of access to private information that official authorities have that can help them prevent issues such as fraud. The S-POWER index ranges from 0 to 14 and greater values indicate that official authorities have more supervisory power.

3.4.2.3 Capital Regulations

The CAP-REG index that stands for capital regulations measures how much capital is required from banks to hold as well as the degree of stringency of the regulatory capital requirements. More specifically, important elements of the index include the level of flexibility in minimum capital adequacy requirements and the types of funds that can be utilized to increase capital ratios. The CAP-REG index ranges from 0 to 10 and greater values refer to more stringent capital regulation.

3.4.2.4 Private Monitoring

The PM index stands for private monitoring and measures the degree to which private monitoring of banks by their creditors is encouraged by official authorities. The index takes into account if banks need to disclose their off-balance sheet exposures, if subordinated debt is permitted or required by regulation to be part of regulatory capital and if there are processes of cease-and-desist form orders that impose penalties on bank directors and managers for their prohibited actions. The PM index ranges from 0 to 12 and greater values refer to greater promotion of private monitoring through the aforementioned regulatory policies.

3.4.2.5 Mitigation of Moral Hazard

The MH index stands for mitigation of moral hazard and measures how many actions authorities have taken to curtail moral hazard issues associated with deposit insurance. Three actions are taken into consideration by the index: whether the deposit insurance scheme is funded by banks, whether banks are charged deposit insurance premiums when they take more risk and whether deposits are fully or partly insured. The MH index ranges from 0 to 3 and greater values indicate that more actions are taken to curtail moral hazard.

3.4.3 Mean Difference Tests

Some first evidence on how liquidity creation is related to the regulation indexes is presented in Table 3.4. More specifically, mean difference tests are conducted for the two liquidity creation measures used in this chapter between two groups after splitting the sample in half with the median of each regulation index. The results show that all mean differences are significant at the 1% level and that the signs of ACT-RES, CAP-REG and PM are negative, while the signs of S-POWER and MH are positive. This is a preliminary indication that banks create less liquidity on average in countries that promote more activity restrictions, capital regulations and private monitoring, and they create more liquidity on average in countries that promote official supervisory power and take actions to mitigate moral hazard.

Table 3.4 Mean Difference Tests

	ACT-RES	S-POWER	CAP-REG	PM	MH
LC4 Mean Above Index Median	0.122	0.164	0.133	0.131	0.187
LC4 Mean Below Index Median	0.189	0.144	0.168	0.173	0.110
Difference	-0.067***	0.020***	-0.035***	-0.041***	0.077***
	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)
LC3 Mean Above Index Median	0.243	0.266	0.226	0.233	0.268
LC3 Mean Below Index Median	0.263	0.243	0.275	0.271	0.233
Difference	-0.020***	0.024***	-0.049***	-0.038***	0.034***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Obs.	4,883	4,883	4,883	4,883	4,883
N. of Banks	717	717	717	717	717

This table presents T-tests for the mean difference of the liquidity creation measures (LC3 and LC4) between two groups above and below each regulation index's median. ACT-RES refers to activity restrictions, S-POWER to official supervisory power, CAP-REG to capital regulations, PM to private monitoring and MH to actions taken against moral hazard. Standard errors are reported in parentheses. *** denotes significance at the 1% level.

3.5 Methodology

This thesis uses bank balance sheet panel data to examine the relationship between liquidity creation and other variables, with a strong focus on elements related to bank regulation. Panel data, also referred to as longitudinal data, is a two-dimensional form of data in which apart from the time dimension there is also an entity dimension. For instance, in time-series data, variables fluctuate only through one dimension, i.e. time. In panel data, variables fluctuate not only from period to period, but also from entity to entity. As time periods can be days, months, quarters and years, entities can be people, companies or countries. In the panel data used in this thesis, the time dimension is always in annual frequency and the entity dimension is banks. In other words, the data contain bank-specific observations which vary over time for multiple banks.

Panel data became very popular in research in recent years and panel data estimators are the predominant methodology in many disciplines today, including empirical banking research. Baltagi (2021) suggests that panel data have the following six advantages. First, panel data estimators consider the large heterogeneity that almost always exists among the entities in the dataset. Second, due to the combination of times series and cross-section observations, panel data is more informative than other simpler forms of data, it contains more variability and less collinearity, more degrees of freedom and more efficiency overall. Third, because of the repeated cross-section of observations, panel data are a finer way to examine the dynamics of change. Fourth, panel data can detect effects than are impossible to be captured with time series or cross-sectional datasets (e.g. the effects of minimum wage regulations on unemployment). Fifth, panel data helps the examination of complex behavioural models such as phenomena like economies of scale. Sixth, when using thousands of entities, panel data minimizes the bias that would exist when aggregating the entities into larger categories. This section discusses the main panel data estimators used in this thesis across most empirical chapters.

3.5.1 Panel Data: The OLS Assumptions

Running an ordinary least squares (OLS) regression with panel data is possible but the results violate several assumptions and do not consider the two-dimensional nature of panel data. The main assumptions of OLS are that the error terms (everything that leads Y to be higher or lower than we would expect based on X) have equal and uncorrelated variances. However, in a pooled regression (i.e. an OLS panel data regression), an assumption is made that there is no relationship between the unexplained parts of the Y of two entities in the sample. This is not reasonable in panel data because most often there is something in each entity that makes it unique.

The uniqueness of each entity is reflected in an unobserved individual effect which in the case of a pooled OLS regression is incorporated in the error term. Equation 3.5 demonstrates how apart from the error term $\varepsilon_{i,t}$, the individual effect v_i is also there. If someone neglects this issue, most likely standard errors will be falsely small and OLS will lead to a mistakenly rejected null hypothesis as well as confidence intervals that are too short. In other words, the resulted coefficients are likely to be highly statistically significant if the individuality of entities in the sample is neglected.

$$Y_{i,t} = \alpha + \beta X_{i,t} + (v_i + \varepsilon_{i,t}) \tag{3.5}$$

3.5.2 The Fixed, Between and Random-Effects Estimators

Various estimators that tackle the aforementioned and other problems in panel data have been developed and used over the years. The most basic estimators that are still used today are the fixed, between and random-effects estimators and they are explained here.

First, the fixed-effects estimator attempts to remove the individual effect from the error term and isolate it. There is more than one way to do this. A popular method is the least squares dummy variables (LSDV) estimator as shown in Equation (3.6). The LSDV adds dummy variables to the model that each one equals 1 for an entity's observations and 0 otherwise. In this way, the coefficient of each entity's dummy variable is the individual effect v_i and as such, it is removed from the error term. Other ways to remove the individual effect from the error term that do not consume so many degrees of freedom include mean- and first-differencing. With these methods, the within-group mean or the first lag of each variable is subtracted from the main observation Y as shown in Eqs. (3.7) and (3.8), respectively. Because the individual effect v_i is not varying though time within each group (as does the constant), it is removed completely from the regression as it is subtracted from itself. One important implication of the fixed-effects estimators is that they do not allow the inclusion of any time-invariant variables because they are dropped from the model as the individual effect does. Many times, such variables are important to study and thus, other estimators must be employed.

$$Y_{i,t} = \alpha + (D_1\gamma_1 + D_2\gamma_2 + \cdots) + \beta X_{i,t} + \varepsilon_{i,t} \tag{3.6}$$

$$(Y_{i,t} - \bar{Y}_{i,t}) = \beta(X_{i,t} - \bar{X}_{i,t}) + (\varepsilon_{i,t} - \bar{\varepsilon}_{i,t}) \tag{3.7}$$

$$\left(Y_{i,t} - Y_{i,t-1}\right) = \beta(X_{i,t} - X_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \tag{3.8}$$

Second, the between-effects estimator considers the heterogeneity among entities in panel data but also allows the inclusion of time invariant variables. As demonstrated in Equation (3.9), the between-effects estimator accomplishes that by taking the within-group average of each variable. Therefore, the regression becomes a cross-sectional regression of the variables' means. However, while this estimator takes into account the variation among entities, it does so by sacrificing a lot of information in the time dimension. Because of this limitation, between-effects estimators are not as popular although they are used in many studies to capture long-run relationships and use time invariant variables.

$$\bar{Y}_i = \alpha + \beta\bar{X}_i + (v_i + \bar{\varepsilon}_i) \qquad (3.9)$$

A third option that combines the efficiency of the two previous estimators is the random-effects estimator. It does so by giving a greater weight to the between-effects coefficients when the between model fits better relative to the fixed-effects model. The random-effects estimator is unbiased, uses fewer degrees of freedom that fixed-effects, optimally combines fixed- and between-effects and allows the inclusion of time invariant variables. However, if the individual effect is correlated with the explanatory variables, the estimation of random-effects is biased. More specifically, both OLS and random-effects suffer from omitted variable bias which leads to biased standard errors and coefficients.

To choose between fixed and random effects, researchers have been using the Hausman test. The test simply tests whether the individual effect is correlated with the explanatory variables with the null hypothesis being that they are uncorrelated. If the null hypothesis is rejected, then the fixed-effects estimates are the only consistent, while if the null hypothesis is not rejected then the more efficient random-effects estimator can be used. However, the Hausman test is essentially used to identify whether there is enough individuality among the entities in panel data which is most often the case. Therefore, fixed-effects is much more widely used than random-effects which is rather employed for its advantage of allowing time invariant variables.

3.5.3 The System Generalized Method of Moments (GMM) Estimator

The fixed, between and random-effects estimators are used throughout this thesis whenever appropriate along with other estimators that are more advanced and tackle important problems such as endogeneity. This thesis also employs the system generalized method of moments (GMM) as an additional estimator to test for endogeneity and Nickell bias which is explained in this section.

The conventional and widely used fixed-effects estimator makes several assumptions which are likely to be violated under common modern datasets. For this reason, the dynamic GMM estimators have become very popular during the last decades, since their development by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). The Arellano-Bond is the difference GMM estimator while the other two develop the system GMM estimator. However, both estimators are designed to return accurate results under the following conditions: 1) panels with small T and large N, meaning panels with a short time period (approximately below 30 periods) and many entities; 2) a linear functional relationship between two or more variables; 3) a dependent variable which is dynamic, meaning that it depends on its own past values; 4) explanatory variables are not strictly exogenous, meaning that they are correlated with the error term; 5) fixed individual effects (as in fixed-effects discussed earlier) and 6) there is heteroskedasticity and autocorrelation within entities in the panel but not across them. The Arellano–Bond difference GMM estimator begins with transforming all variables in the regression by differencing them by using the Hansen (1982) GMM. On the other hand, the Arellano–Bover/Blundell–Bond system GMM estimator augments the Arellano–Bond estimator by additionally assuming that the first differences of the instrument variables are uncorrelated with the individual effects. This offers the advantage of introducing more instruments which can improve efficiency dramatically. The system GMM builds a system of two equations, that is the original equation and the transformed difference equation.[14]

The GMM estimators require specifying a certain number of *moment conditions* for the model. The term moment conditions refers to functions of the model parameters and the data for which the expectation is zero at the parameters' true values as shown below:

$$E[m(y_t, \theta_0)] = 0, for\ all\ t. \tag{3.10}$$

where E denotes expectation, θ_0 the q X 1 vector of true parameters, y_t is one or more endogenous variables and m(.) stands for a r-dimensional vector of functions. When q > r, the theta parameters are not identified; when q = r, the parameters are identified exactly; and when q < r, the parameters are overidentified. In the latter case, which is when GMM is used in empirical studies, the moment conditions need to be restricted by using a weighting matrix. Pesaran (2015) suggests that although it is possible to use any of the q unknown parameters to prevent overidentification, the best alternative is to use an efficient combination of all available moment conditions. The Hansen J test is implemented to test for the overidentification issue but as suggested by Roodman (2009) it is not to be trusted blindly and does not offer full confidence on

[14] The application of the system GMM estimator became particularly popular in the literature (especially in the banking literature) after the publication of Roodman (2009) which describes the STATA command xtabond2. Although the command appears easy to handle, Roodman suggests that the disadvantage of both GMM estimators in the context of a STATA command can be complicated and easily generate inaccurate estimates. Implementing xtabond2 stuffs the estimators into a black box in which users may not fully understand the estimators' purpose, design and limitations and thus they may misuse the estimators and report results that are not econometrically sound. To prevent this from taking place, Roodman outlines a series of comments on when to use the estimators, what to avoid and what are the best practices to report all specification choices. Any work on GMM estimators in this thesis uses the xtabond2 command and follows Roodman's advice about the design of the specification and the reporting of all parameters and tests.

the results. See Pesaran (2015) for a more detailed explanation of how GMM estimators work and examples.

3.5.4 Regression Framework for Chapter 3

As explained earlier, a fixed-effects estimator can address the problems associated with possible correlation between the independent variables and the unobserved individual effects. Yet, the fixed-effects estimator does not allow the inclusion of time invariant variables such as the regulatory indexes used in this chapter, since the individual effects are removed from the estimation using mean differencing. To address this limitation, the Hausman and Taylor (1981) estimator is employed which allows the use of time-invariant variables.[15] Except for allowing the inclusion of time-invariant variables, the Hausman-Taylor (HT) estimator also controls for potential endogeneity (Degryse et al. 2012; Alraheb, Nicolas & Tarazi 2019). HT is created using instrumental variables under the assumption that some of the independent variables are correlated with the individual random effects but the same does not happen between the independent variables and the error term. Hence, HT can address possible endogeneity problems arising from variations at the bank- and country-level (Alraheb, Nicolas & Tarazi 2019).[16]

To address endogeneity, the estimator uses a group of internal instruments. To partially test the validity of the instruments used, Sargan-Hansen test of overidentifying restrictions is employed. Not rejecting the null hypothesis suggests that the excluded instruments are uncorrelated with the error term and thus soundly excluded from the estimation. The appropriateness of the HT estimator is tested with the Hausman test and in all regressions the null

[15] Several other studies on banking and other topics have used the Hausman-Taylor estimator when the independent variable is time-invariant such as Degryse et al. (2012), Tennant and Sutherland (2014) and Alraheb, Nicolas and Tarazi (2019).

[16] The two-step system generalised method of moments (GMM) estimator is also used to further address possible endogeneity issues in the robustness tests section.

hypothesis is not rejected, indicating that HT is the appropriate estimator. Moreover, the HT estimator allows the inclusion of weights based on the number of observations per country that addresses potential concerns regarding the unbalanced nature of the panel, while standard errors are clustered at the country level to take into account intra-country correlation. The HT regressions are ran on the econometric model in the following form:

$$Liquidity\ Creation_{i,t} = \alpha_0 + \beta_1 Regulation_c + \sum_{j=1}^{6} \beta_j\ Bank\ Control_{i,t} + \sum_{j=1}^{2} \beta_j\ Country\ Control_{c,t} + \lambda_t + \varepsilon_{i,t} \quad (1)$$

where $Liquidity\ Creation_{i,t}$ is LC4[17] as the main measure of liquidity creation and $Regulation_c$ is one of the five regulation indexes as described earlier. Each regulation index is introduced separately to the regressions to address multicollinearity concerns.[18] 7 bank-specific and 2 country-specific variables are included as control variables, often used as controls in other liquidity creation models in the literature, including: the natural logarithm of the z-score (LNZSCORE), return on average assets (ROAA), loan loss reserves (LLR), equity ratio (EQRAT), net interest margin (NIM), current bank age (AGE), GDP growth (GDPG) and the rate of unemployment in the home country (UNEMP). λ_t and $\varepsilon_{i,t}$ are the time fixed effects and the error term, respectively. Table 3.2 outlines how each variable is constructed. In the HT estimator, AGE, GDPG and UNEMP are treated as exogenous and all other variables as endogenous. The estimator requires using a least one time-variant and one time-invariant exogenous variables. Following the liquidity creation literature, AGE is the exogenous time-invariant variable (e.g. Fungáčová, Weill

[17] This chapter uses only LC3 and LC4 because the regressions with LC1 and LC2 do not return statistically significant results.

[18] When using all regulation indexes together in the HT regressions, the variance inflation factor (VIF) increases above the benchmark of 10, while when each index is included separately, VIF is well below 10. VIF is also considered in the selection of the control variables.

& Zhou 2017) and GDPG and UNEMP are the exogenous time variant variables (e.g. Distinguin, Roulet & Tarazi 2013).

3.6 Results and Discussion

The baseline results on the relationship between national-level regulation and liquidity creation using the HT estimator are presented in Table 3.5. The un-tabulated Hausman test suggests that the HT estimator is preferred over the fixed-effects estimator, while the reported p-values of the Sargan-Hansen test provide some confidence that instruments used are valid.

The results presented in Table 3.5 offer interesting insights to how regulatory policies can influence the capacity of banks to create liquidity. The coefficient of ACT-RES is negative and significant at the 1% level, suggesting that banks create less liquidity when they are restricted from engaging in a larger variety of activities. This is in line with Hypothesis 3.1b that activity restrictions can limit bank liquidity creation because with more restricted access to all available opportunities, banks cannot efficiently diversify their portfolios and exploit synergies that are useful in risk management and balance sheet expansion. This finding is contrasting with previous evidence provided by Jiang, Levine and Lin (2019) who show that removing activity restrictions is harmful for bank liquidity creation.[19]

Second, the coefficient of S-POWER is positive and significant at the 1% level, indicating that banks create more liquidity when regulators have greater power to intervene and prevent problems. Powerful supervisors can help banks escape unfavourable situations that sometimes are triggered by exogenous shocks, while they can also alleviate information asymmetries. Thus, consistent with Hypothesis 3.2a, official supervisory power can help banks absorb risk and increase their capacity

[19] The study by Jiang, Levine and Lin (2019) investigates deregulated interstate banking. Thus, the results presented here are not directly comparable but rather closely related.

of creating liquidity. Interestingly, although earlier research has documented that regulatory interventions can lead to reduced liquidity creation ex-post (Berger et al. 2016), the finding presented here suggests that the presence of powerful supervision is beneficial for liquidity creation.

Third, the coefficient of CAP-REG is negative and significant at the 1% level, suggesting that when bank regulators apply tighter capital requirements, banks create less liquidity. This is consistent with Hypothesis 3.3b and the financial fragility effect (Berger & Bouwman 2009) according to which banks create more liquidity when they have a fragile capital structure due to banks' increased commitment to borrower monitoring and loan creation. While the literature has provided rigorous evidence of this effect using the bank-level variation in capital, the finding presented here extends the extant literature by showing that national-level capital stringency is also negatively associated with liquidity creation.

Fourth, the coefficient of PM is negative and significant at the 5% level, indicating that when authorities promote tighter monitoring of banks by their private creditors, banks create less liquidity. This is in support of Hypothesis 3.4b, positing that banks reduce their risk-taking by contracting their illiquid lending when more transparent disclosures are required. These requirements may force banks to disclose sensitive information such as their off-balance sheet exposures and, for instance, prevent creditors such as wholesale financiers from rolling over their funding when the disclosed data indicate negative signals about the quality of the bank (Huang & Ratnovski 2011). Banks may respond to this by reducing their risk-taking activities such as liquidity creation.[20]

[20] Bermpei, Kalyvas and Nguyen (2018) show that the private monitoring index is negatively associated with bank risk-taking.

The coefficient of MH is positive and significant at the 1% level, suggesting that when regulators take actions to mitigate the moral hazard problems associated with deposit insurance, banks create more liquidity. Regulators can alleviate these problems with actions such as allowing only partial deposit insurance or requiring from banks to participate in insurance scheme. Mitigating moral hazard can be an important driver of banks' commitment to borrower monitoring, while the parallel implementation of an adequate deposit insurance scheme protects depositors' interests. Therefore, this finding is in line with Hypothesis 3.5a which suggests that actions taken to curtail deposit insurance's moral hazard problems enable bank liquidity creation.[21]

The size of the reported regulation coefficients suggest that the results are also economically significant. More specifically, a one standard deviation increase in ACT-RES, CAP-REG and PM is associated with a reduction in LC4 by 16.3%, 10.5 % and 19.8%. respectively. On the other hand, a one standard deviation increase in S-POWER and MH is associated with an increase in LC3 by 18.9% and 16.2%, respectively. The coefficient signs of the control variables are consistent with expectations. More specifically, the coefficients of LLR, EQRAT and UNEMP are negative and the coefficients of NIM and GDPG are positive. Expectedly, poor asset quality and unemployment constraint banks' ability to create liquidity as both are reasonably related to reduced bank activity, while bank capital in negatively associated with liquidity creation consistent with the financial fragility effect. Furthermore, higher net interest margins give banks more space for creating liquidity, as real GDP growth is associated with greater credit activity and liquidity created by banks.

[21] Considering that PM and MH are both closely related to market monitoring, this result is contrasting with the previous PM finding. Yet, the two indexes refer to different types of market monitoring can may have opposing effects on liquidity creation.

Table 3.5 Hausman-Taylor estimations for the relationship between bank regulation and supervision indexes and liquidity creation.

	(1)	(2)	(3)	(4)	(5)
	LC4	LC4	LC4	LC4	LC4
ACT-RES	-0.074***				
	(0.014)				
S-POWER		0.103***			
		(0.029)			
CAP-REG			-0.142***		
			(0.055)		
PM				-0.201**	
				(0.093)	
MH					0.354***
					(0.047)
LNZSCORE	0.004	0.004	0.004	0.002	0.004
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
ROAA	-0.005	-0.009	-0.006	0.002	-0.005
	(0.049)	(0.050)	(0.050)	(0.051)	(0.052)
LLR	-0.221	-0.211	-0.219	-0.237	-0.221
	(0.221)	(0.220)	(0.219)	(0.222)	(0.219)
EQRAT	-0.239	-0.244	-0.237	-0.214	-0.239
	(0.324)	(0.325)	(0.322)	(0.321)	(0.322)
NIM	1.555**	1.551**	1.543**	1.523**	1.565**
	(0.685)	(0.686)	(0.681)	(0.674)	(0.686)
AGE	0.027***	0.025***	0.066***	0.044***	0.022***
	(0.008)	(0.009)	(0.013)	(0.010)	(0.005)
GDPG	1.101***	1.096***	1.087***	1.067***	1.102***
	(0.415)	(0.420)	(0.418)	(0.416)	(0.416)
UNEMP	0.040	0.002	0.030	0.084	0.037
	(0.234)	(0.240)	(0.245)	(0.253)	(0.225)
Constant	0.525***	-1.006***	0.871**	1.683**	-0.539***
	(0.120)	(0.267)	(0.372)	(0.785)	(0.104)
Time dummies	YES	YES	YES	YES	YES
Obs.	4,883	4,883	4,883	4,883	4,883
N. of Banks	717	717	717	717	717
Sargan-Hansen P-Value	0.271	0.549	0.471	0.676	0.480

This table reports Hausman-Taylor estimator results. The sample ranges from 2005 to 2019. The dependent variable is LC3 which is the liquidity creation measure normalized by total assets and contains short-term deposits are liquid deposits. ACT-RES refers to activity restrictions, S-POWER to official supervisory power, CAP-REG to capital regulations, PM to private monitoring and MH to actions taken against moral hazard. Robust standard errors clustered at the country level are reported in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

3.7 Robustness Tests

A battery of robustness tests on the baseline results is conducted. First, the baseline regressions are reproduced using the other three liquidity creation measures. Table 3.6 presents the results of this test using LC3 as the dependent variable which includes short-term deposits compared to transactions and savings deposits included in LC4 as liquid deposits. The signs of all coefficients are maintained, while the coefficients of ACT-RES, S-POWER and MH are significant at the 1% level and the coefficients of CAP-REG and PM are significant at the 10% level. In Table 3.7, LC1 and LC2 are used as the dependent variables which include corporate instead of long-term loans as the illiquid loans. The results for LC2 are similar to the ones with LC3, but the coefficients of all regulatory indices for LC1 are insignificant although they maintain the same signs as in the baseline regressions.

Table 3.6 Hausman-Taylor estimations for the relationship between bank regulation and supervision indexes and liquidity creation with alternate liquidity creation measure.

	(1)	(2)	(3)	(4)	(5)
	LC3	LC3	LC3	LC3	LC3
ACT-RES	-0.046***				
	(0.013)				
S-POWER		0.062***			
		(0.010)			
CAP-REG			-0.089*		
			(0.050)		
PM				-0.129*	
				(0.076)	
MH					0.218***
					(0.074)
Control Variables	YES	YES	YES	YES	YES
Time Dummies	YES	YES	YES	YES	YES
Obs.	4,883	4,883	4,883	4,883	4,883
N. of Banks	717	717	717	717	717
Sargan-Hansen P-Value	0.605	0.473	0.670	0.491	0.451

This table reports Hausman-Taylor estimator results. The sample ranges from 2005 to 2019. The dependent variable is LC4 which is the liquidity creation measure normalized by total assets and contains transactions and savings deposits as liquid deposits. ACT-RES refers to activity restrictions, S-POWER to official supervisory power, CAP-REG to capital regulations, PM to private monitoring and MH to actions taken against moral hazard. Robust standard errors clustered at the country level are reported in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

Table 3.7 Hausman-Taylor estimations for the relationship between bank regulation and supervision indexes and liquidity creation with alternate liquidity creation measure.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	LC1	LC1	LC1	LC1	LC1	LC2	LC2	LC2	LC2	LC2
ACT-RES	-0.005					-0.016***				
	(0.007)					(0.005)				
S-POWER		0.005					0.024***			
		(0.008)					(0.006)			
CAP-REG			-0.016					-0.062*		
			(0.031)					(0.033)		
PM				-0.011					-0.050**	
				(0.027)					(0.021)	
MH					0.039					0.111***
					(0.050)					(0.029)
Control Variables	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Obs.	4,372	4,372	4,372	4,372	4,372	4,372	4,372	4,372	4,372	4,372
N. of Banks	635	635	635	635	635	635	635	635	635	635
Sargan-Hansen P-Value	0.437	0.456	0.486	0.449	0.427	0.298	0.300	0.403	0.523	0.426

This table reports Hausman-Taylor estimator results. The sample ranges from 2005 to 2019. The dependent variables are LC1 and LC2 which are the liquidity creation measures normalized by total assets that contain corporate loans as illiquid loans. ACT-RES refers to activity restrictions, S-POWER to official supervisory power, CAP-REG to capital regulations, PM to private monitoring and MH to actions taken against moral hazard. Robust standard errors clustered at the country level are reported in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

Second, as in the previous chapter, the system GMM estimator is employed to control for the partial adjustment of liquidity creation and endogeneity. The following equation is constructed for the purposes of the estimator:

$$Liquidity\ Creation_{i,t} = \alpha_0 + \beta_1 Liquidity\ Creation_{i,t-1} + \beta_2 Regulation_c + \sum_{j=1}^{7} \beta_j\ Bank\ Control_{i,t} + \sum_{j=1}^{2} \beta_j\ Country\ Control_{c,t} + \lambda_t + \varepsilon_{i,t} \quad (2)$$

An important advantage of the system GMM for this study is that it is designed to be a combination of the original equation and first-difference equation, meaning that the estimator allows the inclusion of time-invariant variables such as the regulation indexes used here. All variables are treated as in the HT regressions regarding their endogeneity classification (with the finite-sample correction by Windmeijer (2005)). The results of this tests are presented in Table 3.8 along with the Arellano and Bond (1991) test for second order autocorrelation and the Hansen J test for instrument validity. The signs of all coefficients remain the same as in the baseline results and are highly statistically significant.

Table 3.8 System-GMM estimations for the relationship between bank regulation and supervision indexes and liquidity creation.

	(1)	(2)	(3)	(4)	(5)
	LC4	LC4	LC4	LC4	LC4
L. LC4	0.752***	0.633***	0.752***	0.807***	0.723***
	(0.051)	(0.100)	(0.072)	(0.069)	(0.067)
ACT-RES	-0.028***				
	(0.006)				
S-POWER		0.043***			
		(0.017)			
CAP-REG			-0.059**		
			(0.029)		
PM				-0.066***	
				(0.025)	
MH					0.139***
					(0.035)
Control Variables	YES	YES	YES	YES	YES
Time Dummies	YES	YES	YES	YES	YES
Obs.	4059	4059	4059	4059	4059
N. of Banks	635	635	635	635	635
AR(2)	0.81	0.971	0.963	0.922	0.911
Hansen J	0.986	0.755	0.928	0.875	0.808
Instruments	99	99	99	99	99

This table reports two step system GMM estimator results. The sample ranges from 2005 to 2019. The dependent variable is LC3which is the liquidity creation measure normalized by total assets and contains short-term deposits are liquid deposits. ACT-RES refers to activity restrictions, S-POWER to official supervisory power, CAP-REG to capital regulations, PM to private monitoring and MH to actions taken against moral hazard. Robust standard errors clustered at the country level are reported in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

Fourth, the sample is split in small and large banks by the median of average total assets, since it is likely that bank regulations may favour only the larger banks due to corruption and political interests. Table 3.9 presents the results of this test, showing that the coefficients of the regulatory indexes maintain their signs and significance regardless of the bank size class.

Table 3.9 Hausman-Taylor estimations for the relationship between bank regulation and supervision indexes and liquidity creation for small and large banks.

	Small Banks					Large Banks				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	LC4	LC4	LC4	LC4	LC4	LC4	LC4	LC4	LC4	LC4
ACT-RES	-0.077***					-0.073***				
	(0.020)					(0.011)				
S-POWER		0.122**					0.089***			
		(0.051)					(0.014)			
CAP-REG			-0.127**					-0.165***		
			(0.054)					(0.052)		
PM				-0.187*					-0.222**	
				(0.095)					(0.091)	
MH					0.339***					0.371***
					(0.073)					(0.047)
Control Variables	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Obs.	2,445	2,445	2,445	2,445	2,445	2,438	2,438	2,438	2,438	2,438
N. of Banks	390	390	390	390	390	327	327	327	327	327
Sargan-Hansen P-Value	0.413	0.433	0.397	0.914	0.605	0.331	0.407	0.117	0.286	0.330

This table reports Hausman-Taylor estimator results for small and large banks separately. The sample ranges from 2005 to 2019. The dependent variable is LC3which is the liquidity creation measure normalized by total assets and contains short-term deposits are liquid deposits. ACT-RES refers to activity restrictions, S-POWER to official supervisory power, CAP-REG to capital regulations, PM to private monitoring and MH to actions taken against moral hazard. Robust standard errors clustered at the country level are reported in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

Finally, the sample is reduced by removing banks from countries with the least developed banking sectors. More specifically, the 15 countries with the lowest ratio of total bank assets to GDP (Demirgüç-Kunt & Huizinga 1999) are excluded from the regressions. The results presented in Table 3.10 are very similar to those of the baseline regressions.

Table 3.10 Hausman-Taylor estimations for the relationship between bank regulation and supervision indexes and liquidity creation excluding the 15 counties with the lowest bank assets to GDP ratio.

	(1)	(2)	(3)	(4)	(5)
	LC4	LC4	LC4	LC4	LC4
ACT-RES	-0.083***				
	(0.015)				
S-POWER		0.099***			
		(0.017)			
CAP-REG			-0.145***		
			(0.056)		
PM				-0.218**	
				(0.100)	
MH					0.391***
					(0.032)
Control Variables	YES	YES	YES	YES	YES
Time Dummies	YES	YES	YES	YES	YES
Obs.	4,309	4,309	4,309	4,309	4,309
N. of Banks	626	626	626	626	626
Sargan-Hansen P-Value	0.143	0.371	0.409	0.505	0.251

This table reports Hausman-Taylor estimator results excluding the 15 counties with the lowest bank assets to GDP ratio. The sample ranges from 2005 to 2019. The dependent variable is LC3 which is the liquidity creation measure normalized by total assets and contains short-term deposits are liquid deposits. ACT-RES refers to activity restrictions, S-POWER to official supervisory power, CAP-REG to capital regulations, PM to private monitoring and MH to actions taken against moral hazard. Robust standard errors clustered at the country level are reported in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

3.8 Policy Implications

The reported results on the relationship between bank regulation, supervision and liquidity creation have important policy implications. First, while banks have always been restricted from engaging in certain activities, activity restrictions have increased by regulators after the global financial crisis of 2007-2009 through frameworks such as the Dodd–Frank Act. However, considering the results reported here, to enhance economic activity and enable bank liquidity creation, regulators may need to consider removing some activity restrictions. Second, according to BCBS (2018), early interventions by bank supervisors can quickly address problems such as fraud and improve the stability of the banking system. This chapter shows that supervisory power enables liquidity creation and therefore regulators may need more power to intervene and enhance banks' capacity to create liquidity in the economy. Third, one of the main focus areas of regulators is increasing the capital adequacy of banks. The risk-adjusted capital adequacy ratio has been widely used by regulators after the crisis to enhance banks' resilience to risks. However, the finding that liquidity creation is negatively associated with capital regulations shows that there is a trade-off between increasing bank capital and creating liquidity in the economy. Regulators need to consider these implications when increasing the capital requirements. Finally, the evidence presented for the effect of market monitoring on liquidity creation is mixed as the private monitoring is found to hinder liquidity creation and the opposite is found for actions taken to mitigate moral hazard. This shows that the ways through which market monitoring is promoted matters. More specifically, the post-2009 regulatory frameworks have largely supported greater disclosure requirements (e.g. Basel Pillar 3) but it appears that transparency can hinder liquidity creation. On the other hand, regulatory bodies have paid attention to mitigating the moral hazard issues of deposit insurance[22], the findings presented in this chapter show that these actions can be beneficial for bank liquidity creation.

3.9 Conclusions

This chapter aims to examine the relationship between national-level regulations and bank liquidity creation. Since Berger and Bouwman (2009) proposed their method of the empirical measurement of liquidity creation, many studies have investigated how bank-level variables that proxy regulatory policies such as capital or liquidity affect liquidity creation. However, bank regulations are often applied on a national level and few studies are dedicated to the effects of national-level regulation and supervision on liquidity creation such as the ones by Berger et al. (2016) and Jiang, Levine and Lin (2019).

Adding to this limited empirical evidence, this chapter updates five major bank regulation indexes using the 2019 Bank Regulation and Supervision Survey to examine how activity restrictions, supervisory power, capital regulations, private monitoring and actions taken to curtail moral hazard may affect liquidity creation. Contrasting theoretical predictions are developed for the relationship of each regulation index with liquidity creation, showing that theory alone is not sufficient to determine which regulations impede and which enable liquidity creation.

The results suggest that banks create more liquidity in countries that have greater supervisory power and take more actions to curtail moral hazard, while they create less liquidity in countries with more activity restrictions, tighter capital regulations and stronger private monitoring. These findings are generally more in line with earlier literature on the effects of these regulations on bank

[22] Mitigating the moral hazard issues of deposit insurance is one of the main components of the Core Principles for Effective Deposit Insurance Systems jointly issued by the BCBS and the IADI (BIS 2009)

efficiency (Chortareas, Girardone & Ventouri 2012; Barth et al. 2013), further indicating that liquidity creation is closely related to bank efficiency.

The empirical investigation between bank- and country-level variables is less likely to be subject to endogeneity issues. This is because the performance of individual banks cannot usually influence the condition of a country's economy or the regulatory reforms introduced by the authorities. Yet, in smaller countries where the economy is also largely bank-dependent, few banks dominate the domestic market and their performance might therefore affect the country's economy and authorities' decisions. To alleviate these concerns, this chapter uses the Hausman-Taylor and system GMM estimators that both employ internally constructed instruments and allow the use of time-invariant independent variables, an important issue in this chapter. The results hold when using these estimators. Due to the time-invariance of the main independent variables, the use of instrumental variables methods has been avoided. Some researchers use instruments based on the legal and geographical characteristics of the host country since they can explain financial institutional development (e.g. Beck et al. 2006; Barth et al. 2013). However, these are used with time-variant regulatory variables. Not tackling endogeneity using external instruments is a weakness of this study that needs to be addressed in future research.

The investigation of the relationship between national-level regulations and bank liquidity creation in this chapter is subject to a number of limitations. First, the 2019 BRSS database covers a large period of time. Although this is addressed by transforming the indexes into time-invariant variables and selecting the appropriate estimators, this eliminates the time dimension of bank regulation and supervision in the analysis. Second, the HT estimator does not deal well with interaction terms because it multiplies the complex internal instruments, thus not allowing the investigation of moderating effects for the relationship between national-level regulations and bank liquidity creation. Finally, it would be interesting to examine the role of these regulation indexes for off-balance sheet liquidity creation. Emphasis by regulators on the off-balance sheet exposures of banks is rising and it is important to understand whether off-balance sheet liquidity creation is affected by these regulatory frameworks. However, off-balance sheet liquidity creation data is not available for the sample used in this chapter.

Chapter 4: The Role of Credit Rating Agencies

Chapter 4.1: Multiple Credit Ratings and Liquidity Creation[23]

4.1.1 Introduction

Credit Rating Agencies (CRAs) have an important role in the financial markets as they are entrusted with evaluating issuers' likelihood of default and their ability to meet their payment obligations. In other words, they act as information intermediaries. Banks rely considerably on CRAs for the evaluation of their creditworthiness and this dependency has increased over the years with regulatory frameworks requiring from banks to obtain investment-grade ratings by multiple CRAs. However, access to and purchase of multiple credit ratings may not always be efficient. CRAs have been subject to considerable criticism for inflating the ratings of complex financial instruments, such as Mortgage Backed Securities (MBSs) and Collateralized Debt Obligations (CDOs) during the financial crisis of 2007-2009. Some researchers have also suggested that competition in the CRA market may facilitate rating shopping (e.g. Bolton, Freixas & Shapiro 2012).

The ratings provided by CRAs are used by multiple parties in the market such as supervisors and investors. In the United States, from as early as 1936, supervisors have delegated their

[23] A paper based on Chapter 4.1: Multiple Credit Ratings and Liquidity Creation has been accepted for publication by Finance Research Letters (see https://doi.org/10.1016/j.frl.2021.102313).

oversight to some extent to CRAs for assessing the credit quality of banks' portfolios (White 2010). For instance, central banks often demand a minimum quality of collateral to compensate for the lack of liquidity, which in many cases is marked by credit ratings. The Basel II accord relied significantly on credit ratings as the weights of the risk-weighted assets were estimated using credit ratings. However, the inadequacy of credit ratings to forecast the failures that took place during the financial crisis of 2007-2009, alerted policymakers. Their concerns were expressed in the Basel III accord where reliance on ratings is broadly mitigated but at the same time an additional role for credit ratings is introduced in the assessment of counterparty credit risk from over-the-counter derivatives.

The complications of purchasing multiple credit ratings have inspired a great deal of research in the empirical and theoretical literature. Researchers have been particularly interested in understanding the incentives of banks and other types of firms to purchase multiple credit ratings. The literature so far documents three non-mutually exclusive hypotheses: information production, rating shopping and regulatory certification. The information production hypothesis suggests that banks purchase multiple ratings seeking to alleviate information asymmetries that are an important issue in the banking sector. Acquiring an additional rating that confirms the existing rating can reduce investors' worries about the issuer's creditworthiness (e.g. Morkoetter, Stebler & Westerfeld 2017; Drago & Galo 2018). The rating shopping hypothesis suggests that issuers try to improve their rating by shopping for additional ratings. In this way, banks may choose to disclose only the ratings that they feel that are more favourable and hide those that reveal their lack of creditworthiness. This behaviour was observed especially during the financial crisis of 2007-2009 and both banks and CRAs received criticism for engaging in rating shopping and catering (e.g. Skreta & Veldkamp 2009; Sangiorgi & Spatt 2017). Finally, the regulatory certification hypothesis suggests that banks purchase multiple credit ratings because of regulatory requirements, according to which certain types of assets need to be rated as investment-grade to be included in the banks' portfolios (e.g. Brister, Kennedy & Liu 1994; Bongaerts, Cremers & Goetzmann 2012).

Although the literature has provided plenty of evidence on the motives for acquiring multiple credit ratings, whether this practice can influence banks' main function in the economy to create liquidity remains unknown. This is an important research question to be answered because the continuous reliance of regulatory policies on the credit assessments by CRAs and banks inclination to purchase more than one rating could hinder the creation of liquidity in the economy.

This chapter posits that the three hypotheses can explain a negative relationship between multiple credit ratings and liquidity creation. First, in line with the information production hypothesis, when banks purchase more ratings, they may reduce their liquidity creation levels to mitigate information asymmetries. Creating liquidity is associated with holding more opaque financial assets such as long-term and corporate loans which may increase rating disagreements (e.g. Morgan 2002; Iannotta 2006). Second, consistent with the rating shopping hypothesis, banks may reduce their liquidity creation levels to reduce risk. Liquidity creation is associated with liquidity risk and banks may choose to become less risky to obtain their desired rating. Finally, regulatory certification may also have an adverse influence on bank liquidity creation. Brister, Kennedy and Liu (1994) find that the separation of investment grade and high-yield assets by regulation can increase market inefficiencies leading to overpriced investment grade assets and isolate high-yield assets, crowding investment away from them. As a result, rating-based regulatory constraints can discourage banks from diversifying their portfolios with high-yield illiquid assets, and hence constraint their capacity to create liquidity.

The results presented in this chapter support these expectations. It is shown that liquidity creation is negatively associated with purchasing more credit ratings by the Big 3 CRAs. Also, the equity to total assets ratio is found to moderate this relationship. Thus, strongly capitalized banks are less likely to reduce their liquidity creation levels when they purchase more ratings. These novel empirical findings have important policy implications, suggesting that the overreliance on CRAs and requirements for obtaining multiple credit ratings can influence the main function of banks in the economy and possibly constraint economic growth. However, at the same time, a great deal of attention by the Basel accords is paid to increasing bank capital ratios to absorb unexpected losses which can significantly limit the extent with which purchasing multiple credit ratings adversely affects liquidity creation.

4.1.2 Literature Review on Multiple Credit Ratings

4.1.2.1 Competition in the Credit Rating Agencies Market

An important strand in the literature investigates CRA competition which is critical for understanding the implications of purchasing multiple credit ratings. Policy makers believe that the lack of competition in the CRA market played a vital role in the inefficiencies that occurred in the run up to the financial crisis of 2007-2009. As a response, regulators have tried to end the domination of the credit rating industry by the two major agencies (S&P and Moody's) by encouraging the entry of alternative agencies such as Fitch (e.g. by certifying a CRA as a NRSRO). At the same time, CRA competition is argued to encourage rating shopping which has negative effects on rating quality. Hence, understanding the implications of CRA competition is important for the research of multiple credit ratings.

Becker and Mildbourn (2011) examine the effects of increased competition in the CRA market on credit ratings. More specifically, they investigate the emergence of Fitch as a major player in the CRA market (as reflected in its increased market share after 2000). The authors find that the entry of Fitch as a third major CRA is associated with a decrease in overall quality which is measured by both the informational content and levels of incumbents' ratings. They also show that this result has significant economic magnitude as a one standard deviation increase in Fitch's market share increases the average issuer and issue ratings by 10%-50% of a step and it is greater for highly levered firms. Flynn and Ghent (2018) provide confirming evidence for this effect. The study is different because they use a period in which the reputation of the established CRAs was extremely poor and they did not receive high income benefits to motivate ratings inflation. The find that new CRA entrants issue higher ratings than the established ones. They also show that established CRAs become more generous in their ratings when a new entrant's market share increases. On the other hand, evidence by Bae, Kang and Wang (2015) shows that greater competition is unlikely to lead to inflated ratings. More specifically, the authors use Fitch's market share as a proxy for competition and find that Fitch's market share and credit ratings are not related. They attribute this to the view that CRAs do not want to sacrifice their reputation by unduly inflating ratings.

Doherty, Kartasheva and Phillips (2012) use S&P's entry into the insurance ratings market which previously covered solely by A.M. Best to analyse the effect of CRA competition on the informational content of ratings. First, they show in a theoretical model that the entrant CRA designs a distinct rating scale and uses more stringent standards. Second, they provide empirical evidence that S&P indeed used higher standards to assign the equivalent rating to the one assigned by A.M. Best, while issuers rated highly by A.M. Best opted to obtain a second rating by S&P too.

Bolton, Freixas and Shapiro (2012) develop a theoretical model of competition among CRAs to examine its implications. Their model is built on three key sources of conflict: CRAs understate risk and inflate ratings to attract business and increase their market share; issuers can purchase and disclose only their most favourable ratings; and investor clients trust published ratings. The authors show that these conflicts lead to two important market distortions. First, competition in the CRA market reduces efficiency because it facilitates rating shopping since issuers can shop their desirable rating and mislead investors. Second, as investors are more trusting during economic booms (or when reputation costs are lower), CRAs are more likely to inflate ratings. Manso (2013) provides contrasting evidence in another theoretical model. The author shows that the entry by a second rating agency (thus increased competition) can lead to rating downgrades which increases the frequency of defaults and reduces overall welfare.

Hirth (2014) develops a model to examine competition in the market for more than two CRAs and unearths four key findings. First, the existence of trusting investors can accommodate ratings inflation, while ratings inflation reduces investors' trust in turn. Second, the entry of an honest CRA can determine whether the equilibrium outcome will be inflating or honest. Third, should an off-equilibrium state prevail such as all CRAs inflating ratings, an honest entrant can transform the entire CRA market into an honest one. Finally, regulations can support honest CRAs, and even if this support last for a short period, its impact can be lasting.

Goel and Thakor (2015) conduct an innovative theoretical study in which they study credit ratings' coarseness (i.e. ratings consist of relatively small number of rating categories). Among other interesting findings, they show that competition among CRAs can increase ratings' coarseness. However, if CRA's objective function remains fixed, competition enhances welfare as more information is provided by the second rating. Moreover, in their model, if competition is permitted to affect the CRA's objective function, competition increases welfare only if the number of CRAs is small but reduces it if the number of CRAs is large.

Guttler and Wahrenburg (2007) examine credit ratings biases for issuers that are near to default and have obtained ratings by S&P and Moody's over the period 1997-2004. First, they show that Moody's is quicker to adjust its ratings to default risk than S&P. Second, neither of the two CRAs exhibit any home preference. Third, any upgrades or downgrades by the CRA that provides its assessment first are followed by larger rating changes by the second CRA in the short-term. Fourth, these changes by the second CRA are significantly more likely when the first CRA has downgraded a rating than when it has upgraded it. Overall, their results show that access to data about the timing of multiple credit ratings can reveal significant interdependencies and biases than may distort the information production process.

4.1.2.2 Why Do Companies Purchase More Than One Rating?

The literature on multiple credit ratings is dominated by three hypotheses that can explain the demand for multiple credit ratings: the information production hypothesis, the rating shopping hypothesis and the regulatory certification hypothesis. Although these hypotheses have different implications, they are not mutually exclusive, meaning that a company may purchase more than one rating for all three reasons.

4.1.2.2.1 Information Production Hypothesis

The information production hypothesis suggests that multiple credit ratings can reduce information asymmetries by providing new information on the issuer's creditworthiness. This can be beneficial for investors' opinion on the issuer's creditworthiness since investors are averse to uncertainty. The rationale for this is based on CRAs using different models to assign their ratings and in an environment with complex financial instruments, CRAs can assign ratings with very different assessment over an issuer's creditworthiness. As a result, to reduce uncertainty in the financial markets over their creditworthiness issuer may purchase ratings from multiple agencies. Should multiple agencies agree over the creditworthiness of an issuer, the assessment is likely to be considered as accurate and this will reflect in the pricing of the issuer's debt instruments. If the agencies disagree over the issuer's creditworthiness, it should signal to the market that the issuer is rather opaque, and its creditworthiness may lie anywhere between the multiple assessments by CRAs. Moreover, if the issuer is a bank's borrower and the additional ratings offer new information about the issuer's creditworthiness, the lender bank will also benefit from reduced information asymmetries and its credit risk assessment by CRAs will be enhanced. Thus, purchasing a second or a third rating that confirms the rating level of the issuer may lower uncertainty over the issuer's creditworthiness and reduce its borrowing costs.

Empirical evidence on the information production hypothesis is very limited. Only a handful of papers examine it and even fewer find confirming evidence. First, Cantor and Packer (1997) examine why companies buy a third rating when the third rating can be either by Fitch or DCR as an additional rating to ratings provided by S&P and Moody's. Their sample includes 1137 US corporations rated by the CRAs with 1993 year-end observations. They use a probit model with a wide range of variables as potential determinants of the decision of a company to purchase a third rating. They use two variables as proxies for ex ante uncertainty, the weighted average rating and the absolute rating difference. While they find that large and experienced issuers are more likely to obtain a third rating, they do not find strong evidence that companies purchase third ratings to resolve ex ante uncertainty. Bongaerts, Cremers and Goetzmann (2012) also fail to find any evidence confirming the information production hypothesis. More specifically, they examine whether an additional third rating provided by Fitch lowers credit spreads, but their results are not statistically significant.

Morkoetter, Stebler and Westerfeld (2017) posit that as competition is more intense among CRAs during the monitoring period, multiple credit ratings are likely to increase information production. Since each CRA's activities are compared to its peers', the CRA is obliged to put more effort in monitoring the issue and the issuer before assigning a rating than when issuers purchase only one rating. Thus, their dependent variable measures the intensity of CRA's monitoring activity. They use a rich US sample of 154,600 tranches from 1985 to 2012. The authors provide strong evidence that CRAs show more effort in monitoring issuers when the tranches have been assigned more than one rating. Also, they show that when multiple ratings have been assigned, CRAs discriminate more efficiently the tranches regarding their default risk.

In a similar analysis to Bongaerts, Cremers and Goetzmann (2012), Drago and Gallo (2018) examine the effect of soliciting multiple ratings on syndicated loan spreads. Their sample contains 7195 syndicated loans granted to 1026 US non-financial public firms. The authors find that on average, banks apply lower spreads to firms that have obtained multiple credit ratings. They attribute this effect on the information production hypothesis as obtaining more credit ratings can lower information asymmetries about borrowers' creditworthiness. They also argue that this finding can be interpreted as evidence of the benefits of the regulatory certification hypothesis (discussed later on), since requiring more credit ratings could reduce information asymmetries and lower the cost of borrowing, increasing market efficiency.

More recently, Goergen, Gounopoulos and Koutroumpis (2021) examine the effect of purchasing multiple credit ratings on initial public offering (IPO) under-pricing. They use a sample of 313 IPOs from 1997 to 2016 of firms that obtained credit ratings before going public, out of which 135 firms received two ratings and 9 firms received three ratings. They unearth several interesting findings. First and most importantly, they show that obtaining multiple credit ratings by the Big 3 CRAs reduces IPO under-pricing as it mitigates uncertainty. Second, multiple ratings also reduce the extent of filing price revisions. Third, multi-rated firms have higher probabilities to survive than firms with only one rating. Finally, the firms that receive the first rating on the borderline between investment-grade and high-yield are more likely to obtain more ratings.

4.1.2.2.2 Rating Shopping and Rating Catering Hypotheses

The rating shopping hypothesis suggests that issuers purchase an additional rating hoping to improve their rating. Should they receive a better rating, they may choose to use this one instead of the lower ones to lower their borrowing costs among other benefits. This process gained significant attention during the financial crisis of 2007-2009. As the NY Times reported: "*The* *banks pay only if [the ratings agency] delivers the desired rating ... If Moody's and a client bank don't see eye*-to-*eye, the bank can either tweak the numbers or try its luck with a competitor like S&P, a process known as ratings shopping*" (Lowenstein 2008).

Although CRAs do not lower their standards and commit to issuing unbiased ratings, additional ratings may still be inflated as a natural consequence of the rating shopping process which is not driven by the CRAs. Instead, it is asset complexity and the ability of issuers to shop for ratings that inflate the final ratings which fail to communicate the true creditworthiness of issuers. An important parameter is that issuers are not obliged to publish their preliminary contacts with rating agencies. Thus, issuers may hide unfavourable pessimistic ratings which reduces the number of ratings publicly available and subsequently decrease the probability of observed rating disagreements and protect the outlook of the issuer from appearing as uncertain.

To prevent the adverse effects of the structure of the credit ratings market, regulators addressed some issues after the global financial crises, without however significant reforms that would curtail or completely restrict rating shopping. For instance, the Dodd-Frank act in the US mandated the removal of credit ratings from regulations, while the cost of entry for new CRAs has increased limiting competition and continuing to rely almost entirely on the Big 3 CRAs. Senator Al Franken attempted to include a provision in the draft of the act that would significantly change the structure of the credit ratings market. The so-called Franken Amendment recommended the establishment of a board that would be overseen by the SEC and would be responsible for assigning CRAs to deals. While issuers would still pay to purchase the rating, they would not be able to select their most favourable CRA anymore. Thus, under this amendment, the practice of rating shopping would end. The Franken Amendment passed in the Senate, but it was not incorporated in the final version of Dodd-Frank act. Another possible regulatory requirement that would make rating shopping innocuous would be to publicly disclose rating solicitation so that investors are aware of the number of ratings initially solicited and those officially issued.

Another hypothesis related to rating shopping introduced by Griffin, Nickerson and Tang (2013) is called rating catering. Although the first part of rating catering encompasses rating shopping, the second part suggests that CRAs may deviate from their standards to increase their revenues or market share. Mathis, McAndrews and Rochet (2009) show that reputational concern is not always a sufficient incentive for CRAs to stick to their standards and report truthful ratings. Indeed, Bolton, Freixas and Shapiro (2012) and Sangiorgi and Spatt (2013) show that due to competition, CRAs have a strong incentive to inflate ratings to attract more business. Under market pressure, the CRA with the higher stringency in assessment standards will lower its standards towards the most lenient competitor's standards. Thus, CRAs compete for market share to "cater" issuers' demand for more lenient ratings, further promoting the rating shopping behaviour by issuers.

The rating shopping hypothesis has received the most attention in the literature than the other two hypotheses because of the unduly behaviour of issuers and CRAs during the financial crisis of 2007-2009. While Bongaerts, Cremers and Goetzmann (2012) among others do not find evidence of the rating shopping hypothesis, many other researchers identify this behavioural trait of issuers either theoretically or empirically.

The seminal theoretical study by Skreta and Veldkamp (2009) develops a theory of ratings inflation based on the rating shopping hypothesis and asset complexity. The authors construct a model of the credit ratings market in which issuers can observe multiple ratings and choose to disclose only the most favourable. They show that when issuers have low asset complexity, they are less likely to shop for more ratings and to receive ratings that disagree. On the contrary, when issuers have high asset complexity, they have an incentive to shop for more ratings and they are more likely to receive ratings significantly differ.

Sangiorgi and Spatt (2017) also investigate the rating shopping hypothesis theoretically. They construct a rational expectations model in which issuers can purchase multiple credit ratings but also choose which ones to disclose. The authors consider the uncertainty around the contacts between issuers and CRAs an important factor. More specifically, they argue that the market may force the disclosure of ratings when the public knows that they have been generated, but endogenous uncertainty can appear and cause rating bias and selective disclosure. Finally, the authors suggest that regulatory disclosure requirements about ratings are going to enhance welfare because while investors price such uncertainty, selective disclosure makes credit ratings more noisy signals and leads to inefficient investment decisions.

Griffin, Nickerson and Tang (2013) argue that rating catering describes more accurately the CRA implications regarding collateralized debt obligations (CDOs) than rating shopping. Their sample contains US CDO ratings from 1997-2007. They show that while investors paid a premium to obtain two ratings, CDO tranches that were double rated by S&P and Moody's as AAA were more likely to default that the ones with only one rating. This is inconsistent with the rating shopping hypothesis which suggests that multiple ratings led to better quality. The authors present evidence that CRAs would make upward adjustments, fluctuating from their assessment model to engage in competition with more lenient CRA market rivals. These inconsistencies were also reflected after the issuance in rating downgrades, showing the harmful misbehaviour of CRAs to attract a larger market share.

He, Qian and Strahan (2015) provide similar evidence of rating catering. They use residential MBS deals rated by the big three rating agencies and issued in the period of 2000-2006. The authors primarily show that except for AAA rated MBSs, multi-rated issues experienced less losses than single-rated tranches which is in line with the rating shopping hypothesis. However, single-rated tranches cannot strongly be explained by their ratings. Interestingly, this suggests that the ratings of single-rated tranches have been "shopped", since unfavourable ratings were never disclosed. For AAA-rated MBSs, their results are in line with those by Griffin, Nickerson and Tang (2013). More specifically, for these securities, 93% of them receive more than one rating and these ratings agree 97% of the time. Thus, CRAs "cater" their ratings to investors when the latter are unable to buy a tranche that is not AAA rated by multiple CRAs.

4.1.2.2.3 Regulatory Certification Hypothesis

The regulatory certification hypothesis suggests that under market and regulatory forces that require the separation of issues in informationally sensitive and non–informationally sensitive, which correspond to high-yield and investment-grade ratings respectively, issuers will seek additional ratings to improve their overall rating towards investment-grade. One of the roles of CRAs is to assist regulators who use ratings as guidelines for regulations. For example, holding high-yield rated bonds is prohibited for many financial institutions. These institutions are only allowed to invest in investment-grade assets. Moreover, the capital adequacy requirements set out in the Basel II and Basel III accords calculate the risk weights of assets based on credit ratings assigned to the assets. For instance, according to the ratings-based approach (RBA) in Basel II, the risk weights depend on the external rating grade, whether the credit rating is a short-term or long-term rating, the granularity of the underlying pool and the seniority of the position. As a result, these regulations affect the pricing of debt securities as portfolio managers not only have to assess the underlying information and quality of the asset, but also have to take into consideration the legal constraints imposed by the rating scale of the asset. For the issuer's perspective, these regulations make the issuer dependent on CRAs not only to assess its creditworthiness, but also to receive an investment-grade rating that will help the issuer attract a larger share from the allocation of capital. Moreover, as Opp, Opp and Harris (2013) show, these regulations can also influence the incentives of CRAs. More specifically, if assigning high-yield ratings is associated with higher costs of regulatory compliance, CRAs are likely to abandon their role as information intermediaries and engage in rating inflation to facilitate regulatory arbitrage to attract revenues and market share. Thus, in the absence of rating-based regulation, issuer-paid ratings would not be subject to misleading inflation, i.e. deliberately reporting higher ratings than the ones produced through adhering on a truthful assessment of issuer's creditworthiness. Also, considering the importance of receiving an investment-grade rating, rating shopping would take place more often around the HY–IG borderline.

Brister, Kennedy and Liu (1994) provide some early evidence on the power of regulatory forces to drive purchases of multiple credit ratings by investors. They argue that with regulations that require from financial institutions to hold only investment-grade assets, ratings may have different effects on the pricing of debt securities. This is because portfolio managers face legal constraints defined by ratings instead of financial information used in the pricing process. The authors show that splitting securities in investment-grade and high-yield through regulation affects both classes' relative yields of corporate bonds. More specifically, the yields of high-yield securities contain a "super premium" (hence the contemporary name) significantly higher than the premium an investor would require to be compensated for the extra default risk associated with high-yield bonds.

Bongaerts, Cremers and Goetzmann (2012) fail to find confirming evidence for the information production and rating shopping hypotheses but they present some results that indicate the existence of regulatory certification. More specifically, they provide strong evidence that Fitch ratings used as complementary to S&P and Moody's ratings have a regulatory certification role. First, receiving a Fitch rating is more likely to be assigned when the other two agencies disagree about the investment grade classification of the issue. This indicates that issuers seek to obtain Fitch ratings to break the tie between S&P and Moody's. More importantly, the authors show that Fitch ratings tend to be better when there are decisive for the classification of the issue. This means that if S&P and Moody's ratings disagree about the investment grade classification of the issue, Fitch ratings are more likely to push the final assessment towards investment grade. Goergen, Gounopoulos and Koutroumpis (2021) provide some similar evidence, showing that the firms that receive the first rating on the borderline between investment-grade and high-yield are more likely to obtain more ratings.

Bruno, Cornaggia and Cornaggia (2015) examine whether the regulatory certification of a CRA as a Nationally Recognized Statistical Rating Organization (NRSRO) affects the CRA's ratings and production of information. The authors present robust evidence that the investor-paid CRA persists on employing the same ratings policy even after its certification for regulatory compliance. This finding indicates that a CRA's policy is more dependent on its compensation structure rather than being certified as an NRSRO. Some related evidence is presented by Opp, Opp and Harris (2013) in their theoretical model. They show that in the presence of ratings-based regulation that favours investment-grade ratings, information production may either be enhanced or impeded, but certainly the number of highly rated securities increases. More importantly, if the advantage of receiving a high rating is significant, the CRA may forgo its role as an information intermediary and choose to facilitate regulatory arbitrage by inflating credit ratings.

4.1.3 Theoretical Framework and Hypothesis Development

All three hypotheses (information production, rating shopping and regulatory certification) that are not mutually exclusive can explain and contribute to a negative relationship between purchasing multiple credit ratings and creating liquidity.

The information production hypothesis suggests that banks purchase more ratings to alleviate information asymmetries. Banks are known as one of the most opaque types of firms (Morgan 2002; Iannotta 2006). Therefore, mitigating informational opacity is critical for bank managers who want to avoid the negative effects of appearing as opaque to outsiders. To present themselves as transparent, banks may purchase more than one rating to show that multiple CRAs agree on their creditworthiness. Publishing multiple ratings that agree would then allow the bank to operate more freely. However, purchasing multiple credit ratings naturally increases the risk of receiving two or more ratings by CRAs that disagree on the creditworthiness of the issuer. As a result, banks that purchase more ratings want to minimize the possibility of receiving ratings that disagree. To achieve this, banks must appear as less opaque and more transparent in the eyes of CRAs. Would banks increase or reduce their liquidity creation to mitigate their relative opacity when they purchase more ratings?

The main components of liquidity creation, i.e. liquid deposits and illiquid loans, are well-connected to bank opacity (Gorton, 2013). Opacity prevents bank runs and maintains the role of liquid deposits as a stable source of funding for the banking industry. The opacity of illiquid loans and assets in general is more obvious. The main underlying reason of bank opacity is the lack of transparency in several aspects of bank assets as discussed in the subsequent chapter in detail. In short, banks mainly hold complex financial assets that are more opaque than simple fixed assets. Illiquid loans are associated with either long maturities or opaque corporate borrowers that make it difficult for outsiders to assess the true value of these loans. Considering the entire function of funding illiquid loans with liquid deposits, Wagner (2007) shows that opacity is valued by bank managers who purposefully design their portfolios to be opaque to increase the difficulty of monitoring by creditors, hence preventing runs (even in the presence of deposit insurance). Therefore, to reduce uncertainty in the eyes of multiple CRAs and increase the chances of receiving ratings that agree on the bank's creditworthiness, banks are likely to reduce their liquidity creation levels when they purchase more ratings.

The rating shopping hypothesis suggests that banks "shop" for multiple ratings to improve their existing rating and as it has been evident in the literature, they often choose their more desirable ratings. It is also evident that rating shopping leads to ratings inflation. Banks and managers are particularly interested in receiving better ratings because they can use them to enjoy a series of advantages such as lower borrowing costs, reduced scrutiny from investors and other outsiders, bypassing regulatory requirements more easily, while managers may also benefit through gaining better reputation and compensation. However, to improve their rating when they purchase additional ratings, banks must improve their creditworthiness.

To achieve this, banks may attempt to lower their risk in various ways such as adjusting their liquidity creation levels as funding illiquid assets with liquid deposits is associated with greater risk. This can happen through all three main components of liquidity creation. First, to increase their resilience to unexpected losses, banks may increase their capital buffers which has a negative weight in the calculation of liquidity creation and it is well-established in empirical literature to cause adverse effects on the creation of liquidity. Second, banks may adjust their deposit structure, i.e. make it less fragile by reducing the percentage of liquid deposits in their balance sheet. Third, banks may reduce their exposures to risky and opaque illiquid loans to control their exposures.

Therefore, as banks seek an improved rating through rating shopping, they may be more conservative with their risk-taking and reduce their liquidity creation levels through these three channels.

Finally, regulatory certification may affect the extent to which banks diversify their portfolios. Regulatory certification leads to the separation of issues in informationally sensitive and non–informationally sensitive, which reflects in their ratings as high-yield and investment-grade respectively.[24] This separation important implications for portfolio diversification. Banks that are subject to regulatory restrictions are unable to diversify their portfolios efficiently not only because high-yield assets are prohibited, but also because they are unreasonably overpriced. As a result, banks may forgo investing in high-yield illiquid assets, reduce the efficiency of their portfolio diversification and be unable to create more liquidity as high levels of liquidity creation require a great level of efficient balance sheet management.

Overall, all three non-mutually exclusive hypotheses can explain why banks that purchase multiple credit ratings have strong incentives to reduce their liquidity creation levels which can be an adverse consequence for economic growth. Since issues that are strongly taken into consideration by CRAs such as risk and opacity can increase with liquidity creation, banks that purchase more ratings are more likely to be conservative with their liquidity creation levels to attract their favourable ratings and mitigate information asymmetries. Therefore, the following hypothesis is developed:

H4.1.1: Banks that purchase more credit ratings, create less liquidity.

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[24] The literature documents that this separation may lead to inefficiencies in the market. Brister, Kennedy and Liu (1994) show that this separation significantly increases the yields of high-yield bonds to a "super premium", much above a justified level for the respective level of risk and uncertainty. More recently, Kisgen and Strahan (2010) provide similar evidence by exploiting the certification of a new CRA by the SEC. They show that firms rated better by the new agency compared to the ratings by other CRAs reduced their cost of debt and bond yields compared to firms for which the new agency provided the same rating as the other CRAs.

4.1.4 Data and Main Variables

The relationship between multiple credit ratings and liquidity creation is examined with a diverse sample of 412 banks from 66 countries which belong mainly to the regions of Europe and Asia-Pacific. Table 4.1.1 presents the number of banks per country available in the sample. The sample ranges in the period of 2005-2018. Bank-level data is obtained from the S&P Global Market Intelligence database and country-level data is collected from the International Monetary Fund (IMF). The S&P Global Market Intelligence database offers rich information on credit ratings provided by the Big 3 CRAs, namely, S&P, Moody's and Fitch. Unlike other studies that use issue-specific ratings, the ratings used in this study are long-term Issuer Credit Ratings (ICR).[25]

The availability of the number of ratings that were purchased by a bank allows the creation of the main independent variable used in this study, MULT, which stands for multiple credit ratings. The variable ranges from 1 to 3 in an ordered form, indicating how many ratings each bank purchased. Following the literature on multiple credit ratings (e.g. Drago & Galo 2018; Goergen, Gounopoulos & Koutroumpis 2021), observations for which MULT is equal to 0 are not included in the regressions.

Figure 4.1.1 presents how the average of MULT across all banks has evolved in the sample period. More specifically, the three-year moving average of MULT is presented, showing that, on average, banks have increased their purchases of credit ratings. This increase can be attributed to regulatory certification since banks have been gradually required in many cases to obtain more than one investment grade ratings. The figure shows that from 2010 onwards banks purchase on average two ratings.

[25] See the following subchapter for a discussion on the advantages of using issuer-specific ratings.

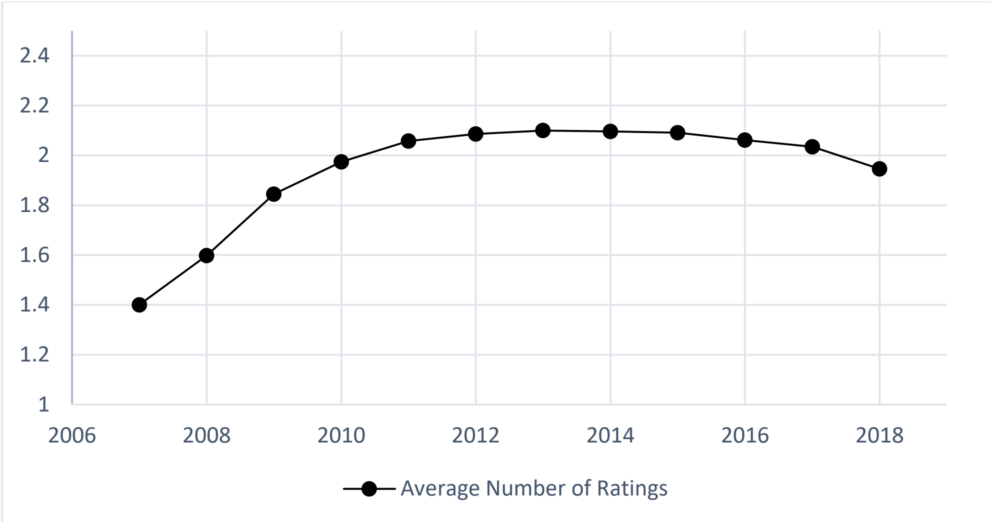

Figure 4.1.1 Average number of ratings purchased by banks per year. The figure presents the three-year moving average of the average number of ratings purchased by banks. The figure includes only banks with at least one rating available.

Table 4.1.1 Number of banks per country

Country	N. of Banks	Country	N. of Banks
Italy	36	Cyprus	4
China	21	Australia	4
Spain	17	Chile	4
Russia	17	Bulgaria	4
United Kingdom	16	Belgium	3
Hong Kong	16	Slovakia	3
France	14	Sweden	3
Austria	14	Ukraine	3
Turkey	14	Czech Republic	3
Germany	13	Lithuania	3
Saudi Arabia	12	Colombia	3
Poland	12	Mongolia	3
Vietnam	12	Slovenia	2
Malaysia	11	Singapore	2
Netherlands	9	Morocco	2
Portugal	9	Georgia	2
Canada	7	Thailand	2
Brazil	7	Philippines	2
Greece	7	Brunei	2
South Korea	7	Croatia	1
Indonesia	7	Bahrain	1
Nigeria	7	Malta	1
Luxembourg	6	Hungary	1
Denmark	6	Norway	1
South Africa	6	Switzerland	1
Kazakhstan	6	Iceland	1
Ireland	5	Mexico	1
Israel	5	Belarus	1
Panama	5	Sri Lanka	1
Peru	5	Dominican Republic	1
Finland	5	Venezuela	1
New Zealand	5	Latvia	1
Romania	5	Azerbaijan	1

4.1.5 Regression Framework

Considering that the main independent variable of the study, MULT, is largely time-invariant, the fixed-effects estimator is not the most efficient method to follow. To address this issue, the baseline regressions use the between- and random-effects estimators in the following forms:

$$\overline{Liquidity\ Creation}_i = \alpha_0 + \beta_1 \overline{MULT}_i + \sum_{j=1}^{7} \beta_j\ \overline{Bank\ Control}_i + \sum_{j=1}^{2} \beta_j\ \overline{Country\ Control}_c + \mu_c + \varepsilon_i \quad (5.1.1)$$

$$Liquidity\ Creation_{i,t} = \alpha_0 + \beta_1 MULT_{i,t-1} + + \sum_{j=1}^{7} \beta_j\ Bank\ Control_{i,t-1} + \sum_{j=1}^{2} \beta_j\ Country\ Control_{c,t-1} + \lambda_t + \mu_c + \varepsilon_{i,t} \quad (5.1.2)$$

where liquidity creation is one of the liquidity creation measures and MULT is the multiple credit ratings variable as described earlier. The regressions include seven bank-level control variables and two country-level control variables. More specifically, the bank-level control variables are the equity to assets ratio (EQRAT), loan loss reserves (LLR), return on average assets (ROAA), managerial quality measured by the ratio of operating expenses to operating income (MQ), natural logarithm of the ZSCORE[26] (LNZSCORE), bank size measured by the natural logarithm of total revenue and current bank age in years (AGE). The country-level control variables are real GDP growth (GDPG) and the unemployment rate (UNEMP) of the bank's host country. Both regression frameworks include country dummies denoted by μ_c, and the random-effects regressions also include year dummies denoted by λ_t. ε_i and $\varepsilon_{i,t}$ are the errors terms. The descriptive statistics of all variables used in these regressions are presented in Table 4.1.2.

[26] ZSCORE is calculated as the sum of EQRAT and ROAA divided by the standard deviation of ROAA.

Table 4.1.2 Descriptive Statistics

	Obs.	Mean	Median	Std. Dev.	5th Perc.	95th Perc.
LC1	2,509	0.245	0.261	0.186	-0.102	0.506
LC2	2,509	0.134	0.128	0.172	-0.159	0.403
LC3	2,437	0.218	0.238	0.167	-0.113	0.450
LC4	2,437	0.098	0.107	0.138	-0.148	0.308
MULT	2,509	2.019	2.000	0.826	1.000	3.000
MULT-D	2,509	0.668	1.000	0.471	0.000	1.000
EQRAT	2,509	0.084	0.078	0.038	0.033	0.157
LLR	2,509	0.035	0.024	0.041	0.003	0.102
ROAA	2,509	0.008	0.008	0.012	-0.007	0.024
MQ	2,509	0.559	0.546	0.208	0.312	0.840
LNZSCORE	2,509	2.914	3.094	1.066	1.074	4.163
SIZE	2,509	2.297	2.000	0.750	1.000	3.000
AGE	2,509	3.867	3.951	1.072	2.197	5.252
GDPG	2,509	0.026	0.024	0.035	-0.037	0.079
UNEMP	2,509	0.075	0.064	0.045	0.030	0.172

This table presents the descriptive statistics of all variables used in the regressions. LC1, LC2, LC3 and LC4 are the liquidity creation measures, MULT and MULT-D are the multiple credit ratings variables, EQRAT is the equity ratio, LLR is the ratio of total loan loss reserves to total loans and leases, ROAA is the return on average assets, MQ is the cost to income ratio, LNNZSCORE is the natural logarithm of the ZSCORE, SIZE is the bank size class (1 = small, 2 = medium, 3 = large), AGE is the natural logarithm of the bank's age in years, GDPG is the real GDP growth and UNEMP is the unemployment rate.

4.1.6 Results and Discussion

The baseline results using the BE and RE estimators are presented in Table 4.1.3. The first four columns report the results of the liquidity creation measures (LC3 and LC4) being regressed only on the multiple credit ratings variable (MULT). In the next four columns, the nine bank- and country-level control variables are added to the regressions. The results appear to be consistent with our theoretical prediction that liquidity creation is negatively associated with the number of ratings purchased by the bank. More specifically, the coefficient of MULT is negative and significant at the 1% or 5% level in all regressions. The size of the coefficients suggests that the results are also economically significant. As expected, the BE coefficients are larger than the RE coefficients. The BE coefficients that refer to a long-term relationship between the averages of each variable indicate that purchasing an additional rating is associated with creating less liquidity by 4.2%. On the other hand, in the RE estimations, where one-year lags are used, purchasing an additional rating in the previous year is associated with a decrease in liquidity creation by about 0.7% to 1.6%. In both cases, the relationship seems to be largely economically significant.

As discussed in the hypothesis development, all three existing hypotheses about why firms purchase multiple credit ratings can explain the negative relationship between purchases of multiple credit ratings and liquidity creation. First, banks may contract their long-term and corporate lending that is inherently opaque to reduce information opaqueness and obtain ratings that agree about their creditworthiness by multiple CRAs. Second, banks may contract their overall liquidity creation to reduce liquidity risk and obtain a better creditworthiness assessment when they are shopping for additional ratings. Third, regulatory certification may force banks out of efficiently diversifying their illiquid assets portfolio and thus requirements for obtaining multiple investment-grade ratings may lead to contractions in liquidity creation. However, it is empirically challenging to distinguish among the three hypotheses that are not mutually exclusive and can coexist. In the robustness tests section, an indication towards rating shopping is provided.

Table 4.1.3 Between- and random-effects estimations for the relationship between multiple credit ratings and liquidity creation.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	LC1	LC2	LC1	LC2	LC1	LC2	LC1	LC2
MULT	-0.034***	-0.030***	-0.017***	-0.009**	-0.042***	-0.042***	-0.016***	-0.007**
	(0.012)	(0.011)	(0.004)	(0.003)	(0.014)	(0.014)	(0.004)	(0.003)
EQRAT					-0.230	-0.278	0.017	0.019
					(0.347)	(0.338)	(0.126)	(0.114)
LLR					0.143	-0.127	-0.557***	-0.528***
					(0.409)	(0.398)	(0.082)	(0.073)
ROAA					-0.445	-0.103	-0.869***	-0.780***
					(1.308)	(1.275)	(0.275)	(0.246)
MQ					0.023	0.012	-0.006	0.001
					(0.065)	(0.064)	(0.009)	(0.008)
LNZSCORE					0.014	0.012	0.018***	0.021***
					(0.010)	(0.010)	(0.007)	(0.006)
SIZE					0.015	0.022	-0.004	0.000
					(0.017)	(0.017)	(0.014)	(0.014)
AGE					0.009	0.009	0.002	0.005
					(0.008)	(0.008)	(0.007)	(0.006)
GDPG					-0.146	-0.123	0.487***	0.467***
					(0.623)	(0.607)	(0.075)	(0.066)
UNEMP					-1.055	-0.740	-0.053	-0.097
					(0.750)	(0.731)	(0.087)	(0.077)
CONSTANT	0.526***	0.358***	0.495***	0.313***	0.494***	0.324***	0.414***	0.197**
	(0.081)	(0.079)	(0.084)	(0.081)	(0.121)	(0.117)	(0.092)	(0.089)
Year Dummies	NO	NO	YES	YES	NO	NO	YES	YES
Country Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Obs.	2,509	2,509	2,066	2,066	2,509	2,509	2,066	2,066
N. of Banks	413	413	352	352	413	413	352	352
R2 Between	0.387	0.343			0.400	0.359		
Pseudo R2			0.055	0.058			0.082	0.091
Method	BE	BE	RE	RE	BE	BE	RE	RE

This table reports between- and random-effects estimator results. The sample ranges from 2005 to 2018. The dependent variable is liquidity creation denoted as LC1 or LC2. The main independent variable MULT stands for multiple credit ratings. EQRAT is the equity ratio, LLR is the ratio of total loan loss reserves to total loans and leases, ROAA is the return on average assets, MQ is the cost to income ratio, LNNZSCORE is the natural logarithm of the ZSCORE, SIZE is the bank size class (1 = small, 2 = medium, 3 = large), AGE is the natural logarithm of the bank's age in years, GDPG is the real GDP growth and UNEMP is the unemployment rate. In the RE regressions, independent variables are used in their one-year lagged form. Standard errors are reported in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

4.1.7 Robustness Tests

Five robustness tests are conducted on the baseline results. The robustness tests results are presented in Tables 4.1.4 and 4.1.5. First, the results are reproduced using the LC1 and LC2 as the dependent variables. The coefficient of MULT in columns (1) and (2) of Table 4.1.4 remains highly significant in both cases. Second, an alternative measure of the number of ratings is used. More specifically, the variable MULT-D takes the value of 0 if the bank has purchased one rating and the value of 1 if the bank has purchased more ratings. The coefficient of MULT-D remains highly significant in column (3) but not in column (4) of Table 4.1.4. Third, the weaker banks are removed from the sample. Bongaerts, Cremers and Goetzmann (2012) suggest that regulatory certification increases the need for multiple credit ratings more for the weaker issuers, compared to the stronger issuers. Weak banks are identified as those that either have average problem loans[27] higher than the 75th percentile of the total sample or have been assigned a high-yield rating by at least one CRA. The results reported in columns (5) and (6) of Table 4.1.4, show that the weaker banks do not drive the baseline results since the coefficient of MULT is highly significant in both columns.

Fourth, since multiple credit ratings and liquidity creation are bank-level variables, the relationship is likely to be endogenous and the baseline regressions cannot rule out reverse causality. To address this issue and considering the that the MULT and MULT-D variables are largely time-invariant, the Hausman-Taylor (HT) estimator is employed. The underlying assumption of the HT is that some of the explanatory variables are correlated with the individual

[27] Average problem loans refers to the bank-level average of the best available in the following order: 1) Non-Performing Loans, 2) Gross Impaired Loans, 3) Net Impaired Loans, 4) Other Problem Loans (of unknown categorization), normalized by Net Total Loans.

random effects but none of the explanatory variables are correlated with the error term.[28] The HT uses a group of internal instruments to address endogeneity. The Sargan-Hansen test of overidentifying restrictions is reported to assess the validity of instruments used in the regressions. The null hypothesis is not rejected in all regressions reported. This indicates that the excluded instruments are uncorrelated with the error term and therefore they are correctly excluded from the estimations. To run the HT regressions, the MULT and MULT-D variables are transformed into completely time-invariant by estimating their bank-level average. All bank-level variables are treated as endogenous except for Age. Following the literature on liquidity creation, country-level control variables (e.g. Distinguin, Roulet & Tarazi 2013), Age[29] (e.g. Fungáčová, Weill & Zhou 2017) and the time dummies are treated as exogenous. The HT estimator results are presented in Columns (7) to (10) of Table 4.1.4. The coefficients of MULT and MULT-D are significant at the 10%, 5% or 1% level, confirming the baseline findings.

Finally, to test the moderating role of bank capital in the relationship between multiple credit ratings and liquidity creation, an interaction term between MULT and EQRAT is introduced, using the BE and RE estimators.[30] Bank capital is an important element of bank regulations as it is used to help banks survive unexpected losses. In this test, all four liquidity creation measures are used, and the results are presented in Table 4.1.5. The coefficient of MULT maintains its negative sign and high significance in almost all regressions. At the same time, the coefficient of the interaction term between MULT and EQRAT is positive and significant at the 5% or 10% level in six of the

[28] Many studies that face similar issues with endogenous time-invariant independent variables have previously used the HT estimator (e.g. Tennant & Sutherland 2014; Alraheb, Nicolas & Tarazi 2019).
[29] As the estimator requires one exogenous time-invariant variable, Age is transformed into time-invariant by calculating the bank-level average.
[30] These regressions are not reproduced using the HT estimator because when using interaction terms, the HT multiplies the number of valid instruments required, making it difficult to be applied in models with interaction terms (Lepetit et al. 2018).

eight columns. The positive coefficient of the interaction term indicates that bank capital can mitigate the negative relationship between multiple credit ratings and liquidity creation. This is an indication that the relationship might be driven by insolvency risk and that the rating shopping hypothesis might prevail. For example, although banks can reduce their liquidity creation levels to enhance their credit profile and obtain their desired rating, higher stability with more capital may increase banks' confidence about their perceived creditworthiness by CRAs and prevent unnecessary reductions in liquidity creation.

Table 4.1.4 Robustness Tests.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	LC3	LC4	LC1	LC2	LC1	LC2	LC1	LC2	LC1	LC2
MULT	-0.011***	-0.006**			-0.025***	-0.013***	-0.112*	-0.140**		
	(0.004)	(0.003)			(0.005)	(0.004)	(0.066)	(0.067)		
MULT-D			-0.017***	-0.006					-0.201**	-0.274***
			(0.006)	(0.005)					(0.093)	(0.088)
Control Variables	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country Dummies	YES	YES	YES	YES	YES	YES	NO	NO	NO	NO
Obs.	2,008	2,008	2,066	2,066	1,445	1,445	2,509	2,509	2,509	2,509
N. of Banks	335	335	352	352	245	245	413	413	413	413
Pseudo R2	0.093	0.071	0.080	0.090	0.105	0.104				
Sargan-Hansen P-Value							0.337	0.507	0.397	0.547
Method	RE	RE	RE	RE	RE	RE	HT	HT	HT	HT

This table reports random-effects and Hausman-Taylor estimator results. The sample ranges from 2005 to 2018. The dependent variable is liquidity creation denoted as LC1, LC2, LC3 or LC4. The main independent variables are MULT and MULT-D that stand for multiple credit ratings. The same control variables are used as in Table 3. In the RE regressions, independent variables are used in their one-year lagged form. In Columns (5) and (6), banks with more than 7.5% in average problem loans or rated as high-yield have been removed. Standard errors are reported in parentheses (robust standard errors clustered at the country level for the HT regressions). *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

Table 4.1.5 The moderating role of bank capital in the relationship between multiple credit ratings and liquidity creation.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	LC1	LC2	LC1	LC2	LC3	LC4	LC3	LC4
MULT	-0.103***	-0.088***	-0.017**	-0.020***	-0.058**	-0.052**	-0.010	-0.020***
	(0.031)	(0.030)	(0.007)	(0.006)	(0.028)	(0.025)	(0.007)	(0.006)
MULT*EQRAT	0.759**	0.557*	0.019	0.159**	0.544**	0.473*	-0.001	0.154**
	(0.333)	(0.325)	(0.074)	(0.065)	(0.273)	(0.250)	(0.073)	(0.061)
EQRAT	-1.416**	-1.149*	-0.015	-0.248	-1.164**	-0.945**	0.139	-0.177
	(0.624)	(0.610)	(0.176)	(0.158)	(0.496)	(0.454)	(0.171)	(0.145)
Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Year Dummies	NO	NO	YES	YES	NO	NO	YES	YES
Country Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Obs.	2,509	2,509	2,066	2,066	2,437	2,437	2,008	2,008
N. of Banks	413	413	352	352	402	402	335	335
R2 Between	0.409	0.365			0.499	0.417		
Pseudo R2			0.082	0.092			0.093	0.072
Method	BE	BE	RE	RE	BE	BE	RE	RE

This table reports between- and random-effects estimator results. The sample ranges from 2005 to 2018. The dependent variable is liquidity creation denoted as LC1 or LC2. The main independent variable MULT stands for multiple credit ratings. The same control variables are used as in Table 4.1.3. In the RE regressions, independent variables are used in their one-year lagged form. Standard errors are reported in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

4.1.8 Policy Implications

The documented negative relationship between multiple credit ratings and liquidity creation has important policy implications. Despite the fact that CRAs received criticism during the financial crisis of 2007-2009 and that in Basel III reliance on credit ratings was attempted to be reduced, regulators still depend on CRAs for the assessment of banks' creditworthiness significantly. As shown earlier in Figure 4.1.1, banks are purchasing more credit ratings after the financial crisis, while even Basel III still relies a lot on CRAs. By obtaining multiple investment grade ratings, banks reduce their perceived risk and thus they are subject to fewer disciplinary actions. However, as shown in this study, purchasing more credit ratings can lead to reduced liquidity creation levels which might impede economic growth. Therefore, should regulators continue to rely on multiple credit ratings to enhance the quality of information on bank creditworthiness or reduce their reliance on CRAs to enable the creation of liquidity? The results on the moderating role of bank capital show that the negative relationship between multiple credit ratings and liquidity creation can be mitigated with tighter capital requirements. Although capital requirements have been shown to be harmful for liquidity creation (e.g. Horváth, Seidler & Weill 2014; Fungáčová, Weill & Zhou 2017), it appears that they can also be beneficial for liquidity creation in another indirect way. Hence, the results extend the policy implications of the relationship between bank capital and liquidity creation, showing that it is not only the direct relationship that needs to be investigated and that regulators have to consider a wider pool of effects when judging the effectiveness of policies.

4.1.9 Conclusions

This subchapter aims to investigate the relationship between the number of ratings that banks purchase and liquidity creation. The literature on multiple credit ratings is growing but a small part of it is dedicated to the banking industry, while no other study examines the relationship of multiple credit ratings with forms of bank output such as liquidity creation. The purchase of multiple credit ratings in an issue with important policy implications because regulatory frameworks such as Basel II and III rely significantly on creditworthiness assessment by CRAs. Does this shift towards purchasing more credit ratings help or impede banks capacity to create liquidity in the economy?

Using an international sample, the empirical analysis undertaken in this chapter shows that the number of ratings that banks purchase and liquidity creation are negatively related. This is consistent with the three non-mutually exclusive hypotheses on the incentives of banks for purchasing additional ratings, i.e. the information production, rating shopping and regulatory certification hypotheses. First, banks may contract their liquidity creation levels to reduce the opaqueness associated with illiquid loans to private borrowers that increase uncertainty in the assessment by CRAs. Second, banks may simply reduce their liquidity creation levels to reduce liquidity risk, an important determinant of credit ratings. Third, banks may create less liquidity as a result of the limits on portfolio diversification imposed by regulatory certification. Yet, it is difficult to indicate towards which of the hypotheses might prevail. Attempting to address this, additional analysis shows that capital can positively moderate this relationship, suggesting that banks' primary concern is their risk profile when purchasing multiple credit ratings.

The relationship between multiple credit ratings and liquidity creation is subject to endogeneity concerns. Although the theory suggests that banks have specific incentives for purchasing multiple credit ratings, we cannot eliminate the possibility that banks purchase more ratings after they have created more liquidity. This chapter uses the Hausman-Taylor estimator to address endogeneity concerns since this estimator employs some internally constructed instruments. Yet, using this estimator alone cannot alleviate all concerns, while the time-invariance of the main independent variables and the fact that both multiple credit ratings and liquidity creation are at the bank-level do not allow more examination of this issue. Therefore, further investigation of the endogeneity problems of this relationship should be undertaken by future research.

The examination of the relationship between multiple credit ratings and liquidity creation in this chapter has some limitations. First, due to the nature of main independent variables that are largely time-invariant, the relationship is not examined using fixed effects. The fixed-effects estimator can remove the individual effect from the error term and thus reduce the chances of omitted variable bias issues. Second, due to the availability of data, it is not possible to examine all three hypotheses on which the negative relationship between multiple credit ratings and liquidity creation is based and offer safer conclusions with respect to which hypotheses prevail the most.

Chapter 4.2: Bank Asset and Informational Quality[31]

4.2.1 Introduction

The literature demonstrates that banks are not always transparent about their risks and losses. Banks can use accounting techniques to hide loan losses such as rolling over or refinancing loans (Niimaki 2012) or choose to delay the recognition of their losses (Bushman & Williams 2015). Banks can exploit the disclosure of better asset quality than the truth as it reduces their capital needs, helps them gain better reputation and market share, while bank managers can also enjoy better compensation and credentials (Jensen & Meckling 1976). Yet, such information asymmetries can adversely affect the stability of individual banks and the wider financial system since important information about bank risk-taking is hidden from regulators who would otherwise intervene to prevent problems in due time. One of the external parties that regulators significantly rely on for bank monitoring are credit rating agencies (CRAs). When all information about banks' creditworthiness is not available to CRAs, they can issue ratings that disagree with each other, indicating the presence of opacity. This chapter investigates whether measures of poor asset quality indeed widen credit rating disagreements among the Big 3 CRAs.

The problem of lack of informational quality, also referred to as opacity, is an important issue especially for banking entities. The literature has documented that banks are inherently more opaque than other types of firms because they hold more risky types of assets in their portfolios

[31] A paper based on this subchapter has been published by the Journal of International Financial Markets, Institutions and Money in the November 2020 issue (see https://doi.org/10.1016/j.intfin.2020.101256).

(Morgan 2002; Flannery, Kwan & Nimalendran 2004; Iannotta 2006). Banks hold few assets that can be easily valued and are not risky. Instead, bank portfolios are dominated by risky financial assets, leading to significant agency problems among shareholders, managers and creditors. Small loans provided to private borrowers are particularly difficult to be monitored effectively (Diamond 1984). Morgan (2002) suggests that the delegation of borrower monitoring to banks is efficient but banks might not always be transparent about the creditworthiness of their borrowers. Gao et al. (2020) further support this argument by showing that lending to opaque borrowers can adversely affect bank monitoring. Therefore, bank opacity can arise either through loss-hiding techniques or because of the opacity associated with opaque loans. In other words, poor asset quality is likely to be positively associated with bank opacity.

Whether banks should be opaque or transparent is debated in the literature. One strand of the literature suggests that the functions of banks are enabled by opacity. Berger et al. (2000) show that banks' organizational complexity helps them exploit their access to proprietary information about core depositor balances and thus use deposit information to manage and extend their lending. Jungherr (2018) argues that transparency can even facilitate bank runs. This is because banks' private creditors cannot easily differentiate which banks are healthy and which are taking excess risks when the risk exposures are unobservable to outsiders. Therefore, opacity is inherent in the well-being of banks and protects vulnerable institutions from runs. On the other hand, the literature has documented the adverse effects of bank opacity as well. First, opaque firms are more difficult to be accurately valued by investors which reduces the share's market liquidity and increases price volatility (Dudley 2009). Indeed, the literature has shown that opacity can affect several aspects of the financial markets such as bond yields (Livingston & Zhou 2010), price delay (especially for banks) (Hou & Moskowitz 2005; Blau, Brough & Griffith 2017) and fund leverage through agency problems (Sato 2014). Second, extant evidence suggests that opacity can increase bank risk and instability (Fosu et al. 2017; Cao & Juelsrud 2020). Finally, Zheng (2020) show that opacity can reduce bank loan growth.

Regulators have been particularly interested in reducing the worrying levels of NPLs and increasing transparency in the banking sector after the global financial crisis of 2007-2009. Both in the EU and the US significant effort was put to reduce NPL levels. In the US, actions such as the Troubled Asset Relief Program (TARP) helped banks significantly to get rid of non-performing assets. In the EU, the European Council agreed upon the Action Plan to tackle NPLs supported by important structural changes in the banking sector that however were delayed considerably compared to the respective response in the US. Globally, one of the recommended tools for reducing NPL levels is increased transparency of non-performing exposures to enhance comparability across jurisdictions and quicken the reduction process. This chapter seeks empirical evidence to test whether poor asset quality in bank portfolios indeed has been associated with the lack of transparency and whether regulators' call for increased transparency is justified.

Although bank opacity is an important issue for the stability of the financial system, only a few studies are dedicated to examining the determinants of bank opacity as measured by split ratings. For instance, the seminal study by Morgan (2002) examines the disagreement between S&P and Moody's ratings on bond issues by US banks in the period of 1983-1993. Morgan demonstrated for the first time that a bank's asset composition has an important contribution on the likelihood of a split rating. In particular, the types of assets that are traditionally more opaque, such as loans or trading assets, are positively associated with split ratings. On the other hand, fixed assets such as real estate that carry less uncertainty are inversely associated with split ratings. Similar evidence is provided by Iannotta (2006) for European banks. However, these studies do not investigate whether the quality of financial assets can also contribute to split ratings. One could argue that these studies document that split ratings are positively associated with low credit ratings, which can be influenced by asset quality (e.g. Poon, Firth & Fung 1999; Huang & Shen 2015). Yet, credit ratings and asset quality are two different constructs that should be studied separately. Credit ratings may reflect the overall creditworthiness of banks and their ability to meet their financial commitments, but asset quality measures such as NPLs are only partly related to banks' capacity to repay their creditors as banks can turn to alternative sources of funding to cover their debt obligations in times of distress such as wholesale funding or raising capital. The inadequacy of credit ratings to predict bank failures during the financial crisis of 2007-2009 and the strong focus of regulatory policies in recent years on reducing the levels of NPLs, further support that the effects of poor asset quality on split ratings should be investigated separately, regardless of previous findings on the effect of credit ratings.

4.2.2 Literature Review on Bank Opacity

This section reviews the most prominent studies on bank opacity that relate to the relationship between asset quality and rating disagreements. More specifically it attempts to answer the following questions: Why do banks actively hide their losses, increasing bank opacity? Why are banks inherently more opaque than other types of firms? Which are the consequences of opacity for banks and the wider financial system? Why is poor asset quality threatening stability and which are the responses of regulators to mitigate this problem?

4.2.2.1 Why and how do banks hide their loan losses?

As this chapter posits that banks become more opaque when their asset quality deteriorates, it implies that banks may hide their loan losses. The motives, economic drivers and mechanism of this act remain largely under-researched, although some studies have attempted to explain it.

Hiding loan losses is a notable practice in the banking industry and it can even constitute a key driver of banking crises. The banking crisis in Mexico that took place in 1994-1995 was widely seen as the outcome of a crisis in the balance-of-payments. However, Desmet (2000) argues that the crisis was essentially nurtured for many years before by a common practice of hiding non-performing loans in the Mexican banking industry. Calomiris, Klingebiel and Laeven (2004) support this argument suggesting that many banks at the time of their privatization were suffering by poor asset quality, something that was not actually reported. More specifically, hiding the adverse quality of loan portfolios served the interests of the bank owners, helping them to comply with the regulatory requirements and avoid costs associated with recapitalization.

Theoretical literature and anecdotal evidence suggest two possible motivations for banks behaviour to hide their loan losses. One refers to a regulatory perspective and the other to conflicts between managers and shareholders. The two immediate benefits for the bank after hiding loan losses are the increased profitability because of lower provisioning against problem loans and the appearance of a less risky asset portfolio than the truth because of the underreporting of problem loans. Both of these advantages can help the bank to lower its capital needs, and managers may hide losses to meet capital requirements more easily. Simultaneously, bank managers can take advantage of under-reported losses through higher compensation because of a better reported performance and enhance their reputation in the labour market. Therefore, although hiding loan losses may hinder the long-term interests of shareholders, managers are still motivated to under-report problem loans for their own short-term benefits. Managerial myopia, defined as the behaviour of boosting current earnings at the expense of long-term value, has been investigated extensively by researchers (e.g. Stein 1989; Von Thadden 1995). In the model of Rajan (1994) bank managers with short-term goals attempt to change the market's perception of the bank’s true performance by unduly inflating earnings or hiding losses, as for instance they may continue to lend to borrowers who are close to default or have defaulted. Rajan (1994) highlights that this agency problem can occur even for well-capitalized banks, suggesting the significance of shareholder monitoring and managerial incentives in the practice of under-reporting and hiding negative information.

Such managerial agency problems arise mainly because of the informational advantage of managers of the firm compared to its shareholders. It is more likely for managerial behaviour to take place when shareholders do not possess a lot of information about managers’ actions or when shareholders are unable to evaluate the information that is communicated to them. For instance, misinformed shareholders may reward managers with luxurious performance bonuses if managers have managed to inflate their short-term performance by under-reporting problem loans. Boot and

Macey (2003) emphasize that a fundamental trade-off in the corporate governance mechanism exists between proximity and objectivity. Proximity enhances the quality of information that is available to monitors and thus increases their efficiency. On the other hand, monitors with high proximity may become too intimate with management and lose their objectivity that is essential for monitoring managers effectively.

Trying to unearth the economic drivers of banks' behaviour to hide loan losses, Flanagan and Purnanandam (2019) use these arguments to develop proxies for monitoring, taking into consideration the identity and composition of banks' shareholder base and banks' board nature. Their main dependent variable is the log of the ratio of actual NPLs to reported NPLs followed by several variants. The authors measure information asymmetry between bank managers and shareholders by the percentage of shares held by foreign institutional shareholders. The authors use a small sample of 73 bank-year observations of Indian banks. The findings show that weak close supervision by the shareholders and strong managerial incentive contracts are important economic drivers of hidden loan losses. More specifically, banks that owned by a greater percentage by distant and passive foreign institutional investors hide more losses. Also, this effect is stronger for banks in which the CEO is very well compensated for higher reported profits.

Some other researchers conduct closely related studies, although not for the banking industry. Burns and Kedia (2006) examine the effect of performance-based CEO compensation on misreporting. The authors compare S&P 1,500 firms that publish a restatement of their financial statements with the rest of the firms that do not restate in the period of 1995-2002. The findings show that the dependency of the CEO's option portfolio on the firm's stock price is significantly and positively associated with the firm's tendency to misreport. The study does not find however that other components of the CEO's compensation are related to the propensity to misreport (e.g.

equity, bonus, restricted stock). The authors attribute this finding to the convexity of CEO wealth (due to stock options) which controls the downside risk when misreporting is detected.

Povel, Singh and Winton (2007) conduct a theoretical study to examine fraud (through altering publicly reported information) and monitoring decisions by investors. Their theoretical model unearths interesting findings related to the discussion in this section. First, the results show that fraud occurs more often during relatively good times, and the reduction of monitoring costs can strengthen this relationship. However, fraud may be mitigated when business conditions improve. Second, the authors explain why fraud peaks close to the end of a boom, followed by a bust which reveals the fraud. Except for the more traditional view that during booms investors are more naïve or careless, the authors argue that fraud during boom peaks can occur also by perfectly rational agents whose self-interests drive their decision on whether to monitor or whether to commit fraud. Finally, they show that fraud can also be fostered when firms disclose more information to the public.

But how do banks manage to hide their real loan losses and unduly report untrue numbers? Niimaki (2012) introduces two methods of hiding loan losses. First, when a loan (especially a large one) loses its value or quality because the borrower cannot repay, the bank can roll over the loan. In this way, the bank gives more time to the borrower to repay and the loan is prevented from turning non-performing. Second, an alternative way to hide the adverse status of the loan is to issue a new loan to repay the original loan, a method that is called refinancing. With this method, while both the old and the new loan incorporate a certain level of risk and uncertainty, they both appear as perfectly performing to outsiders. The author argues that refinancing is similar to a Ponzi scheme but it is more profitable than the rollover method for a non-monitoring bank because the rollover method can increase bank illiquidity. The profitability that arises from the rollover method is reduced when regulators ask from banks to diversify their loan portfolio in a way that makes problematic banks illiquid and increased when capitalized loan interest payments are allowed to be used for the purposes of capital adequacy requirements. While, the refinancing method is more profitable, the author cannot explain why banks choose more often to hide loan losses with the rollover method.

Niimaki (2012) also makes suggestions on how regulators can eliminate the hiding of loan losses. The author argues that eliminating hidden losses is challenging because sometimes it is socially optimal to reschedule loans such as the case in which a loan is profitable and performing in the long-run but the borrower cannot meet the short-term obligations to the bank. However, the analysis shows that regulators can mitigate bank loss hiding by reducing the dividend pay-outs of a bank that possesses many rescheduled loans. Yet, this is not a very realistic method to banks have long-term relationships with borrowers that receive sequential loans based on their stochastic needs. As a result, it is practically impossible to reduce the dividend pay-outs of all banks with such long-term relationships with their borrowers.

4.2.2.2 Why are banks more opaque than other types of firms?

Perhaps the strand of the literature that relates most closely with the empirical work of this chapter is the one investigating the relative opacity of banks. This stream of literature supports that the main motivation for regulating and supervising banks is that banks are much like black boxes, full of information that is difficult to possess and understand. Banks receive money mostly in the form of deposits and use these deposits to create loans, but what happens during the intermediation process is difficult for outsider to observe. In the absence of regulation that offers deposit insurance, a lender of last resort, capital adequacy requirements and other important tools, the financial system would be completely exposed to the adverse effects of bank opacity as explained earlier. Based on this motivation, a series of studies investigated whether banks are indeed more opaque than other types of firms.

The first comprehensive study that strongly documented the relative opacity of banks is conducted by Morgan (2002). The study measures bank opacity with the disagreements between the ratings provided by S&P and Moody's on 7,862 new bonds issued by US firms in the period of January 1983 to July 1993. Morgan includes in the sample all available industries to investigate bank relative opacity and unearths interesting findings that set a strong basis for future research on bank opacity and rating disagreements. First, Morgan focuses on bond characteristics that affect rating disagreements and shows that disagreements are positively related with the average rating and the maturity of the bond, while they are negatively related with bond face value. Second, the study shows that banks relative to firms from other industries are more opaque as they are more likely to be assigned ratings that disagree. Finally, Morgan attempts to investigate which types of bank assets contribute the most to bank opacity and rating disagreements. The results show that financial assets that more likely to be opaque such as loans and trading assets contribute positively to rating disagreements, while assets that are usually more transparent such as real estate reduce bank opacity.

A study very closely connected to Morgan's work was conducted by Iannotta (2006). Iannotta provides similar evidence with Morgan but uses a sample of 2,473 bonds issued by European firms during the period of 1993–2003. The study unearths four main findings. First, although bank issues have fewer split ratings than other types of firms, controlling for risk and other firm-level characteristics shows that banks are more likely to receive ratings that disagree. Second, subordinated bonds are also more likely to attract unaligned ratings. Third, as Morgan also showed, rating disagreements increase with opaque financial assets and decrease with more transparent fixed assets. Finally, bank opacity measured with split ratings also increases with bank size and stronger capitalization. The author argues that although bank opacity may be driven by the complexity of large organizations, it may also flow from unclear government guarantees on bank liabilities which make outsiders judgement on bank risk rather subjective.

Livingston, Naranjo and Zhou (2007) also present similar evidence as they study the importance of asset opaqueness for split ratings. They examine 1,779 US bond issues in the period of 1983-2000. Importantly, the authors exclude financial issues from the sample because Morgan (2002) had already shown that banks are more opaque. Although this prevents the study from adding evidence directly to the question in the title of this section, it adds to the most important part of this chapter which is the effect of asset opaqueness on split ratings. To proxy asset opaqueness, the authors use a battery of variables including accounting-based, opinion-based, market microstructure and firm size measures. Consistent with the findings by Morgan, the authors document that asset opaqueness contributes significantly to split ratings.

On the other hand, Flannery, Kwan and Nimalendran (2004, 2013) argue that banks may not necessarily be opaque than other types of firms. Both studies focus on market microstructure characteristics to measure opacity in the stock market. In the first attempt, the authors use a sample of about 5,000 observations of US bank holding companies in the period of 1990-1997. The results show that large bank holding companies traded on the NYSE share similar market microstructure characteristics to nonfinancial firms, while smaller bank holding companies traded on NASDAQ have similar spreads but their stocks are traded less frequently. The authors argue that banks are not unusually opaque; but rather boring. In the second study, they use a much richer sample that consists of about 45,000 firm-month observations for NASD firms and 13,000 firm-month observations for NYSE firms in the period of 1993-2009. They fail to find that banks are more opaque than matched nonfinancial firms during non-crisis periods. They show that during these normal times banks exhibit a bit larger spreads but lower price impact which is a rather mixed finding regarding opacity. On the other hand, in the two crisis periods that the authors investigate (LTCM and 2007-2009 crises) banks' stock price spreads and price impact increased significantly which is consistent with the expectations of banks being more opaque than other types of firms.

4.2.2.3 Other Studies on the Determinants of Opacity

Jiang, Levine and Lin (2016) examine the effect of regulatory induced competition on bank opacity. The motivation of the study is based on mixed evidence of existing models. Some predict that competition motivates managers to manipulate the information they disclose, while others show that competition enhances efficiency and forces banks to disclose more truthful information. The authors develop three measures of regulatory induced competition which take into account the regulatory environment of its subsidiary and its distance from the capital of every other state. Their sample contains 27,137 bank-quarter observations starting in 1986. The empirical findings of the study show that regulatory induced competition in the US reduced bank opacity and that it did not make monitoring of banks more difficult.

As discussed earlier, large corporations with complex organizational structure can be informationally opaque. However, small and medium-sized enterprises can also exhibit symptoms of opacity because they are more dependent on external financing and lack the established presence in the market of old and big firms. Hyytinen and Pajarinen (2008) examine whether young and small firms are informationally opaque using a dataset of 3825 Finnish SMEs in the period of 1999-2002. Opacity is measured with the rating disagreements between ratings provided by Asiakastieto Ltd. and Dun and Bradstreet Finland Ltd. The findings show that split ratings are negatively related to the age of firms, but they are not related to the size of firms.

4.2.2.4 Negative Effects of Opacity

Researching opacity is important because it can adversely affect both the opaque firm but also the stability of the wider financial system. Dudley (2009) emphasizes that the financial crisis of 2007-2009 indicated a need for mitigating opacity and enhancing transparency and homogeneity in securities. Dudley suggests that when it is difficult to value opaque financial securities, illiquidity, price volatility and market risk increase, while asset opacity can also lead to greater haircuts and more enforced deleveraging. Increased opacity has led to excessive reliance on credit ratings, which as this chapter and other studies show can disagree significantly about the quality of an issue or the creditworthiness of the issuer.

The financial markets can be significantly affected by opacity as it is evident in the empirical literature. Livingston and Zhou (2010) investigate the relationship between split bond ratings and bond yields. The authors use a sample of 14,005 splits between ratings by S&P and Moody's for the period of 1983-2008. The authors find that bonds for which the CRAs disagree carry a 7-basis-points yield premium compared to bonds for which the CRAs have assigned the same rating. Interestingly, the level of disagreement is important as the premium for 1-notch rating disagreements is 5 basis points but for two- and three-notch disagreements it is 15 and 20 basis points respectively. Moreover, the yield premium is greater during economic recessions, suggesting that borrowing costs increase during economic downturns due to opacity as measured by split ratings. Blau, Brough and Griffith (2017) also uncover opacity implications for the financial markets by investigating price delay and inefficiency in bank stock prices. They use a sample of every listed security on CRSP that ranges from 1996 to 2008. The measure price delay based on Hou and Moskowitz (2005) and opacity with microstructure proxies and asset composition measures. They show that stock price delay is economically significantly greater for banks compared to other types of firms and that delay on bank stocks is greater during crises. More importantly, they show that banks with the higher opacity have significantly higher stock price delay than the other banks. Sato (2014) employs theoretical models to examine the effects of opacity on the financial markets. The author argues that opacity generates agency problems in the delegation of portfolios which leads to highly leveraged funds and reduced welfare. As opacity increases the concerns of fund managers about their careers, the prices of opaque assets are driven up and managers manipulate investor assessment to collect higher fees. Also, under the existence of both opacity and transparency, an opacity premium arises even if both opaque and transparent assets have the same payoffs. This difference in the price is coupled by endogenous market segmentation. Transparent funds trade only transparent assets, while opaque funds trade only opaque assets. At the same time, financial engineers exploit the opacity premium and transform transparent assets into opaque ones.

Bank opacity can adversely affect the stability of the financial system as well. Morgan (2002) argues that in the absence of deposit insurance schemes, bank opacity would increase the vulnerability of the financial system to systemic exposures such as bank runs. Should depositors become worried about the safety of their bank deposits due to increased uncertainty in the banking sector, they may opt to withdraw their funds collectively when there is also no insurance policy to protect them. However, Jones, Lee and Yeager (2013) suggest that bank opacity is important even in the presence of deposit insurance because opacity increases the difficulty of valuing assets even by the most sophisticated investors and reduces the effectiveness of market discipline on banks (which is already partly reduced because of the presence of deposit insurance). Moreover, they investigate the effects of opacity on bank valuation synchronicity in bank equity returns. Their sample contains 8638 bank-quarter observations of US banks for the period of 2000-2006. They find that investments in opaque assets are more profitable than investments in transparent assets as well as that opaque assets have higher valuation discounts.

Another strand of the literature examines how bank opacity affects risk at the bank level. Fosu et al. (2017) use a sample of US banks from 1995 to 2013 and proxy bank opacity with analysts' forecast errors. The authors find three interesting results. First, the study documents that opacity increases bank insolvency risk (measured by the Z-SCORE). Second, the results show that this positive relationship can be strengthened under greater competition in the banking industry. Finally, the authors provide evidence that the bank business model can marginally alleviate the risk-taking behaviour of opaque banks. Cao and Juelsrud (2020) use a unique dataset of Norwegian banks that ranges from 1993 to 2015 for on-balance sheet data and from 2002 to 2007 for off-balance sheet data. This distinction is important because the authors use two measures of bank opacity: available-for-sale (AFS) securities (which are marked-to-market and their gains and losses are immediately reflected in banks' equity value, hence a proxy for transparency) and the ratio of off-balance sheet items to total assets (proxy for opacity). In line with the expectations, the findings show that banks with more AFS securities have lower risk and banks with more off-balance sheet items have greater risk. Also, this relationship between bank opacity and risk weakens for well-capitalized banks and banks that are subject to greater market discipline. Finally, additional analysis shows that capital requirements can mitigate both bank opacity and risk. Overall, the aforementioned studies show that analysts forecast errors, AFS securities and off-balance sheet items as measures of bank opacity are useful for understanding the risk-taking behaviour of banks and help policy makers to manage the stability of the banking system more effectively.

Finally, literature on how bank opacity affects banks' lending behaviour is largely limited. Zheng (2020) conducts the first comprehensive study on the issue, using a sample of US bank holding companies with quarterly data in the period of 2002-2015. The author measures bank opacity with the absolute values of the residuals in a regression of loan loss provisions to proxy informativeness, lending is measured by loan growth. The study finds that opacity affects negatively bank loan growth and that this effect is greater for banks that rely more on wholesale funding and smaller for banks with stronger capitalization, while it is also mitigated by high GDP growth. This is consistent with the theoretical expectations of the author, positing that opacity drives wholesale financiers away from the bank and that with more limited access to wholesale funding, banks contract their lending.

4.2.2.5 Positive Effects of Opacity

Although the negative effects of opacity dominate the literature and regulators' interest, some researchers argue that opacity might not be all bad. Berger et al. (2000) examine the persistence of bank profits. They argue that informational opacity is a strong determinant of this persistence because it allows banks to gain market power in input markets. The authors measure bank informational opacity by the percentage of the balance sheet which contains proprietary information, core deposits and small business loans and by proxies for organizational complexity (e.g. the bank being a multibank holding company or not). They argue that banks can take advantage of access to proprietary information regarding core depositor balances as well as use deposit information to support their lending plans. On the other hand, a complex organizational structure can limit competitors' ability to exert information about the bank's persistent success and methods and strategy that led to it. Thus, in these ways, opacity helps banks protect their competitive advantage and enjoy persistent profits.

Jungherr (2018) examines a theoretical model of endogenous bank opacity. The author argues that although an adherent of the public interest would choose the highest level of transparency (instead of a higher market outcome) to increase market discipline, full transparency does not maximise the efficiency and stability of the financial system. The results show that, through the Hirshleifer effect, opacity has an important role which is beneficial for society even at the expense market discipline. More specifically, the Hirshleifer effect refers to the case in which transparency may facilitate bank runs for a certain level of risk-taking. This is because if the exposure levels of a bank are unobservable to outsiders (e.g. depositors, wholesale financiers), then the latter cannot easily distinguish between healthy and problematic banks. As a result, opacity fosters this pooling mechanism, while transparency may destroy it and leave the weaker banks vulnerable to bank runs.

4.2.2.6 The Negative Effects of Poor Asset Quality

Researchers have investigated a lot the determinants of banks' poor asset quality (e.g. non-performing loans, loan loss provisions etc.), one of the key elements of banking under discussion throughout the years. However, relatively limited evidence exists on the effects of poor asset quality on bank behaviour. Overall, researchers appear to agree that poor asset quality is one of the most important determinants of bank failure. Asset quality is also the second constituent of the CAMEL profile of banks which along with capitalization, managerial quality, earnings and liquidity, is a framework that is widely recognized by supervisory authorities as a baseline aggregate indicator for rating bank health. For instance, Cole and Gunther (1995) examine the timing of bank failures (separately from the likelihood of failures) using quarterly data on US banks from 1985 to 1992. Their findings show that capital, troubled assets and net income are important predictors of the timing of bank failures. Also, more recently, Poghosyan and Čihak (2011) investigate the determinants of bank distress using a novel dataset of 5,708 European banks. The authors measure bank distress using a textual analysis method, identifying those banks that media described as distressed in a given year or not. Their results show that asset quality and profitability are important determinants of bank distress along with leverage. Similar evidence for the contribution of poor asset quality to bank distress and failures is also provided by Gonzalez-Hermosillo, Pazarbaşioğlu and Billings (1997) for Mexican banks, Kraft and Galac (2007) for Croatian banks, Kick and Koetter (2007) for German banks and Arena (2008) for Latin American banks among other studies.

Berger and DeYoung (1997) investigate the relationships among problem loans, cost efficiency, and bank capital. They employ Granger causality methods and use a rich sample of US banks in the period of 1985-1994. They proxy bank efficiency with the percentage of maximum cost efficiency achieved by the bank based on the estimated best-practice cost frontier for the given year. The results show that the relationship between loan quality and cost efficiency is bidirectional. First, the regressions suggest that, in support of the bad luck hypothesis, non-performing loans lead to reductions in cost efficiency. Non-performing loans appear to increase monitoring spending in the process of rescheduling or selling off these loans as well as in increasing the scrutiny on their currently performing loans. Second, for the total industry, the findings suggest that, in support of the bad management hypothesis, the weakening of cost efficiency leads to increases in non-performing loans. This suggests that bad management as reflected in cost efficiency does not only affect the expenditures of the bank, but also it weakens the diligence of the underwriting and monitoring processes that eventually leads to non-performing loans.

Poor asset quality is also known to be associated with moral hazard by the bank managers. Zhang et al. (2016) examine the moral hazard implications of non-performing loans in China. The authors argue that bad management is likely to be the reason behind the deterioration of asset quality and it is likely to be followed by further risk-taking. This is because bank managers may attempt to compensate for the existing loan losses by taking more risk through more (and riskier) lending. The study uses a sample of 87 Chinese banks in the period of 2006-2012. Their results are in line with the moral hazard hypothesis and suggest that increases in non-performing loans lead to riskier lending by the bank which as a result is likely to further deteriorate the quality of the bank's loan portfolio and increase the vulnerability of the financial system's stability. Another strand of the literature also shows that poor asset quality is associated with lower capital ratios, indicating the existence of a moral hazard mechanism. For instance, Nier and Baumann (2006) investigate whether market discipline can provide incentives for bank managers to limit their risk of default by holding more capital, hence protecting their banks against unfavourable outcomes in portfolio risk. More importantly, they provide strong evidence that ex post realised risk measured by loan loss provisions leads to reductions in bank capital. Similar evidence on the negative effect of poor asset quality on bank capitalization is also provided by Ayuso, Pérez and Saurina (2004) and Flannery and Rangan (2008).

Krüger, Rösch and Scheule (2018) show that poor asset quality may have even indirect negative effects on bank capital. More specifically, they examine how the updated loan loss provisioning that follows the International Financial Reporting Standards (IFRS) and the US Generally Accepted Accounting Principles (GAAP) can lead to reductions in Tier 1 capital. The study uses annual data on US banks in the period of 1990-2013. The results show that reductions in Tier 1 capital because of the revised rules on loan loss provisions are likely to be more severe in four conditions: during financial crises, for banks with poor asset quality, for banks that do not increase their capital during financial crises and when IFRS uses a more comprehensive definition of a significant increase in credit risk. Moreover, the new loan loss provision rules increase the procyclicality of bank capital adequacy requirements. Hence, poor asset quality may not only affect directly bank functions, but also through the ex-post response of regulators to the deterioration of asset quality in the banking industry.

4.2.2.7 Regulation and Reduction of Non-Performing Loans

The financial crisis of 2007-2009 affected significantly the European banking sector, leading to the deterioration of loan portfolio quality across the continent as expressed through the increased levels of NPLs and non-performing exposures (NPEs). Although initially financial institutions, regulators and supervisory authorities jointly attempted to control and eliminate the problem, only a slow improvement was achieved in the first years as reflected in NPE levels compared to historical standards. To escape this stagnation, in 2017, the finance ministers of the EU countries as well as the European Council agreed upon the *Action Plan to tackle non-performing loans (NPLs) in Europe*. The council and the ministers emphasized that to minimize the high levels of existing NPLs and to prevent the emergence of new NPEs, a comprehensive approach is needed, one that incorporates a mix of complementary policy actions both at the national and at the European level.

One of the key authorities that was asked to lead the supervision of the reduction of NPEs in Europe is the European Banking Authority (EBA). Along with other official institutions, the EBA is contributing to the Action Plan in four main areas: 1) active supervision of banks to improve their NPEs' reduction strategies; 2) actions to enhance the functioning of the secondary market; 3) making structural changes to develop a better environment for managing NPEs and 4) promoting the restructuring of the EU banking system. One of the key areas that is also aligned with Basel III capital requirements is the Guidelines on disclosure of non-performing and forborne exposures published by the EBA in 2018. The guidelines advise banks to use common content and uniform disclosure formats for NPEs, forborne exposures and foreclosed assets that they are required to disclose to enhance the comparability and transparency across the EU banking system. The action plan indeed worked this time. The asset quality of EU banks has improved significantly over the last years. Statista (2021) reports that weighted average ratio of NPEs in the EU in December 2014 was 6.5% and it gradually dropped down to 2.4% in September 2020.

The financial crisis of 2007-2009 also affected US banks as their non-performing loans started increasing in late 2008 and reaching their peak of $375 billion in the first quarter of 2010 before they start being gradually reduced to numbers that are closer to their pre-crisis levels in 2019. US authorities and banks followed similar techniques to the EU to reduce their worrying levels of NPLs after the crisis, but the US has been clearly more effective. This shows that although EU countries and US are all members of the BCBS and follow the Basel accords, they still exhibit important structural differences. The most effective solutions to resolving NPLs appear to be employing asset management companies to administer NPLs as well as using public funds to recapitalize banks (Balgova, Plekhanov & Skrzypinska 2018). Indeed, BIS (2017) reports that US was far ahead than European countries in loan portfolio sales before 2015, in transactions that mostly involve loans collateralised by commercial or residential real estate assets.

One of the actions taken to help US banks recover from the adverse levels of NPLs is the establishment of Troubled Asset Relief Program (TARP) in 2008 to purchase toxic assets and equity from distressed financial institutions. The TARP originally authorized expenditures of $700 billion, however the realized amount gradually dropped to $431 billion with an estimated cost of $24 billion. The original purpose of the program was to reduce the losses of financial institutions by purchasing the mortgage-backed securities (MBS). Small modifications at later stages allowed the treasury to buy bank equity. Through the Capital Purchase Program (CCP), the treasury invested about $200 billion in 707 financial institutions to save them from collapsing (Kim, Kim & Lee 2019).

In contrast to US and EU banks, Chinese banks are relatively immune to global financial crises because of strict government controls which reduce the interconnections of the domestic financial sector with foreign counterparties. Since 2003, the Chinese government begun implementing significant reforms in the banking sector. A part of these reforms was to inject a significant amount of capital to Chinese banks, helping them reduce their levels of NPLs significantly. According to the China Banking Regulatory Commission (CBRC), after 2009, the average NPL ratio of Chinese banks has constantly remained below 2%. This reduction of NPLs has contributed, along with the rest of the reforms, to the rapid expansion of the Chinese banking system.

4.2.3 Theoretical Framework

There are two channels through which banks with poor asset quality can receive ratings by the CRAs that disagree, and they are not mutually exclusive. This section describes them in detail.

4.2.3.1 Poor Asset Quality Widens Credit Rating Disagreements Through Active Hiding of Loan Losses

The first channel is related to bank hiding and misreporting behaviour. Section 5.2.2.1 describes the methods that banks use to hide their loan losses and reviews the relevant literature, although empirical evidence remains limited possibly due to the level of sensitivity that accompanies this form of information. Some studies have focused on the role of loan loss provisions for bank transparency, and they help to develop a sound theoretical framework on this first channel.

From an accounting perspective, banks are motivated to misreport their loan loss provisioning because it is a key accounting policy that directly affects, except for their portfolio quality, their earnings' volatility, and cyclicality. Although accounting standards such as the FASB and the IASB are clear about their requirements on using an incurred loss model for loan loss provisioning, loan portfolios are significantly complex, allowing banks to use the accounting standards at their own discretion (Dugan 2009). Generally, loan loss provisions are seen as protection against expected losses, while capital is seen as a more proactive cushion against unexpected losses (Laeven & Majnoni 2003).

There is plenty of evidence that apart from hiding loan losses banks are also keen to delay the recognition of their expected loan losses, a process that is referred to as Delayed Expected Loss Recognition (DELR) (Bushman & Williams 2015). When banks take advantage of the complexity of their loan portfolios to opportunistically engage in DELR, a portion of their expected losses is not recorded and banks avoid a current expense with important implications. First, this hides the true risk profile of a loan portfolio, subsequently leading to the miscalculation of the true risk-weighted capital ratio which protects banks from unexpected losses. Second, unrecognized expected losses will most likely be recognized in future, creating expected loss overhangs transferred over to bank earnings and capital adequacy of the future. Bushman and Williams (2015) examine how DELR affects banks' stock market liquidity risk (measure of opacity), downside tail risk and co-dependence of downside tail risk for multiple banks. The authors find that high-DELR banks are more illiquid in the stock market, indicating signs of lower levels of transparency. More importantly the authors argue that this mechanism is likely to elevate financing frictions for banks and promote risk-shifting behaviour during financial crises. Kim, Kim and Lee (2019) provide some related evidence by examining the effect of the troubled asset relief program (TARP) on changes in bank loan loss provisions' recognition. They find that compared to non-TARP banks, TARP banks reduced their transparency levels by recognizing their loan loss provisions in smaller volumes and less timely after they received injections of government funds. The authors argue that this is a sign of moral hazard motives as TARP banks were evident to engage in higher risk-taking in other studies as well. Andries, Gallemore and Jacob (2017) provide evidence that the corporate tax system can alleviate such asymmetries through its treatment of loan losses and loan loss provisions reporting requirements. More specifically, they show that a 1 percentage point increase in general provision tax deductibility leads to increasing reported provisions by 4.9 percentage points.

This evidence provides strong ground for arguing that when banks hide their loan losses through the roll over and refinancing methods as described by Niimaki (2012) or they exploit the opacity and complexity of their assets to delay the reporting of their expected losses, outsiders are likely to assess the quality of high-asset-risk banks with great difficulty. Thus, should CRAs be worried about DELR or hiding practices by banks with poorer asset quality, they are more likely to report ratings that disagree as they cannot assess accurately not only banks' asset risk, but also their true capacity to absorb future unexpected losses and their overall creditworthiness.

4.2.3.2 Poor Asset Quality Widens Credit Rating Disagreements Through Borrower Opacity

The second channel is related more to the traditional view on bank transparency, suggesting that banks are more opaque than other types of firms. This strand of literature that was reviewed earlier argues that banks are more opaque because they hold assets that are much less transparent than the assets of other types of firms. Indeed, bank asset portfolios consist of large volumes of financial assets that are inherently more difficult to value than other more fixed types of assets such as real estate. However, no other study so far has provided confirming evidence that measures of poor asset quality such as NPLs or loan loss provisions/reserves are associated with bank opacity as measured by credit rating disagreements. This channel suggests that NPLs are a more direct measure of borrower opacity than general financial assets. Therefore, the mechanism of how borrower opacity is transferred through the bank to outsiders who cannot estimate the creditworthiness of the bank accurately needs to be analysed as well.

As borrower monitoring is delegated to the bank, many factors can contribute to borrower opacity that make it difficult both for the bank and outsiders to evaluate the creditworthiness of borrowers and the actual quality of loan portfolios. While technological innovations have offered new tools for monitoring, borrowers remain opaque and their monitoring is still difficult for banks.

An important element that contributes to the complexity and opacity of banks' asset portfolios is that most loans by banks are issued to private firms. Small private firms are not required to publicly disclose information on regular basis, while they are also less likely to be scrutinized by CRAs or financial analysts. As a result, private borrowers are more likely to carry information asymmetries which makes it difficult to assess their credit risk. It is actually so difficult to conduct direct monitoring on opaque borrowers, that banks use a series of contracting features such as collateral, syndication, covenants, loan size and maturity to supplement direct monitoring (see Strahan (1999) and Hubbard, Kuttner and Palia (2002)).[32] Ackert, Huang and Ramírez (2007) examine the information opacity of loans to private firms. Using a sample of 5,966 loans in the period of 1993-2003, they argue that private firms are more opaque and riskier than public firms. They show that due to this information opacity, there are significant differences in design of loans to public and private firms. More specifically, compared to loans to public firms, loans to private firms are usually issued by a single lender, they are collateralized and have sweep covenants. Also, because of the information opacity associated with private borrowers, the latter are charged a higher cost of borrowing than public borrowers are.

Also, two of the traditional obstacles in borrower monitoring are borrower size and lender-borrower geographical distance. The consolidation strategies in the banking industry has led to the development of very large banks that are mostly oriented towards providing liquidity to large corporate clients. However, smaller firms that are locally based usually rely on relationship-based information to acquire access to liquidity from the bank. Berger, Klapper and Udell (2001) provide some first evidence on this issue, using a rich dataset of 62,295 non-financial firms that received

[32] Bhaumik, Owolabi and Pal (2018) emphasize the difficulties associated with information acquisition. They find that local banks with better customer relationships and soft information are unattractive to potential multinational acquirers because of the cost of verification of this information.

loans from 98 private and 17 public Argentine banks. Their findings show that large and foreign-owned banks experience difficulties in extending relationship-based loans to small opaque borrowers. DeYoung, Glennon and Nigro (2008) provide similar evidence both theoretically and empirically using data in the period of 1984-2001 with 29,577 Small Business Administration (SBA) loans issued by 5,535 qualified SBA program lenders. The study shows that borrower-lender distance is associated with higher default probabilities for borrowers, suggesting that distance affects the collection of information about the borrower. Xu et al. (2020) provide novel evidence on the importance of relationship-based lending and soft information for borrower opacity. More specifically, they examine the impact on lending when firms are forced to change their contacts with another branch of the same bank. The study uses a dataset of Chinese banks in the period of 2007-2014 and measures borrower opacity with the frequency of provision of financial statements to the bank. The results show that the relationship with the previous branch was valuable for exerting important soft information. This soft information is lost to a significant extent when banks move to a new branch. As a result, the branch switch affects the cost, maturity, and availability of loans provided by the new branch. Finally, the authors show that these adverse effects affect more greatly borrowers with higher information opacity.

One of the developments that has offered banks the possibility to monitor their borrowers from a longer distance is the evolution of credit scoring models. Bannier, Behr and Güttler (2009) show that especially in the case of opaque borrowers, such unsolicited ratings that rely on public information and lack the soft information component tend to be downward biased. This is because of higher level of caution associated with the lack of relationship-based information and borrower opacity. However, theory does not provide a clear prediction about whether credit scoring models reduce or increase borrower opacity. On the one hand, we can expect these models to deliver valuable information to lenders as they are designed to do. The literature provides evidence that these technological advances promote the growth of the supply of credit to small businesses (e.g. Frame and White 2012), while Berger, Cowan and Frame (2011) show that credit scoring is associated with an increase in small business lending but it is moderated over time. The latter study also shows that employing credit scoring models does not affect the quality of bank asset portfolios. Yet, on the other hand, when the lending process is automated and relies on credit scoring models, banks may be encouraged to take on excessive risk by lending to less creditworthy borrowers. DeYoung, Glennon and Nigro (2008) examine the implications of credit scoring models for borrower opacity and survival. The findings show that the use of credit scoring models by the bank is associated with higher default probabilities for borrowers, suggesting that production inefficiencies promote the use of such models by lenders who want to expand their loan portfolio by issuing more risky and opaque loans. Berger, Frame and Miller (2005) also provide similar evidence. They show that while small business credit scoring (SBCS) supports the expansion of the credit supply to small businesses, it is also associated with higher average prices, while the risk profile of banks' credit portfolio for loans under $100,000 is also deteriorated. Overall, the existing evidence on credit scoring models that rely on less soft information shows that borrower opacity grows in importance as banks trust continuously more these models to assess their borrowers' creditworthiness.

Gao et al. (2020) provide compelling evidence about the causes and consequences of borrower opacity. They use survey data provided by the China Banking Regulatory Commission to develop a new proxy for a borrower opacity which is positively related to the borrower-lender distance, the geographic dispersion of business groups, and the size of the intra-group guarantee. More importantly, the study documents that opaque borrowers have a higher default probability, especially when they have a poor credit history, or they are members of a business group that carries low credit quality. The authors argue that this happens because information opacity makes post-lending monitoring more difficult which in turn prevents lenders from intervening when it is necessary, eventually leading to a greater default probability.

Overall, there are two clear channels through which poor asset quality may lead to disagreements between two CRAs. First, banks are well-known for actively hiding their losses and delaying the recognition of their expected losses something that can confuse CRAs and lead to reported ratings that disagree about the bank's creditworthiness. Second, the literature documents that the lack of soft information and increased reliance on quantitative models increases borrower opacity that can make it more difficult for outsiders to evaluate the overall creditworthiness of the bank. Based on these two channels the following hypothesis is formed:

H4.2.1: Poor asset quality widens the disagreements between two CRAs about the creditworthiness of a bank.

4.2.3.3 The Moderating Role of a Third Rating

Analysing the effect of the worsening of bank asset quality on the rating disagreement between two CRAs is based on the fact that the bank has purchased at least two credit ratings. However, sometimes banks may buy even a third rating. Does the purchase of a third rating improve or worse the adverse relationship between poor asset quality and rating disagreements? If so, how can this happen?

Chapter 4.1 outlines in detail the three existing hypotheses for the purchase of one or more additional ratings: the information production hypothesis, the rating shopping hypothesis and the regulatory certification hypothesis. Since this chapter examines bank informational quality through the prism of credit rating disagreements, the information production hypothesis is possibly associated with the relationship between poor asset quality and rating disagreements. In short, the information production hypothesis argues that the purchase of additional credit ratings can reduce information asymmetries by providing new information on the issuer's creditworthiness. Yet, it is not clear from the extant empirical evidence whether this hypothesis is true. Some studies such as the ones by Cantor and Packer (1997) and Bongaerts, Cremers and Goetzmann (2012) fail to find evidence that a third credit rating makes markets more informative. In contrast, more recently, Morkoetter, Stebler and Westerfeld (2017) and Drago and Gallo (2018) show that the purchase of additional ratings can reduce uncertainty.

No study so far has examined whether additional credit ratings are related to rating disagreements and this relationship is particularly important for ratings assigned to banks. As Morkoetter, Stebler and Westerfeld (2017) argue, in more opaque markets, investors are more dependent on the information published by CRAs and as discussed earlier, banks are significantly more opaque than other types of firms because of the complexity of their assets, borrower opacity or bank hiding behaviour. As a result, the purchase of multiple credit ratings is more likely to reveal its information production power in the banking industry.

Therefore, should a bank purchase three credit ratings instead of two, the effect of poor asset quality on the width of the rating disagreement between the latter two CRAs should be smaller due to the enhanced and confirming information provided by the third CRA. Based on the information production power of the third rating, the following hypothesis is constructed:

H4.2.2: The assignment of a third credit rating mitigates the positive effect of poor asset quality on rating disagreements.

4.2.4 Data and Main Variables

4.2.4.1 Measures of Bank Opacity

Researchers have used different variables to proxy the lack of transparency in the banking industry, including split ratings, market microstructure variables and asset-mix. In this chapter, bank opacity is proxied with the absolute difference between pairs of ratings among the big three credit rating agencies. For this purpose, long-term Issuer Credit Ratings (ICR) by S&P, Moody's and Fitch are converted from alphanumeric to numerical values in the range of 1 to 17 as shown in Table 4.2.1.[33] Since three different ratings are available, three split ratings are constructed are depicted in Equations (5.2.1), (5.2.2) and (5.2.3). The average of the three split ratings is also constructed to capture the overall uncertainty as shown in Equation (5.2.4).

$$SPLIT\ 1_{i,t} = \left|S\&P_{i,t} - Moody's_{i,t}\right| \tag{4.2.1}$$

$$SPLIT\ 2_{i,t} = \left|S\&P_{i,t} - Fitch_{i,t}\right| \tag{4.2.2}$$

$$SPLIT\ 3_{i,t} = \left|Moody's_{i,t} - Fitch_{i,t}\right| \tag{4.2.3}$$

$$SPLIT.A_{i,t} = (SPLIT\ 1_{i,t} + SPLIT\ 2_{i,t} + SPLIT\ 3_{i,t})/3 \tag{4.2.4}$$

where SPLIT 1, SPLIT 2 and SPLIT 3 are the split ratings and S&P, Moody's and Fitch are the credit ratings by the respective CRAs in numerical values for bank i at time t. The split ratings are ordered variables and vary between 0 which indicates CRA agreement and 9 which is the highest rating disagreement between two agencies in the sample.[34] SPLIT.A is the average of SPLIT 1, SPLIT 2 and SPLIT 3. SPLIT.A is calculated only when all three splits are available to ensure the consistency of the estimation.

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[33] Jiang (2008) and Shen, Huang and Hasan (2012) also transform ratings into 17 numerical values.

[34] Other studies use the binary measurement of split ratings (i.e. = 1 when two ratings disagree, 0 otherwise). However, this is not efficient for this sample as there is large variability in rating disagreements (see Table 4.2.5).

Table 4.2.1 The transformation of credit ratings to numerical values.

S&P	*Moody's*	*Fitch*	*Numerical*
AAA	Aaa	AAA	17
AA+	Aa1	AA+	16
AA	Aa2	AA	15
AA-	Aa3	AA-	14
A+	A1	A+	13
A	A2	A	12
A-	A3	A-	11
BBB+	Baa1	BBB+	10
BBB	Baa2	BBB	9
BBB-	Baa3	BBB-	8
BB+	Ba1	BB+	7
BB	Ba2	BB	6
BB-	Ba3	BB-	5
B+	B1	B+	4
B	B2	B	3
B-	B3	B-	2
CCC+	Caa1	CCC	1
CCC	Caa2		1
CCC-	Caa3		1
CC	Ca	CC	1
C	C	C	1
D		D	1

The table presents the rating scales of long-term Issuer Credit Ratings (ICR) by S&P, Moody's and Fitch and their numerical transformation. All ratings below B-/B3 take the value of 1 to ensure comparability across all three credit ratings.

4.2.4.2 Measures of Asset Quality

Three variables are used as measures of asset quality in this chapter. The first measure is problem loans which refers to the best available in the following order: 1) Non-Performing Loans, 2) Gross Impaired Loans, 3) Net Impaired Loans, 4) Other Problem Loans (of unknown categorization) normalized by Net Total Loans. Second, the ratio of NPLs, net of guaranteed loans to loans is used. Generally, the literature has recommended that NPLs are an appropriate proxy of asset quality (e.g. Meeker & Gray 1987). Finally, as an alternative to problem and non-performing loans which are closely related and highly correlated, the ratio of loan loss reserves to gross loans is used. This is calculated as the ratio of total loan loss and allocated transfer risk reserves to total loans and leases, net of unearned income and gross of reserve. Loan loss reserves is an amount that banks reserve to cover estimated loan losses due to defaults and non-payment. Therefore, loan loss reserves are an indicator of how stable banks perceive their lending base to be and are recorded as negative figures on the asset side of the balance sheet, constituting an adequate measure of banks' asset quality.

4.2.4.3 Data

Bank-level data is sourced from the S&P Global Market Intelligence database, while country-level data is obtained from the International Monetary Fund (IMF). The sample contains a panel of 699 banks from 84 countries and ranges in the period of 2005-2018. The sample is largely dependent on the post-2009 period when capital requirements increased significantly globally after the financial crisis. Calveras (2003) suggests that banks become more opaque under tighter capital requirements, making the sample period more relevant to the investigation.

An important differentiation to other studies that investigate split ratings using the ratings by two CRAs (e.g. Morgan 2002; Iannotta 2006), this chapter uses three long-term Issuer Credit Ratings (ICR) from the three most renowned CRAs (S&P, Moody's and Fitch). Thus, three split ratings are calculated compared to the one that most studies use. This allows the analysis to extend and conduct more rigorous testing of the results, while the average split rating can also be estimated to capture the overall uncertainty.

Another differentiation point of this study is that it uses long-term ICRs instead of issue-specific ratings due to the following considerations. First, while an issuer's creditworthiness can be accurately depicted through issue-specific credit ratings, the latter do not always reveal all implications associated with the issuer's long-term creditworthiness because they are designed to reflect the nature and provisions of the particular financial obligation. On the other hand, long-term ICRs are robust forward-looking assessments about the banks' creditworthiness and thus they contain more information about the issuer's overall quality and probability of default. Second, the ratings used in this study by the big 3 CRAs are also issuer-paid which are more likely to be inflated (e.g. Jiang, Stanford & Xie 2012), particularly in times of economic booms.[35] Therefore, they are more sensitive and better capture information asymmetries than investor-paid ratings.

Table 4.2.2 shows how split observations are distributed across the 84 countries in the sample in the period of 2005-2018. The regions with the most bank-year observations are North America, Europe and Asia-Pacific. Indicatively, the top seven countries in total split observations are USA (1650), United Kingdom (605), Italy (391), France (384), Australia (363), Russia (348) and Taiwan (320).

[35] Bolton, Freixas and Shapiro (2012) show that CRAs are more likely to inflate their ratings during booms due to higher investor naivety and trust in the reported ratings as well as due to smaller issuer default risk.

Table 4.2.2 Distribution of split rating observations across countries in the sample.

Country	*SPLIT 1*	*SPLIT 2*	*SPLIT 3*	Country	*SPLIT 1*	*SPLIT 2*	*SPLIT 3*
Argentina	0	0	15	Liechtenstein	11	0	0
Australia	150	103	110	Luxembourg	38	35	28
Austria	42	30	45	Malaysia	61	18	25
Azerbaijan	3	6	2	Malta	0	2	0
Bahrain	12	21	13	Mexico	47	57	57
Bangladesh	1	0	0	Mongolia	9	0	7
Belarus	14	16	9	Morocco	4	8	6
Belgium	67	64	52	Netherlands	54	67	65
Bermuda	9	9	11	New Zealand	63	44	44
Brazil	113	85	86	Nigeria	15	39	18
Bulgaria	0	10	2	Norway	26	14	14
Canada	49	55	49	Oman	8	8	9
Chile	49	30	28	Panama	6	25	0
China	89	77	106	Peru	24	34	22
Colombia	20	20	43	Philippines	12	9	48
Costa Rica	2	2	12	Poland	22	16	69
Croatia	2	12	2	Portugal	44	41	45
Cyprus	4	5	19	Qatar	25	26	33
Czech Republic	35	21	28	Romania	4	1	21
Denmark	57	33	33	Russia	127	71	150
Dominican Republic	0	0	6	Saudi Arabia	67	58	72
Egypt	17	15	12	Singapore	41	32	39
Finland	36	17	17	Slovakia	0	0	7
France	125	136	123	Slovenia	5	5	29
Georgia	2	6	11	South Africa	23	22	44
Germany	90	93	110	South Korea	112	89	95
Greece	40	34	33	Spain	103	81	97
Guatemala	9	11	6	Sri Lanka	0	5	6
Hong Kong	80	41	102	Sweden	56	57	39
Hungary	13	0	15	Switzerland	28	18	12
Iceland	0	4	0	Taiwan	137	115	68
India	94	48	65	Thailand	74	67	83
Indonesia	24	34	49	Togo	1	1	1
Ireland	53	40	40	Trinidad and Tobago	7	0	0
Israel	26	18	17	Tunisia	6	6	6
Italy	128	134	129	Turkey	33	30	116
Japan	131	82	83	USA	539	597	514
Jordan	0	9	0	Ukraine	4	4	21
Kazakhstan	22	20	8	United Arab Emirates	37	32	83
Kenya	1	0	0	United Kingdom	189	205	211
Kuwait	31	26	50	Uzbekistan	17	9	0
Lebanon	15	9	14	Vietnam	30	13	24
				All Countries	3764	3337	3783

4.2.5 Regression Framework

Considering the categorical nature of the split rating variables, a random-effects ordered logit estimator with time and country dummies is employed in the following form:

$$\Pr(Rating\ Disagreement_{i,t}) = F(Asset\ Quality_{i,t-1}, Controls_{i,t-1}, Year_t, Country_i) + \varepsilon_{i,t} \quad (5.2.5)$$

where *Rating Disagreement* is one of the split ratings as constructed in Eqs. (1), (2), (3) and (4) and *Asset Quality* is one of the problem loans, NPLs or loan loss reserves. Eight bank-specific variables are used as controls that capture important bank aspects and have been used in other studies as control variables for split ratings. More specifically, the return on average assets is a proxy for profitability, the equity ratio for bank capital, the cost-to-income ratio for managerial quality, the natural logarithm of the total assets for bank size, the natural logarithm of the ZSCORE for bank risk, the intangible assets ratio, the liquidity ratio and a dummy variable that is equal to 1 when the bank is publicly listed and 0 otherwise. All independent variables are used in their one-year lagged form to partially address endogeneity. Table 4.2.3 summarizes all variables used in the regressions. The regressions also include year and country dummies to account for differences that are constant for each time period and for each country. $\varepsilon_{i,t}$ is the unobservable error term which follows a logistic distribution with mean zero and variance $\pi^2/3$.

Table 4.2.3 Descriptive statistics

Variable	Definition	Detailed Description	Mean	Std. Dev.	Min	Max	Obs.
Credit Rating Disagreement							
SPLIT 1	Credit Rating Disagreement 1	The absolute difference between long-term Issuer Credit Ratings (ICR) by S&P and Moody's	0.959	0.880	0.000	8.000	3764
SPLIT 2	Credit Rating Disagreement 2	The absolute difference between long-term Issuer Credit Ratings (ICR) by S&P and Fitch	0.792	0.823	0.000	7.000	3337
SPLIT 3	Credit Rating Disagreement 3	The absolute difference between long-term Issuer Credit Ratings (ICR) by Moody's and Fitch	1.077	0.994	0.000	9.000	3783
SPLIT.A	Average Credit Rating Disagreement	The average of SPLIT 1, SPLIT 2 and SPLIT 3 (restricted to all individual splits being available)	0.938	0.650	0.000	6.000	2682
Asset Quality							
PL	Problem Loans	The best available in the following order: Non-Performing Loans, Gross Impaired Loans, Net Impaired Loans, Other Problem Loans / Net Total Loans.	5.607	9.526	0.000	98.830	5150
LLR	Loan Loss Reserves	Total loan loss and allocated transfer risk reserves divided by total loans and leases, net of unearned income and gross of reserve	3.261	4.152	0.000	83.837	5393
NPL	Non-Performing Loans	Non-performing loans, net of guaranteed loans, divided by loans before reserves	5.404	8.545	0.000	90.343	4589
Assignment of a 3rd Rating							
3rd Rating Dummy	3rd Rating Dummy Variable	= 1 if bank has been assigned three ratings, 0 if bank has been assigned two ratings	0.486	0.500	0.000	1.000	5520
Bank-Specific Control Variables							
ROAA	Return on Average Assets	Net Income/Average Assets	0.762	1.600	-34.690	33.814	5366
EQRAT	Equity Ratio	Total Equity/ Total Assets	8.808	4.157	-35.043	60.335	5489
MQ	Managerial Quality	Operating Expenses/ Operating Income	56.028	20.380	-172.261	380.818	5437
LNTA	Bank Size	Natural logarithm of total assets	17.680	1.617	12.457	21.981	5479
LNZSCORE	Bank Risk	Natural logarithm of the ZSCORE which is calculated as the sum of EQRAT and ROAA divided by the standard deviation of ROAA	3.121	1.046	-3.682	17.047	5309
INTANGLIBLES	Intangible Assets	Total Intangible Assets/ Total Assets	0.820	1.317	0.000	16.808	5315
LIQUIDITY	Bank Liquidity	Liquid Assets/ Total Assets	29.709	14.891	0.635	167.913	4977
LISTED	Ownership Status	= 1 if bank is listed in the stock market, 0 otherwise	0.536	0.499	0.000	1.000	5520

Table 4.2.3 ***(continued)***

Variable	**Definition**	**Detailed Description**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Obs.**
Macro Control Variables							
GDPG	Real GDP Growth	Annual percentage change of real GDP	2.523	3.001	-15.100	25.100	5498
INFG	Inflation Growth	Annual percentage change of the average consumer price index (CPI)	3.110	3.602	-3.700	59.200	5279
UNEMP	Unemployment	The number of unemployed people as a percentage of the total labor force	7.002	4.289	0.400	27.500	4955

The sample consists of an unbalanced panel of 699 banks from 84 countries and covers the years from 2005 to 2018. The ratings have been transformed into numerical values as shown on Table 4.2.1. Asset quality and control variables are in percentage points (%), apart from LNTA, LNZSCORE and LISTED.

4.2.6 Descriptive Analysis

Table 4.2.4 offers significant insights to the split ratings. First, the average absolute rating gap across all three splits appears to be higher for banks with an average problem loans ratio above the sample median than those below the median. Second, banks with an average problem loans ratio above the sample median receive on average lower credit ratings. Third, SPLIT 3 which stands for the disagreement between Moody’s and Fitch has the highest values on average, while SPLIT 2 which stands for the disagreement between S&P and Fitch has the lowest values on average. Finally, the reported Kappa statistic indicates that the three CRAs did not make their determinations randomly in all cases.

Table 4.2.5 presents the rating gap distribution for the three splits. The level of agreement among the three CRAs appears to be at about 30-40%, while a substantial percentage of the rating gaps is higher than 1. In particular, for the sample of investment grade banks used in the regressions, for the 21.8% of SPLIT 1 (the rating disagreement between S&P and Moody’s) observations, rating gaps have a value of 2 or more, while the same holds for 16.2% and 27.1% of SPLIT 2 and SPLIT 3 observations respectively.

Table 4.2.4 Differences Among Ratings and Rating Disagreements

		Average Ratings				Kappa Statistic		
		S&P	*Moody's*	*Fitch*		*S&P and Moody's*	*S&P and Fitch*	*Moody's and Fitch*
Sample Total		10.048	10.103	10.149		0.245	0.344	0.230
Problem Loans	Above Median	9.010	8.927	9.356		0.266	0.324	0.221
	Below Median	11.129	11.437	11.116		0.214	0.359	0.231
Classification	Investment Grade	10.417	10.464	10.487		0.227	0.337	0.225
	High-Yield	4.004	3.551	4.579		0.301	0.262	0.127
		Average Absolute Gap				Correlation Between Ratings		
		SPLIT.A	*SPLIT 1*	*SPLIT 2*	*SPLIT 3*	*S&P and Moody's*	*S&P and Fitch*	*Moody's and Fitch*
Sample Total		0.938	0.959	0.792	1.077	0.940	0.946	0.916
Problem Loans	Above Median	0.984	0.966	0.859	1.171	0.940	0.948	0.908
	Below Median	0.887	0.951	0.718	0.962	0.918	0.926	0.911
Classification	Investment Grade	0.934	0.971	0.782	1.066	0.919	0.925	0.893
	High-Yield	0.976	0.791	0.913	1.224	0.823	0.796	0.776

S&P, Moody’s and Fitch are the transformed credit ratings by the respective rating agencies (see Table 4.2.1). Kappa Statistic is a measure of interrater agreement (See Morgan (2002)). Average absolute gap is the mean of each split. Banks are divided in subsamples of banks with average problem loans above and below the sample median (2.51%) and of banks that are rated by at least one of the three rating agencies as investment grade or not.

Table 4.2.5 Rating Gap Distribution

		SPLIT 1				*SPLIT 2*				*SPLIT 3*			
Gap =		0	1	2	3+	0	1	2	3+	0	1	2	3+
Sample Total		0.316	0.470	0.170	0.044	0.411	0.424	0.136	0.029	0.300	0.425	0.206	0.069
Problem Loans	Above Median	0.327	0.462	0.162	0.050	0.385	0.427	0.149	0.039	0.288	0.412	0.199	0.101
	Below Median	0.306	0.479	0.178	0.037	0.440	0.421	0.121	0.018	0.315	0.440	0.216	0.029
Classification	Investment Grade	0.309	0.472	0.175	0.043	0.415	0.424	0.136	0.026	0.304	0.424	0.204	0.067
	High-Yield	0.413	0.441	0.091	0.055	0.370	0.429	0.138	0.063	0.244	0.429	0.240	0.087

Banks are divided in subsamples of banks with average problem loans above and below the sample median (2.51%) and of banks that are rated by at least one of the three rating agencies as investment grade or not.

Figure 4.2.1 presents the evolution of the three split variables as well as the average split. The variables are presented in their three-year moving average form and the sample contains the financial crisis and its aftermath. The movement of SPLIT.A indicates that, on average, disagreements among CRAs increased during the global financial crisis of 2007-2009, and that they gradually returned to their pre-crisis levels from 2010 onwards. This increase during the crisis appears to be driven by SPLIT 1 and SPLIT 3 which also increased significantly during this period probably because of greater uncertainty over banks' risk-taking and exposures. While SPLIT 1 was reduced after the crisis, SPLIT 3 remained high. SPLIT 2 was maintained at low levels compared with the other two splits. Generally, it is observed that the three splits have been converging towards 0.9 in recent years.

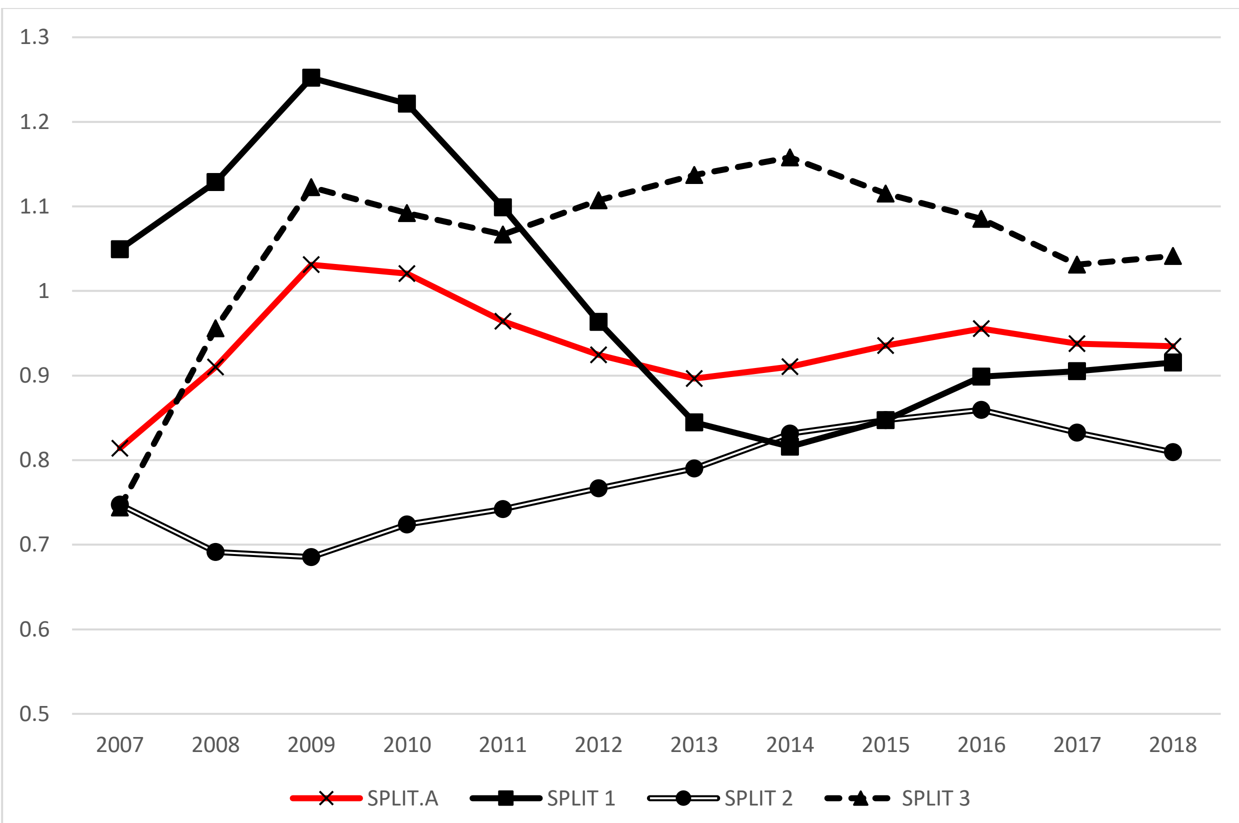

Figure 4.2.1 Credit Rating Disagreements Over Time. The figure reports the three-year moving average of the mean of each rating split including the average split.

4.2.7 Results and Discussion

4.2.7.1 Main Results

Table 4.2.6 presents the results of random-effects ordered logit regressions where problem loans (PL) is used as the main measure of bank asset quality and the sample contains only investment grade banks. In the first four columns, PL is the only independent variable and the average split (SPLIT.A) followed by the three individual splits are the dependent variables. In columns (5) to (8), eight bank-level control variables are added.

In Table 4.2.6, the coefficient of PL is positive and significant at the 5% or 1% level throughout the eight columns either SPLIT.A or the individual splits are the dependent variable. This is consistent with Hypothesis 1 that poor asset quality widens the disagreements between two CRAs about the creditworthiness of a bank. This finding extends the work of Morgan (2002) and Iannotta (2006) who show that the asset mix is an important driver of split ratings and bank opacity. While they suggest that holding riskier types of assets increases the probability of a split rating, the finding in Table 4.2.6 shows that the quality of banks' risky assets is also a significant determinant of bank opacity.

External parties such as investors and CRAs cannot easily and directly evaluate the creditworthiness of banks' borrowers, especially when their loans being due. This is not only because direct borrower monitoring is delegated to the bank, but also because the efficiency of borrower monitoring can be impeded for the bank too due to several factors such as borrower size, lender-borrower geographical distance, and effectiveness of internal credit scoring models (e.g. DeYoung, Glennon & Nigro 2008; Gao et al. 2020). Moreover, the literature has documented that banks are less willing to be fully transparent when their asset quality is deteriorated, and they are incurring loan losses. Banks often delay the recognition of their loan losses (Bushman & Williams

2015) or they even use several hiding methods (i.e. refinancing and rolling-over NPLs) (Niinimaki 2012) to appear as more healthy than they actually are. Therefore, the difficulties associated with accurately valuing problem loans and the lack of reliability in banks' published information can increase the probability of disagreements between CRAs about banks' creditworthiness.

In Tables 5.2.7 and 5.2.8, the baseline results are reproduced after substituting PL with loan loss reserves (LLR) and NPLs respectively. As expected, the coefficients of NPL are close in sign, size and significance to those of PL since the two variables are highly correlated. Similar results are observed with LLR as six of the eight coefficients are positive and statistically significant at the 1% level. The coefficient of LLR in column (7) is not statistically significant and as a result the significance of the LLR coefficient in column (5) is reduced to the 10% level. Overall, the positive relationship between poor asset quality and split ratings is confirmed using alternative measures of asset quality.

The signs of the statistically significant coefficients of control variables are also consistent with the expectations. The probability of a split rating between S&P and Fitch (SPLIT 2) is negatively associated with profitability, while SPLIT 1 and SPLIT 3 are positively associated with poor managerial quality. Finally, banks' listed status is positively related to SPLIT 2.

To assess the economic significance of the results, Table 4.2.9 presents the percentage point increase of the probability for wider splits when the proxies of poor asset quality (PL, LLR or NPL) increase from their 10th to their 90th percentile, assuming that the rest of the variables are maintained at their median levels. For estimating the percentage point increases, the coefficients of PL, LLR and NPLs from columns (5) to (8) in Tables 5.2.6, 5.2.7 and 5.2.8 are used. The analysis in Table 4.2.9 shows that the results are economically significant. For instance, an increase of PL from the 10th to the 90th percentile increases the probability of a SPLIT.A wider than 1 by

6.37%. Table 4.2.9 shows that this increase of the probability for a wider split due to the deterioration of asset quality can be as high as 21%. Moreover, Table 4.2.9 suggests that asset quality is not only associated with rating disagreements but also with the degree to which CRA assessments disagree. More specifically, the worsening of asset quality can increase the probability of greater splits even when CRAs disagree by three rating scales. Finally, consistent with the regression results in which the coefficient of LLR is not significant (Table 4.2.7 Column (7)), the percentage point increase of the probability for all split widths is only marginal.

Table 4.2.6 Random-Effects Ordered Logit Models with Problem Loans (PL) as measure of Asset Quality.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	SPLIT.A	*SPLIT 1*	*SPLIT 2*	*SPLIT 3*	*SPLIT.A*	*SPLIT 1*	*SPLIT 2*	*SPLIT 3*
PL	0.066***	0.041***	0.079***	0.047***	0.046**	0.040***	0.039**	0.057***
	(0.016)	(0.010)	(0.015)	(0.010)	(0.018)	(0.012)	(0.017)	(0.012)
ROAA					-0.080	0.071	-0.324***	-0.193**
					(0.112)	(0.095)	(0.103)	(0.087)
EQRAT					0.070	0.036	-0.032	0.005
					(0.049)	(0.030)	(0.038)	(0.033)
MQ					0.017***	0.010***	-0.005	0.016***
					(0.005)	(0.004)	(0.005)	(0.005)
LNTA					-0.106	-0.112	-0.113	-0.073
					(0.110)	(0.073)	(0.104)	(0.088)
LNZSCORE					-0.167	-0.268**	-0.125	-0.023
					(0.161)	(0.114)	(0.144)	(0.138)
INTANGIBLES					-0.201**	0.041	-0.131*	-0.053
					(0.092)	(0.063)	(0.077)	(0.074)
LIQUIDITY					-0.010	-0.009	0.008	0.005
					(0.008)	(0.006)	(0.007)	(0.006)
LISTED					0.148	0.040	0.718**	-0.005
					(0.290)	(0.199)	(0.291)	(0.247)
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Country Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1964	2786	2488	2798	1753	2413	2203	2455
N. of Banks	294	380	364	409	278	352	340	379
Pseudo R2	0.196	0.159	0.214	0.169	0.184	0.162	0.218	0.162
Log Likelihood	-1997.81	-2766.62	-2191.8	-2989.82	-1783.941	-2388.32	-1943.48	-2653.51

SPLIT 1, SPLIT 2 and SPLIT 3 are the dependent variables and each one is the absolute difference between each pair of the three credit rating agencies (S&P, Moody's and Fitch). SPLIT.A is the average of the three individual splits. The explanatory variables are all in their 1-year lagged form. Standard errors are in parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% level respectively.

Table 4.2.7 Random-Effects Ordered Logit Models with Loan Loss Reserves (LLR) as measure of Asset Quality.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	SPLIT.A	*SPLIT 1*	*SPLIT 2*	*SPLIT 3*	*SPLIT.A*	*SPLIT 1*	*SPLIT 2*	*SPLIT 3*
LLR	0.139***	0.125***	0.112***	0.123***	0.077*	0.095***	0.022	0.140***
	(0.037)	(0.030)	(0.035)	(0.028)	(0.043)	(0.034)	(0.041)	(0.032)
ROAA					-0.114	-0.0004	-0.354***	-0.172
					(0.106)	(0.093)	(0.100)	(0.087)
EQRAT					0.040	0.009	-0.045	-0.027
					(0.048)	(0.030)	(0.034)	(0.034)
MQ					0.018***	0.008**	-0.005	0.016***
					(0.005)	(0.004)	(0.004)	(0.004)
LNTA					-0.155	-0.134	-0.077	-0.065
					(0.105)	(0.073)	(0.101)	(0.087)
LNZSCORE					-0.119	-0.183	-0.171	0.012
					(0.158)	(0.116)	(0.142)	(0.139)
INTANGIBLES					-0.238***	0.044	-0.147**	-0.102
					(0.088)	(0.063)	(0.075)	(0.073)
LIQUIDITY					-0.009	-0.014**	0.008	0.000
					(0.007)	(0.006)	(0.007)	(0.006)
LISTED					0.212	0.014	0.688**	0.059
					(0.283)	(0.205)	(0.288)	(0.246)
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Country Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Observations	2044	2876	2578	2888	1821	2478	2278	2532
N. of Banks	302	394	377	420	284	364	350	388
Pseudo R2	0.179	0.159	0.203	0.166	0.188	0.161	0.210	0.160
Log Likelihood	-1894.273	-2878.07	-2315.37	-3135.47	-2137.574	-2472.01	-2036.44	-2776.35

SPLIT 1, SPLIT 2 and SPLIT 3 are the dependent variables and each one is the absolute difference between each pair of the three credit rating agencies (S&P, Moody's and Fitch). SPLIT.A is the average of the three individual splits. The explanatory variables are all in their 1-year lagged form. Standard errors are in parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% level respectively.

Table 4.2.8 Random-Effects Ordered Logit Models with Non-Performing Loans (NPL) as measure of Asset Quality.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	SPLIT.A	*SPLIT 1*	*SPLIT 2*	*SPLIT 3*	*SPLIT.A*	*SPLIT 1*	*SPLIT 2*	*SPLIT 3*
NPL	0.086***	0.045***	0.090***	0.055***	0.067***	0.041***	0.048**	0.056***
	(0.019)	(0.012)	(0.017)	(0.012)	(0.021)	(0.014)	(0.020)	(0.014)
ROAA					-0.021	0.058	-0.285***	-0.216**
					(0.109)	(0.097)	(0.102)	(0.088)
EQRAT					0.088	0.038	-0.020	0.009
					(0.048)	(0.031)	(0.038)	(0.034)
MQ					0.018***	0.011***	-0.005	0.016***
					(0.005)	(0.004)	(0.005)	(0.005)
LNTA					-0.092	-0.098	0.006	-0.085
					(0.110)	(0.080)	(0.105)	(0.093)
LNZSCORE					-0.382**	-0.308**	-0.149	-0.130
					(0.166)	(0.121)	(0.146)	(0.148)
INTANGIBLES					-0.244***	0.034	-0.149	-0.060
					(0.090)	(0.064)	(0.076)	(0.075)
LIQUIDITY					-0.006	-0.010	0.008	0.002
					(0.008)	(0.006)	(0.007)	(0.006)
LISTED					0.099	-0.046	0.649**	-0.057
					(0.285)	(0.209)	(0.283)	(0.256)
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Country Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1794	2475	2234	2499	1584	2123	1967	2174
N. of Banks	270	343	331	372	255	317	310	344
Pseudo R2	0.189	0.161	0.198	0.165	0.177	0.161	0.199	0.160
Log Likelihood	-1869.179	-2472.07	-2024.7	-2710.84	-1648.169	-2120.49	-1793.5	-2383.74

SPLIT 1, SPLIT 2 and SPLIT 3 are the dependent variables and each one is the absolute difference between each pair of the three credit rating agencies (S&P, Moody's and Fitch). SPLIT.A is the average of the three individual splits. The explanatory variables are all in their 1-year lagged form. Standard errors are in parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% level respectively.

Table 4.2.9 The percentage point increase of the probability for wider splits when banks increase their PL, LLR or NPL from the 10th to the 90th percentile.

	PL				LLR				NPL			
	SPLIT.A	*SPLIT 1*	*SPLIT 2*	*SPLIT 3*	*SPLIT.A*	*SPLIT 1*	*SPLIT 2*	*SPLIT 3*	*SPLIT.A*	*SPLIT 1*	*SPLIT 2*	*SPLIT 3*
Gap > 0	7.90%	2.12%	8.74%	15.51%	4.39%	1.82%	3.50%	20.62%	3.66%	2.07%	13.64%	9.96%
Gap > 1	6.37%	12.11%	4.07%	1.89%	8.94%	14.97%	0.72%	2.66%	18.53%	12.23%	1.43%	10.51%
Gap > 2	0.35%	2.89%	0.23%	0.15%	0.74%	5.32%	0.04%	0.22%	2.37%	3.09%	0.08%	1.19%
Gap > 3	0.02%	0.38%	0.01%	0.02%	0.06%	0.88%	0.00%	0.03%	0.18%	0.39%	0.00%	0.15%

The table presents the percentage point increase of the probability for wider splits when the problem loans (PL), loan loss reserves (LLR) or non-performing loans (NPL) variables increase from the 10th to the 90th percentile, holding the rest of the variables at their median levels. The calculation uses the PL, LLR and NPL coefficients from models (5), (6), (7) and (8) from Tables 5.2.6, 5.2.7 and 5.2.8. Results for Gap > 4 and higher are not reported as those percentage point increases are very close to zero.

4.2.7.2 Does the Third Rating Matter?

The availability of three credit ratings and the fact that the sample is not restricted to having all three ratings available but only two of them to construct the individual split ratings offers the opportunity to examine the role of the third rating. The previous subchapter discussed extensively the information production hypothesis which suggests that banks purchase more credit ratings to mitigate uncertainty, i.e. receive ratings from multiple CRAs that agree. For instance, Morkoetter, Stebler and Westerfeld (2017) and Drago and Gallo (2018) find that additional ratings may indeed reduce uncertainty. Would the purchase of a third rating increase or decrease the effect of the deterioration of asset quality on the rating disagreement between the other two CRAs?

To examine this research question, first, a dummy variable is created (3rd Rating Dummy Variable) that equals 1 is a bank has purchased ratings from all three CRAs and 0 if the bank has only purchased ratings from Moody's and Fitch.[36] Second, an interaction term between the asset quality measures and the 3rd Rating Dummy Variable is introduced to Equation (5). Table 4.2.10 presents the results of these regressions which largely confirm the expectations. More specifically, the coefficient of the interaction term is negative and significant at the 5% or 1% level, while the coefficient of PL remains positive and significant at the 1% level as in the baseline regressions. This is in line with Hypothesis 2, suggesting that the assignment of a third credit rating mitigates the positive effect of poor asset quality on rating disagreements because of the information production provided by the third rating.

[36] S&P rating is treated as the third rating due to data availability. Credit rating data is obtained from the S&P Global Market Intelligence database, which suggests that missing ratings are unavailable due to not having been purchased by the bank rather than due to the limited data availability. Therefore, it is assumed that if a S&P rating is unavailable, it is because the third rating agency (S&P) never assigned a rating to the bank.

Table 4.2.10 The Moderating Role of The Assignment of a 3rd Rating.

	(1)	(2)	(3)
	SPLIT 3	*SPLIT 3*	*SPLIT 3*
PL	0.084***		
	(0.015)		
PL*3rd Rating Dummy	-0.047***		
	(0.017)		
LLR		0.242***	
		(0.044)	
LLR*3rd Rating Dummy		-0.167***	
		(0.049)	
NPL			0.078***
			(0.017)
NPL*3rd Rating Dummy			-0.043**
			(0.019)
3rd Rating Dummy	-0.001	0.255	0.010
	(0.185)	(0.207)	(0.198)
Control variables	YES	YES	YES
Year Dummies	YES	YES	YES
Country Dummies	YES	YES	YES
Observations	2455	2532	2174
N. of Banks	379	388	344
Pseudo R2	0.164	0.162	0.161
Log Likelihood	-2648.43	-2769.65	-2380.6

SPLIT 3 is the dependent variable which is the absolute difference between Moody's and Fitch. 3rd Rating Dummy equals 1 if the bank has been assigned three ratings and 0 if it has been assigned two ratings. The explanatory variables are all in their 1-year lagged form. Standard errors are in parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% level respectively.

4.2.8 Robustness Tests

A series of robustness is conducted on the baseline and additional findings. First, while split ratings constitute a popular measure of informational opacity in the literature, the baseline results that show that the probability of a wider split rating is positively associated with poor asset quality may not refer to informational opacity. Although Morgan (2002) and Iannotta (2006) document that split ratings appear more often in the banking industry due to the opacity that bank assets are inherently associated with, Ederington (1986) suggests that it is difficult to determine whether rating disagreements are due to random errors made by the CRAs or not. Ederington argues that if the creditworthiness of issuers rests in the middle between two adjacent ratings, two CRAs are likely assign two different ratings simply because of a random error. Based on this reasoning, Livingston and Zhou (2010) argue that if the ratings provided by two CRAs disagree by more than one notch, then it is easier to attribute the rating disagreement to informational opacity rather than on a random error. Using this argument, a test is conducted to rule out the possibility of the results being driven by random errors. To remove the randomness of one-notch splits, non-splits are transformed into one-notch splits and thus the regressions now start from the base of split = 1 instead of 0. Hence, any deviation from 1 implies the deterioration of informational opacity.

This test's results are presented in Tables 5.2.11 and 5.2.12. In columns (3), (7) and (11) of Table 4.2.11 where SPLIT 2 is the dependent variable the coefficients of the asset quality measures are not significant which is expected since SPLIT 2 contains overall smaller disagreements compared to the other two splits. However, remaining coefficients of PL, LLR and NPL are significant at the 5% or 1% level, except for the coefficient in column (5). This is in line with the results presented in Table 4.2.9 that poor asset quality can increase the probability of greater than one-notch rating splits. Similarly, the results of the additional analysis that are reproduced in Table

4.2.12 confirm the initial findings that the assignment of the third rating can mitigate the positive relationship between poor asset quality and rating disagreements between Moody's and Fitch. Overall, this test's results suggest that the increased probability of rating disagreements due to deterioration in asset quality should be attributed to informational opacity rather and not to random errors.

Second, the sample includes banks from a diverse group of countries that are at various phases of financial and economic development and implement different regulatory frameworks. To address these issues, two tests are employed. First, three macroeconomic control variables (i.e. GDP growth, inflation growth and unemployment) are added to the econometric specification because split ratings may be influenced by the economic conditions at the country level. The results of this test are presented in Tables 4.2.13 and 4.2.14 and they remain similar to the initial results. However, as with the previous test, the coefficients of asset quality measures are not significant when the dependent variable is SPLIT 2. The second macroeconomic test is to run the regressions for regional subsamples. More specifically, the sample is split into USA, European Union and Asia-Pacific. The regressions with SPLIT.A are not included because of very limited availability of observations. These results are presented in Table 4.2.15 and show that while SPLIT 1 is positively associated with poor asset quality in all regions, the same does not hold for the other splits. The remaining coefficients are insignificant except for column (6) where the PL coefficient is positive and significant for SPLIT 3 for the European Union sample.

Table 4.2.11 Random-Effects Ordered Logit Models with The Non-Split to One-Notch-Split Transformation.

	(1) *SPLIT.A*	(2) *SPLIT 1*	(3) *SPLIT 2*	(4) *SPLIT 3*	(5) *SPLIT.A*	(6) *SPLIT 1*	(7) *SPLIT 2*	(8) *SPLIT 3*	(9) *SPLIT.A*	(10) *SPLIT 1*	(11) *SPLIT 2*	(12) *SPLIT 3*
PL	0.044**	0.040***	0.034	0.062***								
	(0.019)	(0.015)	(0.025)	(0.013)								
LLR					0.053	0.098**	-0.073	0.159***				
					(0.043)	(0.042)	(0.062)	(0.039)				
NPL									0.076***	0.036**	0.038	0.064***
									(0.022)	(0.018)	(0.028)	(0.015)
Control variables	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1753	2413	2203	2455	1821	2478	2278	2532	1584	2123	1967	2174
N. of Banks	278	352	340	379	284	364	350	388	255	317	310	344
Pseudo R2	0.174	0.234	0.319	0.237	0.165	0.231	0.312	0.239	0.168	0.233	0.302	0.231
Log Likelihood	-1731.63	-1220.8	-836.012	-1526.84	-1862.65	-1274	-885.018	-1598.77	-1654.47	-1111.37	-787.735	-1409.82

SPLIT 1, SPLIT 2 and SPLIT 3 are the dependent variables and each one is the absolute difference between each pair of the three credit rating agencies (S&P, Moody's and Fitch). SPLIT.A is the average of the three individual splits. All non-splits have been transformed into one-notch-splits. The explanatory variables are all in their 1-year lagged form. Standard errors are in parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% level respectively.

Table 4.2.12 The Moderating Role of The Assignment of a 3rd Rating with The Non-Split to One-Notch-Split Transformation.

	(1) *SPLIT 3*	(2) *SPLIT 3*	(3) *SPLIT 3*
PL	0.085***		
	(0.016)		
PL*3rd Rating Dummy	-0.042**		
	(0.018)		
LLR		0.255***	
		(0.051)	
LLR*3rd Rating Dummy		-0.168***	
		(0.057)	
NPL			0.082***
			(0.018)
NPL*3rd Rating Dummy			-0.037*
			(0.021)
3rd Rating Dummy	-0.117	0.159	-0.094
	(0.253)	(0.275)	(0.263)
Control variables	YES	YES	YES
Year Dummies	YES	YES	YES
Country Dummies	YES	YES	YES
Observations	2455	2532	2174
N. of Banks	379	388	344
Pseudo R2	0.239	0.241	0.232
Log Likelihood	-1522.46	-1593.12	-1407.22

SPLIT 3 is the dependent variable which is the absolute difference between Moody's and Fitch. 3rd Rating Dummy equals 1 if the bank has been assigned three ratings and 0 if it has been assigned two ratings. All non-splits have been transformed into one-notch-splits. The explanatory variables are all in their 1-year lagged form. Standard errors are in parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% level respectively.

Table 4.2.13 Random-Effects Ordered Logit Models with Macro Controls.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	SPLIT.A	*SPLIT 1*	*SPLIT 2*	*SPLIT 3*	*SPLIT.A*	*SPLIT 1*	*SPLIT 2*	*SPLIT 3*	*SPLIT.A*	*SPLIT 1*	*SPLIT 2*	*SPLIT 3*
PL	0.056***	0.035***	0.025	0.049***								
	(0.018)	(0.012)	(0.017)	(0.012)								
LLR					0.066	0.079**	-0.006	0.117***				
					(0.044)	(0.034)	(0.041)	(0.032)				
NPL									0.055**	0.035**	0.033	0.047***
									(0.022)	(0.014)	(0.021)	(0.014)
GDPG	0.031	-0.003	-0.053	-0.010	0.031	-0.002	-0.048	-0.017	0.024	0.001	-0.062*	-0.017
	(0.035)	(0.028)	(0.034)	(0.026)	(0.034)	(0.028)	(0.034)	(0.026)	(0.036)	(0.029)	(0.035)	(0.027)
INFG	-0.081	-0.083	-0.021	-0.005	-0.065	-0.074	0.006	0.019	-0.099	-0.099*	-0.010	-0.011
	(0.060)	(0.051)	(0.056)	(0.043)	(0.059)	(0.050)	(0.055)	(0.042)	(0.063)	(0.054)	(0.057)	(0.044)
UNEMP	0.047	0.045	0.127***	0.061	0.057	0.056	0.140***	0.057	0.056	0.070*	0.113**	0.050
	(0.047)	(0.037)	(0.045)	(0.039)	(0.047)	(0.037)	(0.044)	(0.039)	(0.049)	(0.038)	(0.046)	(0.041)
Bank-Specific Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1700	2244	2054	2295	1742	2305	2125	2368	1497	1954	1818	2015
N. of Banks	264	326	315	349	269	338	325	358	237	291	285	315
Pseudo R2	0.175	0.150	0.215	0.155	0.173	0.149	0.208	0.153	0.169	0.150	0.194	0.151
Log Likelihood	-1765.22	-2254.75	-1814.03	-2506.55	-1830.84	-2336.26	-1903.59	-2626.82	-1566.76	-1984.60	-1663.75	-2238.33

SPLIT 1, SPLIT 2 and SPLIT 3 are the dependent variables and each one is the absolute difference between each pair of the three credit rating agencies (S&P, Moody's and Fitch). SPLIT.A is the average of the three individual splits. The explanatory variables are all in their 1-year lagged form. Standard errors are in parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% level respectively.

Table 4.2.14 The Moderating Role of The Assignment of a 3rd Rating with Macro Controls.

	(1) *SPLIT 3*	(2) *SPLIT 3*	(3) *SPLIT 3*
PL	0.075***		
	(0.015)		
PL*3rd Rating Dummy	-0.046***		
	(0.017)		
LLR		0.217***	
		(0.044)	
LLR*3rd Rating Dummy		-0.166***	
		(0.049)	
NPL			0.069***
			(0.017)
NPL*3rd Rating Dummy			-0.043**
			(0.020)
3rd Rating Dummy	0.021	0.268	0.035
	(0.189)	(0.211)	(0.202)
GDPG	-0.001	-0.013	-0.009
	(0.026)	(0.026)	(0.027)
INFG	-0.005	0.028	-0.009
	(0.043)	(0.042)	(0.044)
UNEMP	0.071*	0.069*	0.061
	(0.040)	(0.039)	(0.041)
Control variables	YES	YES	YES
Year Dummies	YES	YES	YES
Country Dummies	YES	YES	YES
Observations	2295	2368	2015
N. of Banks	349	358	315
Pseudo R2	0.157	0.156	0.152
Log Likelihood	-2501.84	-2620.32	-2235.36

SPLIT 3 is the dependent variable which is the absolute difference between Moody's and Fitch. 3rd Rating Dummy equals 1 if the bank has been assigned three ratings and 0 if it has been assigned two ratings. The explanatory variables are all in their 1-year lagged form. Standard errors are in parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% level respectively.

Table 4.2.15 Random-Effects Ordered Logit Models with Problem Loans (PL) as Measure of Asset Quality for Different Geographical Subsamples

	USA			European Union			Asia-Pacific		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	SPLIT 1	*SPLIT 2*	*SPLIT 3*	*SPLIT 1*	*SPLIT 2*	*SPLIT 3*	*SPLIT 1*	*SPLIT 2*	*SPLIT 3*
PL	0.553***	0.092	0.169	0.030***	0.002	0.031***	0.432***	0.214	0.094
	(0.117)	(0.123)	(0.127)	(0.010)	(0.017)	(0.011)	(0.145)	(0.253)	(0.161)
ROAA	0.261	-0.325	0.516	0.117	-0.196	-0.268***	-0.039	-0.078	-0.272
	(0.322)	(0.322)	(0.359)	(0.117)	(0.135)	(0.102)	(0.497)	(0.686)	(0.475)
EQRAT	-0.089	0.082	0.056	0.003	-0.109	-0.020	-0.008	-0.340	-0.089
	(0.066)	(0.079)	(0.083)	(0.034)	(0.055)	(0.044)	(0.095)	(0.172)	(0.110)
MQ	0.023	-0.007	0.050***	0.006	-0.008	0.006	-0.007	-0.002	0.016
	(0.015)	(0.014)	(0.016)	(0.004)	(0.005)	(0.005)	(0.015)	(0.022)	(0.018)
LNTA	-0.362*	0.540	0.156	-0.002	-0.321**	-0.334***	-0.382*	-1.289***	0.455*
	(0.188)	(0.249)	(0.246)	(0.087)	(0.132)	(0.099)	(0.217)	(0.381)	(0.247)
LNZSCORE	-0.485*	-0.223**	-0.691	-0.147	-0.077	-0.027	0.512	-0.005	0.332
	(0.284)	(0.338)	(0.436)	(0.109)	(0.169)	(0.140)	(0.429)	(0.647)	(0.488)
INTANGIBLES	0.098	-0.048	-0.096	-0.256**	-0.519	0.205	1.336***	1.170*	0.525
	(0.096)	(0.112)	(0.119)	(0.125)	(0.170)	(0.133)	(0.429)	(0.606)	(0.482)
LIQUIDITY	-0.023	-0.016	0.004	-0.012***	-0.005	0.004	0.039**	0.099***	0.015
	(0.016)	(0.019)	(0.019)	(0.005)	(0.008)	(0.006)	(0.018)	(0.029)	(0.014)
LISTED	-0.858	-0.435	0.499	-0.074	1.232***	0.257	1.025*	1.324	-1.656***
	(0.628)	(0.797)	(0.885)	(0.207)	(0.343)	(0.261)	(0.583)	(0.862)	(0.636)
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country Dummies	NO	NO	NO	YES	YES	YES	YES	YES	YES
Observations	418	441	388	854	811	895	703	520	616
N. of Banks	55	61	52	121	120	134	96	76	92
Pseudo R2	0.187	0.212	0.222	0.112	0.171	0.116	0.317	0.335	0.303
Log Likelihood	-386.07	-384.01	-359.96	-918.93	-757.18	-1083.25	-545.48	-336.72	-476.14

SPLIT 1, SPLIT 2 and SPLIT 3 are the dependent variables and each one is the absolute difference between each pair of the three credit rating agencies (S&P, Moody's and Fitch). SPLIT.A is the average of the three individual splits. The explanatory variables are all in their 1-year lagged form. Standard errors are in parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% level respectively.

4.2.9 Policy Implications

This chapter's findings have important policy implications. Adding to the previous studies that have documented the relative opaqueness of the banking sector, the results here indicate that the deterioration of asset quality can also be an important factor that contributes to bank uncertainty. The results support regulators who want to address the opacity associated with risky loan portfolios by introducing policies to help banks manage their risk more efficiently. Reducing bank opacity should be one of the main regulatory goals since banks are essential financial institutions in the economy, enabling asset allocation and risk transformation. As a result, the post-2009 regulatory frameworks that require from banks to reduce their NPLs will not only reduce the overall risks in the banking sector, but also increase transparency and promote the stability of capital markets. Furthermore, the results also support the call for increased transparency in NPL reporting since poor asset quality is shown to increase disagreements between CRAs which are key information intermediaries and both regulators and investors rely on their assessment. Therefore, increased NPL transparency will enable the effectiveness of regulatory policies and increase efficiency in the financial markets. Finally, the results suggest that regulators can use the increase of disagreement between ratings by CRAs to detect problems of poor asset quality and intervene to resolve them promptly.

This chapter has also provided evidence that the assignment of a third rating mitigates the positive effect of the deterioration of asset quality on the split rating between the other two CRAs. Regulatory bodies rely significantly on ratings provided by the Big 3 CRAs to control and enhance the stability of the banking sector and the efficient allocation of capital (Cantor and Packer 1997). Moreover, the previous subchapter shows that banks purchase more ratings after 2009, possibly driven by regulatory requirements. Hence, banks rely on CRAs not only to communicate their creditworthiness, but also to acquire regulatory certification that helps them receive a greater share from the allocation of capital. This is highlighted by Opp, Opp and Harris (2013) who show that when lower credit ratings are related to increased costs of regulatory compliance, CRAs abandon their role as information intermediaries, and inflate ratings to facilitate regulatory arbitrage. The findings in this chapter indicate that such asymmetries associated with worsened bank asset quality can be mitigated through the purchase of a third rating and thus enhance transparency in the information market.

4.2.10 Conclusions

This subchapter investigates the role of asset quality for bank opacity. Earlier studies show that what makes banks more opaque than other types of firms is their unique asset structure (Morgan 2002; Iannotta 2006). Banks hold mostly risky financial assets, usually in the form of loans to private borrowers. These loans are opaque and difficult to value, making banks opaque institutions with important implications for both the bank and the wider financial system.

Yet, the literature neglects the role of these assets' quality for bank opacity. Asset quality gained the attention of researchers and policymakers in recent years due to the global financial crisis of 2007-2009 that left many banks with large amounts of non-performing assets in their portfolios, especially in Europe. Therefore, it is important to understand how the reduction of NPLs in the banking industry may affect bank transparency which is also an important target for regulators.

The results show that the deterioration of poor asset quality can increase the probability of wider credit rating disagreements among the Big 3 CRAs. This finding is both statistically and economically significant and it is consistent with the expectations, as banks may either actively hide their loan losses or simply be less transparent due to the opacity associated with private borrowers. Moreover, additional evidence is provided on the information production hypothesis. It is found that the assignment of three ratings instead of two can alleviate this adverse effect of poor asset quality on rating disagreements.

The relationship between asset quality and credit rating disagreements is less likely to be subject to endogeneity concerns compared to other relationships investigated in this thesis because CRAs provide their assessment on the bank's creditworthiness after the bank's asset quality has been observed. Nevertheless, we cannot completely rule out the possibility that low credit ratings might impede a bank's ability to monitor its borrowers effectively and lead to the deterioration of asset quality. In an attempt to partially address this concern, the empirical methodology uses the independent variables in their one-year lagged form. The ordered nature of the dependent variables does not allow the use of techniques such as instrumental variables regressions as the results of such an estimator would not be comparable with the random-effects ordered logit regression results presented in this chapter. Such issues are also found in the seminal work by Morgan (2002) and Iannotta (2006) where the estimation method is similar to the one used in this chapter. Therefore, future research should attempt to address such concerns.

These findings are subject to some limitations. First, it is not possible to distinguish between the active hiding of loan losses by banks and the passive borrower opacity that makes banks more opaque. Yet, the literature has documented that both take place. Second, although three split ratings are employed which is an advantage compared to similar studies in the literature, no other measure of opacity is used. The most obvious alternative would be some market liquidity measure, but this refers to publicly listed banks and the sample used in this study contains unlisted banks too. Finally, the analysis referring to the information production value of the third rating is only conducted for when the third rating is provided by S&P. This is because the data is provided by S&P and it is possible that ratings by the other CRAs are missing. Therefore, it cannot be tested whether when one of the other two CRAs provides the third rating has the same moderating effect on the relationship between asset quality and credit rating disagreements by the other two CRAs.

Chapter 5: Ethical Bank Disclosures and Liquidity Creation: Evidence from Textual Analysis of Annual Reports

5.1 Introduction

Ethical behaviour in the banking sector is of significant interest because of the ethical duties that banks have towards depositors and borrowers. Banks, as financial intermediaries, constitute a unique type of entities and their risk exposures, systemic interconnectedness and output can significantly impact social welfare. The ethical relevance of banks gained some attention only after the global financial crisis of 2007-2009 when numerous institutions failed or had to be refinanced with taxpayer money, eventually impeding social welfare.[37] Since then, banks have started engaging in more corporate social responsibility (CSR) activities and reporting codes of ethics, attempting to assure their clients that their operations have strong moral foundations.

Generally, researchers attempt to explain the incentives of firms for their engagement in ethical activities, such as CSR, through the relationship between social and financial performance (e.g. Baron 2001; Dam, Koetter & Scholtens 2009; Bénabou & Tirole 2010). The two main strands refer to the altruistic and strategic preferences of firms. First, firms with altruistic preferences want to

[37] One of the most prominent examples is Fortis, a leading financial group of the Benelux for many years before it was hit by the crisis. At its prime, Fortis had built a strong reputation for its corporate governance and commitment to CSR and ethical behaviour. However, the group collapsed and was absorbed by other institutions, raising many questions about ethics in the banking sector. Why did an "ethical" bank take so much risk leaving its customers vulnerable?

do good because they are honestly concerned about social and environmental welfare. In this case, firms will invest large amounts of money to achieve their social goals, but this will impede their financial performance with excess and inefficient costs. Second, firms with strategic preferences will make well-estimated social investments, expecting a high return for the money they have spent. Should firms invest in social activities for their strategic goals, their financial performance will be enhanced by efficiently attracting more customers.

However, compared with the extensive literature on CSR in other industries, only a handful of studies investigate the ethical activities of banks and their relationship with bank financial performance. The studies by Chih, Chih and Chen (2010), Soana (2011), Wu and Shen (2013) and Shen et al. (2016) document in different ways that banks have strategic preferences when they employ social activities, aiming to enhance their competitive advantage and increase their profitability. For instance, Wu and Shen (2013) provide rigorous evidence that bank CSR policies are positively related to the return on assets, return on equity, net interest income and non-interest income, while they are negatively related to non-performing loans. Moreover, a few other studies show that regulatory interventions and reforms can play an important role in influencing banks' behaviour towards their stakeholders' interests (Cozarenco & Szafarz 2018; Maxfield, Wang & De Sousa 2018), indicating the presence of significant policy implications surrounding the investigation of bank social performance.

Surprisingly, the literature appears to neglect the ethical relevance of one of banks' main financial activities, i.e. creating liquidity for depositors and borrowers. Creating liquidity has strong ethical implications. First, liquidity creation on the liability side of the balance sheet suggests that banks fund themselves with more liquid deposits, thus allowing depositors to use their money for payments or withdrawals when they wish to do so. However, it is a common practice for banks to delay credit transfers and complete debit payments on the spot (e.g. Koslowski 2011), or “hide” charges (e.g. Armstrong & Vickers 2012). Second, banks create liquidity when they use liquid deposits to fund reasonably risky investment opportunities, in the form of illiquid loans. Yet, the existence of moral hazard may motivate banks to increase their risk-taking and transfer the excess risk to their private creditors such as depositors (Jensen & Meckling 1976). Therefore, liquidity creation is usually strongly connected to the ethical performance of banks. Attempting to fill this apparent gap in the literature, this chapter investigates the relationship between banks’ key function in the economy, which is creating liquidity for depositors and borrowers, and their ethical disclosures.

Measuring bank ethics is difficult because it is not directly observable. Previous studies use mostly CSR ratings provided by secondary databases to proxy “social performance”. This chapter follows the work by Loughran, McDonald and Yun (2009) to estimate ethical bank disclosures using textual analysis. By counting the relative occurrences of a certain group of terms, the main independent variable in the analysis intends to measure the intensity of ethics-related terms in annual reports. It is important to note however that banks do not “give their word” in a contractual sense when their annual reports use more ethics-related terms. Therefore, it is assumed that using these terms more often develops an implicit assurance and expectation that banks hold high standards of ethics, values, and business conduct (Loughran, McDonald & Yun 2009). The results show that liquidity creation is positively associated with ethical disclosures, indicating the presence of banks’ strategic preferences. More specifically, the results suggest that banks may increase the intensity ethics-related words in their annual reports to mitigate the perceived uncertainty associated with creating more liquidity and thus attract more deposit and credit customers.

5.2 Literature Review on Corporate and Bank Ethics

5.2.1 Why Do Companies Act Ethically?

The most prominent view argues that corporations are encouraged to act ethically because operating in an ethical way is perceived to benefit both the society and the corporations themselves. This is usually accomplished by engaging in CSR activities. In the macro-level, the ethical operations of a corporation can contribute to environmental improvements such as limiting pollution and promoting renewable sources of energy, as well as to social equality by employing workers regardless of sex, gender, ethnicity, age, sexual orientation etc. In the micro-level, corporations can improve their own performance through enhancing their reputation, charging a premium for their products and being able to attract and maintain high-quality employees. Although corporations are more likely to be convinced by the micro-level benefits and hence incorporate CSR policies, as long as they understand that the long-term financial benefits are greater than the costs, society and all stakeholders also benefit from their ethical behaviour, thereby creating a win–win situation.

An alternative view suggests that corporations that implement strong CSR policies can alleviate potential conflicts of interest. For instance, Heal (2005) argues that adopting CSR can mitigate two important types of conflicts of interest between corporations and society. First, should a corporation refuse to adopt CSR practices, it may not internalize the external costs of its operations that can be massive for society. This conflict can be illustrated by the example of a large oil corporation that pollutes the environment with an immense external cost for the environment but does not suffer any large internal costs. Second, a conflict of interest may emerge between corporations and society due to distributive injustice. An important issue that demonstrates this conflict of interest relates to the wages that corporations pay to workers in poor countries which are significantly lower than what the corporations would pay in their home countries. This gives rise to the sweatshop problem that can only be resolved with either government intervention or CSR implementation. As government intervention has proven ineffective in this issue, the role of CSR and ethics is vital. In line with Heal (2005), Harjoto and Jo (2011) also suggest that corporations can employ CSR as a tool to reduce conflict with several stakeholders when corporate managers forgo society and the financial claimants of the corporation to pursue their own interests.

Baron (2001), Dam, Koetter and Scholtens (2009), and Bénabou and Tirole (2010) argue that at the micro-level corporations may have three different incentives for adopting CSR policies: altruism, strategic choices, and greenwashing. First, the altruism incentive suggests that corporations engage in CSR for its own sake because they want to be good corporate citizens and protect the society and the environment (Baron 2001). Second, the strategic incentive indicates that corporations calculate the costs and the benefits from conducting ethical corporate activities and opt to do so because they expect to receive substantial benefits (Wu & Shen 2013). Finally, greenwashing refers to corporations' incentive to enhance their public image without making important changes to their business (Frankental 2001). Dam, Koetter and Scholtens (2009) argue that when there are no clear differences in the costs occurred by between responsible and irresponsible corporations, this will reflect in their earnings as a sign of greenwashing.

Hundreds of empirical studies have attempted to present evidence of the positive relationship between ethical corporate activities and financial performance. However, the evidence unearthed is largely mixed and unclear. Margolis and Walsh (2003) conduct an analysis of the findings of 127 empirical studies that date from 1972 to 2002 on this relationship. They show that 54 of these studies argue for a positive relationship, 28 present insignificant relationships, 20 find mixed results and only 7 argue that a negative relationship holds. Margolis, Elfenbein and Walsh (2009) that extend this analysis show that the overall effect found in the literature may be positive, but it is small, and it is even smaller in the more recent decades. They demonstrate that the average effect size of corporate social performance accounts for only about 2.23% of the financial performance's variance. Similarly, Peloza (2009) review 128 studies and find that 59% of them report a positive relationship, 27% a mixed or neutral relationship, and 14% a negative relationship. Another review by Aguinis and Glavas (2012) also finds that overall a small but positive relationship exists between CSR and financial performance.

In summary, although engaging in CSR activities does not appear to penalize corporations financially or impair their operations, it also fails to promise any significant financial performance relative to interest generating activities.

5.2.1.1 The Positive Relationship Between Ethical Corporate Activities and Financial Performance (Strategic preferences)

Although evidence remains limited on the financial benefits for firms with strong CSR policies, some researchers have unearthed important findings. This section reviews some recent and important studies in this area. It should be noted that the papers reviewed here are primarily focused on general firms rather than on the banking industry and empirical evidence on bank ethics is reviewed in section 6.2.2.

Ghoul et al. (2011) examine the effect of CSR on the cost of equity capital. They use a large sample of US firms with 12,915 firm-year observations in the period of 1992-2007 and they employ different methods to measure firms' ex ante cost of equity. The study shows that firms with higher CSR scores attract cheaper equity financing. More specifically, the findings indicate that investing in more responsible employee relations, environmental policies, and product strategies helps firms to reduce their cost of equity. In line with these results, the authors also show that when a firm belongs to a "sin" industry (tobacco or nuclear power), it suffers an increased cost of equity. Overall, the evidence presented in the study supports the view that CSR practices can improve firm valuation and mitigate risk.

Deng, Kang and Low (2013) investigate the benefits of CSR for the shareholders of acquiring firms. They use a sample of 1,556 completed mergers in the US for which the acquirers have received CSR ratings by KLD in the period of 1992-2007. The authors compare the returns of acquirers with high and low CSR performance. They find that high CSR performers enjoy greater merger announcement returns, greater announcement returns on their value-weighted portfolio and better post-merger long-term operating performance. The authors also show that high CSR acquirers realize positive long-term returns on their stock which shows that it takes time for the market to price the benefits of CSR. Finally, they show that mergers completed with high CSR acquirers are completed faster and are less likely to fail.

Lins, Servaes and Tamayo (2017) examine whether investment in social capital helped firms have better performance during the financial crisis of 2007-2009. They proxy social capital with CSR intensity (CSR ratings from the MSCI ESG Stats Database) and their final sample contains 1,673 nonfinancial US firms. The authors show that during the crisis, firms with higher CSR ratings had stock returns that were 4 to 7 percentage points greater than those with lower CSR ratings. Except for the stock price performance, high-CSR firms also had greater profitability, growth, and sales per employee, while they also were able to raise more debt than low-CSR firms. The authors interpret the results as evidence that trust between firms and their stakeholders (as expressed through high CSR performance) can compensate firms in times of negative shocks in the market.

Bae et al. (2019) study if CSR affects the interactions of firms with their customers and competitors, as well as if it can decrease the costs associated with high leverage. Their investigation is based on earlier research that shows that high leverage is related to significant losses in market share because of unfavourable behaviour by firms' customers and competitors. The sample of the study contains 2,739 U.S. firms over the period of 1996–2012 and CSR activity is measured with data by the MSCI ESG STATS database. The authors show that CSR can mitigate the loss of market share under high leverage. Because CSR can reduce the adverse actions by customers and competitors, it helps highly leveraged firms to maintain their customers and protect themselves against competitors' predation.

Nguyen, Kecskés and Mansi (2020) examine the benefits of CSR for shareholder value creation and highlight the importance of long-term investors. The authors posit that long-term investors can play a vital role as they can make sure that managers adjust the CSR level appropriately to maximize shareholder value. The sample of the study includes 3,592 US firms in the period of 1991-2009 and CSR data are obtained by KLD. The results support the authors' hypothesis and show that long-term investors can enhance shareholder value derived from CSR activities, mainly through lower cash flow risk rather than through increased cash flow.

In summary, the aforementioned studies support the value benefits of engaging in CSR activities. In all cases, the benefits are shareholder-centred and especially in favour of long-term investors. Although these findings relate mainly to non-financial firms, one could argue that such benefits do reflect the overall CSR-driven financial value enhancement for which we cannot rule out the banking industry. Therefore, banks may also benefit from engaging in CSR activities, as their clients do.

5.2.1.2 The Negative Relationship Between Ethical Corporate Activities and Financial Performance (Altruistic Preferences)

As explained earlier, there are considerably fewer studies that report a negative relationship between corporate social and financial performance. The main underlying reasoning of this negative effect is that spending too much on doing good can inefficiently reduce the financial resources of a firm (Friedman 1970). Nguyen, Kecskés and Mansi (2020) argue that when managers overinvest in CSR because they are not adequately monitored, long-term investors might experience a negative effect on their investment.

Margolis and Walsh (2003) find only seven studies (out of 127) during the 1970s-1990s that document a negative relationship between social and financial performance. Barnett and Salomon (2006) examine the relationship between social and financial performance using mutual funds that practice socially responsible investing (SRI). The authors posit and document that SRI funds incur financial losses because of poor diversification but this can be offset with more intense social screening which can be used to select better-managed and more stable firms to invest in. More specifically, the results indicate that while financial returns initially decline, the more social screens are used by the SRI fund, the more returns bounce back. More evidence on this U-shaped relationship between social and financial performance is provided by Barnett and Salomon (2012). In particular, the authors show that firms with low social performance have higher financial performance than firms with moderate social performance, but firms with high social performance have the highest financial performance. They argue that this due to stakeholder influence capacity that firms initially lack when they invest in CSR and thus incur financial losses, but as they spend more, those that build their stakeholder influence capacity can exert financial benefits as well.

Garcia-Castro, Ariño and Canela (2009) criticize the empirical findings of studies that document a positive relationship between social and financial performance. They argue that the heterogeneity that exists in the results of this strand of the literature may be due to not properly taking into account endogeneity. More specifically, using the KLD database, they show that the positive relationship found in the majority of the previous studies on the relationship between social and financial performance becomes statistically non-significant or even negative when they properly control for endogeneity.

5.2.2 Bank Ethics

The literature as well as the finance industry have historically neglected the ethics implications of banking entities. Especially before the global financial crisis of 2007-2009, banks and other financial institutions believed that their business operations are not ethically relevant and financial mathematics were the only principles guiding their decisions. Financial services were rather entirely focused on shareholder value and return on investment, defying any value or relevance associated with ethics. Following the shareholder approach, banks were maximizing shareholder value as long as everyone abided by the bank's contracts. Especially for banks, adhering to ethical criteria seemed to be irrelevant because assuming the total rationality of market participants and under full disclosure of the contractual terms, any ethical standards were automatically enforced by the market. Therefore, with rational market participants and rational banks, no one could deceive the other party.

Yet, there is plenty of evidence suggesting that this ideal state of the market does not exist. Even before the financial crisis, researchers have continuously uncovered several problems in the financial markets such as contagion, the infectious over- or under-pricing of stocks, herding behaviour, following those who have the most followers, adverse selection, moral hazard etc. For instance, in the case of herding, it is easier to judge whether the first people are rationally following a knowledgeable opinion leader. However, as the "herd" is growing it becomes more difficult to assess whether following the followers is a rational decision or these followers follow other people without any significantly rational reasoning (Trueman 1994). Thus, one cannot expect that the market will drive banks into ethical transactions (Acharya & Yorulmazer 2008).

In the run-up to the financial crisis, the international banking system put a lot of faith into the financial alchemies that dominated the structured finance market. But how can wise and rational analysts create structured products such as collateralized debt obligations (CDOs) by combining as underlying assets multiple non-performing mortgages and expect that nothing bad will happen? Indeed, financial products such as these diluted CDOs brought immense disrepute to the banking industry during the financial crisis (Shivdasani & Wang 2011; Chernenko 2017).

Because banks play a crucial role in an economy by providing liquidity to the market, one can argue that they are even more ethically relevant than sectors from the real economy. Yet, a conflict arises as it is difficult to deprive from banks and other types of firms their commercial freedom and freedom of contract. Except for activity restrictions imposed by authorities to control competition and risk, the financial industry has the right to engage in a commercial contract even if it increases risk and instability. Although many banks made mistakes in the past, it is not possible to deprive their (or any other citizen's) rights of private autonomy and freedom of contract. These rights are not granted by governments, but rather by the principles on which governments are founded (Koslowski 2011).

Also, since banks as lending institutions do not directly generate dangerous pollutants in the environment such as emissions or toxic waste, they may appear as harmless to the environment. In this regard, their operations would be entirely irrelevant to the preservation of the welfare of nature except for small instances such as paper recycling and energy efficiency of their buildings. However, banks are inextricably connected to any commercial activity that damages the natural environment through their lending. This connection entails multiple sources of risk for banks, as they are not only subject to public criticism that can lead to customer dissatisfaction, but also regulatory reforms in environmental policies can increase the threat on banks' loan portfolios (see Aracil, Nájera-Sánchez and Forcadell (2021) for a review on sustainable banking).

Fortis, one of the leading financial groups in the Benelux region prior to the financial crisis of 2007-2009 was reputed for its multiple successful mergers of bank and insurance firms. Its case is a great example of bank CSR failure. The banking group, which was the world's 20th largest financial services business, collapsed due to the severe problems that encountered during the crisis and it was absorbed by BNP Paribas and ABN AMRO after receiving bailouts by the Benelux governments (Fassin & Gosselin 2011). The Fortis bankruptcy triggered a number of on-going concerns about the reliability of bank products and services. The most important concern is that the Fortis group was renowned for its corporate governance and commitment to CSR and ethical behaviour and the collapse of an "ethical" institution challenged the beliefs around the role of ethics in banking. The questions that emerged are how can a systemic institution that takes so much risk can be perceived as socially responsible and why the strong CSR policies of the group failed to prevent its collapse.

"It is sad to observe that the more the (Fortis') bankers talked of social responsibility and stakeholder management, the more it was shareholder value and personal bonuses that seem to have driven them" (Fassin & Gosselin 2011, p. 187).

5.2.2.1 The (Ethical) Duties of Banks to Depositors and Borrowers

As banks strive to attract deposits against competition to fund loans to borrowers, they have a purpose to fulfil towards their customers that has a significant ethical relevance. Depositors give their money to banks for three reasons (Evans 2014). First, depositors opt to hold current accounts to facilitate their payment transactions and keep their funds liquid. Second, depositors may opt to invest in savings accounts that allow them to earn a small interest profit at very low risk. Third, current account holders expect from the bank to eliminate any risk related to their deposits and keep their money safe and liquid. Therefore, banks have a significant duty towards depositors to ensure the reliability and management security of their customers' money.

Banks' duties towards borrowers are different from the ones towards depositors. First, borrowers expect from the bank to offer them financing at an affordable cost, even if the project carries significant risk. Since potential loan customers can seek funds elsewhere (e.g. issue bonds, go public, retain profits, go to another bank etc.), banks are in competition to secure these customers and the profit from charging interest on the loans. Hence, the main duty of banks towards borrowers is to make financial resources available at market-competitive prices for the risk-bearing ventures of their loan customers (Koslowski 2011). However, this affects the main duty of banks towards depositors, to whom they have ensured reliability and management security, to issue loans to good investment projects that will not endanger the security and liquidity of their deposits.

5.2.2.2 Ethical Implications of Liquidity Creation

Based on the aforementioned duties of banks towards depositors and borrowers, bank liquidity creation that involves using liquid deposits to fund illiquid loans has serious ethical implications. Koslowski (2011) argues that several duties arise from banks' nature to facilitate payments and enable credit and that these can be divided into the duties related to safeguarding deposits' liquidity and the duties related to deposits' transformation into loans.

First, creating liquidity for depositors means that they can withdraw their money or use it to make payments whenever they want. Yet, banks often receive complaints for delaying credit transfers into accounts, while debit payments are facilitated immediately (Bech, Chapman & Garratt 2010; Humphrey 2010). With this uneven value-dating practice, banks not only save interest payments on deposits, but they also earn a small extra interest from overdrawn accounts (which are overdrawn because of such delays in credit transfers) (Koslowski 2011). Although it may seem surprising, this practice of banks does not arise from any practical obstacles in telecommunications. It is a rather common method that has existed for a long time, which helps banks to minimize collateral costs (Humphrey 2010). The rise of technological innovations in FinTech has generally improved the speed of bank transactions in recent years, especially for retail payments (Bech et al. 2017), but the problem has not been eliminated.[38] Thus, an important ethical implication of bank liquidity creation is that banks tend to perform a practice that is unjust towards their depositors with liquid accounts and the more liquidity a bank creates, the bigger the consequences of this practice are.

Second, another key duty of banks when they create liquidity is to ensure the safety of liquid deposits by allocating these funds to risky but promising ventures, while they also are responsible for not engaging in credit rationing that would limit the level of liquidity in the economy. In the years that preceded the financial crises of 2007-2009, banks engaged in extensive provision of credit to borrowers whose investment projects were not as sound as to justify the level of credit

[38] For instance, German consumer groups have found that the time required for credit transfers today does not differ significantly from the time needed in the era of the Fugger Bank in the sixteenth century in Germany (Koslowski 2011).

provided as well as the low prices and interest rates charged by banks. Such behaviour by banks can put depositors' money at risk as should the bank fail, it will not be able to fulfil its promises and duties towards depositors. On the other hand, in the years of the crisis and in several instances of the past, banks (especially the large ones) were accused of credit rationing, i.e. refusing to lend to financially healthy customers with promising projects (particularly to small and medium enterprises) (e.g. Carbo-Valverde, Degryse and Rodríguez-Fernández 2015). One reason for this is that branches of large banks follow a centralized set of criteria to approve loan requests, while the requests may also be processed centrally without the involvement of the branch, and thus the bank may fail to do justice towards small clients. Another reason is that monitoring small borrowers is difficult as they are more opaque, and thus the bank may opt to avoid the extra risk associated with small borrowers for which the provision of credit is also subject to stricter rules, especially in terms of collateral (Gao et al. 2020). Thus, when creating liquidity, banks have ethical duties towards their deposit and credit customers.

5.2.2.3 Empirical Literature on Bank Ethics

Although banks have strong commitments towards depositors and borrowers, this does not necessarily mean that they will maximize their ethical standards or at least be more careful to fulfil their promises towards their clients. The literature attempts to investigate empirically the drivers and the consequences of ethical bank behaviour. Such literature emerged in greater volume especially after the financial crisis of 2007-2009, when banks were at the centre of accusations for their lack of prudency and contribution to an economic catastrophe. This subsection reviews the literature related to bank ethics.

5.2.2.3.1 Ethical Bank Behaviour and Awareness

Mitchell, Lewis and Reinsch (1992) conduct one of the earliest studies on bank ethical behaviour. They interview employees of four small banks about their experience with, and attitudes towards a list of seventeen categories of behaviours collected from the literature. They find that younger employees possess a greater level of ethical consciousness than older employees. Also, they show that the longer an employee works for a bank, the more he/she will set job security as a priority, leading to rationalizing or disregarding seemingly unethical behaviours. The authors argue that these findings emphasize the important role of internal behaviours (i.e. employee misbehaviour) as more attention is often paid over external behaviours (e.g. bribery of authorities).

Cowton and Thompson (2000) investigate a sample of banks which had signed a statement on banking practices and the protection of the environment put forth by the United Nations Development Programme. By comparing banks that signed the statement and those who did not, the authors try to see whether such initiatives affect banks' attitude towards taking into consideration their impact on the environment. First, the authors find that banks that signed the statement incorporated environmental considerations into their formal lending policy more than the non-signatory banks. Second, the authors show that signatory banks included environmental issues in their risk assessment (but did not amend their formal lending policies accordingly) but only marginally more than non-signatory banks.

5.2.2.3.2 Bank Social and Financial Performance

Simpson and Kohers (2002) examine the relationship between corporate social and financial performance in the banking industry. Their sample contains 385 US national banks that were examined for Community Reinvestment Act compliance in 1993 and 1994. The authors proxy bank social performance with a dummy variable that equals 0 if the rating needs improvement and

1 if the rating is outstanding. The findings show that bank social performance is positively associated with the return on assets and negatively associated with the loan loss reserves.

Soana (2011) examines the relationship between corporate social performance and corporate financial performance in the banking sector by using a correlation method. The study uses a sample of 21 international banks rated by Ethibel and 16 Italian banks rated by AXIA as well as a sample of 31 Italian banks rated by AEI. The author fails to find confirming evidence of negative or a positive relationship between corporate social performance and financial performance. The author argues that this finding can be described as reassuring as CSR activities appear to not affect negatively the financial performance of banks. On the other hand, not being able to exert benefits from CSR may discourage banks from engaging in CSR activities.

Wu and Shen (2013) investigate the financial consequences for banks from adopting CSR policies. They use data on 162 banks from 22 countries in the period 2002-2006. The authors propose the use of an extended version of the Heckman two-step regression, which consists of a first-step with a multinomial logit model, and a second step that estimates the performance equation with the inverse Mills ratio generated by the first step. The authors find strong evidence that CSR is positively associated with banks' financial performance. More specifically, their results show that CSR is positively related to the return on assets, return on equity, net interest income and non-interest income, while it is negatively related to non-performing loans. The authors argue that these findings indicate that the decision of CSR engagement by banks is largely driven by strategic choices. Shen et al. (2016) attempt to extend the analysis by Wu and Shen (2013). In contrast to Wu and Shen (2013), the authors use a larger global sample, they differentiate between CSR and non-CSR banks and attempt to confirm their findings through three different advanced methods. Their results show that regardless of the method used, CSR banks considerably outperform non-CSR banks as they exhibit higher return on assets and higher return on equity.

5.2.2.3.3 Determinants of Bank Social Performance

In the absence of objective metrics on the social conduct and performance of firms in the early 2000s, Scholtens (2009) develops a framework to investigate the social responsibility of international banks. The sample contains 32 large banks from Europe, North America and Asia-Pacific. The author assessed banks' performance by taking into consideration several aspects such as reporting, adoption of international codes, using certified management systems, internal environmental policies and the existence of sustainability-focused financial products etc. The author does not observe significant difference in CSR scores among regions although some countries are shown to have the banks with the highest scores and others the ones with the lowest. Yet, the author finds that banks increased their CSR performance significantly from 2000 to 2005.

Chih, Chih and Chen (2010) conduct one of the first comprehensive studies on the determinants of CSR activity in the financial industry. Their sample consists of data on 520 financial firms from 34 countries in the period 2003-2005 and they provide numerous findings that are well connected to this chapter's empirical results. More specifically, they show that larger firms are more CSR minded and their financial performance is not related to CSR; firms may engage in CSR activities to improve their competitive advantage under more intense market competition; CSR activities are positively associated with stronger national legal environment but negatively associated with stronger shareholder rights. Finally, they show that in countries that have more collaborative employer–employee relationships, higher quality management schools and a better macroeconomic environment, firms act in more socially responsible ways.

Jizi et al. (2014) examine the effect of corporate governance on CSR in the banking sector using a sample of US commercial banks from 2009 to 2011. The authors focus on several board characteristics such as board size, board independence, CEO duality (dual chair) and number of board meetings. The authors document that board independence and board size, which are often the board characteristics associated with the protection of shareholder interests, exhibit a positive relationship with CSR disclosure. Their findings suggest that more independent and larger boards are the internal corporate governance mechanisms that can promote not only shareholders' interests, but also those of more stakeholders. The study also shows that CEO power, measured by CEO duality, can also have a positive effect on CSR disclosure, as powerful CEOs may increase CSR transparency for their own benefits.

5.2.2.3.4 The Role of Policymaking in Bank Social Performance

Escaping the mainstream CSR-centred literature, Cozarenco and Szafarz (2018) examine gender bias in bank lending. As evidence on the issue remains scarce and controversial, the authors use a microfinance institution (MFI) to conduct a natural experiment based on the introduction of a regulation that imposes a strict €10,000 loan ceiling on microcredit and examine the gender discrimination on the loan applicants. The authors first show that the loan ceiling is associated with severer treatment of female borrowers. They also show that the change in this MFI's attitude was triggered by banks through co-financing (MFI applicants have to secure funding by a major bank first). The authors argue that the co-existence of co-financing and a loan ceiling pushes MFIs towards gender biases in the loan granting process.

Maxfield, Wang and De Sousa (2018) investigate the effects of the post-financial crisis corporate governance reforms in the banking sector. In contrast to other studies that use bank-specific data, the authors' use a macroeconomic sample that contains 134 countries over the period of 2004-2011. The aforementioned reforms correspond to the shift towards a stronger focus on the stakeholder impact of corporate governance in the financial sector, following the criticism on the shareholder-focused corporate governance practices that dominated the sector in the past. The study's findings indicate that these reforms are effective in promoting banks' focus on non-shareholder stakeholders' interests. More specifically, the results show that the bank governance reforms reduce net interest margins and increase the aggregate level of bank credit provision.

5.2.2.3.5 How Banks Perceive Borrower Ethics/Social Performance

Another stream of literature focuses on the ethical consideration of banks in their lending process. Goss and Roberts (2011) investigate the relationship between CSR and bank debt by exploiting the role of banks as delegated monitors of borrowers. They use a sample of 3996 loans to US firms and measure these firms' CSR with indexes provided by KLD Research and Analytics Inc and the dataset allows a distinction between firms with CSR strengths and those with CSR concerns. The authors find that firms with CSR concerns are charged between 7 and 18 basis points more than those that are responsible and that this effect increase in the absence of security. They also show that low-quality borrowers that spend significantly on CSR activities are subject to greater loan spreads and shorter maturities. On the contrary, banks are indifferent to CSR spending by high-quality borrowers.

Herbohn, Gao and Clarkson (2019) examine whether a bank loan announcement for a firm-borrower with high carbon risk signals negative information to investors about the firm's carbon risk exposure. Such information is often collected during the pre-loan screening period, but also through the ongoing monitoring. The study uses a sample that contains 120 bank loan announcements in the period of 2009-2015 and firms' carbon risk exposure is measured based on the NGER scheme's reporting threshold that borrower may meet or not. The findings indicate that loan renewals for firms with high carbon risk experience positive and significant loan announcement returns and even greater for renewals with more favourable terms. The same is not found for loan initiations. These results highlight the role of banks as information intermediaries and that their screening process is vital for the market and for the protection of the natural environment.

5.2.2.3.6 Conclusions on the Empirical Literature on Bank Ethics

Overall, evidence on the drivers of ethical bank behaviour remains limited and mixed. However, some conclusions can be drawn. The studies by Chih, Chih and Chen (2010), Wu and Shen (2013) and Shen et al. (2016) show that banks' incentives for ethical behaviour are more closely related to their strategic choices for competitive advantage, greater profitability and lower risk rather than for altruism. At the same time, banks do not reward their more ethical borrowers as they charge them more interest. Moreover, evidence by Cozarenco and Szafarz (2018) and Maxfield, Wang and De Sousa (2018) shows that regulatory interventions and reforms can significantly influence banks' behaviour towards their stakeholders' interests either positively or adversely. Thus, regulators need to consider how their new policies influence bank behaviour before implementation.

5.2.3 The Role of Codes of Ethics

Ethical organizational conduct relies significantly on the behaviour of the organization's members. The implementation of codes of ethics and compliance officers who are responsible for the organization's adherence to legal and ethical rules are practices that are adopted to prevent ethical organizational failure. Such practices appeared as mandatory in the US after the Enron scandal and the subsequent Sarbanes-Oxley Act with important repercussions for all major international corporations. More specifically, Section 406 of the Sarbanes-Oxley Act of 2002 by the SEC requires the annual disclosure of a code of ethics by all investment companies (SEC 2003). It specifically applies to each Fund's President/Principal Executive Officer and Treasurer/Principal Financial Officer who are called the "Covered Officers". This requirement aims to promote the following six areas:

1. Honest and ethical business conduct.
2. Full and accurate report disclosure.
3. Compliance with the relevant laws and regulations.
4. Encouraging the reporting of concerns related to ethics and compliance.
5. Encouraging internal reporting of breaches of the code of ethics.
6. Accountability for following the code of ethics.

The SEC argues that Covered Officers are essential to the goal of substantially developing a culture of high ethical standards and commitment to compliance with the rules. In their professional roles, the Covered Officers will avoid their involvement in any action that can compromise their professional ethics or bias their capability to perform their duties towards the firm. The Covered Officers must act in good faith and without distorting material facts and misleading stakeholders.

Codes of ethics are important in shaping the decisions and behaviour of professionals in financial services. Codes of ethics can define the ethical obligations and form the basis for ethical conduct in financial transactions. For instance, ING, the finance corporation with the highest revenue in Europe, describes its commitment to ethics as: "*Integrity, above all. Our operations touch many lives: customers, employees, shareholders, suppliers and society at large. Each individual within these groups can and should expect us to act with integrity. Balancing the rights* *and interests of all involved is key to our ongoing viability. To act in ways that can stand the test of time; to live up to the values we hold as true. By being explicit about our values, we tell the world this is how you can expect us to behave. For us, success will only be achieved if we act with integrity. We will not ignore, tolerate or excuse behaviour that breaches our values. To do so would break the trust of society and the trust of the thousands of great colleagues who do the right thing to take this company forward every day.*" (ING 2021).

Generally, the codes of ethics in the finance industry differ from those in other industries as they focus on specific areas such as the obligations that practitioners in financial services have as professionals. Codes of ethics in financial services introduce the moral duties that professionals in the industry must follow and use them as guidelines for shaping their relationship with their clients, their colleagues and society in the wider sense. In the US, finance professionals are required to align their activities with four different pillars of regulatory or moral requirements:

1. the laws and rules of the community/society in which they exercise their profession
2. the regulatory requirements formed by the legal authorities such as the SEC, FINRA, and other regulatory bodies
3. the moral norms of the community/society in which they exercise their profession
4. the moral principles as outlined in their profession's code of ethics and the code of ethics of other organizations with which they decide to affiliate their professional activities

5.2.3.1 The Effectiveness of Codes of Ethics: The Importance of Content and Communication.

The practical effectiveness of codes of ethics troubled researchers from the early days. The numerous collapses of corporations that appeared as ethical has maintained this discussion over the years and empirical studies have attempted to unearth the drivers of the effectiveness of codes of ethics.

Weller (1988) is probably the first to investigate the effectiveness of corporate codes of ethics. The author proposes a series of hypotheses for conditions that would increase or decrease the effectiveness of such codes. The paper splits the discussion into three categories. First, it discusses the concept of legitimacy and posits that the effectiveness of the code can be enhanced under greater presence of one of the sources of legitimacy (i.e. traditional charismatic and legal authority). Second, it focuses on the importance of the content of the code (since policy is different than action) and posits that when the code outlines the priorities in a clear manner, it is more likely to be effective than a code that only introduces some ethical rules to the existing agenda. Third, the paper concentrates on theories of individual behaviour and posits that when a code reflects the existing values of current employees, it is more likely to be effective. Finally, the study highlights that self-regulation of business has an advantage over law in promoting ethical corporate behaviour as the latter is often inadequate.

Boo and Koh (2001) investigate the effectiveness of the code of ethics in promoting ethical behaviour. The study employs regression analysis based on survey data with 237 managers, most of whom hold middle- or top-level positions in their companies, and unearths two interesting findings. First, their study proposes that the effectiveness of the code of ethics is largely dependent on the level of communication, enforcement and encouragement of reference to the code. Second, the authors find that organizational ethics variables such as organizational ethical climate, top management backing of ethical behaviour and the connection between ethical behaviour and career success are much more powerful in promoting ethical behaviour than a code of ethics.

Singh (2011) examines the determinants of the effectiveness of corporate codes of ethics. The method of the study includes regressions of managers' perceptions of code effectiveness against several parts of ethics programs. The author sent a questionnaire to managers of the top 500 companies in Canada and received 101 useable responses. The findings show that 18 independent variables explain 58.5% of managers' perceived effectiveness of corporate codes of ethics. Examples of such independent variables include ethics training for all staff, communicated to all employees, customers should be informed and should inform new employees. Such variables show that communication and disclosure are important drivers of the effectiveness of the code.

Singh et al. (2018) look for the measures that top executives view as important in determining the value of a code of ethics in their organization. They use data on the top 500 private companies in revenue in Australia, Canada and Sweden. The authors find that four internal management factors are positively related to executives' perceptions about the value of their corporate codes of ethics. More specifically, these factors are internal communication measures (ICM), organization directed measures (ODM), ethical support measures (ESM) and staff directed measures (SDM).

If parameters such as content, communication and enforcement can foster the effectiveness of codes of ethics, what can make them fail? Evidence of ethics codes failure can be found in numerous collapses of firms in the past, either from the financial or other sectors. A distinct example however in the finance industry will always be the case of Lehman Brothers. Lehman Brothers was the fourth-largest investment bank in the US before filing for bankruptcy in 2008 and triggering a systemic turbulence. Surprisingly, the bank had a code of ethics before its collapse. How can a large institution that its management fosters ethical behaviour take on so much risk as to fail, leaving the thousands of its employees unemployed, and most stakeholders significantly adversely affected? Stevens and Buechler (2013) analyse the code of the bank and argue that it was not written to play an important role in the operations of the bank, nor to have a significant role in the bank's strategy. The authors used the Competing Values Framework (CVF) and the Erwin scheme to assess the code of bank by shedding light on its rhetorical aspects. The analysis showed that code was quite generic, common and lacked any significant originality. It also did not include any aspects of transformation or guidance that would help during a crisis. Moreover, the code failed to provide details regarding the overall ethical values of the bank and what behaviours are mostly desired and promoted. The bank rather forbid actions that are persecuted by the law such as insider trading and actions that would harm the bank's reputation. Yet, no explicit mention was made on the organization's specific ethical culture. Although it would be naive to claim that an ethically richer code could have been more effective in preventing the collapse Lehman Brothers, the bank did take on more risk than it should through a rather unethical series of actions. Therefore, it is important that future research focuses on the effectiveness of codes of ethics and industry and policy makers try to improve their practicality and communication.

5.2.3.2 Other Research on Corporate Codes of Ethics

Schwartz (2002) examines the content of codes of ethics and analyses how ethical these codes are. To achieve this, the author develops a set of universal moral standards which are used to ethically evaluate corporate codes of ethics. These standards are divided into six categories: trustworthiness, respect, responsibility, fairness, caring and citizenship. The author posits that using these standards to four stages of the ethics code development (content, creation, implementation and administration) can help the development of a code that enhance the audit of firms for compliance to ethical standards. The study uses the set of six moral standards to analyse corporate codes of ethics of four large Canadian firms from four different industries (i.e. manufacturing, banking, telecommunications, and high technology). The author essentially conducts an ethical audit on the code of ethics of each firm. The results show that the codes of all firms have space for improvements in all stages of code development mentioned earlier. The bank scored 6 out of 9 as three areas were lacking adequacy. Those are involvement in code creation, training, support and reinforcement in code implementation and protections in code administration.

5.2.3.3 Are Corporate Codes of Ethics Truthful or a Strategic Tool?

Long and Driscoll (2008) examine to what extent organizations use codes of ethics as institutionalized organizational structures to pursue their legitimacy. The authors review the literature on legitimacy theory and analyse how legitimacy is a consequent of codes of ethics to investigate which of the existing forms of legitimacy firms obtain from their codes. The study analyses a sample of 7 of the top 40 firms in Atlantic Canada as they were the only ones with a code of ethics to examine whether the adoption of a code is due to a strategic and self-interested rationale. The findings of the study indicate that not only employing a code of ethics has become a strategic choice, but also it is an institutionalized method that brings a cognitive form of legitimacy to the firm which further distances the content of the code from its moral foundation.

Helin et al. (2011) use an interesting approach to examine the role of corporate codes of ethics. The study unravels a narrative based on a case study of how a Nordic subsidiary interpreted and implemented its parent's company's corporate code of ethics. The authors conducted 34 interviews with the subsidiary's employees. The empirical findings of the study show that codes of ethics do not have an enabling role in organizations and they are not being used as instruments of enlightenment and self-regulation. Instead, they are used as tools for enhancing domination. The authors argue that the appropriate use of corporate codes of ethics is to use them as enabling forms of management control and not as instruments that allow managers to reconstruct power relations, using the codes in a coercive way. They suggest that this practice relates to managers using such codes to blame others for their own failures of diligence.

Adelstein and Clegg (2016) posit that the coexistence of legal compliance and corporate codes of ethics encourages firms to define their goals and interests more pretentiously by outlining ethical norms for their employees. The authors argue that codes of ethics tend to have a cosmetic role that is used for insurance purposes. More specifically, such codes are used subtly and strategically to enhance organizational risk management and protection. Based on this, the study uses the code of ethics of Microsoft, which is named by the Ethisphere Institute as “one of the world’s most ethical companies”, to conduct a genealogical discourse analysis and examine how the firm’s management responds to compliance expectations. The analysis shows that if codes of ethics are used as window dressing for risk management strategies, then ethics codes merely focus on corporate compliance and legality with adverse effects on the firm. In particular, using codes of ethics ostentatiously and denying the role of the moral intuition of the organization’s members will increase the segmentation of focus on organizational members, selectivity of disciplinary actions and the code will remain a shady tool of organizational risk management.

5.3 Theoretical Framework and Hypotheses Development

The established framework on why firms engage in ethical corporate activities offers a solid basis for explaining the possible ways in which ethical bank disclosures may influence liquidity creation. More specifically, as discussed in section 5.2.1, many studies have followed two main distinct incentives on why firms engage in CSR activities: altruism and strategic choices. Based on these postulated incentives and using extant evidence and discussions in the literature, this section outlines the hypotheses that predict the relationship between ethical disclosures and liquidity creation.

5.3.1 The Negative Relationship Between Ethical Bank Disclosures and Liquidity Creation

Researchers argue that when firms engage in ethical activities due to their altruistic preferences, their financial performance will be impeded. Baron (2001) defines altruistic CSR as those activities that are undertaken by a firm for their own sake and not for enhancing the firm's financial performance. The altruistic preferences of firms can take several forms such as voluntary redistribution of shareholder wealth in the context of charitable contributions and engagement in public politics (e.g. influencing the government to act in favour of the public good). Lantos (2002) criticizes the altruistic preferences of firms. The author argues that assessing altruistic preferences from any ethical perspective such as utilitarianism, justice, right or care is immoral in the context of public corporations. The author suggests that altruistic preferences harm shareholder property rights by unfairly diminishing shareholder wealth. In this case, managers act in the benefit of the general welfare and social interests but this happens at the expense of fairness towards shareholders who should be the firm's primary focus.

Misallocating resources to improve the condition of the environment or have a positive contribution to society may harm liquidity creation in several ways. First, wholesale financiers who possess superior information on banks are likely to withdraw their financing if they observe that their funds are not used efficiently (Huang & Ratnovski 2011), and this can adversely affect banks' ability to create liquidity as these funds are valuable for liquidity creation. Dewally and Shao (2014) find that wholesale funding can enable lending during normal times. Second, misallocating resources is likely to adversely affect the effectiveness of borrower monitoring which is critical for the successful and continuous creation of liquidity (Diamon & Rajan 2001). Third, if misallocation of resources decreases profitability, banks are likely to reduce their liquidity creation levels because their risk-taking would be suboptimal for a lower level of profit (Berger 1995). Finally, bank cost efficiency is beneficial for asset quality (Berger & DeYoung 1997) and cost of credit (Shamshur & Weill 2019) which can enable the provision of loans.

Overall, firms with altruistic preferences may unduly deteriorate their financial performance by misallocating critical resources. Therefore, we can expect that if ethical disclosures are related to the altruistic preferences of bank managers, liquidity creation will contract.

H5.1: Liquidity creation is negatively related with ethical disclosures.

5.3.2 The Positive Relationship Between Ethical Bank Disclosures and Liquidity Creation

Baron (2001) argues that a profit-maximization firm will engage in ethical corporate activities only if it believes that they would enhance the demand for its products. This refers to the strategic preferences of firms and it is motivated solely by a firm's self-interest instead of doing good for social welfare. For instance, firms adopt CSR policies to expand their customer base, enhance customer loyalty and develop an attractive reputation if the benefits of doing so exceed the associated costs. Fombrun and Shanley (1990) show that firms with higher contribution to social welfare enjoy better reputation, while Kay (1993) argues that reputation and brand awareness help firms to develop or improve their competitive advantages. Brine, Brown and Hackett (2007) show that using CSR as an element of a brand can allure customers from competitors and increase the firm's profitability. Hence, firms that engage in any form of ethical activities may do so to improve their financial performance.

Accordingly, banks with greater ethical disclosures can also attract more customers and enjoy increased profits. Bertrand, Klein and Soula (2021) find that a positive trust environment can help banks create more liquidity. They attribute this effect to the power of an established trust environment to attract a smooth stream of deposits that enables banks to create loans by mitigating the costs related with the liquidity mismatch. Moreover, Diaz and Huang (2017) find that better-governed banks create more liquidity. They show that this effect is stronger for large banks and attribute it to the ability of internal governance to absorb the risk associated with liquidity creation.

Similarly, increasing the frequency of ethics-related terms in the annual report can be perceived as a sign of a well-governed bank and help the constant stream of deposits by building a trust environment, enabling liquidity creation. Portraying the bank as more ethical in public disclosures can develop the bank's brand name and build customers' sense of a bank identity. Using ethical disclosures can alleviate the information asymmetries that banks suffer from. In this sense, ethical disclosures may be more important for informationally opaque firms such as banks (Morgan 2002; Iannotta 2006) and help them win the trust of creditors and borrowers.

Overall, banks with more ethical disclosures can attract more deposit and loan customers which helps them increase their liquidity creation levels. Therefore, we can expect that banks that use ethics-related terms in their annual reports with greater frequency create more liquidity.

H5.2: Liquidity creation is positively related with ethical disclosures.

5.4 Measuring Bank Ethics

While the literature suggests that accounting and market indicators are good proxies for the financial performance of a firm, the same consensus does not hold for proxying the ethics or social performance of a firm. Studies in the literature use different types of social performance measures and there is no widespread unanimous agreement on which measure is the most effective. First, authors use questionnaire surveys in which the managers and directors of firms complete questionnaires and evaluate the social performance of their firm (e.g. Mitchell, Lewis & Reinsch 1992; Helin et al. 2011). However, this method relies on the objectivity of managers who might not be completely honest or objective about the social performance of the firm they are working at. Second, researchers may employ reputational measures such as "goodwill" ratios estimated by specialized researchers (e.g. McGuire, Schneeweis & Branch 1990; Brown & Perry 1994). The disadvantage of this method is that it implies that the perceived reputation by a third party is an adequate proxy of social performance and that the calculated measures are influence by financial performance. Third, researchers may use one-dimensional indicators such as orientation towards the client, dialogue with local community and philanthropy, degree of connection with illegal practices and protection of the environment (Seifert, Morris, & Bartkus 2004; Core, Guay & Rusticus 2006). Fourth, as one-dimensional indicators can be quite short-sighted, other studies use multi-dimensional indexes that are more comprehensive. For instance, earlier in the literature review it was shown that a popular database for ethical ratings is provided by KLD Research and Analytics Inc. (Garcia-Castro, Ariño & Canela 2009; Goss & Roberts 2011; Deng, Kang & Low 2013; Nguyen, Kecskés & Mansi 2020).

However, this chapter uses a unique group of banks for which data on liquidity creation is provided by the S&P Global Market Intelligence Database. Therefore, it is impossible to match this database with any existing database containing comprehensive ethics or CSR ratings. To tackle this issue, the chapter employs another popular method of measuring corporate ethics through textual analysis. This method measures the level of ethics or social responsibility as expressed in published documents such as annual reports. It is a widely used method in the literature to capture several aspects of managerial sentiment and the most closely related studies are reviewed below, divided in studies using textual analysis of bank annual reports and those using textual analysis to proxy corporate ethics (excluding CSR and similar measures reviewed earlier).

5.4.1 Literature Using Textual Analysis of Bank Annual Reports

This section reviews the methods that other studies have used to conduct textual analysis on bank annual reports. One of the first studies that uses textual analysis of bank annual reports investigates the social reporting of Islamic banks. More specifically, Kamla and Rammal (2013) attempt to explain the reasoning behind disclosures and silences regarding social reporting. The authors analyse the annual reports and websites of 19 Islamic banks to test whether the bank practices are widely used, scarce, rare, or absent by examining how often specific individual themes are mentioned in the annual reports.

Heidinger and Gatzert (2018) examine reputation risk management in the banking and insurance industry. They focus on 82 US and EU large cap firms for a 10-year period of 2006–2015 because adopting a reputation risk management system is costly and more relevant for larger firms. They use a text mining method to analyse the firms' annual reports with respect to their awareness of reputation risk and reputation risk management by grouping certain keywords related to either reputation risk or reputation risk management.

Gandhi, Loughran and McDonald (2019) attempt to use annual report sentiment as a proxy for bank financial distress. They argue that the existing measures of bank distress have only a marginal value in predicting extreme events in the banking sector (except for capital adequacy). They capture managerial sentiment by measuring the percentage of negative words in the annual reports of US banks.

Wei et al. (2019) argue that using financial data from financial statements to aggregate bank risk are subject to biases as their time lags are not forward-looking. To address this concern, the authors incorporate into bank risk aggregation forward-looking textual risk disclosures as reported in the financial statements. The authors proceed with comparing the total risk as measured with and without the forward-looking textual risk disclosures.

Katsafados et al. (2021) use textual analysis to identify merger participants in the US banking industry. More specifically, they investigate how banks' annual report sentiment influences the probability of a bank to participate in a merger transaction. The authors use the Loughran and McDonald's (2011) lists of positive and negative sentiment.

5.4.2 Literature Using Textual Analysis for Identifying Ethics

This section reviews the textual analysis methods that other studies use to measure ethics in annual reports regardless of the industry. The most closely related research to this chapters' mechanics is probably the work by Loughran, McDonald and Yun (2009) who investigate the occurrence of ethics-related terms in annual reports. The authors count the occurrences of two lists of words in the 10-K reports of US firms in the period of 1994-2006. One of the lists contains general ethics-related terms, while the other one contains terms related to codes of ethics. More information about these lists is provided in section 6.4.3. The authors use a logit regression model with the dependent variable being a dummy variable that equals one if the firm has mentioned either of the groups of words in the annual report and equals zero otherwise. They find that those firms that use these terms in their disclosures are more likely to be sin "stocks", to be engaged in class action lawsuits, and to exhibit poor corporate governance performance. This shows that portraying the firm as ethical in the annual report is more likely to be a systematic practice of misleading the public.

Forster, Loughran and McDonald (2009) examine commonality in codes of ethics as the SEC suggests that codes of ethics should vary from firm to firm. The authors develop a database of codes of ethics disclosed by firms included in the S&P 500 index and another group of small firms. They use textual analysis to measure commonality across firms' codes of ethics as these appear in firms' Corporate Governance section of the Investor Relations webpage. The results suggest high levels of common sentences used by these firms, while in some cases the codes of ethics are identical. The authors suggest that when codes of ethics are part of legal documents, duplication is often mandated. However, value-based codes of ethics statements should be of greater originality.

Larcker and Zakolyukina (2012) attempt to identify and analyze deceptive discussions in conference calls using textual analysis. They combine quarterly earnings conference calls and the subsequent financial restatements to detect the severity of accounting issues and then label each conference call as "truthful" or "deceptive". The authors then employ word categories from earlier psychological and linguistic research that deems them related to deception to run prediction models. They show that the out-of-sample performance of models based on CEO or CFO narratives is superior to a random guess by about 6% to 16% and equivalent to models using financial variables. Also, the language of the deceptive calls contains more general knowledge, fewer references to shareholder value, less nonextreme positive emotion, more extreme positive emotion and fewer anxiety words. Interestingly, the annualized alpha of a portfolio consisting of the firms with the higher deception scores is between -4% and -11%.

Audi, Loughran and McDonald (2016) test the hypothesis that increasing the role of trust in a corporation decreases the necessity for external monitoring and contracts. To gauge whether a firm has a trusting corporate culture the authors employ textual analysis. More specifically, they create a measure of trust in a corporation's culture by counting how many of 21 trust-related words are mentioned in a critical section of the annual report: Management Discussion and Analysis. The sample of the study contains almost all publicly traded firms in the US. Contrary to the expectations, the authors findings show that corporations with a trusting culture often use audit and control-related words, indicating that they remain subject to external monitoring. Moreover, they show that firms' trusting culture is positively related to a subsequent volatility in firms' share price. Breuer et al. (2020) also use the list of word created by Audi, Loughran and McDonald (2016) to examine managerial tone in the Management Discussion and Analysis section. More specifically, the authors investigate whether managerial rhetoric in these documents is informative about the level of managerial opportunism in a firm. Their results suggest that using trust-related words is associated with inefficient investment decisions as well as poor operating performance. Moreover, they show that firms with more trusting culture as expressed in these reports receive less monitoring by institutional investors and analysts, while their accounting depends more on discretionary accruals. Importantly, these results indicate that trust-based managerial rhetoric is used for advertising purposes and suggest that these firms are prone to agency issues.

Hoberg and Lewis (2017) also use textual analysis to examine the Management Discussion and Analysis sections of 10-K reports as Audi, Loughran and McDonald (2016). More specifically they try to analyse the verbal disclosure of fraudulent firms. The authors find that the verbal tone of fraudulent firms is abnormal relative to strong counterfactuals and that it can predict fraud out of sample as well as identify mechanisms that are associated with fraudulent behaviour. Moreover, they show that the managers of fraudulent firms dedicate a smaller part of the discussion to explain the drivers of the firm's performance, they disclose more information about the positive attributes of the firm's performance and provide less information about the managerial team. Finally, the study provides evidence on the hypothesis that firms commit fraud in an attempt to lower their cost of capital.

Balvers, Gaski and McDonald (2016) use textual analysis to investigate the occurrence of the term "customer satisfaction" in in the form 10-K annual reports of US publicly traded firms. They examine the period of 1995-2013 and compare the results across different industries. The study relates the frequency of the term in annual reports to the subsequent scores by the American Customer Satisfaction Index (ACSI). In this way, the authors attempt to test whether discussing customer satisfaction in financial reports is credible and managers are therefore honest. The empirical results are mixed. The findings show that the frequency of customer satisfaction (and closely-related terms) is negatively associated with subsequent ACSI scores, indicating that managers may attempt to mislead the readers of the annual report. However, only for the retail industry, when the term is located next to words that indicate measurement or monitoring of the issue, the relationship turns positive.

Ahluwalia et al. (2018) investigate the effects of adopting a financial code of ethics as required by the Sarbanes–Oxley Section 406 for top financial and accounting officers in public firms. The authors compare the codes of ethics of publicly traded firms between 2005 and 2011 after the start of the disclosure requirement in 2002 to examine the codes' continued implementation. The authors use financial restatements as the dependent variable to proxy improvements in financial reporting following the adoption of financial codes of ethics. They find that adopting a financial code of ethics enhances the integrity of firms' financial reporting (that is not initiated by SEC actions). The authors argue that this can lead to improved scrutiny and more careful judgment decisions by the executives of the firm.

Cannon et al. (2020) use textual analysis of 10-K reports to examine how disclosure of CSR can provide information about firms' competitive advantages. They create new word lists which include words related to general CSR, philanthropy, products etc and they aggregate them into one textual measure. Competitive advantages are measured by employing levels of and persistence of industry-adjusted gross margin; operating margin; and selling, general, and administrative (SG&A) margin. The authors show that the frequency of CSR disclosure is related to lower gross margins but higher SG&A margins. Also, they document that firms using more CSR keywords have gross and operating margins that are significantly above industry medians.

5.4.3 Construction of Bank Ethics Textual Variables

In this chapter, using the names of the banks and their country of origin as provided by the S&P GMI database, about 6,000 bank annual reports written in English are hand-collected for the maximum period available online. After data cleaning and matching the annual reports with the liquidity creation dataset, 3,320 annual reports are included in analysis of this chapter. A custom-made Python code that counts the occurrences of groups of words in PDF documents is used to collect the raw data.[39] The final sample contains 531 banks from 79 countries, mainly from Europe and Asia-Pacific.

The empirical analysis uses the two ethics-related word lists developed by Loughran, McDonald and Yun (2009) as the main tools for identifying bank ethics. Both lists are presented in Table 5.1. The first list contains seven ethics-related terms which are used for the construction of the main independent variable in the regression analysis. Although the term list appears as simplistic, it can be a powerful tool for the sample of this study. Pencle and Malaescu (2016) argue that CSR and ethics are multi-dimensional constructs and are not easy to be captured in textual analysis. Some studies such as the ones by Pencle and Malaescu (2016) and Cannon et al. (2020) attempt to develop more comprehensive CSR and corporate ethics dictionaries but considering that the sample in this study is small and very diverse it would be impossible to capture the meaning of each dictionary across annual reports by banks with very diverse backgrounds. Loughran and McDonald (2016) argue that targeting only a few terms is a powerful tool that avoids the problems of ambiguity associated with large word lists which are also much more prone to error compared to lists that focus on a few unambiguous terms.

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[39] https://github.com/sarvesheb/PDF-file-analysis

To construct a statistically sound variable, an appropriate term weighting scheme must be selected (e.g. Salton & Buckley 1988; Zobel & Moffat 1998). As highlighted by Jurafsky and Martin (2009), the selection of the appropriate weighting scheme can severely affect the retrieval system. Neglecting the use of a weighting scheme is likely to lead to biased results that fail to reflect reality. Two key issues that are not taken into account with simply calculating raw word counts are the log of frequency that addresses the importance of a word in a document and the normalization for document size, usually by total word count of file size in megabytes. To address these problems and estimate a strong measure a widely used weighting scheme is employed based on the adjustments made in the seminal work by Loughran and McDonald (2011) but in its simplified form by Karapandza (2016). The original term weighting by Loughran and McDonald (2011) is presented in Equation (5.1) and it includes the inverse document frequency parameter. More specifically, in Equation (5.1) the term (word or phrase) and document are denoted with i and j respectively; the total occurrences of a term in a document are denoted with $tf_{i,j}$; total word count in a document is denoted with a_j; the total number of documents in the sample is denoted with N; and the number of documents in which a term appears is denoted with df_i. Because the analysis uses only the documents that include at least one of the words in the list, the simplified form that does not include the inverse document frequency parameter is used as in Karapandza (2016). The final term weighting scheme is presented in Equation (6.2).

$$w_{i,j} = \begin{cases} \frac{(1 + \log(tf_{i,j}))}{(1 + \log(a_j))} log \frac{N}{df_i}, & tf_i \geq 1 \\ 0 & otherwise \end{cases} \tag{5.1}$$

$$w_{i,j} = \begin{cases} \frac{(1 + \log(tf_{i,j}))}{(1 + \log(a_j))}, & tf_i \geq 1 \\ 0 & otherwise \end{cases} \tag{5.2}$$

The second list contains terms related to the "code of ethics". Banks that include any of these terms are highly likely to have incorporated a code of ethics in their report. This list is therefore used as an identifier for annual reports that contain a code of ethics. In the preliminary analysis, this is used in the form of a dummy variable that equals 1 if the annual report contains any of the code-of-ethics-related terms and 0 otherwise. In the main regression analysis, only the annual reports that contain any of the code-of-ethics-related terms are included.

Table 5.1 Ethics-Related Term Lists by Loughran, McDonald and Yun (2009).

Ethics-Related Terms	*Code of Ethics-Related Terms*
ETHIC	CODE OF BUSINESS CONDUCT AND ETHICS
ETHICS	CODE OF BUSINESS CONDUCT ETHICS
ETHICAL	CODE OF BUSINESS ETHICS
ETHICALLY	CODE OF CONDUCT AND ETHICS
CORPORATE RESPONSIBILITY	CODE OF ETHICAL BUSINESS CONDUCT
SOCIAL RESPONSIBILITY	CODE OF ETHICS
SOCIALLY RESPONSIBLE	CODE OF ETHICS AND BUSINESS CONDUCT
	CODE OF PERSONAL AND BUSINESS CONDUCT AND ETHICS
	CODE OF PROFESSIONAL ETHICS
	CODES OF CONDUCT AND ETHICS
	ETHICS CODE
	PRINCIPLES OF PROFESSIONAL ETHICS

5.5 Regression Framework

This chapter's regression framework is split into two parts. First, a preliminary analysis using panel data logit estimators and second, a standard fixed-effects estimator.

The preliminary analysis attempts to investigate whether the probability of including a code of ethics in the annual report increases with bank risk. For this purpose, fixed-effects and random-effects logit regressions are presented in the following form:

$$COE_{i,t} = \alpha_0 + \sum_{j=1}^{6} \beta_j \, Bank\ Risk_{i,t-1} + \beta_1 Bank\ Size_{i,t-1} + \sum_{j=1}^{3} \beta_j \, Textual\ Control_{i,t-1} + \lambda_t + \varepsilon_{i,t} \quad (5.3)$$

The dependent variable COE is a dummy variable that stands for code of ethics and takes the value of 1 if the annual report contains any of code-of-ethics-related terms and 0 otherwise. The independent variables include six uncorrelated bank risk factors that are widely used in the literature. More specifically, the bank risk factors included in the logit regressions are: the ratio of loan loss reserves to total loans and leases, the ratio of risk weighted assets to total assets, the equity ratio, the natural logarithm of the Z-SCORE, the ratio of operating expenses to operating income and the return on average assets. The natural logarithm of total assets is included as a proxy for bank size since banks increasing in size may be subject to regulatory requirements for publishing a code of ethics. Finally, since the dependent variable is constructed with a textual analysis method, three textual control variables are included: the ethics variable as described in the previous section and the positive and negative sentiment words lists by Loughran and McDonald (2011). Table 5.2 summarizes the definitions of all variables and Table 5.3 presents their descriptive statistics. λ_t stands for the time dummies and $\varepsilon_{i,t}$ is the unobservable error term that has a standard logistic distribution with mean zero and variance one.

Controlling for the bank fixed-effect is important because the incidence of publishing a code of ethics could be due to the unobservable unique characteristics of each bank. However, it is also important to report the results of the random-effects estimator because for about half of the banks in the sample there is no variation in the COE dummy variable and as a result a lot of observations are dropped in the fixed-effects estimations. Thus, the random-effects estimator results contain more information than the fixed-effects estimator results.

The main analysis investigates the relationship between ethical disclosures and liquidity creation. These regressions use only observations for which the COE variable is equal to 1 because the rest return largely insignificant results and the findings appear to be strong for banks that publish a code of ethics. The fixed-effects regressions are in the following form:

$$Liquidity\ Creation_{i,t} = \alpha_0 + \beta_1 ETHICS_{i,t-1} + + \sum_{j=1}^{8} \beta_j\ Bank\ Control_{i,t-1} + \sum_{j=1}^{2} \beta_j\ Country\ Control_{c,t-1} + \lambda_t + \varepsilon_{i,t} \tag{5.4}$$

where Liquidity Creation is one of the four liquidity creation measures and ETHICS is the textual variable based on ethics-related terms as described in the previous section. The bank control variables are the seven included in the logit regressions and the ratio of employee compensation to total revenue is also added as an additional governance control variable. The country control variables are GDP growth and unemployment. λ_t stands for the time dummies and $\varepsilon_{i,t}$ is the unobservable error term. Standard errors are clustered at the country level to further account for country characteristics by allowing for the possibility of correlations between the errors in the observations within each country.

Table 5.2 Variable Description.

Variable	Definition	Calculation	Source
Liquidity Creation Variables			
LC1	Liquidity Creation 1	Calculated as in Eq. (2.1)	S&P Global Market Intelligence (authors' calculation)
LC2	Liquidity Creation 2	Calculated as in Eq. (2.2)	S&P Global Market Intelligence (authors' calculation)
LC3	Liquidity Creation 3	Calculated as in Eq. (2.3)	S&P Global Market Intelligence (authors' calculation)
LC4	Liquidity Creation 4	Calculated as in Eq. (2.4)	S&P Global Market Intelligence (authors' calculation)
Textual Variables			
ETHICS	Ethics-related Disclosures	The relative frequency of ethics-related terms based on the list Loughran, McDonald and Yun (2009) and calculated as in Eq. (6.2).	Manually collected and constructed
ETHICS-ORD	Ethics-related Disclosures (Ordinal)	The number of ethics-related terms based on the list by Loughran, McDonald and Yun (2009) that appear in the annual report at least once.	Manually collected and constructed
COE	Code of Ethics	= 1 if at least one of the code of ethics-related terms based on the list by Loughran, McDonald and Yun (2009) appears in the annual report, =0 otherwise.	Manually collected and constructed
POSITIVE	Positive Sentiment	The relative frequency of terms related to positive sentiment calculated as in Eq. (6.2). The word list is taken from Loughran and McDonald (2011).	Manually collected and constructed
NEGATIVE	Negative Sentiment	The relative frequency of terms related to negative sentiment calculated as in Eq. (6.2). The word list is taken from Loughran and McDonald (2011).	Manually collected and constructed
LNWORDS	Annual Report Size	The natural logarithm of the total number of words in the annual report.	Manually collected and constructed

(Continued on next page)

Table 5.2 (Continued)

Bank Control Variables			
COMPENSATION	Employee Compensation	Employee Compensation / Total Revenue	S&P Global Market Intelligence
RWATA	Risk-Weighted Assets	Risk-Weighted Assets / Total Assets	S&P Global Market Intelligence
LLR	Loan Loss Reserves	Total loan loss and allocated transfer risk reserves / total loans and leases, net of unearned income and gross of reserve	S&P Global Market Intelligence
EQRAT	Equity Ratio	Total Equity/ Total Assets	S&P Global Market Intelligence
ROAA	Return on Average Assets	Net Income/Average Assets	S&P Global Market Intelligence
LNTA	Bank Size	Natural logarithm of total assets	S&P Global Market Intelligence (authors' calculation)
LNZSCORE	Bank Risk	Natural logarithm of the ZSCORE which is calculated as the sum of EQRAT and ROAA divided by the standard deviation of ROAA	S&P Global Market Intelligence (authors' calculation)
MQ	Managerial Quality	Operating Expenses/ Operating Income	S&P Global Market Intelligence
Country Control Variables			
GDPG	Real GDP Growth	Annual percentage change of real GDP of the host country	International Monetary Fund
UNEMP	Unemployment	The number of unemployed people as a percentage of the total labour force of the host country	International Monetary Fund

Table 5.3 Descriptive Statistics.

Variable	Obs.	Mean	Median	St. Dev.	5th Perc.	95th Perc.
LC1	914	0.226	0.244	0.156	-0.087	0.445
LC2	887	0.091	0.097	0.133	-0.149	0.307
LC3	912	0.262	0.291	0.203	-0.161	0.524
LC4	861	0.133	0.136	0.176	-0.178	0.388
ETHICS	1184	0.379	0.378	0.075	0.259	0.516
ETHICS-ORD	1184	3.506	3.000	1.099	2.000	5.000
COE	3096	0.382	0.000	0.486	0.000	1.000
POSITIVE	3096	0.635	0.638	0.037	0.575	0.680
NEGATIVE	3096	0.662	0.669	0.040	0.592	0.707
LNWORDS	3096	11.187	11.242	0.767	9.822	12.347
COMPENSATION	3096	0.282	0.270	0.128	0.136	0.460
RWATA	3096	0.559	0.576	0.207	0.207	0.888
LLR	3096	0.033	0.022	0.041	0.002	0.104
EQRAT	3096	0.087	0.081	0.039	0.035	0.159
ROAA	3096	0.008	0.008	0.011	-0.005	0.023
LNTA	3096	17.273	17.147	1.808	14.549	20.483
LNZSCORE	3096	3.021	3.188	0.977	1.235	4.168
MQ	3096	0.563	0.540	0.249	0.298	0.847
GDPG	3096	0.027	0.024	0.032	-0.028	0.075
UNEMP	3096	0.074	0.061	0.049	0.029	0.183

5.6 Descriptive Analysis

Figures 5.1 and 5.2 depict the evolution of the ethics-related textual variables during the sample period. Figure 5.1 presents the three-year moving average of the mean of the Ethics variable, while Figure 5.2 presents the three-year moving average of the sum of COE for all banks normalized by the number of observations per year. In both figures a constant upward trend is observed that is accelerated after 2012. Figure 5.1 can be interpreted as banks using more ethics-related terms year-on-year, possibly because they believe that they can exert financial benefits from ethical disclosures. While banks' strategic preferences can be the case in Figure 5.2 too, the increase in disclosing codes of ethics may also be the result of regulatory requirements. Figure 5.2 suggests that in the last years of the sample period, more than half of the banks are expected to disclose a code of ethics.

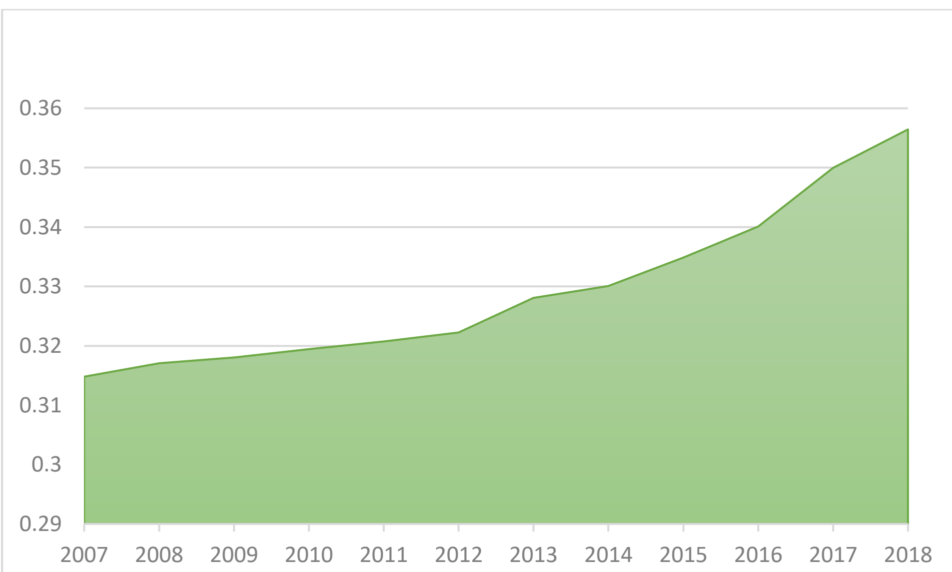

Figure 5.1 ETHICS over time. The figure presents the three-year moving average of the mean of the ETHICS variable across all banks.

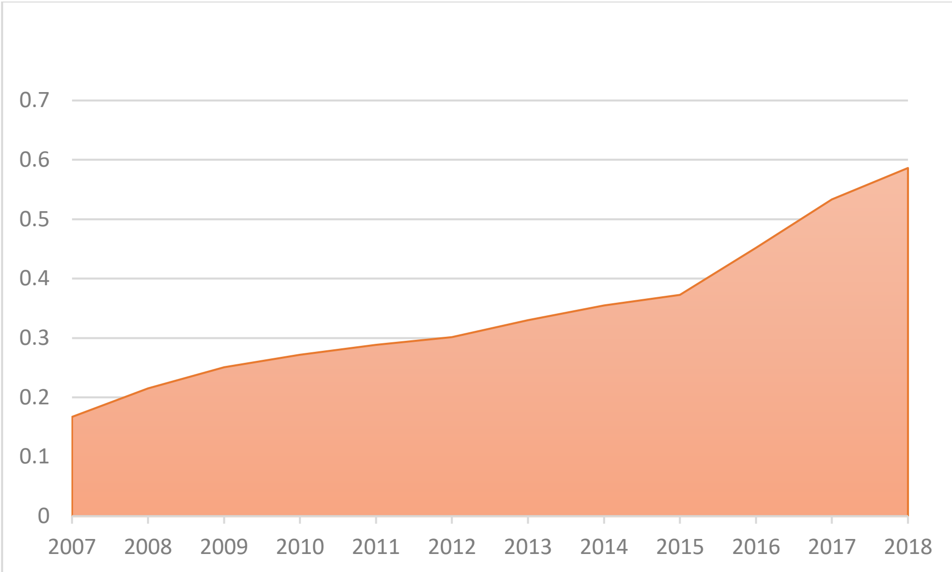

Figure 5.2 The ratio banks that include a code of ethics in their annual report over time. The figure presents the three-year moving average of the sum of COE for all banks normalized by the number of available observations per year.

5.7 Results and Discussion

5.7.1 Preliminary Analysis – Which Banks Include a Code of Ethics in their Annual Reports?

Table 5.4 presents the results of the preliminary logit regressions to assess whether financial variables related to bank risk increase or decrease the probability of a bank disclosing a code of ethics. While the nature of the data requires the control of bank fixed-effects, random-effects estimations are also presented because they allow the inclusion of many more observations making it a more informative regression framework. Columns (1) to (3) include only financial independent variables, while in Columns (4) to (6) three textual control variables are added. All regressions include time dummies while in Columns (3) and (6) country dummies are added as well. The results show that the probability of a bank to disclose a code of ethics increases with bank risk. More specifically, the coefficient of LLR is consistently significant at the 1% level, while the coefficient of RWATA is significant at the 5% level in the fixed-effects estimations and at the 1% level in the random-effects estimations. These findings are also economically significant suggesting that an increase of one percentage point in LLR and RWATA increases the probability of a bank reporting a code of ethics by 19.5% and 3.4% respectively.[40] It is also observed that the coefficient of LNTA is positive and significant at the 1% level across all regressions, indicating that banks are more likely to include a code of ethics in their disclosures as they get bigger. The coefficients of NEGATIVE and POSITIVE are also interesting as they support the expectations about the role of risk in these regressions in a more subtle way. In particular, the coefficients suggest that the probability of disclosing a code of ethics is positively related with negative

[40] The economic significance of the predictors is calculated using the odds ratios of the fixed-effects regressions.

sentiment and negatively related with positive sentiment. This suggests that banks disclose a code of ethics when things are not going so well as expressed through managerial sentiment in the annual report. This finding supports the role of a code of ethics in an annual report as a risk management tool, and its deviation from its moral foundations and original purpose.

Table 5.4 Predictors of codes of ethics in annual reports

	(1)	(2)	(3)	(4)	(5)	(6)
	COE	COE	COE	COE	COE	COE
LLR	**0.178*****	**0.136*****	**0.136*****	**0.173*****	**0.137*****	**0.130*****
	(0.054)	(0.041)	(0.045)	(0.054)	(0.040)	(0.044)
RWATA	**0.033****	**0.046*****	**0.036*****	**0.029****	**0.039*****	**0.029*****
	(0.015)	(0.009)	(0.011)	(0.015)	(0.009)	(0.010)
EQRAT	-0.188*	-0.087	-0.146**	-0.170	-0.066	-0.136**
	(0.100)	(0.054)	(0.058)	(0.104)	(0.052)	(0.058)
LNZSCORE	1.118	0.083	-0.152	1.132	0.152	-0.070
	(0.709)	(0.199)	(0.209)	(0.731)	(0.182)	(0.201)
MQ	0.008	0.000	0.005	0.010	0.000	0.004
	(0.006)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)
ROAA	0.142	0.301	0.209*	0.166	0.306**	0.217*
	(0.172)	(0.122)	(0.124)	(0.195)	(0.129)	(0.131)
LNTA	1.878***	0.458***	0.695***	1.661***	0.367***	0.528***
	(0.465)	(0.122)	(0.129)	(0.475)	(0.114)	(0.125)
ETHICS				0.073***	0.132***	0.110***
				(0.019)	(0.015)	(0.016)
NEGATIVE				0.058	0.137***	0.130***
				(0.036)	(0.033)	(0.034)
POSITIVE				-0.118**	-0.160***	-0.135***
				(0.054)	(0.044)	(0.044)
Time Dummies	YES	YES	YES	YES	YES	YES
Country Dummies	NO	NO	YES	NO	NO	YES
Method	FE	RE	RE	FE	RE	RE
Obs.	1,315	2,587	2,543	1,315	2,587	2,543
N. of Banks	201	488	472	201	488	472
Pseudo R2	0.331	0.362	0.416	0.348	0.387	0.434

The table reports fixed- and random effects logit regressions. The dependent variable is COE which proxies whether an annual report contains a code of ethics or not. LLR are the loan loss reserves. RWATA is the risk-weighted assets normalized by total assets. EQRAT is the equity to total assets ratio. LNZSCORE is the natural logarithm of the ZSCORE. MQ is the cost-to-income ratio. ROAA is the return on average assets. LNTA is the natural logarithm of total assets in Euros. ETHICS stands for the relative frequency of ethics-related terms in the annual report. POSITIVE and NEGATIVE stand for positive and NEGATIVE sentiment in the annual report, respectively. All regressions include time dummies and two random-effects logit regressions include country dummies too. Standard errors are reported in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

The results of the preliminary analysis are in line with the literature that argues and documents that firms use the code of ethics for their strategic choices (e.g. Long & Driscoll 2008; Helin et al. 2011; Adelstein & Clegg 2016). However, deviating from the original purpose of the code of ethics which is to enable management control may have adverse consequences. Long and Driscoll (2008) argue that using the code of ethics as a strategic tool can develop a wrong sense of legitimacy about the firm's practices which further distances the content of the code from its moral foundation. Helin et al. (2011) suggest that these moral deviations can go as far as managers using the code to blame others for their own failures of diligence. Adelstein and Clegg (2016) support that more adverse consequences can take place such as increasing the segmentation of focus on organizational members and the selectivity of disciplinary actions.

5.7.2 Main Analysis – Ethical Bank Disclosures and Liquidity Creation

The results of the main regression analysis on the relationship between the disclosure of ethics-related terms and liquidity creation are presented in Table 5.5. These regressions contain only the observations for which the variable COE is equal to one as in the overall sample no statistically significant relationship is found. This happens probably because as it was shown earlier in the preliminary analysis, banks that include a code of ethics in their annual reports are more likely to have strategic preferences. The main independent variable in these regressions is ETHICS. Columns (1) to (4) report the total sample results, while in the subsequent regressions each regression's sample is split in half between small and large banks by the median of average total assets.

In the results of the regressions including all banks, the coefficient of ETHICS is positive and significant at the 1%, 5% or 10% level. This relationship is also economically significant as the results suggest that a one standard deviation increase in ETHICS is associated with a 0.5% to 1%

increase in liquidity creation. In Columns (5) to (12) where the sample is split by size, it is observed that this positive relationship is driven by the large banks sample as the coefficient of ETHICS for small banks is consistently insignificant, while the coefficient of ETHICS for large banks is similar in significance and larger in size compared to the total sample results. The signs of the coefficients of the control variables are mostly in line with the expectations. The coefficient of EQRAT is negative in almost all regressions but positive in one case in the large banks sample. This is consistent with Berger and Bouwman (2009) who document a negative relationship for small banks and positive for large banks. The coefficient of LLR is negative for the total sample which appears to be driven by the small banks sample, since small banks probably find it more difficult to create liquidity when their asset quality is poor. Also, the coefficient of RWATA is positive throughout all sample classes as the more risky assets banks hold, the more liquidity they are creating. Finally, the coefficient of ROAA is positive in two regressions of the large banks sample, while the signs of the coefficients of LNZSCORE and Compensation are largely mixed and no conclusions can be made.

The results presented in Table 5.5 are in line with Hypothesis 6.2 and suggest that liquidity creation is positively related with ethical disclosures. This finding extends the extant empirical literature on bank liquidity creation that finds a positive link between liquidity creation with governance (Diaz & Huang 2017) and trust (Bertrand, Klein & Soula 2021). It is also connected to studies that document a positive relationship between other measures of financial performance (e.g. profitability, asset quality) and social performance (e.g. CSR ratings) (e.g. Chih, Chih & Chen 2010; Soana 2011; Wu & Shen 2013; Shen et al. 2016).

Liquidity creation is a financial performance measure that is more important for social welfare and economic growth rather than for bank managers and shareholders. Thus, banks may intentionally increase the reliance of their annual reports on ethics-related content to attract more business and mitigate perceived risk, allowing them to create more liquidity.[41] Bertrand, Klein and Soula (2021) show that a positive trust environment can help banks create more liquidity by attracting a smooth stream of deposits that enables banks to create loans by mitigating the costs associated with the liquidity mismatch. The results are also in line with Diaz and Huang (2017) who find that a positive effect of bank internal governance indicators on liquidity creation. They argue that strong governance can help banks to control excessive risk of insolvency, and thus enable liquidity creation. Diaz and Huang also find that this positive effect is more likely to appear in large banks. The rationale is that the larger banks usually create more liquidity and they are in more need of risk absorption (Berger & Bouwman 2009), which in this case can be facilitated through ethics-related disclosures.

[41] The variable ETHICS measures the relative frequency of terms related to both “ethics” and “CSR”. However, the variable does not aim to reflect the engagement of the bank in CSR activities. It is rather assumed that using these terms more often develops an implicit expectation that the bank holds high standards of ethics, values, and business conduct (Loughran, McDonald & Yun 2009).

Table 5.5 The relationship between ethics-related disclosures and liquidity creation.

	All Banks				Small Banks				Large Banks			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	LC1	LC2	LC3	LC4	LC1	LC2	LC3	LC4	LC1	LC2	LC3	LC4
ETHICS	**0.121****	**0.080***	**0.130*****	**0.062****	0.081	0.010	0.152	0.039	**0.171*****	**0.132****	**0.136****	**0.101***
	(0.055)	(0.040)	(0.047)	(0.030)	(0.084)	(0.057)	(0.087)	(0.062)	(0.048)	(0.053)	(0.058)	(0.054)
COMPENSATION	0.142*	0.060	0.032	-0.202*	0.132	0.147	0.137	-0.060	0.215*	-0.016	0.049	-0.151
	(0.083)	(0.090)	(0.144)	(0.112)	(0.116)	(0.117)	(0.211)	(0.205)	(0.110)	(0.095)	(0.138)	(0.095)
EQRAT	-0.701**	-0.545	-0.560	-0.196	-0.719**	-0.362	-1.059**	-0.594	-0.918	-0.847*	0.585	1.203**
	(0.316)	(0.462)	(0.463)	(0.492)	(0.328)	(0.574)	(0.488)	(0.506)	(0.593)	(0.498)	(0.507)	(0.543)
LNTA	-0.031	-0.006	-0.006	0.004	-0.021	0.012	-0.029	0.009	-0.032	0.008	-0.003	-0.008
	(0.022)	(0.016)	(0.022)	(0.019)	(0.035)	(0.025)	(0.030)	(0.028)	(0.029)	(0.023)	(0.024)	(0.020)
LLR	-0.545***	-0.457	-0.288**	-0.368	-0.527***	-0.596**	-0.446***	-0.534**	-0.242	0.155	0.078	0.169
	(0.161)	(0.278)	(0.141)	(0.224)	(0.188)	(0.258)	(0.140)	(0.221)	(0.413)	(0.336)	(0.268)	(0.208)
RWATA	0.134***	0.032	0.214***	0.073	0.111*	0.021	0.219***	0.075	0.190**	0.103*	0.257***	0.121*
	(0.045)	(0.039)	(0.049)	(0.052)	(0.062)	(0.042)	(0.080)	(0.068)	(0.077)	(0.055)	(0.072)	(0.064)
LNZSCORE	0.019*	0.027	0.011	0.007	0.019**	0.013	0.035***	0.022	0.048	0.061**	-0.041*	-0.041**
	(0.011)	(0.024)	(0.014)	(0.016)	(0.008)	(0.021)	(0.010)	(0.016)	(0.044)	(0.035)	(0.019)	(0.024)
ROAA	-0.462	-0.288	-0.165	0.494	-0.808	-0.388	-1.101	-0.297	0.736	0.119	2.729**	2.425***
	(0.531)	(0.678)	(0.548)	(0.496)	(0.648)	(0.582)	(0.495)	(0.416)	(0.790)	(0.763)	(1.071)	(0.659)
MQ	-0.067	-0.047	-0.019	0.099*	-0.031	-0.138*	-0.152	-0.082	-0.114	-0.001	-0.005	0.086
	(0.050	(0.061)	(0.072)	(0.056)	(0.066)	(0.072)	(0.096)	(0.108)	(0.074)	(0.070)	(0.075)	(0.052)
GDPG	0.079)	0.047	0.259	0.197	-0.050	0.015	0.177	0.283	0.255	0.206	0.345	0.124
	(0.137	(0.147)	(0.187)	(0.188)	(0.179)	(0.250)	(0.261)	(0.254)	(0.269)	(0.168)	(0.263)	(0.170)
UNEMP	-0.222	-0.278	0.209	-0.046	-0.029	0.495	0.386	0.591	-0.266	-0.696*	-0.019	-0.591
	(0.188)	(0.238)	(0.230)	(0.304)	(0.338)	(0.452)	(0.274)	(0.343)	(0.419)	(0.382)	(0.426)	(0.448)
Constant	0.702	0.170*	0.193	-0.025	0.528	-0.048	0.611	-0.021	0.572	-0.238	0.146	0.175
	(0.390)	(0.303)	(0.399)	(0.376)	(0.527)	(0.387)	(0.450)	(0.459)	(0.623)	(0.470)	(0.491)	(0.403)
Bank FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
S.E. Cluster Level	Country	Country	Country	Country	Country	Country	Country	Country	Country	Country	Country	Country
Obs.	775	755	773	733	370	357	369	352	405	398	404	381
N. of Banks	223	217	226	209	113	110	113	104	110	107	113	105
R2 (Within)	0.170	0.243	0.151	0.226	0.188	0.276	0.219	0.305	0.207	0.350	0.179	0.302

The table reports fixed-effects regressions. The dependent variables are LC1, LC2, LC3 and LC4 which are the liquidity creation measures normalized by total assets. ETHICS stands for the relative frequency of ethics-related terms in the annual report. COPMENSATION is employees' compensation normalized by total revenue. EQRAT is the equity to total assets ratio. LNTA is the natural logarithm of total assets in Euros. LLR are the loan loss reserves. RWATA is the risk-weighted assets normalized by total assets. LNZSCORE is the natural logarithm of the ZSCORE. ROAA is the return on average assets. MQ is the cost-to-income ratio. GDPG is the real GDP growth of the host country. UNEMP is the unemployment rate of the host country. The regressions include bank and time fixed-effects. Robust standard errors clustered at the country level are reported in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

5.8 Robustness Tests

Four tests are conducted to assess the robustness of the baseline results of the main analysis. First, the baseline results do not necessarily imply that banks use the disclosure of ethics-related terms as a strategic tool for risk management purposes. This is because creating more liquidity is not necessarily associated with private benefits for managers and shareholders that would be enabled by making more ethical disclosures. Thus, to further test the strategic preference hypothesis, an interaction term between Ethics and LNSCORE is incorporated in the model. Should the strategic preference hypothesis hold, the coefficient of ETHICS will be larger as it refers to the case of high bank risk (compared to the coefficient in the baseline regressions), while the coefficient of the interaction term will be negative, suggesting that bank stability reduces the positive effect of ETHICS on liquidity creation. The results of this test are presented in columns (1) to (4) of Table 5.6 and confirm the strategic preference hypothesis. More specifically, for the regressions that include LC1, LC2 and LC4, the coefficient of ETHICS is larger and more statistically significant than the coefficient of Ethics in Table 5.5, while the coefficient of the interaction term is negative and significant at the 5% or 1% level. These coefficients are not highly significant when LC3 is the dependent variable but still have the expected signs. These results suggest that banks strategically use their ethics disclosures to compensate for the risk associated with liquidity creation in times of instability.

Second, an alternative calculation of the ETHICS variable is used. Using the relative frequency of word lists can be biased as it may give large weights to words that are used repetitively. This is particularly important in studies that investigate ethics-related terms as firms may use these terms repetitively to describe their corporate culture (Audi, Loughran & McDonald 2016). Also, term repetition may be inflated by writers who use the term repetitively compared to writers that use pronouns such as "it" to avoid repetitions. To address these concerns, a new ethics variable, namely Ethics-Ord, is created which only considers the first occurrence of each term. Thus, the variable is the sum of how many of the words in the list appear at least once and has a range of 1 to 7 since seven terms are included in the list used in this analysis.[42] The results of this test are presented in Columns (5) to (8) of Table 5.6 and they are consistent with the baseline findings.

Table 5.6 Robustness tests.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	LC1	LC2	LC3	LC4	LC1	LC2	LC3	LC4
ETHICS	**0.664*** **	**0.568*** **	0.566	**0.381** **				
	(0.204)	(0.151)	(0.342)	(0.164)				
ETHICS-ORD					**0.006** **	**0.006** **	**0.004***	**0.005** **
					(0.002)	(0.002)	(0.002)	(0.002)
ETHICS *LNZSCORE	**-0.168*** **	**-0.153*** **	-0.135	**-0.100** **				
	(0.056)	(0.041)	(0.104)	(0.050)				
LNZSCORE	0.094***	0.095***	0.069	0.050	0.021*	0.027	0.011	0.007
	(0.027)	(0.032)	(0.054)	(0.030)	(0.011)	(0.024)	(0.015)	(0.016)
Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES
S.E. Cluster Level	Country	Country	Country	Country	Country	Country	Country	Country
Obs.	775	755	773	733	775	755	773	733
N. of Banks	223	217	226	209	223	217	226	209
R2 (Within)	0.185	0.260	0.161	0.233	0.167	0.248	0.144	0.229

The table reports fixed-effects regressions. The dependent variables are LC1, LC2, LC3 and LC4 which are the liquidity creation measures normalized by total assets. ETHICS stands for the relative frequency of ethics-related terms in the annual report. ETHICS-ORD is the count of how many of the ethics-related terms appear at least once in the annual report. LNZSCORE is the natural logarithm of the ZSCORE. The same control variables as in Table 5.5 are included. The regressions include bank and time fixed-effects. Robust standard errors clustered at the country level are reported in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

[42] Loughran and McDonald (2014) and Audi, Loughran and McDonald (2016) use similar methodologies in their analyses to address these concerns.

Finally, the two-step system generalised method of moments (GMM) and the 2SLS estimators are employed to further address endogeneity concerns. Garcia-Castro, Ariño and Canela (2009) argue that properly addressing endogeneity is important and should not be neglected when examining the relationship between social and financial performance. In the specification of the system GMM, the first lag of the liquidity creation measures is added to control for the sluggishness of liquidity creation in the following form:

$$Liquidity\ Creation_{i,t} = \alpha_0 + \beta_1 Liquidity\ Creation_{i,t-1} + \beta_2 Ethics_{i,t-1} +$$

$$+ \textstyle\sum_{j=1}^{8} \beta_j\ Bank\ Control_{i,t-1} + \sum_{j=1}^{2} \beta_j\ Country\ Control_{c,t-1} + \lambda_t + \varepsilon_{i,t} \qquad (5.5)$$

The estimator uses the lags of the endogenous variables as instruments to partially address endogeneity. The macroeconomic variables and the time dummies are treated as exogenous, while all other variables are treated as endogenous which means that their second and longer lags can be used as instruments. Their validity is assessed with the Hansen J test, while Arellano and Bond (1991) test is also employed to test for second order autocorrelation. The results of this test are presented in Table 5.7 and the coefficient of the ETHICS variable is significant at the 5% or 1% level in three of the four regressions, strongly supporting the baseline results.

Table 5.7 The relationship between ethics-related disclosures and liquidity creation using the System-GMM estimator.

	(1)	(2)	(3)	(4)
	LC1	LC2	LC3	LC4
Dependent Variable	0.735***	0.866***	0.825***	0.860***
	(0.094)	(0.078)	(0.109)	(0.075)
ETHICS	0.204***	0.066	0.186**	0.087*
	(0.064)	(0.057)	(0.087)	(0.052)
Control Variables	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES
Obs.	766	750	754	719
N. of Banks	220	216	225	208
AR(2)	0.210	0.151	0.549	0.983
Hansen J	0.691	0.129	0.023	0.196
Instruments	150	150	151	151

The table reports two-step system-GMM regressions. The dependent variables are LC1, LC2, LC3 and LC4 which are the liquidity creation measures normalized by total assets. ETHICS stands for the relative frequency of ethics-related terms in the annual report. The same control variables as in Table 5.5 are included. The regressions include bank and time fixed-effects. Robust standard errors clustered at the country level are reported in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

For the instrumental variables two-stage least squares (2SLS) regressions, the same control variables are used as in the baseline regressions, while two text-based instruments for ETHICS are employed. The instruments are used first separately in columns (1) to (8) and then together in columns (9) to (12). The first instrument used is the variable POSITIVE that captures positive sentiment in the annual reports. Positive sentiment is expected to positively affect the relative frequency of ethics-related terms because it contains ethical connotations (Cook 2017). The results presented in columns (1) to (4) show that the coefficient of POSITIVE in the first-stage regressions is always positive and highly significant, while the coefficient of ETHICS maintains its sign and significance as in the baseline regressions.

Yet, although it is unlikely that general positive sentiment may influence the level of liquidity created by the bank, one may argue that positive sentiment is not truly exogenous because it might be associated with the enhanced performance of the bank that leads to increased levels of liquidity creation. To address these concerns, the natural logarithm of the size of the PDF file in total words (LNWORDS) is employed as a second instrument. While there is reasonable ground to expect that banks with longer annual reports that are more detailed and comprehensive use more often ethics-related terms, there is no theoretical basis that annual report length and liquidity creation are related in any way. This increases the chances that the selected variable is a good instrument and the results presented in columns (5) to (8) show that in all four first-stage regressions, the coefficient of LNWORDS is positive and highly significant. Moreover, the coefficient of ETHICS in the second-stage regressions is positive and significant in two of the regressions, confirming the baseline results. These results are also confirmed when using both instruments together in columns (9) to (12). For these regressions, the validity of the instruments used is further supported by the

Hansen J-test of overidentifying restrictions for which the null hypothesis is not rejected, suggesting that the instruments are correctly excluded from the second-stage regressions.

Table 5.8 The relationship between ethics-related disclosures and liquidity creation using the instrumental variables 2SLS estimator.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
First stage												
	ETHICS	ETHICS	ETHICS	ETHICS	ETHICS	ETHICS	ETHICS	ETHICS	ETHICS	ETHICS	ETHICS	ETHICS
POSITIVE	1.468***	1.682***	1.476***	1.625***					1.342***	1.562***	1.390***	1.542***
	(0.099)	(0.112)	(0.097)	(0.107)					(0.105)	(0.123)	(0.100)	(0.112)
LNWORDS					0.042***	0.046***	0.031***	0.032***	0.033***	0.038***	0.019***	0.022***
					(0.005)	(0.005)	(0.005)	(0.006)	(0.005)	(0.004)	(0.005)	(0.005)
Second stage												
	LC1	LC2	LC3	LC4	LC1	LC2	LC3	LC4	LC1	LC2	LC3	LC4
ETHICS	0.441***	0.507***	0.449***	0.423***	0.212	0.665***	0.494	0.931***	0.379***	0.552***	0.455***	0.495***
	(0.119)	(0.103)	(0.145)	(0.138)	(0.186)	(0.158)	(0.340)	(0.357)	(0.105)	(0.091)	(0.144)	(0.139)
Control Variables	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Obs.	775	755	773	733	775	755	773	733	775	755	773	733
N. of Banks	223	217	226	209	223	217	226	209	223	217	226	209
R2	0.334	0.153	0.213	0.078	0.341	0.114	0.211	0.149	0.339	0.144	0.213	0.071
Hansen J									0.271	0.361	0.893	0.118

The table reports instrumental variables 2SLS regressions. The dependent variables are LC1, LC2, LC3 and LC4 which are the liquidity creation measures normalized by total assets. ETHICS stands for the relative frequency of ethics-related terms in the annual report. POSITIVE stands for positive sentiment in the annual report. LNWORDS is to natural logarithm of the total number of words in the annual report. The same control variables as in Table 5.5 are included. The regressions include time fixed-effects. Robust standard errors clustered at the bank level are reported in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

5.9 Policy Implications

Several bank failures have indicated that there is considerable distance between the principles outlined in the codes of ethics and the ones that bank managers and employees follow in practice. The results presented in this chapter further show that the decision to adopt a code of ethics is a rather strategic choice, while talking more ethically in the annual report is also used to attract more business and manage risk. This implies that employing codes of ethics and ethical principles remains unable to discipline banks. Banks rather choose to use their ethics-related disclosures for expanding their business, managing risk and claim that their actions are ethical since they follow certain principles. Such findings give rise to a debate on the need for ethical principles in the banking industry. On the one hand, more traditional regulations that discipline banks such as capital and liquidity requirements appear to remain the only solution that can promote stability in the banking sector. On the other hand, legal rules are not always capable of capturing the wide spectrum of bank risks that are also difficult to forecast when new opaque instruments are developed through financial innovation. Traditional legal regulations tend to be rigid and inflexible without being able to quickly address new risks, while excessively strict bank regulations can also impede banks' efficiency and contribution to an economy. Therefore, the banking industry needs to establish strong ethical principles to better anticipate unexpected risks with self-regulation, but it appears that so far banks have been using their principles for strategic purposes.

5.10 Conclusions

This chapter investigates the relationship between ethical bank disclosures and liquidity creation. The chapter uses a unique set of hand-collected annual reports and employs textual analysis to construct text-based variables. As it is not clear from theory alone whether ethical disclosures can enable or impede bank liquidity creation, the analysis and results contribute to the literature on ethics-related topics such as trust and CSR performance and their relevance for the financial performance of banks.

Generally, there are two contrasting views on how ethical bank disclosures may affect liquidity creation. On the one hand, should the bank make excessive investments on ethical activities due to its altruistic preferences, it may drop its efficiency which can impede liquidity creation. At the same time, establishing excess trust over the public towards the bank can adversely affect the positive effect of financial fragility on liquidity creation. On the other hand, the bank may use ethical disclosures strategically for risk management purposes since liquidity creation is associated with risk, especially for large banks that are creating more liquidity. Moreover, establishing trustworthiness in the market can help the bank to attract a smooth stream of deposits that is essential for continuing to create loans by mitigating the costs related with the liquidity mismatch.

Overall, the results point towards the strategic use of ethical disclosures by banks. First, it is shown that banks are more likely to disclose a code of ethics in their annual report when risk increases through loan loss reserves and the share of risk-weighted assets. Second, liquidity creation is positively associated with the relative frequency of ethics-related terms in annual reports. This is in line with the respective theoretical background on the power of such disclosures to attract more customers as well as to be used as a risk management tool. The results show that this effect is more likely to take place for large banks that are possibly in greater need of risk absorption.

Examining the relationship between ethical bank disclosures and liquidity disclosures is subject to endogeneity concerns which have been partly alleviated in the empirical analysis. While the theoretical framework suggests that the level of liquidity created by the bank is influenced by how frequently banks use ethics-related terms in their annual reports, the reverse direction in the relationship might hold too. Since both variables are at the bank-level, we cannot rule out that creating more liquidity may motivate bank managers to use more ethics-related terms. To alleviate these concerns, three actions are taken. First, all regressions are repeated with the independent variables in their one-year lagged form. Second, the system GMM estimator is employed which mitigates endogeneity concerns by using the lags of the endogenous variables as instruments. Finally, the instrumental variables 2SLS estimator is employed, using the annual report size and positive sentiment as instruments. The results hold robustly in these estimations and any limitations lie with the extent to which annual report size and positive sentiment can be considered as “perfect” instruments.

The results in this chapter have certain limitations. First, the variable COE proxies the possibility that an annual report contains a code of ethics rather than that a code of ethics is in fact included. However, although simplistic, it appears to be a useful approach. Second, the sample of banks used in this study is small and diverse. This prevents any rigorous subsample analysis that would help the understanding of which types of banks drive the positive relationship between ethical disclosures and liquidity creation. Nevertheless, some evidence is presented by splitting the banks by size.

Chapter 6: Conclusions

This thesis contributes to our understanding of bank liquidity creation, the main function of banks that enables economic growth but increases risk in the banking sector. Although several researchers have followed Berger and Bouwman's (2009) methodology to measure liquidity creation, many research gaps remain. The studies presented in this thesis attempt to address some of the most apparent gaps with findings that can help both regulators and bank managers.

First, although supranational cooperation on bank regulation is becoming more prevalent, regulations are still differently implemented across countries. Using the 2019 BRSS questionnaire to update the respective database, it is found that banks create more liquidity in countries with greater official supervisory power and more actions taken to curtail moral hazard, while they create less liquidity in countries with tighter capital regulations, more activity restrictions and stronger private monitoring. Since theory provides conflicting predictions on the effects of these regulations, these findings can help bank regulators to make better-informed decisions. Therefore, bank regulators and supervisors may want to consider that while activity restrictions can control competition and capital requirements protect banks from insolvency, they impede banks' capacity to create liquidity. On the other hand, supervisory power that enables regulators to intervene when problems arise and mitigating deposit insurance's moral hazard issues can promote bank liquidity creation.

Second, liquidity creation is found to be negatively associated with multiple credit ratings. Basel II received significant criticism for relying on the assessment by CRAs and although in Basel

III policymakers attempt to reduce this reliance, the problems remain and banks purchase on average more than one rating to comply with the regulations and communicate their creditworthiness. It is difficult however to determine which of the underlying mechanisms drive the negative relationship between multiple credit ratings and liquidity creation. Regulatory certification may limit banks' portfolio diversification opportunities, the informational value of an additional rating may discourage banks from investing in opaque assets, while banks may engage in rating shopping and reduce their liquidity risk levels to receive their desired rating. Some indication towards the rating shopping hypothesis is provided, yet the three hypotheses are not mutually exclusive. The supplementary study on the role of CRAs shows that the deterioration of asset quality can increase the probability of wider rating disagreements. This finding supports the recent calls for reducing the worrying levels of NPLs and suggests that transparency can be achieved with improvements in asset quality.

Finally, the results show that liquidity creation is positively associated with ethical bank disclosures measured by the intensity of ethics-related terms in annual reports. This is consistent with the hypothesis suggesting that firms use their disclosures strategically to earn their customers' trust. Yet, this finding does not advocate against the use of ethical bank disclosures but rather for their better utilization. Since traditional legal regulations cannot capture all the sensitive parts of business conduct because they are rigid and inflexible, bank managers need to adhere to strong ethical principles to protect the banking sector from unexpected risks through self-regulation that is also the original purpose of a code of ethics.

Despite the effort conducted throughout this thesis and in many other studies, there is a plethora of areas on which we still need research on liquidity creation. First, it is important to understand whether liquidity requirements adversely affect liquidity creation or not. Although the obvious answer is yes because liquidity creation is associated with liquidity risk, this thesis showed that reducing banks' reliance on wholesale funding enables liquidity creation. Second, it would be interesting to see which are the implications of FinTech and whether financial innovations enable liquidity creation. Third, greater emphasis is needed on the ethical implications of bank operations and understanding further the role of tools such as the code of ethics and initiatives such as engaging in CSR activities. Finally, there is a great need for further understanding the consequences of liquidity creation. The main areas are whether liquidity creation contributes to the real economy and whether liquidity creation increases risk in the banking industry and evidence is currently limited to a few studies on these topics.

Abbreviations List

Abbreviation	Definition	Abbreviation	Definition
BCBS	Basel Committee on Banking Supervision	LSDV	Least Squares Dummy Variables
BRSS	Bank Regulation and Supervision Survey	LTCM	Long-Term Capital Management
CAR	Cumulative Abnormal Returns	MBS	Mortgage-Backed Security
CBRC	China Banking Regulatory Commission	MFI	Microfinance Institution
CCP	Capital Purchase Program	NBER	National Bureau of Economic Research
CDO	Collateralized Debt Obligation	NGER	National Greenhouse and Energy Reporting
CEO	Chief Executive Officer	NPE	Non-Performing Exposures
CRA	Credit Rating Agency	NPL	Non-Performing Loans
CSR	Corporate Social Responsibility	NRSRO	Nationally Recognized Statistical Rating Organization
DELR	Delayed Expected Loss Recognition	OLS	Ordinary Least Squares
DGS	Deposit Guarantee Scheme	S&P	Standard and Poor's
EBA	European Banking Authority	SBA	Small Business Administration
FASB	Financial Accounting Standards Board	SBCS	Small Business Credit Scoring
GMM	Generalized Method of Moments	SEC	Securities and Exchange Commission
HY	High Yield	SG&A	Selling, General, and Administrative
IADI	International Association of Deposit Insurers	SRI	Socially Responsible Investing
IASB	International Accounting Standards Board	TARP	Troubled Asset Relief Program
ICR	Issuer Credit Ratings	US	United States
IFRS	International Financial Reporting Standards	VIF	Variance Inflation Factor
IG	Investment Grade		

The table provides the definitions of abbreviations used in the thesis. Variable definitions are not included and can be found in the respective tables of each chapter.

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