

BANK OWNERSHIP AND LENDING BEHAVIOUR

ZAMON HALDAROV

Submitted in partial fulfilment of the requirements for the award of
Doctor of Philosophy

Oxford Brookes Business School
Oxford Brookes University

July 2020

ABSTRACT

This study contributes to the academic literature by analysing the impact of bank ownership on bank lending behaviour in developed and emerging market economies. It empirically investigates this issue in the following three areas. First, it explores the lending behaviour of banks with different ownership types during normal and financial crisis periods, using bank-level data from 64 countries for the period of 2004-2013. The sampled banks are classified into foreign-owned, domestic-private and government-owned banks. It uses different loan series' to investigate how banks behaved in loaning to the corporate/commercial and consumer/retail sectors. The findings indicate that bank loan supply across loan series and sample groups significantly declined during the recent global financial crisis period. There are significant differences in loan reductions in different business sectors and in different countries. The results also show that loan growth rates significantly decline in the consumer and retail sectors. The loan reduction was higher in foreign-owned banks, in comparison to the loan reductions in domestic-private banks. This difference is more exacerbated in emerging countries. Overall, our results suggest that the lending behaviour of banks with different types of ownership vary according to whether they are in emerging versus developed economies.

Second, this study analyses the impact of credit information sharing and creditor rights protection on lending behaviour of banks with different ownership types during normal and crisis periods. In addition to the depth of information sharing index, this study uses the coverage ratio of public and private credit institutions. The lending response to changes in creditor rights protection and court efficiency is also tested with a particular interest in the recent global financial crisis. This study examines how banks with different ownership types respond to the strength of creditor rights protection and improved information sharing facilities. The results show that improved information sharing environment and efficient contract enforcement facilitates bank lending in not only during normal times, but also during crisis periods. Furthermore, this study also finds that domestic bank lending is more sensitive to the strength of the information sharing facilities, whereas foreign-owned banks' lending rate is more responsive to the strength of court enforcement.

Third, this study examines the role of banks with different ownership types in implementing the efficient transmission mechanisms of monetary policy during normal and

crisis periods. It examines how banks with different ownership types respond to monetary policy changes. It also considers various types of asset purchase programmes during the recent global financial crisis period and tests the role of domestic and foreign banks in the transmission process of unconventional monetary policy. The study finds a negative and significant relationship between bank lending rates and changes in the monetary policy interest rates. The findings confirm the existence of a bank lending channel during the 2004-2013 period. Furthermore, the results indicate that banks with different ownership types respond differently to the changes in monetary policy. Specifically, the findings confirm that foreign bank lending response to the conventional and unconventional monetary policy was less responsive compared to domestic banks. This indicates that foreign banks dampened the efficiency of monetary policy in host countries.

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LIST OF ABBREVIATIONS

CEE	Central and Eastern Europe
EBRD	European Bank for Reconstruction and Development
ECB	European Central Bank
EMDE	Emerging Markets and Developing Economies
EU	European Union
FGLS	Feasible Generalised Least Squares
GIIPS	Greece, Italy, Ireland, Portugal, and Spain
ICRG	International Country Risk Guide
NBER	National Bureau of Economic Research
NPL	Non-Performing Loans
OLS	Ordinary Least Squares
OECD	Organisation for Economic Co-operation and Development
PCSE	Panel-Corrected Standard Error
SME	Small and medium-sized enterprises
VAR	Vector Autoregression
VECM	Vector Error Correction Model
WBES	World Bank Business Environment Survey
WDI	World Development Indicators
ZLB	Zero Lower Bound

CHAPTER 1: INTRODUCTION

The main aim of this thesis is to investigate the relationship between bank ownership and bank lending behaviour, around the recent global financial crisis. The thesis investigates the following questions: (i) What is the impact of bank ownership on bank lending behaviour?; (ii) What are the roles of creditor rights and information sharing in determining bank lending behaviour?; and (iii) What are the roles of the bank ownership in monetary transmission mechanism?. This chapter presents the background and motivation of the study, followed by the research questions.

1.1 Background and motivation

During the last decades, banking sector liberalisation and foreign bank presence significantly expanded throughout the world. Notably, during the first decade of the transition period in the 1990s, Central and Eastern European (CEE) nations witnessed increased foreign bank entry to their financial sector. This has resulted in much discussion in the literature about the effect bank ownership may have on various financial sector outcomes and lending behaviour, as discussed further on. According to the literature, banks are classified into three main ownership structures: foreign-owned, domestic private and government-owned banks. Much of the literature, however, predates the 2007-2008 global financial crisis. Although there is nascent emerging literature about ownership and lending behaviour in the face of a crisis for individual countries or geographic locations (Fungáčová, Herrala, & Weill, 2013; Meriläinen, 2016) little is known about ownership, lending behaviour, creditor rights and the transmission mechanism during crisis times. The key motivation of this thesis lies, therefore, in investigating these issues. A key starting point is to explore some relevant themes in the economics and finance literature, often considered outside the context of a global financial crisis.

Bank Ownership and Lending Behaviour

Many economists argue that foreign-owned banks and private domestic banks allocate financial resources more efficiently than state-owned banks. This may be due to screening and monitoring investment projects more efficiently and also the increase in the availability of external funding

compared to state-owned banks, thus accelerating economic growth (Bonin, Hasan, & Wachtel, 2005; Cull, Peria, & Verrier, 2018b; De Haas, Korniyenko, Pivovarsky, & Tsankova, 2015; Levine, 1997, 2005). Foreign bank entry also brings efficient and modern techniques to the local banking sector. In order to compete effectively with foreign competitors, domestic banks must introduce innovations in banking technology. Foreign bank entry may also improve the management system of domestic banks by introducing modern management techniques, particularly if these banks gain market entry by taking-over domestic banks or participating in joint ventures. Also, increased foreign bank participation may directly reduce the impact of state involvement in the financial sector, thereby improving resource allocation practices in the domestic banking system. If foreign banks attract highly skilled managers and employees, this may considerably improve the quality of human capital in the local banking sector. If foreign banks gain control of local banks through takeovers local banks or participate in a joint venture with domestic banks, they can invest in training local employees, which boost human capital quality. Furthermore, domestic banks learn and introduce practices from highly skilled foreign managers, and these practices increase the overall quality of human capital and thus result in improved efficiency in the local banking system.

Foreign banks are also argued to increase competition¹ in the host banking sector (Jeon, Olivero, & Wu, 2011). Increased competition via foreign bank entry can reduce costs and improve the quality of services provided by the national banking system (Lee & Hsieh, 2014). Additionally, it is argued that foreign banks introduce high standards of accounting and auditing practices which enhance local corporate governance practices. Furthermore, by increasing pressure on local governments to strengthen the legal, regulatory, and supervisory system, foreign banks can contribute to the domestic financial sector's development (Kouretas & Tsoumas, 2016; Levine, 1997). By increasing competition in the domestic banking sector, foreign bank entry decreases the costs of financial services and increases efficiency. Increased competition by foreign banks, in turn, forces domestic banks to diversify and improve the quality of commercial service to retain market share. Moreover, higher competition in the banking sector reduces margins on interest rates, which may also lead to a decrease in profits.

¹ See Cull *et al.* (2018a) for detailed discussion of how foreign bank presence impact to bank performance, competition in banking sector, financial stability, and access to finance.

It is also believed that the liberalisation of the financial system by easing foreign bank entry and by promoting domestic private bank participation leads to improved financial system stability (Bruno & Hauswald, 2014; Claessens & Laeven, 2005; Ghosh, 2016; Mulyaningsih, Daly, & Miranti, 2015).

Furthermore, according to the so-called ‘cream-skimming’ theory, foreign banks provide loans to transparent and more profitable firms by leaving riskier customers to be served by domestic financial institutions (Lubis, Bustaman, & Riyanti, 2015). It is argued that foreign banks have a better ability to analyse and monitor ‘hard information’ compared to ‘soft information’ (Ghosh, 2018; Kalyvas & Mamatzakis, 2017; Pelletier, 2018). If this is the case, in countries with increased foreign bank participation, ‘soft information’ firms may face credit rationing from foreign banks which in turn can lead to an aggregate decrease in credit supply. Therefore, when foreign banks' penetration results in ‘cream-skimming’, this adversely affects firms that rely upon bank funding (Dell'Ariccia & Marquez, 2004; Detragiache, Tressel, & Gupta, 2008). Furthermore, Detragiache *et al.* (2008) showed consistent results with the ‘cream-skimming’ theory in that opaque firms have limited access to bank finance, and in general, foreign banks have a safer loan portfolio compared to domestic banks.

In comparison to foreign banks, government-owned banks tend to be less cost-efficient. For instance, Bonin *et al.* (2005) concluded that government-owned banks are less efficient, and the privatisation of government banks itself is not sufficient to help these banks to become more cost-efficient and profitable. Compared to government-owned and domestic private banks, they found that foreign-owned banks provide competitive financial services and are more cost-efficient (Lin, Doan, & Doong, 2016). Furthermore, in a case study for China, Berger *et al.* (2009) arrived at the same conclusion regarding bank ownership and efficiency.

However, the link between financial liberalisation and economic growth is debatable (Arestis, 2016; Arestis & Sawyer, 2016). A significant strand of earlier theoretical and empirical research on bank ownership concluded that the performance of private banks is more efficient and competitive compared to state-owned banks. It has been suggested that government-ownership of banks tends to be associated with poor performance, high levels of non-performing loans (NPL), low levels of capitalisation and with a higher likelihood of a banking crisis (Barry, Lepetit, & Strobel, 2016; Iannotta, Nocera, & Sironi, 2007; La Porta, Lopez-de-Silanes, & Shleifer, 2002; Mian, 2003). La Porta *et al.* (2002) concluded that, particularly during the

1970's, government ownership of banks was associated with slower economic growth. They also suggested that government-owned banks are associated with lower subsequent per capita income growth and slower productivity growth. Supporting the idea that state-owned banks result in poorer outcomes, Cornett *et al.* (2010) use cash flow and account-based measures to show that government involvement in a country's financial system affected banking sector performance in 16 countries from 1989 to 2004. They concluded that compared to privately-owned banks, state-owned banks held less core capital, operated less profitably, and had higher credit risk. Furthermore, in economies with greater government involvement and political corruption, the performance differences are more pronounced. State-owned banks also tend to have undercapitalised, low levels of risk management techniques and high levels of NPLs. By analysing 181 large banks from 15 European countries for the period 1999-2004, Iannotta et al. (2007) concluded that public sector banks have poor loan quality and higher insolvency risk compared to other ownership types of banks. Mian (2003) argued that banks with state ownership are significantly under-capitalised and have considerably higher loan default rates compared to foreign-owned and domestic private banks.

The low performance of state-owned banks and high levels of NPL can also be explained by the 'social view' theory according to which state-owned banks make investments in low profitable areas such as infrastructure, agriculture, and education. Excluding these, some authors also use the 'political view' rather than 'social view' as a reason for the poor performance of state-owned banks; politicians with substantial power over state-owned banks tend to financially support their political interests, particularly during election years or in a financial crisis period. By analysing the different reactions of bank ownership to a political event, Dinç (2005) concluded that government-owned banks increase their lending in election years relative to privately owned banks. Sapienza (2004) investigated more than 50,000 Italian companies and found that the electoral results of the party connected to the state-owned bank affect the lending behaviour of that bank. Moreover, interest rates charged by state-owned banks were lower in areas where the elected political party was stronger. In short, the literature suggests that government-owned banks show poor performance, high levels of NPLs, and they are usually undercapitalised. Additionally, in countries with greater government involvement, the profitability of state-owned banks is significantly worse than privately owned banks, and a possible reason for this can be provided by 'social' and 'political' theories about state-owned

banks. In contrast to the above arguments, there is some evidence arising from more recent cross-country studies based on the 1995-2007 period suggesting that government ownership of banks is not negatively associated with growth when estimation is controlled for fundamental determinants relating to institutional quality (Andrianova, Demetriades, & Shortland, 2010). There is also some evidence that government-owned banks may increase lending during times of financial crisis compared to private banks, playing an active countercyclical role (Brei & Schclarek, 2013). These findings were found by using empirical analysis on the period 1994-2009 by (Brei & Schclarek, 2013).

Information Sharing, Creditor Rights and Bank Lending

Apart from bank ownership, the literature also emphasizes the importance of creditor rights protection and information sharing on bank lending behaviour (Brown, Jappelli, & Pagano, 2009; La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1998). Specifically, it is argued that differences in financial markets and the effectiveness of credit market performance around the world are directly related to the availability of borrower information, strength of legal rules and quality of their enforcement (Djankov, McLiesh, & Shleifer, 2007; J. F. Houston, Lin, Lin, & Ma, 2010; Jappelli & Pagano, 2002; Padilla & Pagano, 2000; La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1998). This is because when banks decide to lend to a company, they need to assess not only the quality of the borrower but also the riskiness of the investment project due to poor laws and legal institutions.

Related theoretical views predict that better legal institutions, improved creditor rights protection, and efficiency of the courts stimulate bank lending (Djankov, La Porta, Lopez-de-Silanes, & Shleifer, 2003; La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1998). The positive impact of strong creditor rights also plays an important role in determining interest rates that banks attach to loans, their maturity, and the amount of loans granted (Bae & Goyal, 2009). Under a strong creditor rights environment, banks use collateral to overcome asymmetric information in the credit market (Sengupta, 2007).

The empirical literature on law and finance showed that legal rules that protect investors rights and their enforcement quality differ significantly across countries. The literature highlights the quality and breadth of legal institutions that are important for banks to make loan

supply decisions (Kalyvas & Mamatzakis, 2017; Moro, Maresch, & Ferrando, 2018; La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1998).

From a theoretical point of view in a well-developed legal environment, banks have more bargaining power than borrowers in the event of a bankruptcy and have legal rights to take control of borrower asset under the insolvency process. As a result, stronger creditor rights protection leads to increased loan supply from the banking sector. On the other hand, these rights could also reduce the loan demand in the credit market.

Similar to creditor rights protection, information sharing among lenders through public or private credit information bureaus allow them to efficiently evaluate borrowers' credit history and make loan granting decisions. Theoretical views on information sharing and bank lending predict that improved information sharing stimulates bank credit supply by reducing adverse selection in lending (Pagano & Jappelli, 1993), lowering borrowers' moral hazard and thus increasing their efforts (Padilla & Pagano, 1997, 2000), and decreasing credit rationing in multiple bank lending (Bennardo, Pagano, & Piccolo, 2015). As the theoretical views predict, collecting and analysing information about potential borrowers play an important role in bank lending behaviour. Unfortunately, because of the information problem, the banking sector usually faces difficulty in efficiently allocating funds. Therefore, asymmetric information between lenders and borrowers is one of the main issues in credit market performance.

Related literature highlights four different mechanisms through which information sharing via credit registries help to limit asymmetric information problems in lending. First, by providing relevant information about borrowers' characteristics, credit information sharing facilities allow banks to differentiate risky borrowers from safe ones (Kusi, Agbloyor, Ansah-Adu, & Gyeke-Dako, 2017; Pagano & Jappelli, 1993). Second, the creation of public and private credit registries and the establishment of information sharing reduces the information monopoly in the loan market (Padilla & Pagano, 1997; Sharpe, 1990). This will allow banks to acquire private information about potential borrowers and evaluate accurately the level of riskiness which in turn reduces credit rationing in the market. Third, the creation of credit sharing institutions will encourage borrowers to perform better by repaying the loan on time in order to maintain a good reputation within the financial sector for possible future capital (Klein, 1992; Padilla & Pagano, 2000). This incentive exists because by not making payments on time and repaying the loan, there is a high possibility that borrowers will be blacklisted which in turn

makes it difficult to get further loans in the future. Finally, the establishment of credit information sharing among banks prevents over-borrowing which arises in the case of multiple banks' lending to the same firm (Bennardo et al., 2015).

Houston *et al.* (2010) found a positive impact of information sharing among lenders on bank lending behaviour. The study also states increased information sharing leads to increased bank profitability, lower bank risk, and stimulates economic growth. On the other hand, Fosu (2014) concludes based on bank-level data from African countries, that information sharing has a direct relationship with bank lending policy. Furthermore, improved information sharing facilities reduce contract delinquencies and defaults (Doblas-Madrid & Minetti, 2013) and lower the likelihood of banking crises particularly in developing countries (Büyükkarabacak & Valev, 2012). Karapetyan and Stacescu (2014) report that when hard information is shared, this will increase banks' incentive to invest more on 'soft' non-verifiable information which helps them to make accurate lending decisions and improve welfare.

Monetary policy and bank lending channel

The banking sector plays an important role in improving the efficiency of the monetary policy transmission process. According to the lending channel theory, monetary policy passes to the real economy through loan supply. A change in the monetary interest rate directly influences the volume of bank loan supply. This in turn impacts the investment and consumer spending decisions of companies and households. For instance, a contractionary monetary policy reduces banking sector reserves and deposits. Hence banks usually respond to this change by either replacing deposits with other alternative sources of funding or by shrinking their assets to keep in line with liability. If banks are unable to substitute lost deposits with other sources of funding, this will adversely impact bank lending ability and consequently leads to a slowing down of overall economic activity.

Empirical studies on the bank lending channel investigate bank characteristics that might play a role in the bank's response to monetary policy changes. For instance, according to Kashyap & Stein (1995), smaller banks have limited access to external funds and therefore the balance sheet and loan supply of these banks will be impacted more by a tightened monetary policy, compared to large banks. If banks have large securities holdings, then this will also allow them to quickly adjust the shortage of reservable deposits by selling some of the securities they

hold. Hence, less liquid banks with limited securities holdings are more responsive to contractionary monetary policy (De Santis & Surico, 2013; Kashyap & Stein, 2000). Kishan and Opiela (2000) used the capital-to-asset ratio as the proxy for bank capitalisation to test how banks raise external funds during contractionary monetary policy periods. They conclude that the loan supply of well-capitalised banks is less sensitive to monetary policy changes. Furthermore, Gunji and Yuan (2010) showed that compared to profitable banks, less profitable banks face a higher cost of capital to substitute lost deposits during tight monetary policy periods.

A few studies have used bank ownership as a proxy to test bank lending response to changes in monetary policy. Related literature in this regard emphasizes the insensitivity of foreign bank subsidiaries to monetary policy changes in the host country (De Haas & Van Lelyveld, 2014). On the other hand, Cetorelli and Goldberg (2011) and (2012b) showed that the transfer of funds from U.S. banks' affiliates abroad to their headquarters increased when the liquidity environment was tightened in the U.S. Mihaljek (2010) documents that during the recent global financial crisis, some parent banks increased their borrowing from their foreign branches through internal capital markets. On the other hand, it was also reported that foreign banks located in the U.S. transferred financial resources to their headquarters during the 2008 and 2009, by actively using the Federal Reserve discount window to raise funds. For the Mexican firms, the softening of foreign monetary policy in the U.S. increased the loan supply by foreign banks to these firms (Morais, Peydró, Roldán-Peña, & Ruiz-Ortega, 2019).

Campello (2002) found that compared to standalone banks, banks which are affiliated with a large multinational holding company are less sensitive to monetary policy changes. In a similar context, Ashcraft (2006) showed that affiliated bank loan growth is less sensitive to changes in monetary policy than that of unaffiliated banks. Besides, Bottero et al. (2020) show that the security portfolio of banks play an important role in cross border bank lending policy, whereas Heryán and Tzeremes (2017) state that banks in new European Union (EU) member countries responded differently to monetary shock. Salachas *et al.* (2017) conclude that during the pre-crisis period conventional monetary policies were effective through the bank lending channel, whereas during the post-crisis period these traditional mechanisms were distorted.

As seen above, the literature identifies the main ways in which bank ownership and creditor rights protection affects banks' lending behaviour and the transmission

mechanism. However, little is known about how these effects transpire in the face of a financial crisis. This is an important aspect of our research study that will be investigated in detail, as discussed below.

1.2 Knowledge gap and research questions

Bank ownership and lending behaviour

Firstly, as discussed above, increased participation of foreign and domestic private banks in the financial sector positively contributes to financial stability and consequently to macroeconomic development (Claessens & Laeven, 2005; Levine, 1997; Levine, Loayza, & Beck, 2000; Schumpeter, 1934). Well-functioning banks encourage the production process by mobilising savings and funding new technological innovations. The theoretical and empirical literature on banking sector liberalisation suggests that policy measures, such as limiting government regulation and ownership, encouraging foreign banks entry and abolishing some of the monetary policies lead to a multitude of positive benefits. These include but are not limited to: improved competition, enhanced banking services, greater financial stability, and increased foreign direct investment² (Claessens & Laeven, 2005; Clarke, Cull, Peria, & Sanchez, 2003; Levine, 1997, 2005; Levine et al., 2000; Poelhekke, 2015; Schumpeter, 1934).

Adopting these views, many countries undertook economic reforms that introduced market principles to their financial markets. As a result of financial liberalisation, banking sector integration and foreign bank participation considerably changed the structure of the banking system in countries throughout the world. Some studies confirmed that financial globalisation and banking sector liberalisation, by encouraging foreign banks and domestic private banks, increased financial stability by smoothing aggregate loan supply volatility (De Haas & Van Lelyveld, 2006; Goldberg, Dages, & Kinney, 2000). However, the recent financial crisis caused severe instability in banking systems and volatility in financial markets around the world (Claessens, 2017; Ongena, Peydró, & Van Horen, 2015). Credit market liquidity dropped significantly even in countries with a highly liberalised banking sector, thus causing financial sector instability. Consequently, decreased levels of loan supply reduced the availability of

² For the impact of foreign bank presence on foreign direct investment see Ongena, Qi, & Qin (2015).

production capital to firms³. As a result, credit market illiquidity and the shortage of financial resources led to macroeconomic stagnation in many countries.⁴ For example, after the Lehman failure in September 2008, international bank loans fell by 80%, which was a factor in the reduction in total output growth (Dekle & Lee, 2015).

Considering the difference of banks according to their ownership type and the volatility of credit market performance during the recent global financial crisis, the current research aims to investigate bank lending behaviour. Specifically, we investigate the relationship between bank ownership (foreign-owned, domestic private-owned, and government-owned) and its impact on loan supply during normal and crisis periods. Furthermore, we also attempt to examine the lending behaviour of banks in corporate/commercial and consumer/retail loan markets during the 2008-2009 crisis period. Finally, since economic conditions will be different in countries according to their income level, we also aim to investigate bank lending behaviour in emerging and developed countries separately.

Information sharing, creditor rights, and bank lending

As discussed above, creditor rights protection and information sharing facilities play an essential role in determining the efficiency of the credit market performance and in capital market development. The improved legal system, the strengthening of creditor rights protection, and the establishment of information sharing facilities among lenders have a positive effect on bank lending behaviour. However, considering the volatility of credit market performance during the recent global financial crisis, the current research aims to investigate the impact of creditor rights protection and information sharing on bank lending behaviour. While bank lending rates declined across all affected countries during the recent global financial crisis period, we expect that banks located in countries with better information sharing facilities and stronger creditor rights protection curtailed their lending rates less than those banks that performed in poor institutional environments and with limited information sharing facilities.

³ See Hamada (2018) for more detailed analysis of SME lending in Indonesia during the recent crisis period. For Italy see Presbitero, Udell, and Zazzaro (2014).

⁴ See Ivashina and Scharfstein (2010) for more detailed analysis during the financial crisis of 2008.

We test whether the bank loan supply changes happen according to the differences in creditor rights protection and information sharing. We also examine the impact of creditor rights protection and information sharing on bank lending behaviour during the crisis period. We hypothesize that during the crisis period, the decrease in bank lending rates was lower in countries with better legal institutions and information sharing bureaus. Since the efficiency of the legal environment and information sharing facilities improve as countries continue to develop, this study also attempts to analyse bank lending response to changes in creditor rights and information sharing in emerging countries and developed economies.

Monetary policy and bank lending channel

Finally, relevant literature confirms that monetary policy implemented by central banks plays a vital role in stabilising the volatility in the credit market, particularly during a crisis period. Specifically, as discussed above, the efficient implementation of the monetary policy does not only depend on banks' balance sheet characteristics but also on their ownership types. Excluding bank size, capitalisation, liquidity, and deposit funding, the bank ownership type of a bank is also crucial in determining the efficiency of monetary policy. Particularly, during the recent global financial crisis period, many central banks implemented an expansionary monetary policy to support the liquidity shortage in the real sector in the hope of stimulating overall economic growth. The increased globalisation of the banking sector and consequently the recent developments in many domestic financial sectors has completely changed the layout of the banking sector in many countries. This has meant that central banks have to consider unexpected consequences when implementing efficient monetary policy during turbulent periods.

Therefore, our third aim is to investigate the efficiency of monetary policy with a particular interest to the recent financial crisis. Considering that many countries implemented expansionary monetary policy during the recent global financial crisis, we also test whether foreign and domestic banks responded differently to changes in the monetary interest rates.

1.3 Data and methodology

To undertake empirical analyses and answer the above-mentioned questions we use bank-level and macro-level data in our analysis. The sample includes data for banks from 64 countries for

the period 2004-2013. The countries included in the investigation are from Europe, Latin-America, Asian countries, the Middle East and Africa. Yearly bank-level data is collected from the BankScope dataset for the whole period, whereas macro-level data is collected from the World Bank's 'World Development Indicators' dataset. Banks are classified into three ownership types: domestic private, foreign-owned, and government-owned. In order to test bank lending behaviour in countries with different income levels, we divide the full sample into emerging and developed subsamples. To measure bank lending, we use the total loans growth rate as a dependent variable. As mentioned above, the research also aims to investigate how banks behaved in corporate/commercial and consumer/retail sectors, in order to do this we use the corporate/commercial loan growth rate and consumer/retail loans growth rates as the dependent variable. To control bank-specific characteristics we use variables such as bank asset size, capitalisation, profitability, and deposit funding. Furthermore, we use GDP growth rate and the inflation rate as macro-control variables, since bank lending behaviour is significantly related to both the business cycle and monetary stability.

As mentioned above, current research aims to investigate bank lending behaviour during the 2008-2009 global financial crisis period. For this purpose, following the crisis definitions and measurements which is discussed in Chapter 3, we use three crisis dummies: (i) separate dummies for 2008 and 2009; (ii) a single dummy for 2008-2009; and (iii) a crisis dummy identified following Laeven and Valencia (2018) banking crises dates.

As an estimation method, we use pooled Ordinary Least Squares (OLS) and dynamic GMM panel estimators. To differentiate banks according to their ownership type, we use the value of 1 for either domestic private, foreign-owned, and government banks and a value of zero otherwise. In order to compare bank lending behaviour during normal and crisis periods, the study employs a dummy variable for the crisis.

1.4 Contribution of the study

The main contribution of this study is to provide empirical evidence that looks at whether ownership, lending behaviour, creditor rights and the transmission mechanism are significantly different during crisis times compared to 'normal periods'. Unlike the post-2008 nascent literature in this regard, that considers specific countries, or country groups, this thesis looks at a wider group of countries from the developed world and emerging economies, by using

extended bank-level data for the 2004-2013 period. The thesis contributes to the current bank lending literature through investigating three key questions in the area: (i) the role of bank ownership on lending behaviour with a particular interest to the recent global financial crisis; (ii) the role of information sharing and creditor rights protection in determining bank lending behaviour; and (iii) the role of bank ownership in the monetary transmission mechanism.

The first sub-section of **Chapter 2** contributes to the bank lending literature in the following ways. We review the existing literature on the relationship between banking sector reform and globalisation and its impact on credit market performance. It also discusses how the globalisation of the banking sector might contribute to credit market instability by transmitting economic shocks during crisis periods. It summarises the existing theoretical views on bank ownership (foreign vs domestic banks) and its impact on lending behaviour with a particular interest in periods of financial instabilities. The second sub-section summarises the relevant theoretical framework on how information sharing, and creditor rights protection play a role in shaping bank lending policy. This review is one of the first discussions that consider bank ownership variable in this process. The final sub-section of the chapter critically reviews all relevant theoretical and empirical literature on the relationship between bank ownership and the lending channel of the monetary transmission mechanism.

Chapter 3 contributes to the literature by constructing an extended bank-level dataset to undertake empirical analyses. Furthermore, it provides a detailed discussion of the relevance of bank-specific variables and their role in possible endogeneity problems. The chapter also contributes to the literature through systemizing crisis definitions, its measurements and dates by reviewing all relevant literature in this area.

Chapter 4 adds to existing bank lending literature in the following ways. First, this research uses three different crises classifications in empirical analysis. Specifically, following the literature, we consider 2008-2009 as a global financial crisis period and use two types of dummies to capture bank lending volatilities during this period. In the first case, we use separate dummies for 2008 and 2009, and in the second case, a single dummy was applied for the 2008-2009 period. Next, to also test bank lending behaviour during normal and crisis periods, we use Laeven and Valencia (2018) banking crisis episodes. Furthermore, this thesis will contribute to the literature by comparing the lending behaviour of banks located in emerging economies with those banks located in developed countries. The study will also contribute to the literature by

comparing lending behaviour of banks with different ownership types in corporate/commercial and consumer/retail sectors as well.

Chapter 5 contributes to the literature in several dimensions. First, this research is one of the first studies that compares the lending response of domestic and foreign banks to changes in information sharing and creditor rights. Second, we use not only the depth of information sharing but also include coverage data from public and private credit institutions to investigate how banks respond to these information sharing facilities across sample countries. Next, in addition to creditor rights protection and court enforcement, we use alternative indicators such as court time, costs associated with the claim, and procedures to test potential differences in the banks' lending response to these measures. Finally, this chapter contributes to the literature by comparing foreign and domestic bank lending behaviour in environments with differing information sharing coverage and creditor rights protection, with interest around the period of the recent global financial crisis.

Chapter 6 adds to the existing literature in the following ways. First, this chapter investigates the existence of the bank lending channel in emerging and developed countries. Second, it compares the existence of the pre-crisis bank lending channel to the post-crisis period. Next, we contribute to the literature by comparing the responses of foreign banks and domestic banks to changes in monetary policy changes. Finally, we also investigate the efficiency of unconventional monetary policy during normal and crisis periods.

Chapter 7 contributes by summarising the main findings of this research study and by offering several potential policy recommendations.

1.5 Structure of the thesis

The rest of the thesis comprises six chapters. Chapter 2 investigates the theoretical views and empirical evidence related to the three research questions identified. Chapter 3 describes the issues related to data collection, sampling, variable measurement and some preliminary descriptive analyses. It also presents the panel data econometric methods employed to investigate the research questions. Chapters 4, 5 and 6 separately present the estimation results and findings for each research question. These chapters discuss the empirical research results and present the interpretations of the main findings for the research questions. Finally, Chapter 7 summarises the main findings and offers some policy implications.

CHAPTER 2: LITERATURE REVIEW

This chapter reviews the relevant academic literature related with three main questions that this research will investigate. In the first section, we review the existing literature on the relationship between bank ownership and their lending behaviour during normal and crisis periods. In the second section, we will review the literature on the impact of information sharing and creditor rights protection on bank lending behaviour. The final section focuses on the lending response of banks to changes in the monetary policy stance.

2.1 Bank ownership and lending behaviour

2.1.1 Introduction

This sub-section provides a detailed literature review on the role of ownership in banks on their lending behaviour. First, it will discuss the impact of banking sector liberalisation on credit market stability. It will also review the literature on the relationship between the global financial crisis and the transmission of economic shocks. Next, this sub-section reviews related theoretical views on the lending behaviour of banks with different ownership types. Finally, it will critically assess existing empirical evidence on the loan supply policy of foreign-owned, domestic-private, and government banks.

2.1.2 Globalization, banking sector reforms and credit market stability

The process of financial globalisation and banking system liberalisation considerably changed the structure of the financial systems throughout the world. Most of the research studies emphasise that foreign-owned and domestic private bank participation increased financial stability by smoothing aggregate loan supply volatility (Cull et al., 2018b; De Haas & Van Lelyveld, 2006; Goldberg et al., 2000; Kouretas & Tsoumas, 2016). Levine (1996) states that foreign bank entry improves domestic banking sector performance through (i) implementing recent technological innovations and modern skills that enhance the quality of services and increase the availability of various types of banking sector products, (ii) helping to develop a supervisory and legislative framework, and (iii) boosting the ability of the banking sector to gain access to international capital markets. These findings are mostly based on the theoretical

view that by being a part of the larger bank holding company (the parent bank), foreign banks have access to more stable financial resources, especially during periods of economic difficulties in host countries. In other words, parent banks can provide financial sources to their subsidiaries as a lender of last resort. Furthermore, foreign banks have access to international capital markets through which they can smooth their loan supply policies. There are some other empirical studies as well that support the theoretical view that parent banks efficiently allocate capital and liquidity through their internal capital markets to financially support their subsidiaries (Ashcraft, 2008; De Haas & Van Lelyveld, 2010).

There is extensive empirical literature regarding the banking sector reform, increased foreign and domestic-private bank participation and financial stability. Analysing the impact of foreign bank local lending in Argentina and Mexico during the late 1990s, Goldberg *et al.* (2000) confirm that compared to all domestic financial institutions, foreign banks exhibited stronger loan growth. This paper concludes that foreign bank penetration had lower associated volatility and contributed to greater stability in the overall financial system. Drakos *et al.* (2016) found that as the long-run interest rates decline during the 2000s, foreign banks in CEE countries and the Russian Federation increased their risk-taking incentives. In addition, foreign bank participation stimulates domestic banks to implement recent technologies in the banking industry to compete with foreigners. Ghosh (2016) emphasises that greater banking sector globalisation pushes domestic banks to implement better technology and efficient managerial practices. Furthermore, the positive impact of increased foreign bank participation stimulates financial inclusion. For example, Gopalan and Rajan (2018) highlight that foreign banks have a strong positive impact on furthering financial access in emerging and developing economies.

Jayaratne and Strahan (1998) examined banking sector performance just after lifting the restrictions on interstate branching barriers in the USA. Their study supports that loan loss rates and operating costs declined sharply after allowing the banks to open subsidiaries throughout states. Similarly, Cho (1990) examined how foreign bank entry affected the concentration of the domestic banking sector in Indonesia, and provided evidence that foreign bank entry significantly contributed to increased competition and efficiency in the local banking industry. On the other hand, Claessens *et al.* (2001) investigated the impact of foreign bank entry on the performance of the domestic banking sector and concluded that in developing countries foreign banks tend to have higher interest margins and tax payments compared to foreign banks in

developed economies. The profitability of foreign banks also tends to be higher in developing countries in contrast to developed economies. Overall, they concluded that the banking sector liberalisation and foreign bank presence positively contributed to the functioning of the local banking system. Similar results in terms of performance gains are reported in other papers including (Caporale, Rault, Sova, & Sova, 2015; Luo, Dong, Armitage, & Hou, 2017; Shaban & James, 2018).

As discussed above, the banking sector liberalisation and foreign bank entry increase competition by improving the quality of financial services and increasing pressure on local governments to strengthen the legal, regulatory, and supervisory system. However, theories on bank lending behaviour which incorporate information asymmetries conclude that increased competition in the banking sector can diminish access to bank loans (Beck & Brown, 2015; Gopalan & Rajan, 2018; Petersen & Rajan, 1994).

Similarly, Peek and Rosengren (2000b) examined foreign bank entries to Argentina, Brazil, and Mexico for the period of 1994-1999. They emphasised that despite the economic difficulties in the host countries, foreign-owned banks did not reduce the volume of loan supply. Furthermore, according to Crystal *et al.* (2001), foreign-owned and domestic private banks exhibited superior health relative to state banks. The results of the Bank Financial Strength Rating (BFSR) analysis show that compared to domestic private banks, foreign-owned banks have relatively higher improvement of their ratings over time. Overall, the authors conclude that foreign and domestic private banks have better balance sheet structure, stable loan growth, higher ability to address asset quality deterioration and loss-absorption capacity. It is also highlighted that the cost efficiency of banks differs according to bank ownership type. For example, some recent papers confirm that foreign bank participation improves bank efficiency, whereas, domestic ownership of banks appears to stimulate efficiency after the financial crisis in countries with high financial freedom (Lin et al., 2016).

Based on focused interviews with board members and managers in Central Europe and Baltic states, De Haas and Naaborg (2005) conclude that many foreign banks have improved subsidiaries' lending techniques and have reshaped subsidiaries' customer focus. They also claim that the acquisition of local banks by foreign banks has not considerably changed the loan supply policy of these banks, but improved lending technologies and enhanced competition leading to gradual extension into the small and medium entrepreneurship and retail banking

areas. For example, Papanikolaou (2019) used a spatial competition model to investigate how changes in market structure impact the lending behaviour of banks. Based on the obtained outcomes, the author states that enhanced competition reduces lending cost thus encouraging new entrants to the credit market. Similarly, Mulyaningsih *et al.* (2015) report that foreign banks behaved more competitively than local banks, they were more efficient and had lower overhead costs which allowed them to offer loans with lower interest rates and to also disburse loans of a higher volume and quantity.

Some other research papers have also investigated banking sector reform and foreign bank entry on the credit market in individual countries. Lin (2011) examined how foreign bank entry had an impact on domestic firms' ability to obtain a loan from banks in China. By analysing time series data for publicly traded firms, the author concludes that profitable firms tend to obtain more long-term bank loans after foreign bank entry, whereas firms with high-value collateral do not. Furthermore, the findings also suggest that private and less opaque firms' access to bank finance improved after foreign bank entry. Similarly, Gormley (2010) analysed the impact of banking sector liberalisation and foreign bank entry on firms' access to bank credit and its performance. In contrast to Lin (2011), Gormley (2010) found that only a small set of profitable firms benefited from foreign bank entry and that on average firms access to bank loans was 8% less likely after foreign bank entry. Consequently, decreased access to external capital in the form of bank financing adversely affects firm performance. Gormley (2010) also investigated the impact of foreign bank entry on credit allocation in Poland. The study differentiates foreign banks as greenfield banks and empirically analyses the role of these banks on credit allocation in the Polish economy. Based on regression results, the study shows the importance of foreign banks entering the domestic market on bank loan portfolio composition. Initially, compared to domestic banks, greenfield banks tend to invest a large portion of their loan portfolio to transparent firms and a relatively small portion to opaque firms. However, over time, greenfield banks become more privately informed and increase lending to opaque firms based on soft information.

Chen *et al.* (2017) investigate how foreign ownership impact bank risk-taking behaviour. By employing bank-level data from 32 emerging economies for the 2000-2013 period, the authors conclude that foreign-owned banks take on more risk than their domestic counterparts. For this differential behaviour, they provide the following factors: (i) information disadvantage

of foreign banks; (ii) agency problems within conglomerates; (iii) the impact of parent banks' financial health; and (iv) the different macroeconomic conditions in the host and home country. On the other hand, Chen *et al.* (2019) confirm that foreign banks have an inverted U-shaped risk-taking behaviour. In other words, this indicates that as foreign banks start to enter an economy, initially it will decrease the risk-taking behaviour up to a certain point and afterwards bring a financial fragility to the host country due to excessive competition from increased foreign bank participation in the financial sector.

As discussed above, foreign-owned banks and domestic private banks allocate financial resources more efficiently compared to state-owned banks. In contrast, it is argued that since governments, particularly political bureaucrats, have extremely concentrated control over state-owned banks the loan supply policy of government-owned banks are less responsive to macroeconomic fluctuations in the economy. Micco and Panizza (2006) state that the lending behaviour of government banks is less responsive to macroeconomic shocks in comparison to foreign and domestic private-owned banks. Sapienza (2004) report that state-owned banks usually charge lower interest rates compared to other types of banks and mostly support large firms and firms located in depressed areas.

2.1.3 Global financial crisis and transmission of economic shocks

It is well known that the financial crisis significantly influences on bank lending behaviour. As this study empirically investigates the impact of the recent global financial crisis on bank lending, we first define the 2008-2009 crisis and then discuss the similarities and differences from previous financial crises.

Relevant literature supports the view that foreign banks can transmit financial shocks from their home countries to the host economies. The main point of this view is that the economic difficulties in home countries weaken balance sheet conditions of the parent banks and in turn, this will affect their subsidiaries loan supply policies in the host countries. Specifically, if a bank feels an adverse liquidity shock to its balance sheet during the crisis period, then it may cut back direct cross-border lending. Moreover, if this bank has subsidiaries in foreign countries, it may also reduce financial support to these foreign subsidiaries through internal capital markets. Thus, the parent bank through the internal capital market may impact the lending policy of foreign subsidiaries and therefore transfer the financial shock from the home country

to the host country. Not only foreign banks but also domestic banks may also transfer financial shock. For example, domestic banks can usually fund local investment projects by attracting financial resources from international capital markets or directly from cross-border interbank borrowing. However, as the liquidity drops in global capital markets during the crisis periods, domestic banks may face a liquidity shortage. Consequently, this will impact the lending ability of local banks by transmitting financial shocks⁵.

Houston *et al.* (1997) analyse the sensitivity of foreign bank loan supply policy to parent bank's balance sheet positions by collecting annual data from 1981 to 1989 in the USA. Based on regression results, the authors conclude that the cash flow and capital positions of the parent banks can play a crucial role in their subsidiaries' loan supply policies. In other words, the foreign banks' credit growth is more sensitive to the parent bank's balance sheet position rather than its capital and cash flow positions. Peek and Rosengren (2000a) investigate the effect of Japan's financial shock during the late 1980s on the Japanese banks' lending behaviour in the USA. The study found that the risk-based capital ratio position of parent banks in Japan has an economically and statistically significant effect on subsidiaries' loan supply policy in the USA. As discussed above, the balance sheet condition of parent banks and economic conditions in home countries can affect the lending behaviour of their subsidiaries in host countries. Finally, by analysing semi-annual consolidated data for the banking sector of 11 industrialised countries, Van Rijckeghem and Weder (2003) show that spillover through common bank lenders was a significant factor in transmitting the Mexican and Thai financial crises. However, compared to the Mexican 1994 crisis, the Thai crisis had a large and statistically significant effect on lenders.

Similarly, Allen *et al.* (2014) investigate the transmission of liquidity shock of parent banks to their foreign subsidiaries during the 2008 financial crisis. The study used data for 51 multinational banks and 269 of their affiliates from 20 developed countries for the period 1990 to 2011. Using the GMM estimation methods, the study finds that the subsidiary bank lending considerably declined when the parent bank was not lending through the interbank capital market. In other words, the decreased financial support of parent banks to subsidiaries through the internal capital market caused the decline of subsidiary bank lending during the financial crisis. At the same time, the study shows that the lending rates of subsidiaries with well-

⁵ Hale, Kapan, and Minoiu (2016) provide detailed discussion on global banking and financial shock transmission.

capitalised parent organisations did not fall during the financial crisis period. So, the authors conclude that parent bank's characteristics may have an essential role in subsidiary bank lending behaviour. In addition, Jeon *et al.* (2013) undertook a similar investigation using data for 368 foreign subsidiaries of 68 multinational banks from 47 emerging economies during the period 1994-2008. They provide consistent evidence that foreign bank subsidiaries transform financial shocks from home to host country and that internal capital markets play a crucial role in this process. Particularly, they conclude that internal capital markets transmit favourable and adverse shocks through foreign subsidiary banks, which are more dependent on financial support from parent banks. Moreover, they find that the degree of international transmission of financial shock varies in strength during the tranquil period compared to the crisis period, and the degree also differs according to the geographical location. In other words, the transmission of financial shocks is stronger in foreign subsidiaries located in CEE countries compared to Asia and Latin America. Also, the degree of financial shock is more conspicuous during recent years compared to the period before 2001.

Additionally, some other empirical studies investigated the role of global banks in the transmission of the 2008-2009 global financial crisis. Specifically, they examined how the liquidity shock to the bank balance sheet in developed countries emerged in emerging economies. For instance, Cetorelli and Goldberg (2012b) investigate how internationally active U.S. global banks transfer financial shock through its foreign affiliates. Emphasising the importance of the bank liquidity management policy across its subsidiaries, the authors conclude that if the parent bank experiences a funding shock to its balance sheet, then it will reallocate liquidity according to a locational pecking order through its internal capital markets. In another study, Cetorelli and Goldberg (2012a) showed there was less responsiveness of global banks in the U.S. to changes in monetary policy because these banks have internal capital markets that can help them to prevent the negative impact of monetary policy contraction in the local economy. In contrast, they also report that banks without global affiliates are more sensitive to monetary policy changes. Similar results are found in Lee and Bowdler (2019) who investigated the existence of internal capital markets for banks in Asia.

Furthermore, compared to the financial shocks in the home country, the macroeconomic environment in the host country can also impact the lending behaviour of foreign banks. For example, foreign bank lending can be less stable if these banks respond more procyclically to

financial instability in the host country. Morgan and Strahan (2003) show that on the one hand, by relying on parental liquidity and capital, foreign bank entry can decrease the unexpected effects of bank capital shock on firm investment in the host country. On the other hand, by weakening expected risk and return characteristics, financial instability in the host country can cause foreign banks to reallocate their portfolio to the region with stable macroeconomic conditions. The reason for such a behaviour can be the higher and stable return in other regions which can encourage parent banks to reallocate financial resources from one country to another. Contrary to foreign banks, domestic banks have a lower opportunity to transfer capital from one region to another and may, therefore, be less procyclical to the financial condition of the host country.

In a separate country case, Schnabl (2012) investigated the impact of the 1998 Russian default on international banks' balance sheet, and its transmission to Peruvian banks. Based on empirical analysis, the author concludes that after the default shock, global banks reduced lending to Peruvian banks and in turn, this resulted in reductions in bank lending to firms located in Peru. Mainly, the shock was stronger for domestic banks that borrowed internationally compared to foreign-owned banks. The impact was weak if banks were funding its most active operations from local funding sources. In the same way, Ongena *et al.* (2015) analysed the transmission of financial shocks from banks to firms during the recent financial crisis period. In comparison to Schnabl (2012), they use a bank- and firm-level data from Eastern Europe and Central Asia, however, the conclusions are very similar. As in Schnabl (2012), they conclude that banks (domestic private or foreign-owned) that used to attract funds from international capital markets decreased their lending during the crisis period compared to those banks with local funding sources. Therefore, firms that had a lending relationship with banks that borrow from international capital markets suffer more compared to other companies.

On the other hand, Acharya *et al.* (2018) state that following the recent global financial crisis some European countries such as Greece, Ireland, Italy, Portugal, and Spain (GIIPS) experienced a sovereign debt crisis. Furthermore, they claim that the sovereign debt crisis influenced bank lending behaviour in these countries and consequently firms which had a close pre-crisis relationship with these banks became financially constrained as a result of decreased lending by banks. Considering that banks located in the GIIPS countries suffered from the sovereign debt crisis, we will take into account and analyse the lending behaviour of banks

during the crisis period. Below we will discuss how banks played a role in the transmission of financial shocks from one country to another.

In short, although foreign banks and domestic private banks can improve financial system stability, macroeconomic fluctuations and financial crises in the home country and host economies could negatively affect the lending behaviour of these banks. Therefore, the results of empirical and case studies are contradicting in this regard, and this topic needs further consideration.

2.1.4 Bank ownership and lending behaviour: Theoretical views and empirical evidence

The recent financial crisis started with severe instability and caused significant volatility in financial markets around the world. Credit market liquidity dropped significantly even in countries with a highly liberalised banking sector⁶. To support market liquidity, many central banks ran expansionary monetary policies. Some countries experienced considerable government intervention in the financial sector through various regulations, macroeconomic stimulus and even ownership of large banks. However, the responses of the banking sector to these government policies on financial regulation varied according to the bank ownership type. There are many theoretical and empirical research papers which analyse the lending behaviour of banks with different ownership types.

Reviewing the related literature on loan supply policy during the recent financial crisis shows that banks with different ownership behaved differently. Most of the studies compare the performance of foreign and domestic private-owned banks with state-owned banks and their role in credit stability in the economy. Below we will discuss relevant theoretical views and empirical evidence on bank ownership and lending behaviour.

2.1.4.1 A theory of bank lending with different ownership

Although the above theoretical discussion compares private bank lending behaviour with public bank lending, there is not a single comprehensive theory that can explain foreign bank lending

⁶ Ivashina and Scharfstein (2010) and Cetorelli and Goldberg (2011) analyse the impact of the financial crisis of 2008.

behaviour. The relevant literature mentions some important mechanisms that influence foreign bank lending behaviour during normal and crisis periods. These theoretical mechanisms predict that foreign bank subsidiaries that are part of a larger bank company are not fully independent in loan supply decision making. Therefore, their lending behaviour during normal and crises periods to a certain extent will be influenced by parent bank decisions. Adams-Kane *et al.* (2017) state that it does not matter if branch banks are part of a global or domestic banking group, these branches could not operate independently from their parent banks. For example, Giannetti and Laeven (2012a) state that funding conditions in global banks' home countries impact the relative amount of loans invested through domestic and foreign branches. The authors argue that banks grant a larger proportion of financial resources to foreign lending if they have easier access to domestic sources of funding whereas in situations with difficult access to the funding they will provide a smaller proportion of foreign loans in the respective countries. Access to domestic funding was usually influenced by the valuation of bank stocks in their home country or by the changes in the spread of interbank interest rates.

According to Stein (1997), during the crisis periods, parent banks may act as a lender of last resort 'back-up facility' to support its subsidiaries loan supply policy. Besides, by using the internal capital market, the parent bank may reallocate its financial resources over its foreign subsidiaries, thus providing an opportunity for subsidiaries to provide a more stable credit supply. In other words, foreign subsidiaries with supportive parent banks will be less prone to the adverse effects of the financial crisis in the host country. Furthermore, sufficient financial resources from parent banks will allow foreign subsidiaries to recover relatively quickly compared to domestic banks and continue providing a stable loan supply.

In contrast, it is also argued that foreign banks' may provide a less stable loan supply compared to domestic banks during a crisis period. This response of foreign bank lending to changes in host country macroeconomic situations is considered as more procyclical. A possible reason for these changes in lending policy could be increased risks in the credit market and decreased expected returns. Therefore, when the macroeconomic environment worsens in a particular country, parent banks reallocate financial resources from one region to another. Compared to the foreign banks, domestic banks may not have alternative investment opportunities and thus their lending policy will be less sensitive to home-country economic

conditions. For this reason, it is argued that the relationship between foreign bank lending behaviour and host country macroeconomic condition is positive.

Contrary to ‘back-up facility’, another mechanism that can impact foreign bank lending behaviour changes is a macroeconomic condition in the parent bank’s home country-‘push factor’, but not the economic situation in the host country-‘pull factor’. According to Molyneux and Seth (1998) and Moshirian (2001), a worsening of the macroeconomic situation in the home country led to a negative impact on the balance sheet of parent banks which in turn scale down the loan supply of foreign subsidiaries. As a result of the worsened balance sheet, parent banks usually reduce foreign branch lending activity in order to support the home-country loan supply. Therefore, foreign bank lending is positively related to the macroeconomic condition in the home country. On the other hand, it is also argued that a worsening macroeconomic condition in the home country diminishes investment opportunities in the domestic country which in turn forces parent banks to expand their lending activity in foreign countries through their subsidiaries.

The difference between the lending behaviour of foreign banks and domestic banks does not only depend on the foreign bank’s parent company decision but also differs according to the balance sheet health and lending strategies. For example, De Haas and Lelyveld (2006) argue that banks lending behaviour differs according to their client relationships. Specifically, some banks provide loans to their clients based on ‘transaction-by-transaction-basis’. In this case, they increase loan supply to their clients during the economic expansion period and decreasing their lending when macroeconomic conditions worsen. In contrast, other banks may grant loans to their customers based on ‘through the cycle-basis’ in which case they do not easily cut off their loan supply during an adverse economic period. These types of relationship lending are considered as relatively countercyclical or stable since they are less sensitive to fluctuations in macroeconomic performance and banking crises. Thus, the quality of the bank balance sheet is important in their loan supply behaviour.

There are very limited theoretical papers that investigate the lending behaviour of state-owned banks during the crisis period. Micco and Panizza (2006) attempt to explain the lending behaviour of government-owned banks and provide some reasons why these banks may stabilise the credit market throughout the business cycle. Firstly, according to the authors, the principal aim of the state-owned banks is to stabilise the credit market because of the social benefits

accrued of a stable macroeconomic environment on economic growth. Secondly, if depositors expect that government-owned banks will be safer than private banks during a financial crisis period, then state banks will be able to smooth credit supply because of their more stable deposit base. Next, the lower cyclical of the loan supply of state-owned banks is due to the ‘lazy’ behaviour of bank managers, because they do not have the proper incentives to maximise bank profitability. Finally, the lending behaviour of state-owned banks is directly related to incentive politicians’ have in that they may increase lending in order to improve the possibility of their re-election (Claessens, Feijen, & Laeven, 2008; Khwaja & Mian, 2005).

On the other hand, Brei and Schclarek (2015) developed a theoretical model which analyses the bank lending policy during normal and crisis periods. The theory builds on a three-period model which includes four types of agents: depositors, entrepreneurs, private and public banks. As financial intermediaries, the private and public banks accept deposits from depositors and provides accumulated funds to entrepreneurs as a loan. The model predicts that the lending behaviour of private and public banks are similar during normal times. However, compared to normal times, during financial crisis periods, private bank lending decreases to a larger extent than the public banks. Therefore, the model suggests that public banks play a counter-cyclical role whereas private banks play a pro-cyclical role in their banking systems. To explain these different roles, the model offers the following possible explanations that can describe the lending response of private and public banks to an unexpected financial shock. Firstly, unlike private banks, state-owned banks not only maximise expected returns but also experience a disutility if investment projects scale down as a response to financial turmoil. Secondly, compared to private banks, public banks may suffer fewer deposit withdrawals during a crisis period. This could be because the government will financially support public banks, during severe crisis periods, in the form of recapitalisation to avoid bank runs in the economy.

2.1.4.2 Empirical evidence on bank ownership and lending behaviour

Ivashina and Scharfstein (2010) report that during the fourth quarter of 2008 the new loans to large borrowers fell by 47% in comparison to the prior quarter and by 79% in contrast to the peak of the credit boom period. In addition, Cull and Peria (2013) investigated the effect of bank

ownership on credit growth using bank-level data, including before and during the 2008-2009 financial crisis for Latin American and Eastern European countries. To analyse bank lending behaviour, they examine not only the growth rate of gross loans but also the growth of consumer loans, corporate loans, and mortgage loans as well. For this purpose, they use bank-level data from 2004 to 2009 and employ panel data methods with various fixed estimations such as country, country-year, and bank fixed effects. Based on estimation results, the paper concludes that in both regions, private banks sharply contract lending during the crisis period. However, compared to domestic private banks, they also found that foreign and state-owned banks behaved differently in how they provided loans in these regions. For example, the growth rate of foreign bank loans fell more compared to domestic private banks, whereas the lending rates of government-owned banks were similar to domestic private banks in Eastern European countries. For Latin American countries, the paper concludes that the lending growth rate of state-owned banks exceeded foreign and domestic private bank lending rates. However, compared to the Eastern European region, foreign banks in Latin America did not significantly reduce lending rates before the crisis period. Additionally, the research concludes that in contrast to the Eastern European case, foreign banks in Latin America did not contract their loans at a faster pace than domestic banks during the crisis.

De Haas and Van Lelyveld (2006) also analysed the reaction of domestic and foreign banks to business cycles and banking crises in CEE countries for the period 1993-2000. To examine the lending behaviour of banks, they employ simple (OLS) estimation with random effects, Feasible Generalised Least Squares (FGLS), and Panel-Corrected Standard Error (PCSE) estimation methods. Further, they also divide foreign banks as greenfield or take-over according to their mode of entry. However, the study did not differentiate domestic banks based on their ownership type, such as state-owned or private banks. In general, regression results show that domestic private banks contract lending during crisis periods, whereas greenfield foreign banks provide a stable loan supply. However, both types of foreign banks react more procyclical to changes in the local economy. For example, De Haas and Van Lelyveld (2006) found that during an economic expansion in the home country, greenfield foreign banks reduced lending in the host country. On the other hand, greenfield banks expanded lending in the host country during difficult economic times in the home country. This rise of lending can be explained as increasing the investment to profitable investment projects to compensate for

losses in the home country. Additionally, Allen *et al.* (2017) investigated bank lending and ownership structure in CEE countries, using data for the 1994-2010 period. In general, the study confirms the impact of bank ownership structure on lending behaviour, particularly during the crisis period, however, the level of impact depends on the type of crisis that the bank experiences. For example, during a domestic banking crisis, lending rates of foreign-owned banks were more stable in CEE countries, whereas they decreased their lending during home crisis periods. Compared to the foreign-owned banks, during domestic banking crises government-owned banks did not increase their lending rates, however there were exceptions to this pattern during recent financial crisis periods.

Similarly, Micco and Panizza (2006) investigated the lending response of banks with different ownership types to macroeconomic shocks in developing and industrial countries. They use a panel data set for the period 1995-2002. Different from De Haas and Van Lelyveld (2006) the paper concludes that lending behaviour of state-banks are less responsive to macroeconomic shocks than private banks and thus they may play a crucial role in the credit smoothing process during the crisis periods. Further, the lending behaviour of state-owned banks is less procyclical in developing countries compared to those in industrial countries.

Furthermore, Popov and Udell (2012) investigated the impact of bank financial conditions on loan supply in Eastern European countries before and during the 2008-2009 financial crisis. Using survey data for 10,701 applicant and non-applicant firms, they conclude that both positive and negative financial shocks at both foreign and domestic banks have a significant impact on lending rates to companies in these countries. Specifically, they emphasise that businesses face higher credit rationing in localities where the majority of banks have a low level of equity and Tier 1 capital. The impact was substantial during the early stages of the 2008-2009 financial crisis. Similarly, firms experienced higher credit rationing in countries where the majority of foreign banks were undercapitalised compared to the companies located in countries with sound foreign banks. Moreover, Bonin and Louie (2016) empirically investigated bank loan supply in countries where the majority of the banking system was supplied by foreign banks during the crisis period. As in Popov and Udell (2012), the paper uses data from eight emerging European countries. The paper uniquely separated the foreign banks as either subsidiaries of the Big 6 European multinational banks or subsidiaries of other foreign banks. In general, the study found

that all Big 6 banks continued to provide stable loans growth while all other foreign banks considerably decreased their lending.

Furthermore, the lending behaviour of banks during the recent crisis period was examined by Brei and Schclarek (2013) who analysed bank data from Latin America, Advanced Europe, and Eastern Europe countries for the period 1994-2009. The study investigated the lending behaviour of state banks against private banks. They did not separate foreign banks from domestic private banks, thus ignoring the behaviour of foreign banks during the recent financial crisis period. By employing random effects and system GMM methods with panel data, the study finds robust evidence that during crisis periods, state banks increased lending while private banks decreased loans compared to normal times. Similarly, Bertay *et al.* (2015) also investigated public bank behaviour during the recent financial crisis using data for the period 1999-2010 from 111 countries. Based on system GMM estimation results, the study concludes that the lending of government banks is less procyclical particularly in countries with good governance. Carvalho (2014) reports that the lending policies of state banks are controlled by the central government to expand employment near election years.

Chen *et al.* (2016) investigated the lending behaviour of government-owned banks and their effect on macroeconomic performance during the recent crisis period. Collecting data for banks from 56 countries, they divide the sample into two subsamples-low corruption and high corruption countries using the corruption index from the International Country Risk Guide (ICRG). Thus, they compare the lending behaviour of government banks with private banks and their impact on macroeconomic performance. In addition, they test whether the increased lending of government banks improves the rate of new business creation and economic growth. Pre-crisis and crisis periods in the sample period are divided as 2004-2006 and 2007-2010, respectively. Based on the results of the empirical analysis, the authors conclude that the lending rates of government banks were higher compared to private banks during the crisis period. Further, they found that increased lending by government banks in the low corruption subsample is associated with better economic recovery and bank performance during the crisis. In contrast, increased lending by government banks in high corruption countries did not positively contribute statistically to the beneficial effects, such as new business creation rates or economic growth.

Moreover, using the loan-level data, De Haas and Van Horen (2013) investigated the lending behaviour of large international banks after the collapse of Lehman Brothers. Specifically, they analysed the relationship between bank-borrower closeness and stability of bank lending. Based on estimation results for detailed data set on international bank lending, they conclude that bank lending was more stable if they were located close to each other. In contrast, they found a strong and negative link between geographical location and lending stability. The paper also concludes that banks in countries with pre-crisis lending experience and close relationship with domestic co-lenders provided a more stable loan supply. Furthermore, Frey and Kerl (2015) investigated the impact of funding structure and the level of competition in internal capital markets on the lending of the largest German banks and their affiliates in 40 countries. By employing panel data fixed effects estimation method, the paper concludes that the local deposit funding of foreign subsidiaries and their ability to generate own funds internally played a crucial role in providing a stable loan supply after the collapse of Lehman Brothers. In addition, foreign subsidiaries could receive additional financial support from their parent organisation, if these foreign affiliates are more active in deposit collection and have a strong position in the wholesale funding market.

Comparatively, Giannetti and Laeven (2012b) analysed the effect of a negative shock to banks' net wealth to their lending policy in domestic markets and foreign countries during the financial crisis period by using data from the international syndicated loan market. In general, they found that if banks experience negative shock because of an economic crisis, they reduce lending in a foreign country compared to the domestic market.

As discussed above, the significant economic trouble of the recent financial crisis was a reduction in bank lending and a shortage of financial resources to the real sector. Therefore, economists and policymakers not only investigated bank lending behaviour in cross-country cases but also examined the relationship between lending policy and bank ownership in individual country cases. Below, we will discuss some empirical evidence on the lending behaviour of banks with different ownership types in individual country cases.

Albertazzi and Bottero (2014) investigated foreign bank lending during the recent global financial crisis in Italy using highly disaggregated bank-firm level data. The authors conclude that foreign banks reduced lending sharply (to similar firms located in the same region) compared to domestic banks. Furthermore, they also emphasise the importance of the distance

between the host and home country. Notably, the lending behaviour of foreign banks is strongly affected by the functional distance between them and their headquarters. Similarly, Coleman and Feler (2015) examined the relationship between bank ownership, lending, and economic performance in Brazil during the 2008-2009 financial crisis. The paper analysed the lending behaviour of government-owned banks versus private banks and its impact on Brazilian economic regions during the recent financial crisis. The dataset includes 4 federally owned and 115 privately owned banks which consist of about 20,000 branches throughout Brazil for the period 2005-2012. In general, the paper concludes that while government-owned banks increased lending private banks operated more conservatively before and during the recent financial crisis. Furthermore, it also confirmed that some economic regions with a higher share of government-owned banks recover faster from the financial crisis compared to other areas with a relatively lower share of government bank participation. However, they also indicate that lending by government-owned banks mostly was politically driven and allocated inefficiently.

Furthermore, Fungáčová *et al.* (2013) investigated credit supply changes by banks in Russia before and during the recent financial crisis. The paper used quarterly data from the beginning of 2007 to the end of 2009. They showed that overall bank lending declined during the crisis period. The decrease was more significant for foreign banks compared to state-owned banks. Similarly, Davydov (2018) examined the effects of state ownership and government intervention on the lending behaviour of banks in Russia for the period of 2005-2011. By investigating 348 highly state-influenced banks in the country, the author supports the view that state ownership may be more useful during crisis periods. Specifically, it is confirmed that as the government share increases in ownership structure, the loan growth rate of the bank will also be higher during the financial crisis. In addition, the author concludes that banks with full state ownership charged lower interest rates on their loans. Zhang *et al.* (2018) examined the loan supply of state-owned banks, joint-stock banks, and city commercial banks across 14 provinces of China. The main finding of the study is that state-owned banks expanded their loan supply in counties that were severely affected by the crisis, whereas joint-stock and city commercial banks mostly increased their lending in counties to improve their presence.

2.2 Information sharing, creditor rights, and bank lending

2.2.1 Introduction

In this sub-chapter, we provide a discussion of the relevant literature on information sharing, creditor rights protection, and bank lending behaviour. In the first section, we will review the theoretical views on the impact of creditor rights protection and court efficiency in bank lending behaviour. The next section will discuss theory on how information among lenders can contribute to the bank lending rates. Final two sections critically review relevant empirical papers on the relationship between creditor rights, information sharing and bank lending.

2.2.2 Theory of creditor rights and bank lending

Much of the literature in credit market performance pays particular attention to the importance of creditor rights protection and information sharing on the development of capital markets. Thus, Specifically, recent evidence suggests that improved legal rights, creditor protection, and information sharing among lenders have a positive impact on the credit market performance (Djankov et al., 2007; Houston et al., 2010; La Porta *et al.*, 1997 and 1998). According to the legal view theory, legal rights and well-developed creditor protection are fundamental to credit market development and efficiency. This is because when lenders can enforce their rights to repayment and seize the collateral, they are more willing to provide loans to the real sector. In other words, banks in poor legal systems charge a higher interest rate, demand more collateral and shorten credit maturity, eventually reducing the overall investment to the real business sector in the economy (Bae & Goyal, 2009). Therefore, the strength of creditor rights protection and its enforceability play an essential role in determining the volume, the price, and the structure of the loans provided by lenders⁷.

Theories of debt in incomplete contract frameworks imply that the transfer of control rights upon default play an important role in how creditors are willing to grant the loans to borrowers (Aghion & Bolton, 1992; Hart & Moore, 1994, 1998). For example, if the creditor is able to force the borrower to repay the debt or gain the control in case of the default, then this means that the contract allows the lender more bargaining power. Thus, with more bargaining

⁷ Mc Namara *et al.* (2020) provides detailed discussion on the relationship between country's information, legal, judicial, social and regulatory environment and credit rationing SMEs.

power, creditors will be willing to grant loans with lower interest rates and for longer maturities. In other words, if the lender has more bargaining power, the borrower will not engage in more risky activities knowing that the control of the assets may transfer from them to the lender in the event of a default.

The first systematic study of law and finance was undertaken by La Porta *et al.* (1997), who classified the legal system according to their origin. Specifically, they identified four main legal families; English, French, German, and Scandinavian origins and argue that these legal origins spread to former colonies. Moreover, they point out that modern commercial laws come from two broad traditions-common law (English legal origin) and civil law (French, German, and Scandinavian legal origins). Finally, the paper showed the difference between law and its enforcement across countries and legal origins and concluded that common law countries protect creditors stronger compared to the countries in civil law families. Among the civil law countries, French legal origin is the weakest for creditor rights protection. For instance, countries that utilise English legal origin law have better legal institutions; lower costs associated with enforcement and less corruption (Djankov *et al.*, 2003; La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1999). In turn, improved creditor rights protection and better institutions lead to efficient credit market performance.

The theory predicts that the extent of creditor rights protection also plays an important role in determining the amount of loans offered to firms, its maturity, and the price attached to the loan. Bae and Goyal (2009) argue that as the credit quality declines, lenders often prioritise increased interest rates attached to the loans, require more collateral, and reduce the loan maturity. Furthermore, the legal environments with poor contract enforcement increase the time wasted in repossessing the collateral upon default and decreases the recovery rates. Therefore, compared to the weak legal systems, stronger creditor rights protection and contract enforceability seem to increase the willingness of the lender to provide more loans under favourable terms.

Furthermore, in addition to the contract enforceability, legal rights are also equally important. This is because, the legal rights determine who has the rights to the property once the firm faces bankruptcy (Bae & Goyal, 2009; La Porta *et al.*, 1997 and 1998). Levine (1999), supporting this view confirms that the legal and regulatory environment is important for financial development and the difference in the legal system impacts the relationship between

entrepreneurs and creditors. That is, the legal system gives high priority to creditor rights protection in turn have better developed financial intermediaries compared to the countries where the legal system provides much weaker support to lenders. Moreover, contract enforcement and law efficiency also have as big an impact formal legal code. In other words, countries with better contract enforcement and law efficiency have well developed financial intermediaries than countries where contract enforcement and regulatory environment is not as effective.

Theoretical consideration of creditor rights also highlights the importance of collateral on bank lending decisions. This is because banks use collateral as a signalling device in differentiating good borrowers from bad ones, particularly for foreign banks since they have very limited information about domestic borrowers. Sengupta (2007) developed a model in which foreign banks are assumed to have a disadvantage over domestic borrowers about the information quality of local borrowers. Thus, foreign banks use collateral as a signalling device to minimise this disadvantage and compete successfully for low-risk borrowers with domestic banks. Although the foreign banks demand collateral in reducing asymmetric information in the credit market, they usually grant loans with shorter maturity than domestic counterparts (Beck, Ioannidou, & Schäfer, 2018).

2.2.3 Theories on information sharing and bank lending

Relevant literature emphasises that information sharing positively impact to the credit market performance through reducing adverse selection (Pagano & Jappelli, 1993), lowering borrower hold-up problem (Padilla & Pagano, 1997), minimising moral hazard in lending (Klein, 1992; Padilla & Pagano, 2000), and decreasing customer overborrowing (Bennardo et al., 2015).

According to the information asymmetry theory, adverse selection and moral hazard problems in credit markets may lead to credit rationing and suboptimal allocation of capital (Stiglitz & Weiss, 1981). Specifically, lenders are not always able to obtain reliable information about the characteristics of borrowers and their creditworthiness. As a result, this will create difficulties for lenders to differentiate good borrowers from risky loan applicants. Furthermore, lenders may also face moral hazard problems if borrowers engage in more risky activities once the loan is granted to them. Thus, adverse selection and moral hazard problems in the credit market may lead to an increased interest rate for loans or even credit rationing. Therefore,

information sharing among lenders facilitates lending and reduces the credit default (Padilla & Pagano, 1997, 2000).

Information asymmetries are a common problem in credit markets affecting the lending behaviour of the banks. Because, if lenders have poorly informed about borrower's current financial characteristics or have difficulty obtaining their relevant historical data, they could not differentiate good applicants from risky borrowers. As a result, asymmetric information may lead to credit rationing causing decreased financial intermediation in the market (Jaffee & Russell, 1976; Stiglitz & Weiss, 1981). Therefore, credit information sharing by reducing adverse selection and moral hazard problems facilitate lending (Padilla & Pagano, 2000; Pagano & Jappelli, 1993).

Finally, information sharing may induce bank lending by preventing borrowers to take too much debt when they are borrowing from multiple banks (Bennardo et al., 2015; Petersen & Rajan, 1994). In environments where creditor rights are poorly protected borrowers engage with taking on too much debt. In turn, this overborrowing increases the default rate and thereby can be costly for lenders. Thus, to prevent these banks may increase the interest rate on credit or deny it. Bennardo *et al.* (2015) conclude that by sharing information through the credit reporting system, banks mitigate borrower incentive to overborrowing. Hence, the interest rate charge and possible default rate decreases and credit access improves.

Relevant theory predicts that information sharing among lenders impact the credit market performance with different channels. For instance, Pagano and Jappelli (1993) show that credit information sharing allows lenders to evaluate the borrower's risk correctly and thus reduce the adverse selection problem in bank lending. To put it differently, if lenders have private information about their borrower's quality, sharing this information with other banks allows them to obtain credit history of potential borrowers from other banks. As a result of this information exchange, these lenders will be able to efficiently evaluate the borrower riskiness and correctly identify good applicants from bad ones, thus reducing the problems associated with adverse selection and borrower default. Although the information exchange among lenders reduces the problems associated with the adverse selection and borrower default, its impact on lending volume is still unclear. This is because the total lending only increases when the lending to safe borrowers exceeds the reductions in lending to the risky ones.

The other channel that information sharing may stimulate bank lending is through reducing borrower hold-up problems. When banks have a long relationship with borrowers, this creates an informational advantage over other lenders. Since other lenders have limited information about the borrower, they may reject the loan application or charge a high-interest rate even if the borrower has a good credit record. In turn, this allows banks with information advantage to extract higher than market interest rates from borrowers in the future. However, Padilla and Pagano (1997) show that if lenders exchange their customer's creditworthiness information with each other, this information sharing diminishes their market power to extract higher interest rates in the future. Consequently, increased competition pressurises banks into charging a market interest rate hence encouraging borrowers to perform better and reduce the possibility of a default. Accordingly, reduced default risk by decreasing the interest rates charged on loans increases lending.

Another channel through which information sharing facilitates bank lending is through reducing the moral hazard problem. This is because once the loan is granted borrowers may engage in risky but high return investment projects, which in turn increases the possibility of default (Myers, 1977). On the other hand, lenders blacklist borrowers with default or poor credit history and exchange this information among lenders. Klein (1992) provides an in-depth analysis that information sharing creates incentives for borrowers to alter their behaviour and repay the debt. This is because borrowers know that if they are once blacklisted, it will be difficult for them to obtain credit in the future. Furthermore, in their analysis, Padilla and Pagano (1997) identified that when borrowers know that their default information will be disclosed among lenders, this may induce them to repay their debt. In turn, this will decrease the default rate, which accordingly reduces the costs associated with future borrowings and increases lending.

2.2.4 Empirical evidence on creditor's rights protection and bank lending

Over the past few decades, financial researchers have highlighted the importance of legal origins in financial development. In their seminal work, La Porta *et al.* (1997) empirically examined how legal origins differ across countries, and the quality of law enforcement contribute to the development of financial intermediaries. According to this paper, commercial laws are mainly formed from two broad laws: civil law and common law. They suggest that the legal systems in

many countries are mainly derived from those in England (common law), France, Germany, and Scandinavia (civil law) because of their colonisation or tight economic relationship. Based on this classification, La Porta *et al.* (1998) collected a dataset covering legal rules related to the investor right's protection and the quality of enforcement of these rules. The dataset included 49 countries, and the rules are measured based on the respect for the security of the loan, the ability of lenders to seize the collateral in case of default, and the inability of management to stay in control. La Porta *et al.* (1998) found that because of the differences in legal origins, legal rights and their enforcement vary significantly across countries. Compared to the common law, civil law has weaker creditor rights protection. In other words, countries with English legal origin have strongest creditor rights protection, whereas nations with French origin have weak legal protections. German- and Scandinavian-civil law countries fall between these two legal origins. Furthermore, countries with English legal origin seem to have well established legal institutions, good enforcement of rights and therefore less corruption. La Porta *et al.* (1997) showed that the level of legal rules and their enforcement in a country are important determinants of the size and extent of capital markets in these economies. Civil law countries, particularly French civil law family have weak creditor rights protection and have the least developed capital markets compared to common law countries.

Generally, in a well-developed legal environment, creditor rights protection has four dimensions that allow lenders following restrictions (i) when borrower file for reorganisation; (ii) to have authority to run the business during the reorganisation; (ii) to have priority in the proceeds from liquidation; and (iv) to claim the collateral if the reorganisation has been approved. These legal elements differ country by country according to their legal origins which were initially introduced to literature by (La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1998). Banks located in countries with better creditor rights protection provide loans with more concentrated ownership, for longer periods, and with lower interest rates. Thus, banks located in countries with strong creditor rights protections supply loans on favourable terms (Kalyvas & Mamatzakis, 2017; Moro *et al.*, 2018). Cerqueiro *et al.* (2016) found a significant impact of collateral on debt contracts and the provision of credit. Besides, Ponticelli and Alencar (2016) highlight the efficiency of the courts in increased firm access to finance.

Levine (1998) examined the relationship between the legal system and banking development and its effect on long-run economic growth. Particularly, the paper examines

whether differences in the level of legal rights of creditors, legal origins and enforcement of the legal system explain diversity in banking development in countries with various legal systems. For this purpose, the study first identified legal determinants of banking sector development. Specifically, the paper argues that banks in different legal environments have a varying ability to influence borrower's incentive to repay their loans. Additionally, in some cases such as default or bankruptcy, banks' ability to repossess collateral or liquidate firms differs according to the legal system. Finally, the author argues that the priority given to secured creditors (e.g., banks) compared to the other creditors during the firm liquidation differs in different legal systems. Based on these, the paper measures four different legal rights of banks to estimate the relationship between legal environment and banking sector development and its effect on long-run economic growth. The article uses the amount of bank credit to the private sector divided by GDP to measure the banking sector development indicator. By analysing data from 42 countries for the period 1976-1993, the paper concludes that nations with higher creditor rights protection have a better-developed banking sectors compared to countries where laws do not give high priority to creditor rights. Secondly, the paper emphasises the importance of legal right's enforcement on bank sector development. In other words, countries with well-functioning law and contract enforcement have better-developed banking sectors than countries with weak enforcement. Regarding the legal origins, similar to the La Porta *et al.* (1997, 1998), the author concludes that countries with English common law highly emphasise the creditor rights compared to French, German, and Scandinavian origins. Furthermore, nations with French civil law origin have the lowest creditor rights protection and law enforcement, while countries with Scandinavian and German legal origin tend to be best at law enforcement.

In their study, Djankov *et al.* (2007) investigate how changes in creditor rights determine private credit using cross-country data. The paper analyses data from 129 countries and following La Porta *et al.* (1997) construct a new creditor rights index for each year covering the 1978-2003 period. The index was built based on four powers of secured lenders in bankruptcy: (i) creditor consent for reorganisation; (ii) secured creditor first; (iii) management out; and (iv) no automatic stay on assets. Thus, if any of these powers are granted to the secured lenders, then a value of one is added to the index. So, the index ranges between 0 (weak creditor rights protection) and 4 (strong creditor rights protection). The paper employs a cross-sectional OLS method using private credit to GDP as the dependent variable. The main conclusion of Djankov

et al. (2007) is that legal creditor rights are statistically significant and quantitatively important determinants of private credit development. Furthermore, they also fail to find any significant evidence confirming the convergence hypothesis of legal rights among legal origins.

Also, Haselmann and Wachtel (2010) investigated the relationship between legal environment and bank lending behaviour. The study uses the European Bank for Reconstruction and Development's (EBRD) face-to-face survey data conducted in 2005 for more than 200 bank managers located in 20 transition countries. The major finding of the paper is that the legal environment is an important factor in credit market development and bank lending. For example, if a bank is in a better legal system, its willingness to accept different assets as collateral and to lend to information opaque firms is higher. In contrast, if a bank is in a worse legal environment, it lends mostly to customers with a presented guarantee (government lending) or to large enterprises who can easily provide information about their projects. Hence, the authors state that a better legal system fosters private capital formation. In addition, authors emphasise that banks provide relatively more loans to small and medium-sized enterprises (SME) and mortgages lending if they are operating in a well-developed legal system. Further, in a sound legal system, banks tend to lend proportionally less to large entrepreneurs and governments. Similarly, Haselmann *et al.* (2009) investigated the impact of changes in the legal system on the lending behaviour of banks. They use bank-level data from 12 Eastern European transition countries for the 1995-2002 period. The paper employs a difference-in-differences approach, including both bank-level and macro-level control variables in regressions. Except for the changes in the legal system, they also test which components of the creditor rights are essential for credit supply. The study then goes further in differentiating legal rules between individual enforcement regime (Collateral) and collective enforcement regime (Bankruptcy). The critical distinction between a collateral and bankruptcy regime is that collateral is designed to protect individual creditors' claims outside bankruptcy. Based on the findings, the authors state that the formal changes to the legal rules do indeed stimulate lending by banks. Furthermore, they also conclude that compared to the bankruptcy regime, the collateral regime is of greater importance for lenders. For example, Cerqueiro *et al.* (2016) also state that collateral plays an important role in bank policy decisions. Specifically, collateral is important in designing debt contract, the provision of credit, and increases the lender's incentives to monitor borrowers. In the opposite case, in legal environments that exogenously reduced

collateral values, banks increased interest rates in debt contracts, tightened credit limits, and reduced the intensity of their monitoring.

Rodano *et al.* (2016) investigated Italian bankruptcy law reform on financial contracts and firm investment using loan-level quarterly data starting from the second quarter of 2004 to the last quarter of 2007. Specifically, the study examines how reorganisation and liquidation reforms impact on bank financing. The first 2005 reorganisation reform facilitates loan renegotiation, whereas the second 2006 reform strengthens creditor rights in liquidation. Based on their findings, the authors conclude that the first reform increases interest rates and decreases investment, whereas the second reform decreases interest rate on bank financing and stimulates investment in the economy. On the other hand, Stef and Dimelis (2020) investigate how legal rights impact on private credit, bank lending-deposit spread, and foreign bank presence using data for 87 countries between 2005 and 2016. The authors conclude that strong creditors' right protection and bankruptcy systems have a positive significant impact on foreign bank presence.

As discussed, weak creditor rights protection often results in increased interest rates, shorter loan maturity, and higher collateral requirements. Additionally, the enforceability plays an equally important role in loan volume, maturity, and ownership structure. Diamond (2004) argues that banks with ineffective and expensive legal rights enforceability produce more short-term loans compared to the efficient legal environment. Thus, to assess the risks associated with lending, creditors need to evaluate not only the credit quality of the borrower but also risks associated with the strength of legal rights and law enforcement. Therefore, it stressed that in a well-established institutional environment and strong legal system, loans are more concentrated in ownership, credit periods are extended and there are lower interest rates. Qian and Strahan (2007) study how laws and institutional differences determine the terms and ownership of bank loans. Furthermore, the study also tests legal formalism on loan ownership and contract terms. Legal formalism measures how courts in a borrower's country efficiently enforce contracts. Authors point out that court efficiency is important because it determines lenders ability to enforce specific terms of the loan contract and seize the assets. Excluding the United States, the study uses loan information data from 43 countries for the 1994-2003 period. The paper concludes that in countries with better protection of creditor rights, the concentration of loan ownership is higher. In other words, the number of lenders would be lower if creditor's rights are well protected. To put it another way, if creditor's rights are poorly protected, banks use

diffuse ownership as a tool to mitigate the risk. Regarding firm characteristics, loan ownership becomes more concentrated when a firm is small and opaque. With respect to country characteristics, the loan ownership becomes less diffused as the risk of the country increases measured by sovereign debt rating. Furthermore, the paper also found that foreign bank loan ownership is strongly associated with legal protection of creditor rights. In general, they claim that the absence of strong creditor rights protection leads to more diffused loan ownership and shorter maturities. Similarly, Esty and Megginson (2003) investigate the relationship between legal risk and debt ownership structure using the sample of 495 project finance loan tranches to borrowers located in 61 different countries. After controlling for loan size, sovereign risk, and project risk, the study concludes that the strength of creditor rights and the reliability of legal enforcement is positively related to the debt ownership concentration. This is consistent with the idea that if banks have strong rights and legal enforcement they monitor and provide low-cost re-contracting but vice versa when they have poor legal rights and contract enforcement. Likewise, Esty (2004) shows that in environments with strong creditor rights and reliable legal enforcement, foreign banks are more willing to finance large, long-term, and illiquid projects. Furthermore, foreign banks are more likely to finance investment projects in countries with less government involvement in the banking system.

Similarly, Bae and Goyal (2009) examined how differences in creditor rights and property rights protection impact the loan size, loan maturity, and loan spreads. The study analysed bank loan information data from the Dealscan database for 48 countries covering the 1994-2003 period. Then the paper investigates loans offered to borrowers around the time of the 1997-1998 East Asian financial crisis. To measure property rights protection, the study uses three-country risk indices: the corruption index, the risk of repudiation index, and the risk of expropriation of private investment index. To measure the creditor rights strength, they use the index constructed by Djankov *et al.* (2007) as of January of every year between 1978 and 2003. Concerning the crisis period, authors expect that if the creditor rights and property rights are actual deciding factors then during the crisis period banks would lend relatively more in countries with better enforcement compared to the economies with weak property rights protection. For this purpose, they use the interaction term between creditor and property rights with the crisis period. As a dependent variable, the paper uses the natural log of the loan tranche amount, natural log of the loan maturity, and the natural log of interest spreads. In general, the results demonstrate that in

countries with improved property rights, the loan amounts increased, loan maturities became longer, and loan spreads declined. In countries with poor creditor and property rights, lenders imposed size restrictions on loans, shortened loan maturities, and charged higher loan spreads. Regarding the East Asian crisis period, they failed to find any significant response of loan volume to variations in creditor and property rights during the crisis period. Although they found that the maturity of the loan significantly declined for East Asian borrowers during the crisis period, the results for the interaction terms between creditor and property rights for the crisis period are insignificant. This indicates that creditor rights and property rights had no significant impact on loan maturity during the East Asian crisis period. Regarding the loan spreads, the study concludes that as the risks associated with lending went up during the crisis period, banks responded by increasing the loan spreads. Furthermore, bank loan spreads were lower during the crisis period for firms located in countries with strong property rights enforcement.

In a similar work, Laeven and Majnoni (2005) investigate the relationship between judicial efficiency and lending rate spreads in different countries. The paper uses as a measure the spread between deposit and lending rates to analyse the effect of judicial efficiency on costs associated with bank lending. The article concludes that judicial efficiency plays a vital role in determining the interest rate spreads on bank lending across countries. Notably, they argue that the effectiveness of judicial enforcement of loan contracts is crucial in decreasing the costs associated with bank lending to firms and households. Safavian and Sharma (2007) hypothesise that the effectiveness of creditor rights is strongly linked to the quality of contract enforcement and test it using firm-level data on 27 European countries for the 2002-2005 period. To measure the creditor rights, they use the Creditor Rights Index developed by (Djankov *et al.*, 2007). To measure the contract enforcement, they use time in calendar days (available in World Bank's 'Doing Business Report') to resolve a contract dispute. Accordingly, this measure of contract enforcement predicts that if calendar days are more prolonged, then court enforcement is weak in this country compared to other nations with short periods. They also use court enforcement to investigate the impact of legal effectiveness on bank behaviour. Court enforcement measures how the judiciary system can effectively enforce its decisions. They use indexes from 1 to 6 for court enforcement, with higher values meaning a more efficient judiciary system, obtained from the World Bank Enterprise Survey. Based on cross-section regression results, they conclude

that reforms in creditor rights have relatively little impact on lending if that country experiences poor court enforcement. In contrast, where the court enforcement is efficient, the improvements in creditor rights considerably contribute to bank lending. Comparably, Moro *et al.* (2018) study the relationship between the judicial system and firms' access to bank credit. As in Safavian and Sharma (2007), they found that as judicial enforcement improves the firm's ability to obtain credit increases. Specifically, they emphasise that in countries with a better legal system, the probability of a firm to get credit increases by up to 40%. Similarly, Ponticelli and Alencar (2016) found that firms operating in municipalities with less congested courts enjoyed increased access to finance and investment.

Furthermore, some papers investigate the relationship between creditor rights and bank risk-taking. For example, using a sample of bank information data from 69 countries for the period 2000-2007, Houston *et al.* (2010) examined how creditor rights protection related to risk-taking behaviour on the part of the banks. They use the z-score for each bank as a primary measure for bank-risk taking and creditor rights index developed by La Porta *et al.* (1998) and extended by Djankov *et al.* (2007) to measure the strength of creditor rights protections. Employing OLS and instrumental variable methods, the study concludes that stronger creditor rights tend to promote greater risk-taking. Consistent with this finding, they also found that stronger creditor rights may contribute to the possible likelihood of a financial crisis that a country may experience in the future. On the other hand, the study claims that stronger creditor rights protection is positively related to higher economic growth. The similar impact of creditor rights protection on the likelihood of a financial crisis is also found in (González, 2016).

Some other empirical studies analyse the interaction between the legal system and credit market development in the individual country case (Cristini, Moya, & Powell, 2001; Jappelli, Pagano, & Bianco, 2005). These studies compare the difference in the legal policy and bank lending behaviour by region in a country. Jappelli *et al.* (2005) investigate how an improvement in judicial efficiency increases lending in Italy. For that purpose, the paper uses panel data for Italian provinces and concludes that firms are more credit constrained in regions with longer trials or large backlogs of pending trials. Cristini *et al.* (2001) found similar results for Argentina. Specifically, Argentinian provinces with inadequate law enforcement have less developed credit markets and higher non-performing bank loans compared to regions with

effective law enforcement. Therefore, they emphasise the vital importance of legal efficiency improvement on credit market development and loan availability.

On the other hand, Laeven and Woodruff (2007) investigated the relationship between the quality of the legal system and firm size in Mexico. The results show that firm size will increase by 0.15-0.30 standard deviation as the quality of the judicial system improves by 1-standard deviation. Deakin *et al.* (2010) using time series data analyse the impact of legal reform on banking system development in India. The banking sector development indicator is measured by the volume of bank credit to GDP per capita. By employing Johansen's Maximum Likelihood Estimation procedure, the paper concludes that the legal reforms of the 1990s and 2000s significantly strengthened creditor rights protection and consequently positively contributed to banking sector development in India. Secondly, the authors also confirm that this positive association between the improved legal system and banking sector development in India is independent of stock market development and economic growth.

Stronger creditor rights influence supply and demand for credit, impact the level of lending interest rates and the duration of the loan. Particularly, stronger creditor rights protection allows banks to expect higher recovery rates which in turn increases the willingness of the banks to provide loans to a wider set of borrowers. At the same time, stronger creditor rights may increase the costs associated with potential bankruptcy for companies, which in turn induce some borrowers to look for other sources of funding. However, considering that banks are profit-maximizing entities, they may attach higher interest rates to profitable projects or simply reject loan applications with higher risk-return. Therefore, it can be expected that banks might increase loan supply in countries with stronger creditor rights whereas reducing it in economies with poorer creditor rights protection. To put it differently, Knyazeva *et al.* (2018) state that in economies with weak creditor rights protection, the ability of borrowers with strong financial position decreases in obtaining external finance from banks.

2.2.5 Empirical evidence on information sharing and bank lending

Theoretical views suggest that asymmetric information proposes an information imbalance between lenders and borrowers and therefore, leads to an inefficient allocation of capital (Jaffee & Russell, 1976; Stiglitz & Weiss, 1981). Specifically, during the loan contract process, lenders often fail to collect full information about borrower's financial condition and thus are unable to

correctly evaluate the riskiness of the investment project, which in turn induces adverse selection problems. In some cases, lenders may also fail to control the business activity of the borrower after issuing the loan, which in turn creates moral hazard problems. To overcome these issues, lenders need full information about the potential borrower. Lenders can overcome these problems by gathering information through screening and monitoring their customers. Secondly, lenders also can share information with other financial institutions to get financial information about other customers. In some countries, there are information centres such as ‘credit bureaus’ or ‘public credit registers’. These centres collect, file, and distribute information on borrowers to potential lenders. These information centres allow banks to get available data about the potential borrower and permits them to evaluate more accurately the risks associated with an investment project. This, in turn, by easing adverse selection problems enables banks to target and price loans better.

In their seminal paper, Jappelli and Pagano (2002) investigate the impact of the information sharing on bank lending and credit risk using the purpose-built dataset of the credit bureau from 43 countries. To measure bank lending and credit risk in the country level they use the ratio of bank lending to GDP and credit risk indicator of the International Country Risk Guide Financial Indicator ranging from 0 to 50 (maximum risk). Based on the regression results obtained, the paper concludes that the breadth of credit markets is associated with information sharing. That is, total bank lending to the private sector is larger in countries with intense information sharing facilities. Furthermore, they also found evidence that public and private information sharing diminishes the risks associated with lending.

Similarly, Djankov *et al.* (2007) investigate the impact of information-sharing institutions on private credit. They extend the research of Jappelli and Pagano (2002) by increasing the number of countries from 43 to 129 and covering 1978-2003 period with five-year intervals. They use the presence of public and private credit registries to measure information sharing variables. In regression analysis, they split the full sample into rich and poor sub-samples. Using the cross-country OLS method, the paper demonstrates that information sharing institutions are statistically significant and quantitatively essential determinants in private credit market development. They have also showed that credit information sharing has a different impact on the credit market at a different level of economic development. Their results show that the

presence of a private and public credit bureau has a strong positive impact on credit market development in poorer countries compared to rich countries.

On the other hand, Love and Mylenko (2003) examined the impact of a credit registry presence on bank financing and financing constraints. For this purpose, they use combined firm-level data from the World Bank Business Environment Survey (WBES) with private and public credit registry information. The survey was conducted in 1999-2000 and covered data for 5000 firms from 51 developed and developing countries. To measure financing constraints, they use survey answers to various constraints including financing, infrastructure, inflation and other factors. The scale ranged from 1 to 4, with one meaning 'no obstacle' and four a 'major obstacle'. To measure bank financing, the study uses the survey answer of a firm's financing structure in the past year. In general, the paper concludes that the presence of a private credit bureau decreases financing constraints and increases the share of bank borrowing in the firm's financing structure.

Love and Mylenko (2003) claim that the presence of a public credit registry does not have a significant impact on the availability of financing. They also point out that firms located in countries with a public registry in addition to the private registry face higher perceived constraints compared to the firms located in countries with only a private registry. This contradicts the results from Djankov *et al.* (2007) who demonstrate that the presence of the public credit bureau has a strong positive impact on credit market development in poorer countries. In addition, Brown *et al.* (2009) investigated the impact of information sharing among banks on credit market performance in the transition countries of Eastern Europe and the former Soviet Union. They construct an information sharing index for each country using the information about the presence and structure of public and private registries. Employing cross-sectional and panel estimations, the study shows that information sharing is associated with improved availability and a lower cost of credit. Particularly, the association is stronger for transition countries with poor creditor protection. The impact of information sharing on credit access is stronger for opaque firms compared to transparent ones. Brown *et al.* (2009) also claim that information sharing can play a substitution role in creditor rights. That is, the impact is present on credit access and cost of credit for firms located in weak creditor protection environments, but not for those where creditor rights are strong. In contrast, Asongu and

Nwachukwu (2018) state that both private and public credit registries enhance the quantity of loans.

With particular attention to the banking market concentration, Fosu (2014) investigates the impact of information sharing on bank lending. Using bank-level data from African countries for the period from 2004 to 2009, Fosu (2014) analyses types of information sharing variables: (i) credit information sharing; and (ii) depth of credit information. The credit information sharing was measured as a dummy variable if a country has either a private or public credit registry. To measure the depth of information sharing the study used the index ranging from 0 to 6, where the higher value indicated the availability of more credit information. The dependent variable – bank lending – was measured as the ratio of loans to assets. In the regression estimations, bank-specific and macro-level control variables are included. Thus, using a two-step system GMM estimation, the article concludes that credit information sharing increases bank lending. The author found a positive and statistically significant result for the interaction term between information sharing and bank concentration. The author concludes that information sharing is a decreasing function of banking market concentration. In other words, in a more concentrated banking environment, the information asymmetries are less of a problem.

There are some studies that have examined the relationship between information sharing and bank risk-taking. Houston *et al.* (2010) investigated the relationship between creditor rights, information sharing, and bank risk-taking by analysing nearly 2400 banks from 69 countries. They found that greater information sharing lowers bank risk, reduces the likelihood of a financial crisis, increases bank profitability, and leads to higher economic growth. They also found that well-established creditor rights stimulate bank risk-taking. The authors suggest that lenders in many states share information about the borrower's financial history and this positively contributes to bank risk-taking behaviour. They argue that greater information sharing decreases bank risk, increases bank profitability, and thus positively contributes to overall economic growth. Based on cross-country analysis for the 1975-2006 period, Büyükkarabacak and Valev (2012) concluded that credit information sharing reduces the likelihood of a banking crisis, particularly in low-income countries. This study shows that the presence of public and private credit registries diminishes the impact of rapid credit growth on the banking crisis. Additionally, Luoto *et al.* (2007) emphasise the credit information system as

an effective tool to mitigate the adverse selection and moral hazard problems in the credit market. The credit information system also has been effective in lowering overall default and interest rates. It was also essential in improving the pool of borrowers in the formal credit market. Furthermore, it also highlights that improved credit institutions and better information sharing enables the banking systems to withstand a crisis shock. Specifically, a well-functioning credit information system minimises the negative impact of a financial crisis on the financial sector (Haselmann, Wachtel, & Sobott, 2016).

There are some other papers that investigate the relationship between information sharing and credit market performance at an individual country level. Specifically, Behr and Sonnekalb (2012) analyse the impact of information sharing on access to credit, cost of credit, and loan performance. The study uses loan-level data from the Albanian commercial banks for the time of January 1, 2005-October 31, 2009. To find the impact of information sharing, they employ a difference-in-difference methodology by treating the introduction of a public credit registry by the Albanian central bank in January 2008 as a natural experiment. Their main conclusion is that information sharing between lenders does not impact access to loans or the cost of credit. However, it improves loan performance. Similarly, Grajzl and Laptieva (2016) investigate the impact of information sharing on the volume of private credit by using bank-level panel data from Ukraine for the 2002-2009 period. By employing fixed effects and dynamic panel methods, the paper fails to find any significant impact of information sharing on the volume of private credit when information sharing takes place through the public credit registry. However, it significantly contributes to the volume of bank lending when information sharing takes place through private credit registries. Similarly, Loaba and Zahonogo (2019) could not find a significant direct impact of information sharing on bank credit and economic growth. However, the authors highlight the existence of a nonlinear relationship between information sharing, bank credit, and economic growth.

Finally, Tsai *et al.* (2011) claim that foreign banks prefer to expand operations in countries with a good credit reporting system. Particularly, banks prefer to expand foreign activities to countries where private credit bureaus are operating with high-quality credit information. This is because, compared to the domestic local banks, foreign-owned banks are more specialised in analysing ‘hard-information’ rather than ‘soft-information’.

2.3 Monetary policy and bank lending channel

2.3.1 Introduction

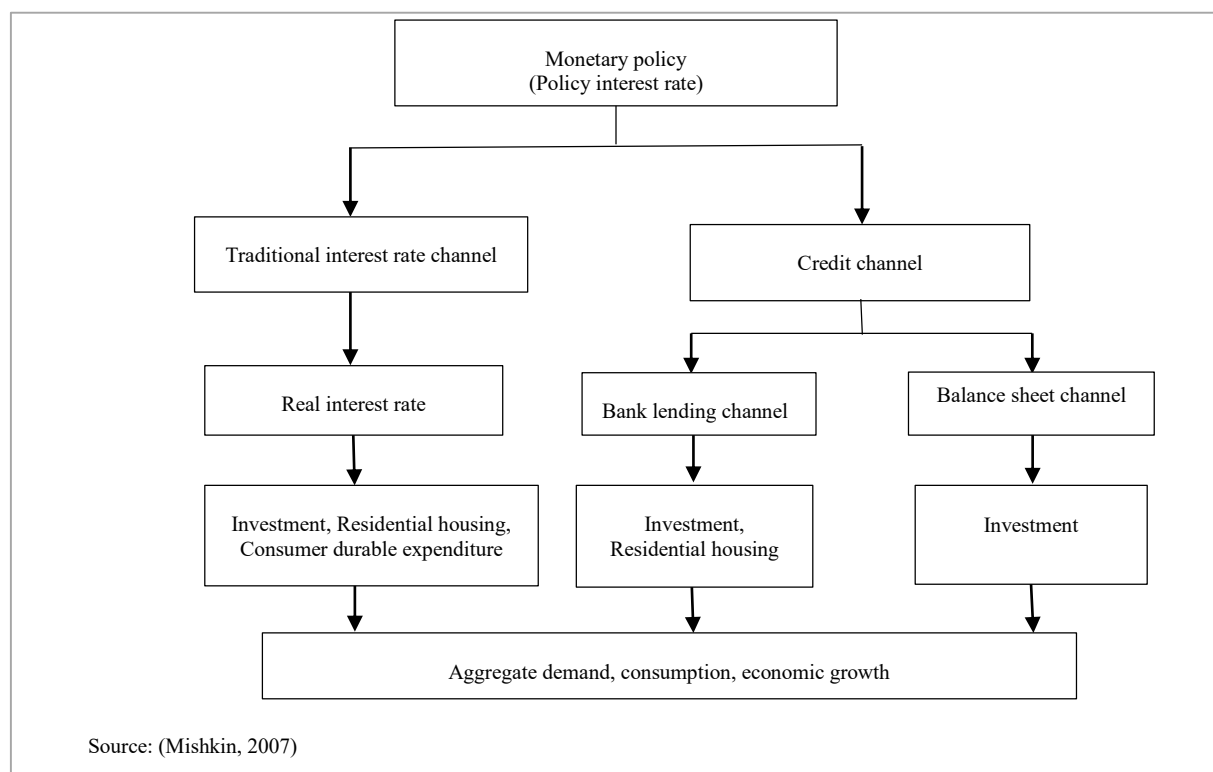
The monetary policy implemented by central banks plays a crucial role in controlling the aggregate loan supply volatility and financial stability in an economy. Specifically, since the 2008-2009 global financial crisis, the re-evaluation of monetary policy efficiency has become an important question as it plays a vital role in providing financial stability in the banking sector. During the post-crisis period, as the short-term interest rates declined to the zero lower bound (ZLB), central banks faced difficulty with implementing effective and efficient monetary policy to prevent any adverse liquidity shock to the financial sector (Salachas et al., 2017). Furthermore, empirical investigation of the relationship between financial development and monetary policy effectiveness found that as the financial sector develops, monetary policy effectiveness declines. In other words, the impact of monetary policy on inflation and output is significantly and negatively correlated with financial sector development (Ma & Lin, 2016). Therefore, the implementation of an effective and efficient monetary policy is becoming a crucial issue to support credit market stability and macroeconomic soundness in countries even with developed financial sectors. The literature for the credit perspective analyses the role of banks in the process of monetary policy transmission according to their characteristics such as size, liquidity, capitalisation, and efficiency. However, the role of the banks in the monetary transmission process according to their ownership type is largely ignored in the related literature. Banking system integration across the world and foreign and domestic private bank participation in host countries increase the role of bank ownership in implementing more effective monetary policy, particularly during a crisis period. Therefore, in this chapter, we will analyse the role of bank ownership in monetary policy transmission.

2.3.2 Theoretical views on the transmission mechanism of monetary policy

As discussed above, credit market liquidity dropped significantly in many countries during the 2008-2009 global financial crisis. This negative shock transmitted to the real sector of the economy through the decreased external finance for firms. Therefore, government authorities in many nations introduced an expansionary monetary policy to support the real sector of the economy through increasing capital market liquidity. However, to prevent a liquidity shortage, implementation of an effective monetary policy is essential. Consequently, monetary authorities

must accurately assess the transmission mechanisms of monetary policy in the economy. This then means they need to understand the transmission mechanisms through which monetary policy can affect the economy. For this reason, we will discuss monetary transmission mechanisms related to the banking sector.

Figure 2.1. Channels of monetary transmission mechanism related to the banking sector



There are three main channels of monetary transmission mechanism through the banking sector: (i) interest rate channel; (ii) bank lending channel; and (iii) balance sheet channel. Figure 2.1 describes in detail how these channels work.

Interest rate channel of monetary policy transmission

The traditional interest rate channel can be characterised by the following schematic:

$$r \downarrow \Rightarrow I \uparrow \Rightarrow Y \uparrow$$

when a central bank runs an expansionary monetary policy, the real interest rate r falls, which in turn the overall investment I in the economy to increase, thereby leading to a higher output Y and economic growth. This transmission process is an interest rate transmission channel, and

when government authorities decide to decrease the central bank policy interest rate, this will, in turn, reduce the real interest rate in the capital market, thereby allowing commercial banks to attract additional financial resources at lower prices to support their active operations. Therefore, reductions in the real interest rate by central banks leads to an increased loan demand and loan supply. In turn, this then leads to higher investment spending and overall economic growth.

The lending channel of the monetary transmission mechanism

The crucial role of banks in financial markets increases the importance of the bank lending channel because they are more specialised to solve problems related to asymmetric information in the credit markets (Mishkin, 2007). The bank lending channel explains the impact of monetary policy on the real economy through its effect on bank assets and liabilities. Specifically, when central bank authorities decide to implement expansionary monetary policy, this will affect bank deposits and bank loans. Schematically, the bank lending channel can be shown as follows:

$$\text{Monetary base} \uparrow \Rightarrow \text{Bank deposits} \uparrow \Rightarrow \text{Bank loans} \uparrow \Rightarrow I \uparrow \Rightarrow Y \uparrow$$

The above scheme shows that expansionary monetary policy leads to a rise in bank deposits and in turn loans, thereby increasing overall investment in the real economy. The bank lending channel also assumes that bank loans are the only source of funds for borrowers and firms in the economy. Considering many businesses are dependent on bank loans to finance their investment projects, the increase in the availability of bank loans will lead to a rise in investment and output.

Balance sheet channel of the monetary transmission mechanism

As in the bank lending channel, Mishkin (2007) emphasise that the presence of financial frictions in credit markets plays a role in the balance sheet channel of the monetary transmission mechanism. Specifically, as the net worth of firms decreases, the adverse selection and moral hazard problems make banks become more reluctant to lend to these companies. This happens because the lower net worth of a firm means less collateral for bank loans which may increase the potential losses for banks. Furthermore, a lower net worth and deteriorations in firms' balance sheet increase the moral hazard problem by encouraging these companies to invest in

more risky projects. This increased moral hazard risks make banks reduce lending, causing a decrease in overall investment and economic growth.

Expansionary monetary policy can affect firms' balance sheet by increasing the stock price of firms. An increased stock price raises the net worth of firms leading to an increase in overall investment and output. Schematically this can be shown as follows:

$$r \downarrow \Rightarrow \text{Stock Price} \uparrow \Rightarrow \text{Firms' net worth} \uparrow \Rightarrow \text{Adverse selection \& Moral hazard} \downarrow \Rightarrow \\ \Rightarrow \text{Lending} \uparrow \Rightarrow \text{Investment} \uparrow \Rightarrow Y \uparrow$$

In contrast, the contractionary monetary policy increases the policy interest rate and thus negatively influences the balance sheet condition of firms. As a result of weakened firms' balance sheets, banks raise the risk premium for firms further increasing the cost of external funding for these businesses (Bernanke & Gertler, 1995; Peek & Rosengren, 1995).

The first formal theoretical model to investigate the existence of a bank lending channel is developed by (Bernanke & Blinder, 1988, 1992). They modify the traditional IS-LM model by including bank loans (in addition to money and bonds). Kashyap and Stein (1995) further extended their model by analysing the effect of monetary policy shock to the bank's balance sheet and lending behaviour. Furthermore, Kishan and Opiela (2000) developed a model which analysed the response of banks with different asset sizes and capitalisation to monetary policy change. We will discuss related theories on monetary policy transmission mechanisms and then move onto considering the empirical evidence.

A simple model of monetary policy and bank lending channel

Kashyap and Stein (1995) develop a two-period model which allows the bank to hold securities in the first period as a buffer stock. The model builds on the simple balance sheet of a bank. Specifically, bank assets consist of two items, illiquid loans, and securities (S) on the asset side of the balance sheet. Due to the illiquid nature of bank loans, these investments cannot be liquidated at period two, and they earn an income return of r . The model also assumes that no new lending opportunities arise during the second period, and therefore, the bank's balance sheet retains exactly (L) amount of loans during this period. Excluding loans, banks can also invest an amount of (S) in securities (such as Treasury bills) during the first period. Such investments in securities usually yield a return which is normalised to zero. Therefore, the interest income return of r on loans is the loan security spread. Further, these securities can be

quickly and costlessly liquidated during the second period. This happens so that banks hold some equilibrium amount of securities at time 1, to prevent an illiquidity problem even when the loan income return $r > 0$.

The liability side of the banks' balance sheet consists of, deposits (M) and non-deposit liabilities (ND). The model assumes that the monetary policy of central banks plays a crucial role in determining the entire amount of deposits in individual banks. Specifically, the increase in interest rates decreases reserves leading to reductions in the deposit. That is, monetary authorities can create a net funding shock to the balance sheet of individual banks when they run a tightened monetary policy during time 1. This is a simple framework of the model which explains how monetary policy transmits to the real economy.

In this framework, once the amount of M_1 is realised at time 1, uniform distribution of M_2 at time 2 takes the following form:

$$M_2 \text{ is uniform on } [\rho M_1 + (1 - \rho)M - \gamma/2, \rho M_1 + (1 - \rho)M + \gamma/2] \quad (2.1)$$

where $\rho M_1 + (1 - \rho)M$ is a mean of M_2 and parameter ρ measures the persistence of monetary shock. Parameter γ measures the variance of these shocks.

Furthermore, after a shock to deposits, i.e., once the amount of M_2 is identified, banks can issue non-deposit liabilities to fund its lending. Therefore, the amount of non-deposit liabilities at period two $ND_1 + ND_2$ is released before and after the shock, respectively. That is, during the period of tight monetary policy, banks can use alternative sources to raise deposit funds. The critical point of the model is that there are increasing marginal costs of finance for (ND). Thus, the costs associated with external funding during the first period are given by $\frac{\alpha_1 ND_1^2}{2}$ and during the next period are provided by $\frac{\alpha_2 ND_2^2}{2}$. Considering that non-deposit liabilities are not covered by deposit insurance, increased issuance of this type of liabilities may signal the balance sheet condition of this particular bank may be poor. Larger banks have more market power compared to the small banks and consequently have better access to the capital markets. This then means that the costs stated above will be higher for small banks, proportionally, in comparison to the large banks.

Once the shock to deposits is captured, and the value of deposits is realised at period two, there will be two possible cases:

1. $ND_1 + M_2 + E_1 > L$, obviously, then there is no need to issue non-deposit external funding (ND) during the second period. In this case, banks, by using its liquid asset buffer (S) can continue to fund its lending.
2. $ND_1 + M_2 + E_1 < L$, then banks face a shortage of funds to finance its loan portfolio. In this case, liquidating all of its securities is not sufficient, and therefore, the bank has to issue non-deposit liabilities (ND_2). By realising the deposit shock as a result of monetary policy during the second period the amount of non-deposit liabilities issued will be the following:

$$ND_2 = \max(0, L - ND_1 - M_2) \quad (2.2)$$

Hence, in the case of a deposit shock, it is essential to estimate the expected cost of external funding at period two to write down the profit function. Since the costs associated with external funding at time 2 are $\frac{\alpha_2 ND_2^2}{2}$, then from the perspective of the first period, the expected costs related to external financing during the second period can be written as follows:

$$E\left(\frac{\alpha_2 ND_2^2}{2}\right) = \alpha_2 (L - ND_1 - \rho M_1 - (1 - \rho)M + \frac{\gamma}{2})^2 / 6 \quad (2.3)$$

We know that the bank's profit is generated from intermediary activity. The bank's profit is the difference between earnings from loans and costs associated with non-deposit issuance at period one and the expected cost of non-deposit issuance at period two. Thus, the profit equation of a bank can be written as follows:

$$\pi = rL - \frac{\alpha_1 ND_1^2}{2} - \alpha_2 (L - ND_1 - \rho M_1 - (1 - \rho)M + \frac{\gamma}{2})^2 / 6 \quad (2.4)$$

The last term in Eq. 2.4 is the expected cost associated with external funding at time 2 Eq. 2.3. Therefore, the lending supply equation can be written as follows:

$$L = \frac{r}{\alpha_1} + \frac{3r}{\alpha_2} + \rho M_1 + (1 - \rho)M - \frac{\gamma}{2} \quad (2.5)$$

The above equation shows that the deposit volume positively influences bank lending. That is, a positive shock to deposits due to expansionary monetary policy leads to increased bank lending. Furthermore, the loan-security spread r also positively affects bank lending. Thus, higher r or lower α_1 and α_2 (closer to zero) encourages banks to increase lending. Additionally, if either α_1 or α_2 are equal to zero and $r > 0$, then it is evident that loan supply will be infinite.

Theory of asset size, capitalisation, and bank lending channel

Kishan and Opiela (2000) develop a model (modified from Peek (1995)) which analyses the impact of monetary policy on bank lending, according to the asset size and capitalisation of the banks. Specifically, they investigate how banks with differing asset sizes and capital leverage ratios respond to monetary policy. This model also utilises an oversimplified bank balance sheet. That is, the model assumes three items on the asset side of the balance sheet: required reserves (R), securities (S), and loans (L); and three items on the liability side of the balance sheet: demand deposits (D), large time deposits (TD), and capital (K). Therefore, the bank balance sheet equation can be written as follows:

$$R + S + LN = D + TD + K \quad (2.6)$$

The market interest rate (such as federal funds rate) denoted by $\mathbf{r}$ and demand for deposits are inversely related. Hence, the role market interest rates play is crucial in the dynamic changes in the volume of demand deposits in the bank balance sheet. For example, a rise in $\mathbf{r}$ increases the opportunity cost of holding demand deposits by encouraging depositors to shift their funds into higher interest rate paying assets. However, the market power of banks in large time deposits (TD) markets enables them to attract funds, by increasing their interest rate (r_{TD}) for (TD) above the market rate ($\mathbf{r}_{TD}$). Therefore,

$$D = a_0 + (a_1)\mathbf{r} \quad (2.7)$$

$$TD = b_0 + (b_1)(r_{TD} - \mathbf{r}_{TD}) \quad (2.8)$$

As reserves, banks hold some portion (α) of demand deposits (D). However, from the profit maximisation perspective, it is assumed that banks hold no excess reserves. Thus,

$$R = \alpha D \quad (2.9)$$

To prevent the illiquidity problem, banks also invest some proportion of demand deposits (D) in liquid securities (S). Hence,

$$S = c_0 + (c_1)D - R \quad (2.10)$$

$$S = c_0 + (c_1)D - R \quad (2.11)$$

In the case of loans, the imperfectly competitive market for bank loans allows the bank to increase (or decrease) the loan volume by charging lower (or higher) compared to the mean market interest rate $\mathbf{r}_L$. So,

$$L = d_0 - (d_1)(r_L - \mathbf{r}_L) \quad (2.12)$$

The uniqueness of bank loans and dependence of firms to bank loans (especially companies with limited access to stock market capitalisation) as a source of financing likely make d_1 more sensitive to changes in the bank's loan interest rates.

The mean market interest rate for large time deposits, securities and loans are assumed to be directly related to the market interest rate $\mathbf{r}$ with fixed spread and takes the following forms:

$$\mathbf{r}_{TD} = e_0 + \phi \mathbf{r} \quad (2.13)$$

$$\mathbf{r}_S = f_0 + \phi \mathbf{r} \quad (2.14)$$

$$\mathbf{r}_L = g_0 + \phi \mathbf{r} \quad (2.15)$$

Thus, the profit equation of banks can be written as follows:

$$\pi = (r_L - \Phi)L + r_S S - r_D D - r_{TD} TD \quad (2.16)$$

By eliminating R, D, L, S and r_D and r_L , the above equation can be maximised with respect to large time deposits (TD). The first-order conditions can be used to solve for (TD). Similarly, by using the same procedure, it can be solved for L and S . Additionally, the model predicts that the lending behaviour of the small and undercapitalised bank should be more sensitive than for large and well-capitalised banks. In other words, policy shocks should have a different impact on weak and strong banks. By taking derivatives of L, S and TD with respect to $\mathbf{r}$, the model derives the following testable hypotheses,

$$\frac{\partial L}{\partial \mathbf{r}} = -\frac{a_1 d_1 (1 - c_1)}{b_1 + d_1} < 0 \quad (2.17)$$

$$\frac{\partial TD}{\partial \mathbf{r}} = -\frac{a_1 b_1 (1 - c_1)}{b_1 + d_1} > 0 \text{ assuming } c_1 < 1 \quad (2.18)$$

$$\frac{\partial S}{\partial \mathbf{r}} = -a_1 (c_1 - a) \leq 0 \quad (2.19)$$

From Eq. 2.18, assuming $c_1 < 1$ it can be seen that a rise in $\mathbf{r}$ leads to an increase in TD . Specifically, this increase can be explained as follows: a rise in market interest rate increases the opportunity cost of holding demand deposits by encouraging depositors to shift their funds to alternative assets with a higher return. Therefore, banks need to attract additional resources in the form of large time deposits. On the other hand, in response to a contractionary monetary policy, bank loans fall (Eq. 2.17). The result for S in response to a change in $\mathbf{r}$ is indeterminate. That is, in periods of contractionary monetary policy well-capitalised banks can liquidate some proportion of securities to fund bank lending activity. This means that for Eq. 2.19, banks with high capital and a large securities portfolio are likely to be negative.

The model also assumes the importance of bank size and capital adequacy in interest rate sensitivity of large time deposits and loans (b_1) and (d_1). This means that the market power of larger banks and better capitalisation will enable banks to raise enough funds by attracting large time deposits (TD). Furthermore, to derive the net effect of asset size and capitalisation to a policy change, the model assumes that large banks usually have lending activity with large firms. By considering the access of large banks to the capital market to attract external finance due to large market power of big firms, the model hypothesises more elasticity of loan demand of large companies to loan interest rate compared to small firms. Thus,

$$b_1 = \beta(A, K) \quad \text{where} \quad \beta_1, \beta_2 > 0 \quad (2.20)$$

$$d_1 = \delta(A), \quad \text{where} \quad \delta_1 > 0 \quad (2.21)$$

So, substituting Eq. 2.20 and Eq. 2.21 into Eq. 2.17 and Eq. 2.18 and differentiating Eq. 2.17 with respect to asset and capital, we obtain:

$$\frac{\partial(\frac{\partial L}{\partial \mathbf{r}})}{\partial A} = \frac{\partial(\frac{\partial TD}{\partial \mathbf{r}})}{\partial A} = \frac{a_1(1-c_1)(b_1\delta_1-d_1\beta_1)}{(b_1+d_1)^2} \leq 0 \quad (2.22)$$

$$\frac{\partial(\frac{\partial L}{\partial \mathbf{r}})}{\partial K} = \frac{\partial(\frac{\partial TD}{\partial \mathbf{r}})}{\partial K} = \frac{a_1d_1\beta_2(1-c_1)}{(b_1+d_1)^2} > 0 \quad (2.23)$$

The Eq. 2.22 shows that the impact of asset size on the sensitivity of L and TD to policy changes is indeterminate. As discussed above, to offset the negative shock of contractionary monetary policy, large banks with better capitalisation can easily attract external finance by issuing large time deposits. This external capital they can now utilize will allow them to continue lending activity. However, because of a rise $\mathbf{r}$, they may also lose loans to substitute means of financing. Therefore, the net impact of asset size is indeterminate.

However, in response to monetary policy, the net impact of bank capital on lending is positive. That is, as banks become more capitalised, the amount of loans it provides become less sensitive relative to policy change. In contrast, the lending response of banks with inadequate capital will be more responsive to monetary policy change.

Andries and Billon (2010) develop a model of the effect of bank ownership structure and deposit-guarantee schemes on monetary policy transmission. The model predicts that state-owned banks are less responsive to monetary policy shocks compared to private-sector banks with respect to credit supply. The authors state that as state participation in bank ownership increases, the probability that depositors do not get back their funds will decrease. This would

then allow state banks to attract additional deposits that in turn, help them to counteract the negative shocks of a monetary policy shift. Consequently, the study claims that a country with a greater share of government-owned banks faces a less effective monetary policy.

2.3.3 Empirical evidence on the monetary policy transmission mechanism

Matousek and Sarantis (2009) analyse the bank lending channel and the monetary transmission mechanism in CEE countries using bank-level data from 1994 to 2003. Particularly, the study empirically investigates how the lending behaviour of banks with differing sizes, capital strength, liquidity, and ownership structure respond to monetary policy changes. By employing dynamic panel estimation techniques, the study confirms the existence of a bank lending channel in all CEE countries. However, the strength of the transmission channel varies across these countries. Overall, the authors conclude that bank size and liquidity play an essential role in identifying the response of the respective banks to monetary policy changes. On the contrary, Altunbaş *et al.* (2002) examined the bank lending channel in Europe classifying banks according to their asset size and capital strength. By using bank balance sheet data from 1991 to 1999, they conclude that undercapitalised banks with any size tend to be more sensitive to monetary policy changes.

Favero *et al.* (1999) collected balance sheet data for individual banks to investigate the monetary tightening in France, Germany, Italy, and Spain. Specifically, they study how banks respond to monetary tightening in these countries. Based on empirical estimations, the paper finds no evidence of a lending channel in the response of bank loans to monetary policy. They explain it as a difference in bank behaviour across these countries. Notably, small banks benefit from their excess liquidity in generating deposits and loans as a response to monetary tightening in Germany, Italy, and France. In contrast, large banks in Germany use the strength of their balance sheet to provide a stable loan supply to decrease the negative shock from monetary policy restriction. Similarly, Ehrmann *et al.* (2001) using microdata on banks examined monetary policy transmission in the euro area. Using two different types of datasets-Bankscope and the Eurosystem-the study concludes that the liquidity level of a bank plays an important role in banks' response to monetary policy actions. Specifically, compared to liquid banks, less liquid banks react strongly to monetary policy change. However, the results are not constant across countries. This could mean that size or capitalisation are not balance sheet characteristics

of banks in adjusting their lending behaviour in response to changes in monetary policy interest rates. This result contradicts the findings for the US, where compared to other types of banks, low capitalised and small banks responded strongly to monetary policy change.

Furthermore, Brissimis and Delis (2009) investigate the existence of bank lending channels using bank-level panel data from six Organisation for Economic Co-operation and Development (OECD) countries by employing the theoretical framework of Bernanke and Blinder. Specifically, the paper attempted to identify bank loan supply function and to assess the role of balance sheet characteristics on bank lending ability. The paper concludes that among the countries, only Japan and Greece have significant bank lending channels. For France, they found a weak balance sheet channel, whereas for Germany they found a clear absence of the bank lending channel. They conclude that the increase in market-based finance decreased the level of bank lending channels in Germany.

Some other papers empirically investigate the impact of competition in the banking sector on the bank lending channel of monetary policy transmission. Theoretically, increased competition in the banking sector affects monetary policy efficiency through the bank lending channel. Specifically, if the increased market share of large banks creates a more competitive environment in the banking sector, then this will reduce the effectiveness of the monetary policy transmission mechanism. That is, competitive large banks will be able to attract additional financial resources (excluding deposits, banks CDs and inter-bank loans) to support their lending policy in a period of monetary policy tightening. Increased competition in the banking sector can reduce the effectiveness of the bank lending channel if increased competition causes a decrease in informational asymmetries about bank borrowers' creditworthiness. That is, by benefiting from the long-term bank-borrower relationship, banks accumulate information about the balance sheet condition of their customers. In turn, this makes it costly for bank customers to switch from their incumbent bank (banks that bank customers have a long-term relationship with) to other banks. However, higher competition in the banking sector caused by an increased market share being gained by the larger banks should decrease the switching costs, and therefore, the effectiveness of monetary policy should diminish. This is partly due to the access of large banks to other sources of financial resources. Finally, on the other hand, increased competition in the banking market can increase monetary policy effectiveness through its effect on the sensitivity of bank loan rates to monetary policy change. In other words, increased

competition can improve monetary policy strength if the monetary shock on deposit interest rates directly transmits to the loan interest rates. Olivero *et al.* (2011a) empirically investigate the impact of competition in the banking market on monetary policy transmission through the bank lending channel. Using bank-level panel data for 20 Asian and Latin American countries for the period from 1996 to 2006 they employ two-step estimation procedure to analyse the relationship between competition and bank lending channel. Specifically, in the first step, they estimate the degree of competition in the banking market in these countries using the methodology proposed by (Panzar & Rosse, 1987). In the second step, to estimate bank loan growth equation they include the measure of banking competition as an explanatory variable. By applying fixed effects and GMM estimation methods, the paper concludes that the degree of competition in the banking market and monetary policy efficiency are inversely related to each other. Particularly, the results are consistent with small size, low liquidity, and less capitalised banks. They also characterise banking markets in Asia and Latin America as monopolistically competitive, and that overall, the banking market competition in Latin America is higher compared to the Asian economies. Furthermore, Gunji *et al.* (2009) using cross-country data empirically examine the impact of banking market competition on monetary policy transmission. Firstly, by using aggregate data, they analyse the correlation between two indices: the first measure is the cumulative response function as an index of the impact of monetary policy shock; the second one is Panzar and Rosse's H-statistic as an index to measure the banking market competition. The study could not find any significant correlation between these two indices. Secondly, they use disaggregated data to empirically analyse the bank lending on the interaction of monetary policy shock and banking market competition. They find significant coefficients for interaction and conclude that the degree of banking market competition influences monetary policy. Similarly, Fungáčová *et al.* (2014) investigate the impact of bank competition on the bank lending channel in 12 euro area countries for the period 2002-2010. The study finds that less market power—a higher level of bank sector competition—improves the efficiency of the bank lending channel of monetary policy transmission. The authors explain that if competition in the banking market is high the access to alternative financial resources will decrease, and therefore, banks with reduced access to the capital market will be more responsive to changes in monetary policy.

On the other hand, Adams and Amel (2005) empirically analysed how a concentrated banking market affected monetary policy efficiency using data for US states from 1996 to 2002. The study finds a weak bank lending channel in rural areas where banking markets are more concentrated compared to the urban areas where banking markets are less concentrated. Additionally, Olivero *et al.* (2011b) study the impact of increased consolidation on monetary policy efficiency in Asian and Latin American countries. By using data for 936 commercial banks from 1996 to 2006 for their empirical investigation, they conclude that an increase in banking sector consolidation reduces the effectiveness of the bank lending channel of monetary policy transmission. According to Olivero *et al.* (2011b), recent consolidations in the banking sectors increased the market share of large banks, and consequently, these large banks are less responsive to monetary policy changes.

The recent global financial crisis created a liquidity shock to the credit market in many countries. To counter this, central banks in many countries implemented an expansionary monetary policy to support financial markets. However, the efficiency and effectiveness of monetary transmission mechanisms declined following the financial crisis. This, in turn, increased the interest in literature to re-evaluate the monetary policy efficiency during and post-crisis period. Gambacorta *et al.* (2014) investigated pass-through of monetary policy to bank loan rates to non-financial firms in Italy, Spain, UK, and US pre- and post-financial crisis of 2007. By employing cointegrating models to determine a long-run relationship between monetary policy interest rate and bank lending rate, the study concludes that implemented monetary policy in these advanced countries slightly reduced bank lending rates to non-financial firms than in the past. The authors also emphasise a steady increase in the difference between the policy rate and bank lending rate since September 2008, and they explain this as an increase in a higher premium for risk and to counter the worsening of banks' balance sheet conditions that were observed. Furthermore, Salachas *et al.* (2017) examine the efficiency of bank lending channels pre- and post-2007 financial crisis periods in advanced economies. The paper used data covering from 2001 to 2013 for the top eighty commercial banks from these countries. To construct a monetary policy instrument, they apply conventional and unconventional policy measures. The short-term central bank rate is used to measure traditional monetary policy, whereas the total asset purchase by central banks is used to measure unconventional monetary policy. For the pre-crisis period, the study found the effective operation of the bank lending

channel in response to central bank monetary policy. In addition, the central bank short-term interest rates influenced bank lending rates positively and significantly. However, for the post-crisis period, they found distorted results for this traditional mechanism. Specifically, the impact of short-term interest rates was insignificant on bank capitalisation and size. Compared to conventional monetary policy, they found a statistically significant result for the impact of unconventional monetary measures on bank behaviour. Therefore, the authors emphasise the efficiency of unconventional monetary policy measures in stimulating credit growth during the post-crisis period.

Some other papers empirically investigated the efficiency of the monetary transmission mechanism in individual country cases. Mainly, most of these studies investigated the response of banks to monetary shocks and cyclical business behaviour. Kashyap and Stein (2000) examine the monetary transmission mechanism using quarterly data from 1976 to 1993 for US commercial banks. To measure monetary policy, they use three different methodologies. First, following Boschen and Mills (1995)'s 'narrative approach,' they estimate the monetary policy index. Specifically, according to this approach each month, the monetary policy rate of the Federal Reserve can be classified as the following categories: "strongly expansionary", "mildly expansionary", "neutral", "mildly contractionary", and "strongly contractionary." Kashyap and Stein (2000) coded these five categories of monetary policy as 2, 1, 0, -1, and -2, respectively. Second, they use as a second monetary policy measure the federal fund's rate. Finally, as a third measure of monetary policy stance, they use the methodology developed by Bernanke and Mihov (1998). This method is used to measure the monetary policy stance in two ways: for the high frequency of monetary policy shock and an overall indicator of monetary policy. The paper finds that banks with less liquid balance sheets are influenced strongly by monetary policy. Furthermore, the authors argue that smaller banks are more affected by changes in monetary policy. Additionally, Gambacorta (2005) analyses the magnitude of any difference in the effectiveness of the bank lending channel in Italy. Specifically, the study investigates how the effectiveness of the bank lending channel can vary according to the bank's access to non-deposit funding. The paper uses quarterly data from 1986 to 1998 for Italian banks. By employing a GMM estimator, the paper concludes that heterogeneity in the effectiveness of the bank lending channel of monetary policy for different banks exists in the Italian case. Firstly, following the contractionary monetary policy, bank deposits fall and lending reduces. Secondly, the negative

shock of monetary policy tightening on deposits is significant for less capitalised banks which have difficulty in attracting non-deposit financial sources. This then significantly influenced the lending policy of less capitalised banks. However, the paper fails to find any significant results for the role of a banks size. Compared to the results for the US, small banks in Italy are not significantly affected by monetary tightening than large banks.

Furthermore, Morsink and Bayoumi (2001) use vector autoregressions (VAR) to examine the impact of monetary policy on the real economy. They use the overnight call rate of the Bank of Japan to measure the monetary policy stance. By analysing seasonally adjusted quarterly time series data from 1980 to 1998, they conclude that banks played a dominant role in the monetary policy transmission process. Specifically, banks were an independent source of monetary policy shock on real economic activity. Similarly, Aleem (2010) employs the same VARs methodology to investigate how unanticipated monetary policy is tightening the effect on the real sector, specifically on GDP, prices and overnight call money rate. By using a VAR model in levels, the paper uses quarterly seasonally adjusted data from 1996 to 2007. Similar to Morsink and Bayoumi (2001), the study finds that banks play an essential role in the monetary transmission process, and the lending rate initially increases as a response to discretionary monetary policy in India. Moreover, Disyatat and Vongsinsirikul (2003) test the interest rate pass-through in Thailand. The paper finds a significant role for traditional interest rate channels and bank lending channels compared to asset price and exchange rate channels.

The Vector Error Correction Model (VECM) employed by de Mello and Pisu (2010) to test the bank lending channel in Brazil used aggregate monthly data for the 1995-2008 period. Specifically, the paper investigated the following three central questions: Do Brazilian banks play an essential role in monetary policy transmission? Do the credit dynamics collected through regular monitoring of credit aggregates provide any useful information about the future inflation path? What is the role of monetary policy in re-establishing short-term loan supply and demand disequilibrium? Based on the VECM estimation results, the authors conclude that the low level of credit-to-GDP ratio does not prevent policy transmission through the bank lending channel. They also emphasise the credit aggregates as a poor indicator of inflation. However, the study finds that monetary policy, through its effect on non-deposit financial sources restores short-term disequilibria in the loan supply market.

Huang (2003), by analysing balance sheet data from 1975 to 1999 for UK listed companies, reports that contractionary monetary policy reduces the volume of credit provided to the firm by the banks. Furthermore, by confirming the existence of bank lending channels, the study states that this channel more significantly affects bank-dependent firms, especially during severe monetary shock periods. Kakes and Sturm (2002) study the effect of monetary policy on bank lending in Germany by focusing on different banking groups. They conclude that after tight monetary policy, compared to the larger banks' lending, the relatively small German banks lending declined to a greater extent. Loupiaz *et al.* (2001) confirmed the existence of a bank lending channel in France by using quarterly data for 312 banks from 1993 to 2000. Based on estimation results, the authors argue that illiquid banks are more sensitive to contractionary monetary policy compared to liquid banks. However, the study could not find any consistent evidence regarding any possible significant impacts of bank characteristics such as size and capitalisation on bank lending.

As in cross-country case, some other papers empirically investigate the impact of competition in the banking sector on the bank lending channel of monetary policy transmission. Yang and Shao (2016) examine the impact of competition on the bank lending channel of the monetary policy transmission mechanism in China. Specifically, they test how heterogeneous bank types in a competitive environment respond to monetary policy stance. By empirically analysing bank-level data for 2003-2014, the study concludes that as competition increases in the banking sector, the effectiveness of the bank lending channels of monetary policy decreases. Particularly, this influence is significant for city-commercial banks, that are liquid and well-capitalised banks.

2.3.5 Empirical evidence on bank ownership and monetary policy transmission

As discussed above, monetary policy plays an important role in stabilising aggregate loan supply volatility. In previous sub-chapters, we discussed empirical evidence on monetary policy transmission in cross-country and individual country cases. These empirical analyses mostly investigated how bank size, liquidity, capitalisation, and profitability play a role in the monetary transmission process. Below we will discuss how banks with different ownership types respond to monetary policy change. There is a limited number of empirical studies that investigate the impact of bank ownership on the lending channel of monetary policy transmission.

Jeon and Wu (2014) investigate the role of foreign-owned banks in the monetary policy transmission process in Asian emerging countries from the 2000 to 2009 period with attention to the 2008-2009 global financial crisis. They use bank-level data and macroeconomic data (such as GDP growth, inflation, interest rate) to construct unbalanced panel dataset. The data is collected for banks from Hong Kong SAR, South Korea, Singapore, Malaysia, Thailand, Indonesia, and Philippine. The ownership of foreign banks is categorised if more than 50% of a bank's capital is owned by a foreign banks, firms, and financial institutions. The paper uses fixed effects estimators including the year and bank-specific fixed effects. To investigate the role of foreign banks in the monetary policy transmission mechanism, the study uses a 3-way interaction term. Specifically, the monetary policy interest rate is multiplied by a foreign bank and crisis dummy variables. Based on empirical results, the paper fails to find any significant difference between the lending behaviour of foreign-owned and domestic private banks to changes in monetary policy stance during the non-crisis period. However, authors confirm that compared to domestic banks, foreign banks are less sensitive to changes in monetary policy in adjusting their loan growth rates during the crisis period. Therefore, the authors conclude that foreign banks played a buffering or even hampering role in the effectiveness of the monetary policy transmission process in Asian countries during the recent crisis period. Similarly, Wu *et al.* (2011) investigated the bank lending channel empirically by applying pooled OLS, system GMM, panel VAR techniques in Asia, Latin America, and CEE countries for the period 1996-2003. Based on the results, the paper confirms the existence of a lending channel of the monetary transmission mechanism in these countries. They also conclude that domestic and foreign banks respond differently to monetary policy changes. Specifically, they state that foreign banks are less responsive to changes in monetary policy compared to domestic banks in host countries. Therefore, the study concludes that increased participation of foreign banks in these countries decreased the strength of the monetary policy transmission mechanism. Importantly, the authors argue that the sensitivity of foreign banks to monetary policy is independent of their size, capitalisation, liquidity, credit riskiness and factors from the demand side.

Denderski and Paczos (2018) conclude that only domestic banks adjust their loans to any changes in the monetary policy interest rate. They support this point as deposits in foreign banks are mostly supply-side driven and hence foreign banks do not react to monetary policy.

Whereas, the bank lending channel is only active through domestic banks. In other words, authors state that parent bank and its country characteristics are irrelevant to foreign branch's lending behaviour. On the other hand, Arena *et al.* (2006), by collecting data for 1,565 banks from 20 emerging economies for the period 1989-2001, compare the response of volume and rates of loans of foreign and domestic banks to the monetary policy. Using the differences in bank ownership as a proxy for financial constraints for banks, the study concludes that the loan growth of banks with different ownership types in response to monetary changes is roughly similar. The authors state that difference is related only to the behaviour of interest rates. In other words, lending and deposit interest rates of foreign banks tend to be less sensitive to changes in monetary policy in host country compared to the domestic banks. Macit (2012) uses bank-level quarterly data between 2006 and 2010 from Turkey empirically analysed how private banks, foreign banks, and public banks respond differently to monetary policy stance by looking at the growth rate of their loan sizes. The study states that the response of banks to the changes in monetary policy differs according to their ownership type. Specifically, foreign banks react aggressively to the changes in monetary policy instruments, while public bank lending rates show the smallest reaction to monetary policy. On the other hand, Shareef and Prabheesh (2020) could not find any significant role of domestic monetary policy in determining the foreign bank's lending in India.

On the contrary, Temesvary (2018) examined the response of all foreign banks located in the US to monetary policy changes in their parents' home country. Using bank-level data for the period 1997-2014, the study found strong evidence that compared to foreign banks with more funding access, foreign banks in the US with limited access to liquidity reduced their lending as a response to tightened monetary policy in their home country. Similarly, Temesvary *et al.* (2018) found that monetary policy changes in the US impact US banks' cross-border lending in a number of foreign countries.

Using bank-level data for 58 Indian banks for the 2000-2007 period, Bhaumik *et al.* (2011) examined the response of banks with different ownership types to monetary policy change in India. Specifically, the study analysed the role of bank ownership during easy and tight monetary policy regimes. Based on regression results, the study finds a considerable difference in the reaction of different banks to monetary policy. Particularly, the authors emphasise that state-owned banks, old private banks, and foreign banks cut back their lending

during tight monetary policy periods. The response of foreign-owned banks was much sharper compared to other types of banks. The results for new domestic private banks were statistically insignificant. In contrast to the tight monetary period, during easy monetary periods, old private banks increased their lending in response to a decrease in the monetary interest rate. However, authors fail to find any significant results for other types of banks for an easy monetary period. On the other hand, Juurikkala *et al.* (2011) investigate how banks with different ownership type respond to the monetary policy changes and play a role in the bank lending channel in Russia. They hypothesise that state- and foreign-owned banks have better access to alternative sources of funding via their owners. Therefore, they expect that domestic private banks would react the most to the changes in the monetary policy interest rate. Contrary to their expectation, the authors fail to find any evidence on the role of ownership in the bank lending channel. However, using the data for 1995-2003 and applying GLS (fixed and random) and GMM estimators, de Souza (2006) found the existence of a bank lending channel in Russia. The results were stronger when the state-owned banks are excluded from the sample.

On the other hand, Fungáčová *et al.* (2016) investigate the role of bank ownership on the process of the impact reserve requirements have on monetary policy transmission through the bank lending channel in China. They found that a tightening in reserve requirements adversely impacted loan growth. Secondly, they also confirm that the influence of the changes in reserve requirements on bank loan growth rates differs across different types of banks. The impact also differs according to the capitalisation and size of the banks. Similarly, Becker *et al.* (2017) examine how (i) reserve requirements impact branch credit supply conditional on parent banks' reliance on demand deposit; and (ii) parent banks' and branches' funding and ownership structure affect the pass-through of macroprudential policies to credit supply. Using the bank-level data for the period 2008-2014 from Brazil, the authors indicate that reserve-requirements for demand deposits imposed on parent banks transferred to branch banks' lending behaviour. Furthermore, they also claim that ownership and funding structure of the banks contribute to the extent of the identified transmission channel. In addition, they show that the lending channel is stronger for bank branches that need internal capital markets and those bank branches that belong to state-owned banks.

There are some other empirical papers that investigated the role of bank ownership in interest rate pass-through. For instance, Gopalan and Rajan (2017) examine interest rate pass-

through in 57 emerging markets and developing economies (EMDEs) for the period 1995-2009. According to the results, compared to limited foreign bank participation, a higher degree of foreign bank presence tends to enhance interest rate pass-through. In other words, the authors fail to find any significant role for foreign banks in the interest rate pass-through process in countries with relatively low levels of foreign bank participation. On the other hand, Kassim and Mannap (2017) investigate the impact of monetary policy interest rate changes on the domestic and foreign banks' lending behaviour. The study employed the impulse response functions and variance decomposition analysis based on VAR models for Malaysian bank-level data from January 1997 to December 2006. The authors find that domestic and foreign banks' responses to changes in interest rate are different. Specifically, compared to the foreign-owned bank's domestic banks are more sensitive to interest rate changes in their lending behaviour. In addition, the authors also showed that foreign-owned banks' balance sheet items were stable despite the monetary policy shocks. In other words, Kassim and Mannap (2017) state that foreign-owned banks have been supportive of the local economy by resuming their lending rates despite tight monetary policy conditions.

From the above discussions, it can be concluded that the related literature in the bank lending channel largely ignores the role of the ownership type of banks in the monetary transmission mechanism, especially for the recent global financial crisis period. Hence, this study aims to investigate how banks with different ownership types respond to monetary policy in countries with various financial structures.

CHAPTER 3: DATA AND METHODOLOGY

3.1 Introduction

This study investigates how bank ownership and lending behaviour plays a role in credit market performance. For this purpose, we first empirically investigate the lending behaviour of banks with different ownership types during normal and crisis periods. Second, we study the role of information sharing and creditor rights protection on bank lending behaviour. Specifically, we test whether banks with different ownership types respond differently to changes in information sharing facilities and creditor rights protection and thus contribute to credit market stability during normal and crisis periods. Finally, we also examine the lending response of banks with different ownership types to monetary policy changes. Hence, we test whether domestic and foreign banks play a significant role in the efficiency of monetary policy and their contribution to credit market performance. Below, we briefly describe the sampling techniques, data collection, and sources. Next, we move on to discuss issues related to variable measurement and conduct preliminary data analysis. The final section reports and discusses descriptive statistics for the data set.

3.2 Sample data and sources

We use bank-level data as well as macro-level data. Specifically, we construct a panel data set by merging bank-level data with macro data according to bank-country classifications. Most of the existing empirical research used data for countries which are located in particular world regions, such as East Europe, Latin America, or the Asian-Pacific countries. Other studies considered data for countries according to their income group⁸.

⁸ In the literature review chapter, we review existing empirical evidence by diving to individual and cross-country cases. Discussions related to the cross-country empirical studies provide evidence that most of these papers used groups of countries in a particular economic area or income group classification.

Table 3.1 Summary statistics of banks, observations and bank sizes by country

Country	Banks	Obs.	Asset size	Country	Banks	Obs.	Asset size	Country	Banks	Obs.	Asset size
<i>Albania</i>	11	65	43506	<i>India</i>	61	466	11541500	<i>Poland</i>	58	273	1758129
<i>Argentina</i>	55	393	947364	<i>Indonesia</i>	72	448	2258744	<i>Portugal</i>	24	136	3515529
<i>Australia</i>	24	123	18209100	<i>Ireland</i>	11	74	5874975	<i>Romania</i>	21	135	565093
<i>Austria</i>	55	378	5159313	<i>Israel</i>	10	87	2686665	<i>Serbia</i>	27	195	180492
<i>Belgium</i>	22	150	8099815	<i>Italy</i>	81	477	14853550	<i>Singapore</i>	11	75	4888008
<i>Bosnia and Herzegovina</i>	22	152	78264	<i>Japan</i>	139	1076	38810150	<i>Slovakia</i>	12	77	353634
<i>Brazil</i>	109	622	8700804	<i>Jordan</i>	11	92	848422	<i>Slovenia</i>	11	91	441144
<i>Bulgaria</i>	20	109	223964	<i>Kenya</i>	29	205	135639	<i>South Africa</i>	14	96	2792626
<i>Canada</i>	44	150	11422100	<i>Latvia</i>	18	125	27264	<i>South Korea</i>	16	46	4589613
<i>Chile</i>	23	95	1316152	<i>Lithuania</i>	9	71	246724	<i>Spain</i>	40	207	13893200
<i>Croatia</i>	29	222	592407	<i>Macedonia</i>	14	86	34639	<i>Sri-Lanka</i>	25	49	80832
<i>Czech Republic</i>	17	121	1547399	<i>Malaysia</i>	32	62	1117318	<i>Sweden</i>	26	135	5530836
<i>Denmark</i>	36	268	9728988	<i>Mexico</i>	40	244	3128824	<i>Switzerland</i>	118	856	1835435
<i>Ecuador</i>	17	121	159604	<i>Moldova</i>	13	90	23816	<i>Taiwan</i>	37	71	1982283
<i>Egypt</i>	22	179	1214104	<i>Montenegro</i>	8	58	23135	<i>Thailand</i>	23	162	3063139
<i>Estonia</i>	8	42	265681	<i>Netherlands</i>	23	149	4780543	<i>Turkey</i>	26	184	3937360
<i>Finland</i>	23	75	3680793	<i>New Zealand</i>	14	74	2258581	<i>UK</i>	110	645	22211880
<i>France</i>	106	805	31594800	<i>Nigeria</i>	18	50	397283	<i>Uruguay</i>	17	113	194504
<i>Germany</i>	120	794	13394200	<i>Norway</i>	16	78	2939049	<i>Venezuela</i>	29	169	1118620
<i>Greece</i>	8	69	3585821	<i>Pakistan</i>	21	49	134624	<i>Zimbabwe</i>	11	32	10972
<i>Hong-Kong</i>	27	212	11372300	<i>Peru</i>	15	110	494883	Total	2170	13394	
<i>Hungary</i>	23	145	1077545	<i>Philippines</i>	38	186	998441				

We are using bank-level data for only commercial banks for the 2004-2013 period because firstly, the data covers the post-crisis period which allows us to compare bank lending behaviour during normal times and crisis periods. Secondly, during recent decades, foreign bank entry significantly changed the banking sector structure across all countries. For example, in 2004 foreign banks as part of the total number of banks was about 34% in the full sample and then continued increasing until 2009 whereby reaching 40%. Similarly, it was about 38% in emerging economies whereas in 2009 the share of foreign banks reached 46% in these countries. Thirdly, Figure 3.2 below shows that bank lending rates (all foreign-owned, domestic private, and government-owned) increased continuously until the start of the global financial crisis and sharply declined afterwards. Related literature confirms that during the fourth quarter of 2008 new lending to large borrowers declined about 47% compared to the previous quarter (Ivashina & Scharfstein, 2010). Finally, many countries across the globe implemented expansionary monetary policy during the recent global financial crisis. However, the effectiveness of these monetary policies was different according to the banking sector structures of countries. Consequently, considering the above reasons, the current research decided to use data from 2004 to 2013 which serves usefully to provide answers for the research questions.

Our sample covers data for banks from Europe, East Asia and Pacific, South Asia, the Middle East, and Africa. We use only commercial banks in our empirical investigations excluding savings banks, investment banks, mutual funds, pension funds, and other microfinance institutions. We split our sample into sub-groups of emerging and developed economies⁹ to achieve a greater degree of homogeneity in our panel results which allows us to also investigate for the possibility of differences in the lending behaviour of banks given different levels of economic development. Countries are divided into sub-groups based on the World Bank's income group classification.

Table 3.1 presents the full list of countries, the number of banks, observations, and asset sizes of total banks per country. In our empirical analysis, we include 64 countries, 2170 banks, and 13394 observations. The number of banks and bank observations in emerging countries is 1098 and 6460 respectively, whereas in developed countries they are 1072 banks and 6934 bank observations. It can be seen from the Table 3.1 that the number of banks and

⁹ List of emerging and developed countries is provided in Appendix 1.

observations in developed countries is higher compared to developing countries. The total asset size of banks in developed countries is larger than those banks located in emerging countries.

Table 3.2 Description of variables and sources

Variable	Description	Source
Panel A: Bank-level data		
<i>Total loans growth rate</i>	% annual change in total loans	Bankscope
<i>Corporate loans growth rate</i>	% annual change in corporate loans	Bankscope
<i>Consumer loans growth rate</i>	% annual change in consumer loans	Bankscope
<i>Foreign</i>	Dummy variable defined as $D = 1$ if the bank is foreign-owned	Bankscope and Claessens and Van Horen (2015)
<i>Government</i>	Dummy variable defined as $D = 1$ if the bank is government-owned	Bankscope and Claessens and Van Horen (2015)
<i>Size</i>	Log of total assets	Bankscope
<i>Capitalisation</i>	Equity to asset ratio (%)	Bankscope
<i>Profitability</i>	ROAA (%)	Bankscope
<i>DepFunding</i>	Deposit funding to total liabilities ratio (%)	Bankscope
Panel B: Country-level data		
<i>GDPgrowth</i>	GDP growth rate (annual %)	WDI of World Bank
<i>Inflation</i>	GDP deflator (annual %)	WDI of World Bank
<i>GDPgrowth_{HOME}</i>	GDP growth rate of the foreign bank's home country (annual %)	WDI of World Bank
<i>Inflation_{HOME}</i>	GDP deflator of foreign bank's home country (annual %)	WDI of World Bank
<i>Political Stability</i>	Ranges from -2.5 (weak) to 2.5 (strong)	Kaufmann <i>et al.</i> (2011)
<i>Crisis2008</i>	Dummy variable defined as $D = 1$ if $t = 2008$	
<i>Crisis2009</i>	Dummy variable defined as $D = 1$ if $t = 2009$	
<i>Crisis</i>	Dummy variable defined as $D = 1$ if $t = 2008, \dots, 2013$	
Panel C: Banking sector regulatory data		
<i>Bank concentration</i>	Largest three bank's asset to total banking asset ratio	WDI of World Bank
<i>Overall capital stringency</i>	Ranges between 0-7 with higher values indicating greater stringency	(Barth <i>et al.</i> 2008)
<i>Financial statement transparency</i>	Ranges between 0-6 with higher values indicating greater transparency	(Barth <i>et al.</i> 2008)
Panel D: Information sharing and creditor rights protection data		
<i>Depth of credit information</i>	The index ranges between 0-6 with higher values indicating more credit information	Doing Business database of World Bank
<i>Public credit registry</i>	Coverage of adult individuals and firms (%)	Doing Business database of World Bank
<i>Private credit bureau</i>	Coverage of adult individuals and firms (%)	Doing Business database of World Bank

<i>Creditor rights</i>	The index ranges between 0-10 with higher values indicating better creditor rights protection	Doing Business database of World Bank
<i>Court enforcement</i>	Ranking-based on scores for below three indicators	Doing Business database of World Bank
- <i>Time</i>	Days to resolve a commercial dispute	Doing Business database of World Bank
- <i>Cost</i>	Attorney, court, and enforcement cost (as % of claim)	Doing Business database of World Bank
- <i>Procedures</i>	Quality of judicial processes index	Doing Business database of World Bank
Panel E: Monetary policy indicator data		
<i>MPrate</i>	Change in monetary policy interest rate (yearly)	WDI of World Bank
<i>CBA-to-GDP</i>	Central bank asset to GDP ratio	WDI of World Bank

Our sample consists of only banks, excluding finance and securities companies, mutual funds and insurance companies, and credit cooperatives. Table 3.2 presents the variables, their description, and data sources.

3.2.1 Sample of bank-specific variables and sources

The primary source for bank-level data is Bureau van Dijk's Bankscope data set. To measure bank lending behaviour, we use the amount of total loans, corporate and commercial loans, and consumer and retail loans. Specifically, we are classifying bank loans into different loan categories to investigate how banks with different ownership types behaved in the corporate/commercial and consumer/retail sector during the normal and crisis periods. However, when we are investigating the impact of information sharing/creditor rights protection on the lending behaviour of banks in Chapter 2 and bank lending response to monetary policy in Chapter 3, we only use total loan growth rate.

We are categorising the loan market into the corporate/commercial and consumer/retail sector due to banks behaving differently in different sectors, particularly during crisis periods. For example, as discussed in the literature review chapter foreign-owned banks have a better ability to analyse and monitor 'hard information' compared to 'soft information'. Considering that firms in the corporate and commercial sector usually publish their annual financial report, these firms may be in a better position compared to those individuals in the consumer and retail sector with limited information (Tsai et al., 2011). Besides, the 'cream-skimming' theory

suggests that foreign banks provide loans to transparent and more profitable firms by leaving riskier customers to domestic banks (Lubis et al., 2015). As a result of increased foreign bank presence, ‘soft information’ customers may face credit rationing from foreign banks.

In addition, the related literature states that the objective of government-owned banks is different from domestic private and foreign-owned banks. Furthermore, it is also highlighted that authorities and political bureaucrats have extremely concentrated control over state-owned banks, and therefore, the lending behaviour of these banks are less responsive to fluctuations in the business cycle (Dinç, 2005; Micco & Panizza, 2006; Sapienza, 2004). Carvalho (2014) reports that in order to increase the employment rate the central government directs state banks to increase their loan supply near election years. Besides, during the economic downturn periods, governments usually inject liquidity into state banks to support large firms and corporations. This is done to keep workers employed and to support the economy. If this is the case, we can expect that the lending rate of government-owned banks may be higher in the corporate and commercial sector compared to the consumer and retail sector.

Finally, we should also highlight that young and small firms tend to borrow from local banks by building a good relationship, whereas international and larger companies tend to borrow from foreign banks (Aristei & Gallo, 2017). Relationship-lending literature also mentions that local banks are more specialised in acquiring ‘soft information’, to analyse the quality of borrower’s managerial practices, and to transfer this information to their own management quickly (Berger & Udell, 2002). As a result, because of ‘soft information’, small and opaque firms are able to obtain funds from local banks even in the absence of ‘hard information’ (DeYoung, Hunter, & Udell, 2004). If this is the case, it can be expected that the local banks lending rates will differ from those foreign-owned banks in the consumer and retail sector. Considering all the factors above, we intend to investigate not only the total lending rates of banks with different ownership types during normal and crisis periods but also their loan supply policy in the corporate/commercial and consumer/retail sector as well.

To control for bank-specific variables that may impact loan supply policy, we also collect additional data such as banks’ balance sheets data such as asset size, capitalisation, profitability, and deposit funding ratio. The sample includes the 2008-2009 financial crisis period and offers an excellent opportunity to investigate bank lending behaviour by comparing the crisis period to not only the pre-crisis period but also the post-crisis period. Following the practise employed

in the literature¹⁰, and to limit the impact of mergers and acquisitions on the growth rates of loans, we exclude data observations of the dependent variables above the top 1% and below the bottom 1%.

Figure 3.1. Total loan growth (%), 2004-2013

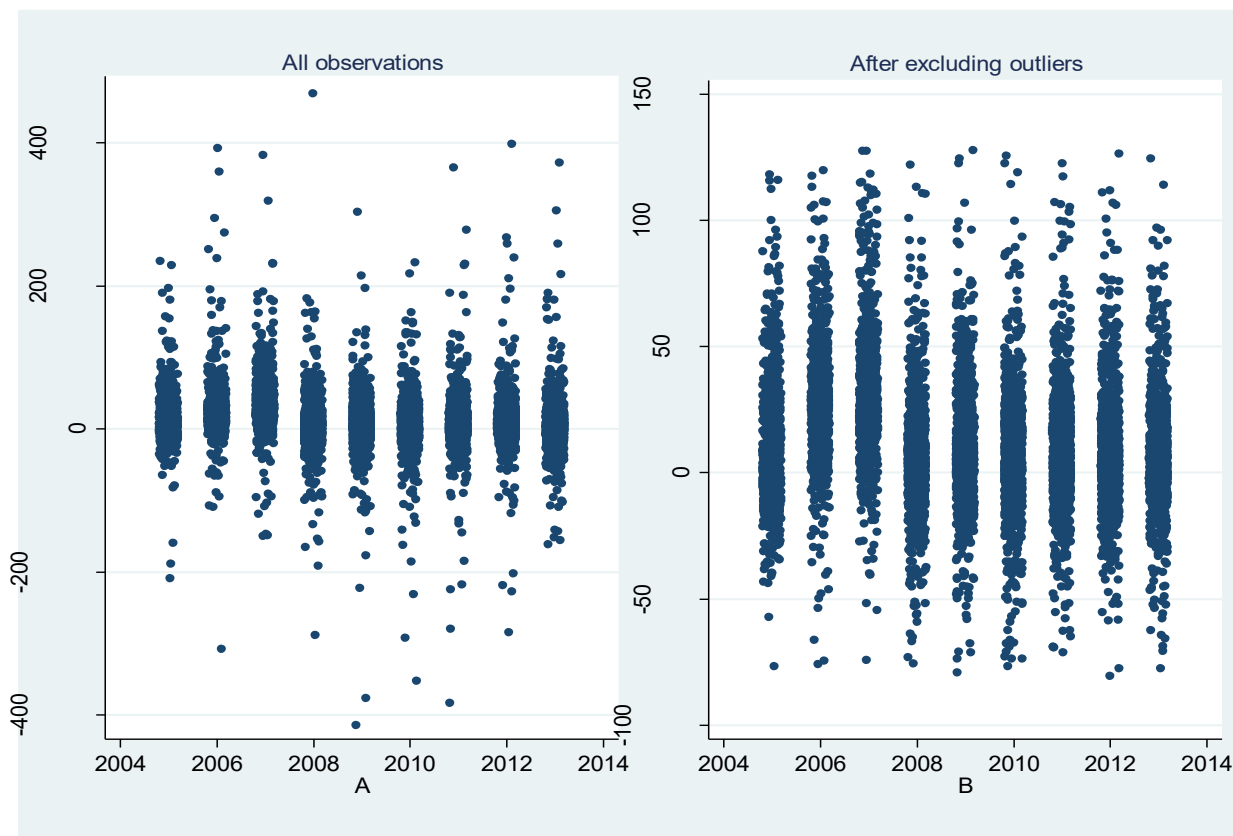


Figure 3.1 above shows the data for total loan growth rates before (Panel A) and after excluding outliers (Panel B). As Panel A shows, the data of the total loan growth rates have higher volatility. The distribution of observations for loan growth rates ranges between -500% and 500%, whereas after excluding the extreme outliers the distribution ranges between -100% and 150%. A similar process is followed for corporate/commercial and consumer/retail loans. However, the number of observations for these other types of loans are considerably smaller than total loans, because not all banks are active lenders in these sectors of the economy.

¹⁰ For example, Cull and Peria (2013) dropped observations in the top 5% and bottom 1% of the loan growth series, whereas Brei and Schclarek (2013) excluded observations below the bottom 1% and above 99%.

Bank ownership classification

To investigate the role of bank ownership on lending behaviour we classify banks into foreign-owned, domestic private owned, and government-owned banks. To classify banks into one of the ownership type we use the definition generally applied in the literature (Allen et al., 2017; Bertay, Demirgüç-Kunt, & Huizinga, 2012; Brei & Schclarek, 2013; Claessens et al., 2001; Clarke et al., 2003; Cull & Peria, 2013; Micco & Panizza, 2006). In other words, we classify banks according to their majority-ownership type. That is, we classified a bank as foreign-owned banks if 50% or more of its shares were held by a foreign entity (whether financial or non-financial). All foreign banks are identified based on direct ownership, that is indirect ownership was not considered. Similarly, we classify a bank as a government-owned bank with the criterion that 50% or more of bank capital is owned by a government or a similar public institution. To classify the domestic private-owned banks, we follow the same procedure. In other words, if 50% of bank capital is held by domestic investors then a bank is classified as a domestic private bank.

To identify whether a bank is foreign-owned or not and to create yearly information of bank ownership we used BankScope information as our primary source of information. We complete this information by using Claessens and Horen (2014) (available online) which provides yearly ownership information that covers at least 90% of the banking sector in terms of assets for 137 countries. As a result, this source gives full information about whether a bank is foreign-owned or domestic for a particular year.

To identify government ownership of a bank we used the Bertay *et al.* (2015) dataset. This was necessary because the Claessens and Horen (2014) dataset classifies banks into foreign-owned and domestic banks, but does not differentiate domestic banks as being either domestic private-owned or government-owned. Therefore, by using the Bertay et al. (2015) data we classified the remaining banks into either a domestic-private bank or government-owned bank. Bertay et al. (2015) classify banks into foreign, domestic private, and government-ownership types on a yearly basis. However, if there is a bank that is not included in Claessens and Horen (2014), Bertay et al. (2015), or BankScope datasets, we then use individual banks' websites and banking sector regulatory institutions data or Central bank websites to identify the ownership type of those remaining banks.

Since mergers and acquisitions are common among banks, we carefully checked all banks for mergers and acquisitions throughout the sample period using BanScope, Claessens and Horen (2014) and Bertay *et al.* (2015) dataset. For example, Claessens and Horen (2014) classified mergers and acquisitions as following: if two banks, Bank-I and Bank-II, are merged in 2007 to create a new Bank-III, then these Bank-I and Bank-II were included in the sample until 2007, whereas they became inactive after this period. After 2007, new Bank-III was included in the sample as an active bank. Similarly, if Bank-I acquired Bank-II in 2007, both banks were included in the sample until 2007, whereas Bank-II was considered as an inactive bank after 2007. For example, the General Bank of Greece (with the BankScope ID number-46888) was a foreign bank from 2004-2012 in our sample and became a domestic-private bank afterwards or how the Bank of Alexandria (ID number 30684) in Egypt was a government-owned bank until 2005, however from that period onwards the bank became a foreign-owned bank. Similarly, Banco BTG Pactual (ID number 44519) in Brazil was a domestic-private bank until 2005, from 2006 to 2008 the ownership structure changed to a foreign bank, and from 2009 the ownership structure reverted to become a domestic-private bank again.

Choice of bank-specific variables

From the financial intermediation theory of banking, the primary function of banks is to intermediate funds from savers to borrowers. To undertake this basic function banks should have sufficient capital, liquid assets, deposit funding sources, and a stable rate of return on assets that can effectively help them to maintain their intermediation capacity. Below we will discuss these bank-specific characteristics that are used as a control variable in our empirical estimations.

Capitalisation

If banks' have more capital, this will allow them to attract additional external sources which then can be provided as a loan. However, instead of lending out its funds, by using higher capitalisation levels, a bank can borrow financial resources from creditors on much better terms than those banks that are poorly capitalised. This will allow banks to attract more funding to support their lending activity and increase profitability. This relationship shows how bank capitalisation is important in shaping bank lending.

Starting from the 1988 Basel Capital Accord¹¹ the importance of capital on bank loan supply policy is widely debated. For instance, the importance of bank capital on lending behaviour has been discussed in the context of the ‘bank lending channel’ (Jayaratne & Morgan, 2000; Kishan & Opiela, 2000). The main conclusion of these studies is that improving the capital position of banks increases their capacity to raise uninsured forms of debt and hence limit the negative impact of deposit shortages on bank lending ability.

The related literature also highlights that monetary policy shocks directly impact bank capitalisation and lending rates. This occurs because monetary tightening decreases banks’ profits and accordingly their capital accumulation. Hence, banks may attempt to increase capitalisation by issuing shares. However, if it is costly for them to issue new shares, banks are forced to reduce lending to meet capital requirements (Gambacorta & Mistrulli, 2004). For instance, Melander and Bayoumi (2008) emphasise that after a negative shock to capital ratio, banks follow strict lending standards by reducing credit volume.

Bank capitalisation impacts loan supply through the different levels of funding costs that can be obtained as a result. This indicates that well-capitalised banks are able to borrow at a lower rate of the cost compared to those undercapitalised banks. Hence, well-capitalised banks, with lower funding costs, can raise funds at a faster pace which in turn allows them to provide greater intermediation activity¹².

Asset size

Several researchers have reported that bank asset size is directly related to lending behaviour. For example, Kishan and Opiela (2000) highlight that the asset size of banks affects the banks’ ability to raise alternative funding and maintain loan growth during a period of contractionary monetary policy. The authors emphasise that small banks with low rates of capitalisation have limited ability to attract large time deposits to support their lending rates, whereas large banks can utilise their access to external finance to maintain their asset growth.

¹¹ See (Jackson et al., 1999) for more details on this subject

¹² See Altavilla, Canova, and Ciccarelli (2020) for more detailed discussion on the relationship between bank capitalisation and lending.

Furthermore, the lending behaviour of banks with different asset sizes can depend on their ability to access the borrower's information. For example, Berger and Udell (2002) mention that large banks primarily focus on lending to large and transparent companies that have 'hard' quantitative information. This is due to these large banks having comparative advantages of lending technologies in analysing 'hard' information – such as financial statements from certified audit firms, information about tax payments, collateral values, and credit scores. In comparison, small banks have more flexibility using 'soft' qualitative information to evaluate credit applications and thus are more interested in providing loans to small, opaque firms. Small banks are usually located closer to their potential relationship clients, which enables bank management to collect, evaluate, and transmit 'soft' information about local markets and the firm characteristics more easily. On the other hand, large banks may have some difficulties in quantifying, verifying, and transmitting 'soft' information through the channels of their complex organizational structure, causing additional expenses and problems (Berger & Udell, 2002).

Furthermore, Aristei and Gallo (2017) report that young and small firms tend to build relationship-lending with local banks, whereas large and international companies usually borrow from national and foreign banks. Since national and foreign banks have access to international capital markets, this will allow them to support large borrowers with enough liquidity.

Profitability

Bank profitability plays an important role in shaping bank loan policy (Altavilla, Boucinha, & Peydró, 2018; Borio, Gambacorta, & Hofmann, 2017; Zimmermann, 2019). From the theoretical perspective, if a bank has a higher growth rate of loan volumes, then they are assumed to be more profitable as a result of the added business and liabilities being created. On the other hand, it could also be expected that the high growth in loan volume might lead to a decrease in the quality of the credit portfolio, in turn reducing the profitability of the bank. For example, Menicucci and Paolucci (2016) report that banks that are fast growing their loans have to pay a higher cost for funding requirements, which in turn may negatively impact bank profitability.

The related theory also highlights the fact that bank profitability might impact lending rates through bank capitalisation. That is when banks' profit increases, the bank now can improve their capitalisation level which in turn leads to an expanded loan supply. Conversely, Albertazzi and Gambacorta (2009) mention that after a drop in profitability, it is too costly for a bank to increase its capitalisation level by issuing new shares. Hence, to meet the capital regulatory requirements the bank has to reduce its loan supply. Bank profitability may also impact lending behaviour through the share of non-performing loans in the bank's loan portfolio. Specifically, it is mentioned that an increase in the share of non-performing loans would lead to the creation of higher provisions and expected lower profitability, which in turn causes a decrease in bank capitalisation (Athanasoglou, Brissimis, & Delis, 2008; Cucinelli, 2015). As a result, this will lead to reductions in the bank loan supply. Bikker and Hu (2002) report that a low-quality loan portfolio reduces bank profitability which in turn limits a bank's ability to increase the volume of loans supplied.

Deposit funding

As discussed above, one of the main functions of the banks is intermediation between savers and borrowers. Hence, deposit funding plays an important role in bank lending behaviour. According to the monetary policy transmission mechanism, there are mainly two ways that a change in monetary policy can influence deposit and bank lending behaviour. According to the traditional interpretation, central banks have a direct influence on a banks deposit base by controlling the reserve requirements and money multiplier mechanism (Bernanke & Blinder, 1988; Kashyap & Stein, 1995). An alternative interpretation is based on the portfolio substitution argument which builds on the proposition that changes in the monetary policy rate alter the yields on deposits compared to other assets, thus influencing depositors' desire to hold them (Kishan & Opiela, 2000).

Contractionary monetary policy shrinks the bank's core deposit funding which in turn pushes the bank to raise external financial sources from other sources. In turn, this will increase the cost of funding that leads to reductions in bank loan supply (Bernanke & Gertler, 1995). Drechsler *et al.* (2017) proposed the deposit channel of monetary policy which relies on bank market power in the deposit market. According to this channel, by changing the policy rate central banks can influence the bank deposit base. For example, when the policy rate is increased

by the monetary authority, banks charge higher spreads on deposits that then leads to a decrease in the deposit base. With this limited deposit funding, banks have to reduce loan supply.

Bank deposits are an important financial source to fund lending activity, particularly during periods of economic downturn. This is because, during this period, depositors usually attempt to withdraw their savings. This then leads to a shrinkage in bank funding sources. Furthermore, recent research papers investigated the relationship between bank deposits when the policy rate becomes negative (Heider, Saidi, & Schepens, 2019; Schelling & Tobin, 2018). The key idea of these studies is that when the policy rate becomes negative, banks' greater reliance on deposit funding adversely impacts their net worth. The lower negative policy rate does not transmit to a lower deposit interest rate because banks appear reluctant to charge negative interest rates on their deposits. Consequently, the adverse impact of negative policy rate on bank net worth explains why banks with a higher volume of deposits should lend less.

In general, the above discussions provide evidence that there is a relationship between bank-specific characteristics and loan supply. Improved bank capitalisation allows banks to attract more external funds that lead to increased bank lending. Furthermore, bank size is also related to lending behaviour in various ways whereas the profitability rate contributes to increased retained earnings. Bank deposit funding also plays an important role in shaping bank lending policy through different monetary policy mechanisms. Our current research includes the above indicators as bank-level control variables in empirical analyses.

3.2.2 Sample of macro-level variables and sources

Banking sector regulatory data

Except for bank-specific and macroeconomic country-level variables, the lending behaviour of banks may be influenced by banking sector regulation policies. To control for these factors, we also collected macro-level banking sector regulation data. In particular, we collect data to control for banking sector concentration, capital regulation, and financial statement transparency. The data for banking sector concentration is collected from the World Bank's 'World Development Indicator', whereas information for capital regulation and financial statement transparency is obtained from (Barth, Caprio, & Levine, 2008).

Information sharing and creditor rights protection data

To investigate the impact of information sharing and creditor rights protection on bank lending behaviour, we also collected country-level data for these factors. Since the level of information sharing and creditor rights protection differs from country to country, these differences should allow us to detect how the banks lending response differs in response to these changes. Hence, to measure the level of information sharing across countries, we use either the depth of information sharing index or the public or private credit bureau coverage of adult individuals and firms. For legal rights, we use the creditor rights protection index and court enforcement index. The data for both information sharing and creditor rights are collected from the Doing Business database of the World Bank.

Monetary policy indicator data

To study banks lending response to monetary policy stance, we use conventional and unconventional indicators. As a conventional indicator, we use the interest rate, whereas, for an indicator of unconventional monetary policy, we use the central bank's asset to GDP ratio. We obtained data for both of these indicators from the World Bank's 'World Development Indicator' database.

Dell'Ariccia *et al.* (2018) emphasise that the relationship between a central bank asset purchase and the effectiveness of unconventional monetary policy is under-explored and remains a key research question regarding the unconventional monetary policy. On the other hand, Wang (2019) confirms that the Federal Reserve and Bank of Japan substantially expanded their balance sheet size during the period of unconventional monetary policy and hence this indicator conveys economically meaningful and important information concerning the monetary policy stance. Similarly, Duygan-Bump *et al.* (2013) state that major central banks around the globe have aggressively used a mix of traditional as well as less traditional policy actions as a response to the 2008-2009 financial crisis. They argue that in addition to cutting interest rates close to zero, the Federal Reserve substantially increased its balance sheet size and expanded the type of assets in its portfolio. Furthermore, Gambacorta *et al.* (2014) highlight the central bank assets as a proxy for the effects of the different unconventional monetary policy measures such as large-scale lending to banks and purchase of public and private securities and use central bank asset to GDP ratio to examine the effectiveness of European Central Bank's

(ECB) unconventional monetary policy in the euro area. Moreover, Salachas *et al.* (2017) employ central bank asset to GDP ratio as an unconventional monetary policy instrument to investigate the impact of monetary policy on the bank lending channel in US, UK, Japan, and Eurozone.

Macroeconomic control variables

In addition to bank-specific variables, we also collected macro-level data to control for the effect of other potential macro factors on bank loan supply. Macroeconomic country-level data were collected from the World Bank's 'World Development Indicator', for GDP growth rates, inflation rates, and domestic credit to the private sector. Additionally, data for GDP growth rates and inflation rates for the foreign banks' parent countries were also collected and merged with the sample to control for supply-side factors that may impact their lending behaviour.

3.3 Summary statistics for bank-specific variables

To measure bank lending behaviour, we use three dependent variables: (i) the total loans annual growth rate, (ii) the consumer and retail loans annual growth rate, and (iii) the corporate and commercial loans annual growth rate. Panel A of Table 3.3 provides summary statistics (means and standard deviations) for the three dependent variables. These summary statistics are provided according to the sample groups and bank ownership types. We observe that the average growth rates for total loans, corporate/commercial loans, and consumer/retail loans were around 12.5% for the entire sample period, whereas these values decreased to 8.5%, 7.9%, and 6.4% for three types of loans respectively during the crisis period. A comparison between bank lending rates in emerging economies and developed countries indicates that the lending rate in emerging economies considerably exceeded the lending rate in developed countries for both the full sample period and the post-crisis period. On the other hand, the summary statistics for the post-crisis period also provide some interesting insights into bank lending behaviour in these sub-sample countries. In the emerging economies, bank lending rates across all loan types declined from about 14.5% to around 8.7% during the crisis period. In developed countries, lending in the corporate and commercial sectors was not significantly reduced, but there was a very drastic reduction (from 6.21% to 0.43%) in the consumer and retail sector lending.

Furthermore, the growth rates of loan types categorised by bank ownership groups show that the loan supply of domestic-private banks was similar to that of foreign-owned banks during the full sample period. However, even though the average growth rates of foreign banks across all loan types were somewhat similar to the domestic private bank lending rates, we observed that during the crisis period their average lending rates were lower than domestic-private banks. In contrast to what the literature predicts, the lending rates of government-owned banks exceeded other banks' lending rates for the full sample period. Notably, compared to domestic-private and foreign-owned banks, the average lending rates of government-owned banks did not fall significantly during the crisis period. Specifically, across all loan types, the average growth rate for government-owned banks was about 14.2% throughout the sample period, whereas it remained around 13% for the crisis period.

Table 3.3 Summary statistics for bank-specific variables.

Panel A								
Sample	Time period	Total loans		Corporate loans		Consumer loans		
		Mean	SD	Mean	SD	Mean	SD	
Full	Full	12.22	23.94	12.35	31.64	12.60	42.53	
	Crisis	8.46	22.64	7.81	29.99	6.38	40.64	
Emerging countries	Full	14.93	25.66	13.93	32.50	14.51	44.15	
	Crisis	10.30	23.97	7.78	30.76	8.23	43.45	
Developed countries	Full	8.20	20.49	8.72	29.30	6.21	35.89	
	Crisis	5.83	20.32	7.89	28.16	0.43	29.20	
Domestic banks	Full	11.59	21.89	12.24	29.46	12.43	41.84	
	Crisis	8.36	20.66	8.04	28.65	6.07	39.54	
Foreign banks	Full	12.63	27.14	12.18	34.34	12.4	44.01	
	Crisis	7.72	25.65	6.78	31.93	5.05	43.49	
Government banks	Full	14.31	20.07	13.61	31.24	14.57	39.09	
	Crisis	12.54	18.77	11.48	29.21	14.76	31.01	
Panel B								
Variables	Full sample		Emerging countries		Developed countries		Crisis period	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<i>Domestic banks</i>	0.53	0.5	0.42	0.49	0.69	0.46	0.52	0.49
<i>Foreign banks</i>	0.39	0.49	0.45	0.50	0.29	0.46	0.39	0.48
<i>Government banks</i>	0.08	0.28	0.13	0.33	0.02	0.13	0.08	0.27
<i>Size</i>	8.09	2.10	7.61	1.96	8.81	2.08	8.09	2.07
<i>Capitalization</i>	11.89	10.39	13.34	10.62	9.75	9.64	11.83	10.46
<i>Profitability</i>	0.95	2.94	1.14	2.68	0.67	3.27	0.78	2.22
<i>DepFunding</i>	85.75	16.12	86.15	15.75	85.15	16.63	84.95	16.65

Panel B of Table 3.3 provides summary statistics for bank ownership shares by sample groups showing that for the full sample, on average, 53% of banks are domestic-private, 39% foreign-owned, and 8% government-owned¹³. More specifically, in the emerging economies subsample, 42% of banks are domestic-private, 45% foreign-owned, and 13% government-owned. In developed economies, domestic-private banks are about 69%, foreign-owned 29%, and government-owned banks around 2% of the total number of banks respectively. The above statistics show that the percentage of government-owned banks in emerging economies (13%) is higher compared to developed economies (2%) or the full sample (8%) indicating that in developed economies the government has limited stakes in the banking sector.

3.4 Summary statistics for macroeconomic country-level variables

Table 3.4 presents the summary statistics for the macroeconomic control variables. The table presents mean statistics and standard deviations for the full sample, emerging countries, and developed economies for the entire period. As the data shows, the mean GDP growth rate in the full sample was about 2.5%, whereas it was approximately 3% in emerging countries and 1.9% in advanced markets. The higher growth rate for emerging countries confirms the well-known convergence theory, which predicts that the economic growth rate in developing countries tends to be faster than advanced economies, but this rate eventually converges when the per capita income of emerging economies reaches that of the developed countries. On the other hand, the inflation rate in emerging countries was considerably higher (5.08%) than the inflation rate in developed countries (2.65%). The average for the full sample was around 4%.

Turning our attention to the information sharing and creditor rights protection indicators, we can see that the average index for the depth of credit information was about 4.07, whereas public credit registry and private credit bureau coverage rates were 4.53% and 47.47% respectively, for the full sample. Also, comparing the mean statistics for emerging and developed countries show that there was not a significant difference between these variables.

¹³ Bertay, Demirgüç-Kunt, and Huizinga (2012) explain that during the crisis period several countries were forced to nationalize failing private banks and this increased government-ownership from 7.3% in 2007 to 10.8% in 2009, although this percentage slightly decreased in the following years.

Regarding the creditor rights and court enforcement variables, mean statistics for creditor rights index was about 6.11 for the full sample, and it was around 5.9 and 6.3 for emerging and developed countries. The average statistics *Time*, *Cost*, and *Procedures* that were used as an alternative measure to court enforcement were about 567 days, 29% of the claim, and 35 steps to file a claim, respectively. Comparing the mean values for emerging and developed countries, we can see that the number of days required to resolve a dispute in emerging countries was about 30 days longer than the time required in developed countries. On the other hand, the average values for *Cost* show that the price to resolve a dispute in developed countries is considerably higher than in emerging countries. In contrast, the relevant data show that to file a claim in emerging countries requires a few more steps compared to the same procedure in developed countries.

Table 3.4 Summary statistics for macroeconomic country-level variables.

Variable	Full sample			Emerging countries			Developed countries		
	Obs	Mean	SD	Obs	Mean	SD	Obs	Mean	SD
<i>GDP growth rate</i>	13,351	2.54	3.49	7,830	2.99	3.85	5,521	1.89	2.78
<i>Inflation</i>	13,351	4.07	5.58	7,830	5.08	6.65	5,521	2.65	3.05
<i>Depth of credit information</i>	13,407	4.53	1.64	7,886	4.45	1.86	5,521	4.66	1.27
<i>Public credit registry</i>	13,407	9.74	16.55	7,886	9.88	16.96	5,521	9.53	15.95
<i>Private credit bureau</i>	13,407	47.34	38.12	7,886	48.57	37.04	5,521	45.62	39.07
<i>Creditor rights</i>	13,407	6.11	2.28	7,886	5.95	2.25	5,521	6.34	2.30
<i>Court enforcement</i>	13,407	63.65	13.43	7,886	62.56	12.88	5,521	65.21	14.02
- <i>Time</i>	13,407	566.78	276.64	7,886	579.70	279.29	5,521	548.31	271.77
- <i>Cost</i>	13,407	28.51	22.14	7,886	24.75	11.09	5,521	33.87	31.08
- <i>Procedures</i>	13,407	34.61	5.61	7,886	36.17	5.70	5,521	32.38	4.63
<i>MPrate</i>	13,205	-0.13	1.55	7,784	-0.14	1.85	5,421	-0.12	0.98
<i>CBA-to-GDP</i>	12,523	4.41	6.54	7,246	6.29	7.88	5,277	1.84	2.19
<i>Bank concentration</i>	13,420	59.33	16.90	7,899	54.62	16.26	5,521	66.07	15.46
<i>Overall capital stringency</i>	13,202	4.24	1.67	7,681	4.03	1.69	5,521	4.52	1.60
<i>Financial statement transparency</i>	13,245	5.23	0.67	7,724	5.13	0.69	5,521	5.36	0.63
<i>Political Stability</i>	13,414	0.29	0.86	7,893	0.15	0.88	5,521	0.49	0.79

The summary statistics for the monetary policy rate (*Mprate*) show negative signs for all sample groups with a slightly higher mean value for emerging countries compared to developed countries. Since the change in the monetary policy rate is measured as a first-difference, the

negative sign indicates an expansionary monetary policy, whereas a positive sign signals a contractionary monetary policy. In contrast, the mean statistic for unconventional monetary policy shows that in average central bank asset to GDP ratio was about 4.4%. Comparison of sub-samples reveals that central banks in emerging countries had a considerably higher asset to GDP ratio in emerging countries (6.3) than their counterparts in developed countries (1.9).

3.5 Variables and preliminary analysis

In this section, we provide detailed explanations of variable measurements and some preliminary analysis. Specifically, we start by discussing bank-specific variables, followed by an explanation of measurement methods for information sharing, creditor rights protection, and monetary policy indicators. The final part describes the macroeconomic country-level control variables.

3.5.1 Bank-specific variables

To measure bank lending, we use the following loan growth rates as dependent variables: (i) the total loans annual growth rate, (ii) the consumer and retail loans annual growth rate, and (iii) the corporate and commercial loans annual growth of the rate. The growth rate of all these loan types is measured as the log difference between current and previous values.

Pairwise correlation coefficients and their significance among bank-specific and control variables are given in Table 3.5. It can be seen from the table that the correlation among bank loan types (total loans/corporate loans/consumer loans) are positive and significant. Because corporate loans and consumer loans are an integral part of total loans. All three types of loan series are negatively correlated with bank size. This indicates that loan growth rates will decrease as bank size increases. In other words, it can be interpreted as small banks loan growth rates are exceeding loan growth of large banks. The bank profitability also positively and significantly correlated with all types of loan series. This indicates that as bank profit increases, it will positively contribute to bank loan supply. The relationship between bank profitability and size is negative indicating that smaller banks are more profitable than larger banks. Regehr and Sengupta (2016) report that large banks were more profitable during the pre-crisis period whereas smaller banks showed higher return during the crisis period.

Table 3.5 Pairwise correlation among bank-specific and control variables

	Total loans	Corporate loans	Consumer loans	Size	Profitability	Capitalisation	Dep Funding	Foreign	Domestic	Government	MPrate	CBA-to-GDP
Total loans	1.0000											
Corporate loans	0.4771*	1.0000										
Consumer loans	0.4045*	0.1853*	1.0000									
Size	-0.0797*	-0.0360*	-0.0416*	1.0000								
Profitability	0.1240*	0.0484*	0.0978*	-0.0113	1.0000							
Capitalisation	0.0057	0.0138	0.0094	-0.4656*	0.1879*	1.0000						
DepFunding	0.0469*	-0.0090	0.0409*	-0.1070*	-0.0259*	-0.1514*	1.0000					
Foreign	0.0100	-0.0166	0.0044	-0.1419*	-0.0465*	0.1815*	0.0184	1.0000				
Domestic	-0.0233	0.0145	-0.0147	0.0817*	0.0303*	-0.1751*	-0.0020	-0.8443*	1.0000			
Government	0.0245	0.0034	0.0184	0.1030*	0.0271*	-0.0037	-0.0289*	-0.2385*	-0.3190*	1.0000		
MPrate	-0.0041	-0.0178	-0.0003	-0.0014	0.0141	-0.0127	0.0270 *	-0.0308*	0.0039	0.0476*	1.0000	
CBA-to-GDP	-0.0289*	0.0119	0.0423	0.1983*	0.0082	-0.0863*	0.0375 *	-0.0844*	0.0599*	0.0385*	0.0226	1.0000
DepthCredInfor	-0.1241*	-0.0275	-0.0348	0.1307*	-0.0561*	-0.0451*	-0.0480 *	0.0105	0.0183	-0.0517*	0.0075	0.0527*
PubCreditRegister	-0.0364*	-0.0633*	-0.0185	-0.0420*	0.0074	0.0356*	-0.0972 *	0.0346*	-0.0415*	0.0140	0.0343*	0.0083
PrivCreditRegister	-0.0922*	-0.0334	-0.0201	0.1259*	-0.0632*	-0.0232*	-0.0409 *	0.0047	0.0367*	-0.0749*	0.0132	0.1702*
Creditor Rights	-0.1135*	-0.0587*	-0.1070*	0.0632*	-0.0717*	-0.0567*	0.1240 *	0.0425*	0.0020	-0.0787*	-0.0370*	-0.3297*
Court Enforcement	-0.1101*	-0.0461*	-0.0528*	0.0311*	-0.0465*	-0.0316*	0.0476 *	0.0484*	0.0951*	-0.2577*	-0.0289*	-0.2049*
GDPgrowth	0.2739*	0.1363*	0.1659*	-0.0811*	0.1467*	0.0721*	0.0071	0.0239	-0.1077*	0.1526*	0.1964*	0.0343*
Inflation	0.1437*	0.0557*	0.0983*	-0.1734*	0.1494*	0.1361*	-0.0449 *	0.0134	-0.1149*	0.1841*	0.1099*	0.0958*
	DepthCred Informat	PubCredit Registry	PrivCredit Bureau	Creditor Righths	Court Enforcement	GDP growth	Inflation					
DepthCredInformat	1.0000											
PubCreditRegister	0.0932*	1.0000										
PrivCreditBureau	0.5711*	-0.2502*	1.0000									
Creditor Rights	0.0894*	-0.2764 *	0.1729*	1.0000								
Court Enforcement	0.1983*	-0.0400 *	0.2070*	0.4094*	1.0000							
GDPgrowth	-0.2296*	-0.0708 *	-0.2193*	-0.1463*	-0.3007*	1.0000						
Inflation	-0.2666*	0.0938 *	-0.1579*	-0.3530*	-0.3310*	0.3576*	1.0000					

* indicates significance level at 0.01

On the other hand, although the coefficients for bank capitalization are positive, they are not significant at a 1% significance level. The correlation between bank capitalization and size is negative and significant. This indicates that compared to the large banks, smaller banks are better capitalized. However, a positive and significant correlation between bank capitalization and profitability indicates that as bank's profit increases, these banks tend to redirect some portion of their retained earnings to improve their capitalization level. Bank deposit funding variables have positive significant relationship with total loans and consumer loans, whereas it is negatively correlated with corporate loans. The relationship between bank ownership variables and bank-specific variables are not statistically significant.

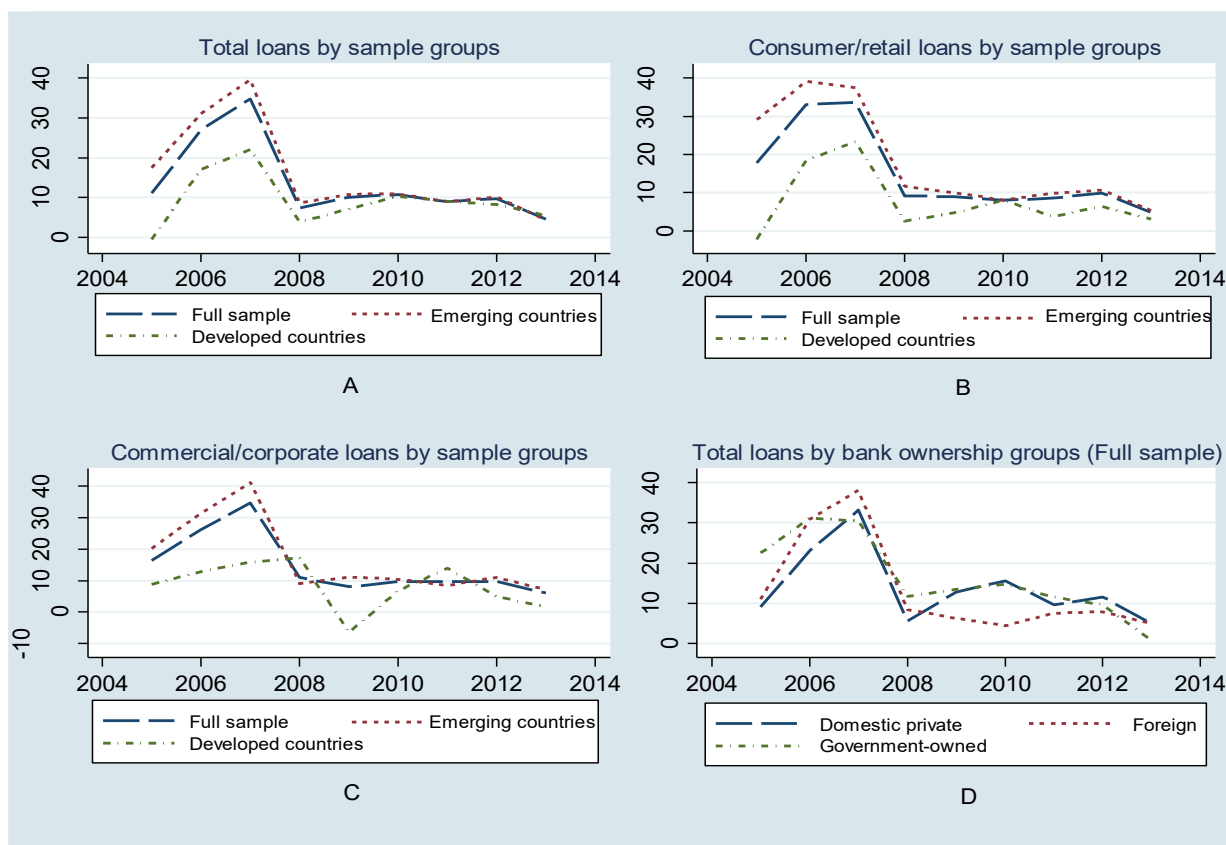
Monetary policy interest rate is negatively correlated with all loan series, although they are not statistically significant. This negative relationship indicates that as the central bank decreases the monetary policy indicator, this will stimulate bank lending rates. However, central bank asset to GDP ratio is negatively and significantly related with total loan growth rates, indicating that as central bank asset to GDP ratio increases bank lending rates decrease. Although this correlation contradicts to the theoretical view, there is a high possibility that banks across sample countries decreased their lending rates during the crisis period, even though central banks injected liquidity into the financial sector through various asset purchase programs. Similarly, information sharing, and creditor rights protection variables are negatively and significantly correlated with bank loan growth rates. Although this correlation contradicts to the theory, we will check the real impact of these variables on bank lending behaviour in our empirical estimations by including other bank-specific and macro-specific control variables.

The positive and significant correlation coefficients between GDP growth rates and bank loan types indicate that as the economy booms, banks tend to increase their lending. Besides, the other macro-control variable, the inflation indicator is positively related to bank lending rates. On the one hand, it can be expected that banks usually reduce their loan supply in the inflationary environment. On the other hand, it can also be expected that if banks increase their lending rates, this will raise the money supply in the economy which eventually contributes to inflation at the end.

Below we describe how bank lending rates changed throughout the sample time by sample groups and ownership types. Figure 3.2 describes the average rate of loan growth by the full sample and sub-samples (A, B, C) and by bank ownership types (D). The figure shows important

information about lending patterns between sample groups and bank ownership types. Panel A in Figure 3.2 shows the difference in total loan growth rates in the full sample as well as subsamples. As can be seen from the graph, lending rates for the full sample increased considerably from about 10% in 2005 to 35% until 2007, whereas it sharply decreased to below 10% in 2008.

Figure 3.2. The average growth rate of loan series by sample group and ownership type



Although it started to rise slightly over the next year, it did not change significantly afterwards. Furthermore, the total loan growth rates in emerging countries were higher compared to the full sample countries. It is also important to mention that the average percentage for the total loan growth rate in developed countries was lower during the 2008-2009 period compared to the full and emerging countries samples. However, the percentage converges afterwards.

Panel B of Figure 3.2 describes the average percentage growth rate of consumer and retail loans. The growth rate for consumer and retail loans in emerging countries was higher compared to the full sample, whereas it was considerably lower in developed countries' sample during the

pre-crisis period. Like total loans, the average growth rate for consumer and retail loans sharply declined in 2008 for all sample groups. Notably, the growth rate of this loan type in developed countries was remarkably lower in 2008 and continued to remain lower compared to other samples during and after crisis periods.

Panel C of Figure 3.2 describes the average percentage growth rate of corporate and commercial loans. The average percentage growth rate of corporate and commercial loans in the full sample increased from about 18% in 2005 to about 32% in 2007, whereas it rose from 20% in 2005 to 40% in 2007 in emerging countries. To compare, the growth rate in developed countries was considerably lower than full and emerging countries during the pre-crisis period. As in other types of loans, the growth rate of corporate and commercial loans significantly dropped during the crisis period. Specifically, the growth rate of this kind of loan in developed countries turned negative in 2009 and however picked up again after the crisis period.

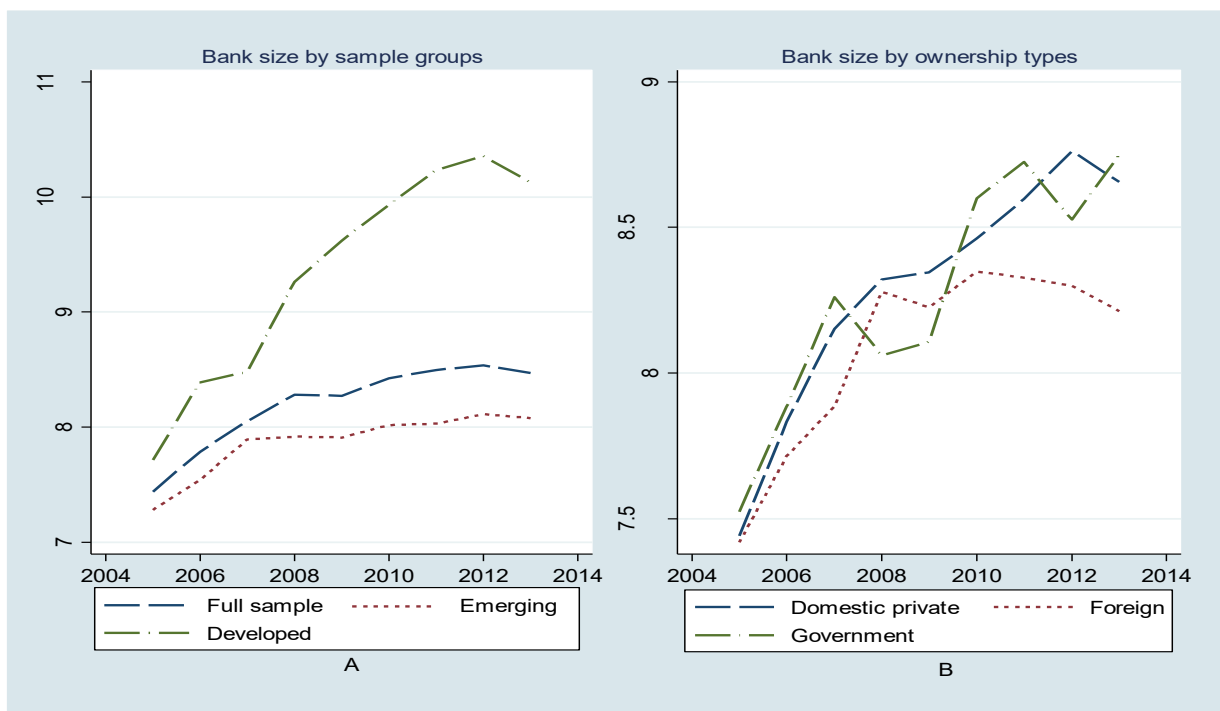
Panel D of Figure 3.2 describes the average growth rate of total loans by bank ownership type in the full sample. As the graph shows the growth rate of total loans for all types of banks increased remarkably during the pre-crisis period, however then sharply declined in 2008. Interestingly, the total credits of domestic private and government-owned banks started to increase slightly in 2009, whereas growth rates of total loans for foreign banks continued to decline. For example, the growth rates for domestic private and government-owned banks were about 15% in 2010, while it was around 5% for foreign banks.

As discussed above, average growth rates of all types of loans increased remarkably during the pre-crisis period and declined sharply during the crisis period in all sample groups and bank ownership types. Although the graphs in Figure 3.2 confirm the findings of literature review (Allen, Jackowicz, & Kowalewski, 2013; Choi, Gutierrez, & Martinez Peria, 2016; Ivashina & Scharfstein, 2010), it does not control for other bank characteristics such as bank assets, equity, profitability, and funding structures which might play an essential role in shaping bank lending policy. To empirically investigate the lending behaviour of banks with different ownership types, we use these bank characteristics as control variables in our estimations.

As mentioned in the literature review, bank asset size is an essential indicator of bank lending policy. Therefore, to control bank size in our estimations, we use the log of total assets. Larger banks might have easy access to internal and external capital markets compared to smaller banks. Hence, larger banks could be in a better position to acquire additional financial

resources to withstand adverse shocks during the crisis periods and thus increase loan supply. In contrast, Gambacorta (2005) argues that being in a close relationship with customers, small banks tend to provide more stable loans to borrowers through relationship lending during crisis periods. As a result, including bank size as a control variable in our estimations is essential to obtain unbiased estimators. Following the related literature, we measure the *Size* variable as a log of total bank assets (Cull & Peria, 2013; Sapienza, 2004). Figure 3.3 describes the movements in *Size* variables by sample groups and bank ownership types for our sample period.

Figure 3.3. Bank size by sample groups and bank ownership types



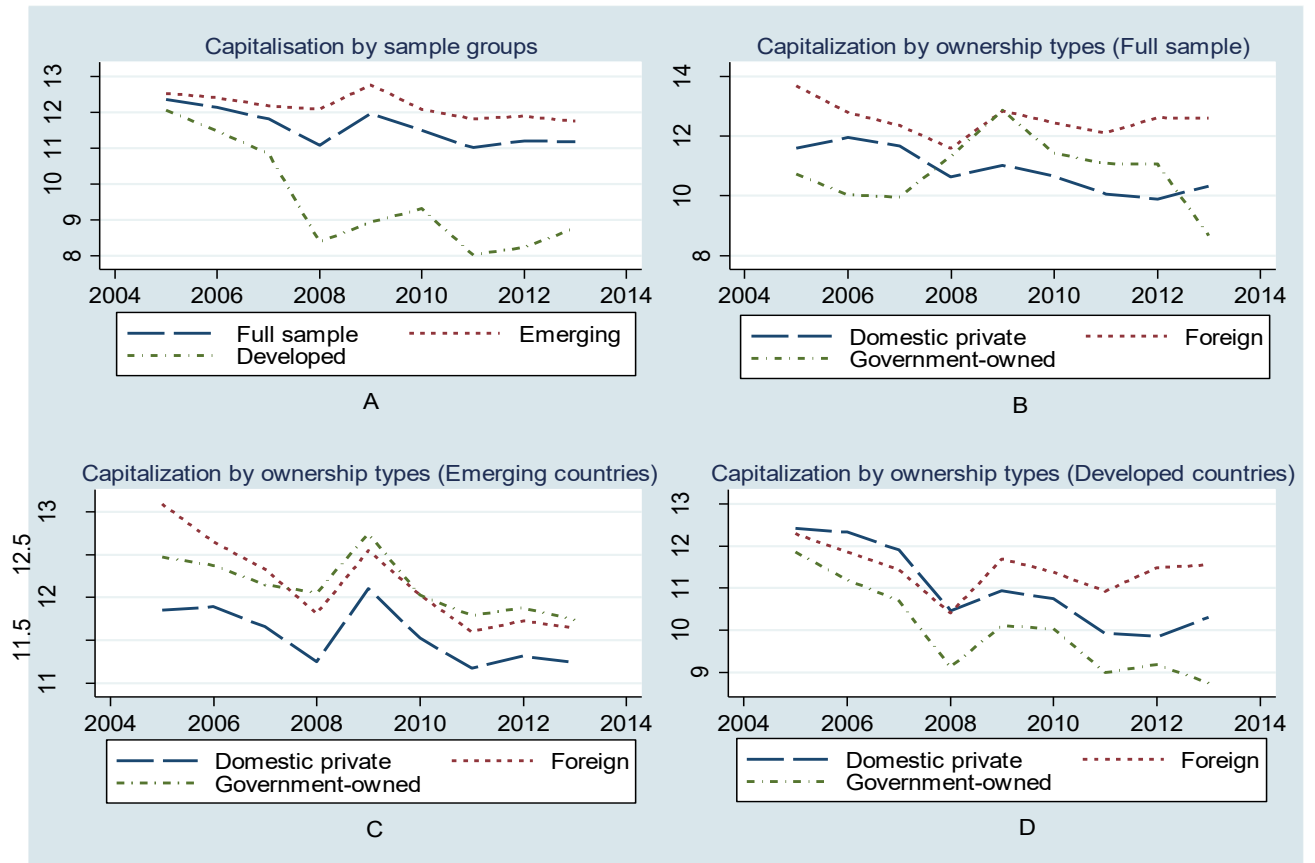
Panel A of Figure 3.3 shows that the average bank sizes for all sample groups rose in a similar magnitude during the 2005-2007 period. However, banks' size in the developed countries' sample started to increase sharply in the 2008-2013 period whereas, in the full sample and emerging countries, sizes went up slightly for the same period. The critical point here is that the mean total assets of banks in developed countries started to rise after the crisis period, and it became considerably larger during the 2010-2013 period. One reason for this can be the shrinkage of asset size of foreign banks located in emerging countries during and after crisis periods (Cetorelli & Goldberg, 2011; Cull & Peria, 2013; De Haas & Van Horen, 2013). As discussed earlier, compared to in developed countries, foreign banks were about 45% of banks

in emerging countries. This can explain why the reduction in mean asset size in emerging countries was higher compared to the developed countries.

Panel B of Figure 3.3 describes bank size by ownership types in the full sample. As can be seen, the asset size of banks with all types of ownership sharply increased from 2005 to 2008. Although the asset size of domestic private banks remained constant during the 2008-2009 period, it continued to grow after that period. In contrast, the asset size of foreign-owned banks decreased in 2009 compared to 2008. Although there was a slight increase in 2010, the asset size continued to decline afterwards. The full sample data for government-owned banks in panel B shows important information about the changes in the asset size of government-owned banks during the crisis period and after that. During the pre-crisis period, the asset size of government-owned banks decreased remarkably compared to other types of bank ownership. However, there was a slight increase in asset size of government-owned banks during the crisis period, and then it started to rise sharply, reaching its peak in 2011. This increase in asset size of government-owned banks can be explained by the intervention of authorities to the banking sector through nationalising troubled banks during and after crisis periods. The nationalisation of troubled banks by state authorities in both developed and emerging countries may explain the increase of asset size of government-owned banks during and after crisis periods (Bertay et al., 2015). For example, although they have started to privatise the bank in recent years, the UK government nationalised the Royal Bank of Scotland during the 2008-2009 crisis period by acquiring a 63% stake in the company.

We also include capitalisation as a bank-specific control variable. The *Capitalisation* variable is measured as a ratio of equity over the total assets of the bank. Through this, we can evaluate how the bank capitalisation level plays a role in bank lending behaviour. Banks with higher capitalisation rates are assumed to have more funds for lending and have a positive association with loan growth, particularly during the crisis period. Figure 3.4 describes how bank capitalisation changed throughout the full period by sample groups and ownership types. Panel A of Figure 3.4 shows that although the bank capitalisation declined during the pre-crisis period for all sample groups, it decreased faster for banks located in developed countries. From the year 2008, the capitalisation rate of banks in all samples started to increase. After the crisis period the rate declined slightly and stayed the same for the full sample and emerging countries, whereas it continued to fluctuate in developed countries. Consequently, it can be concluded

Figure 3.4. Capitalisation ratio of the bank by sample and ownership groups

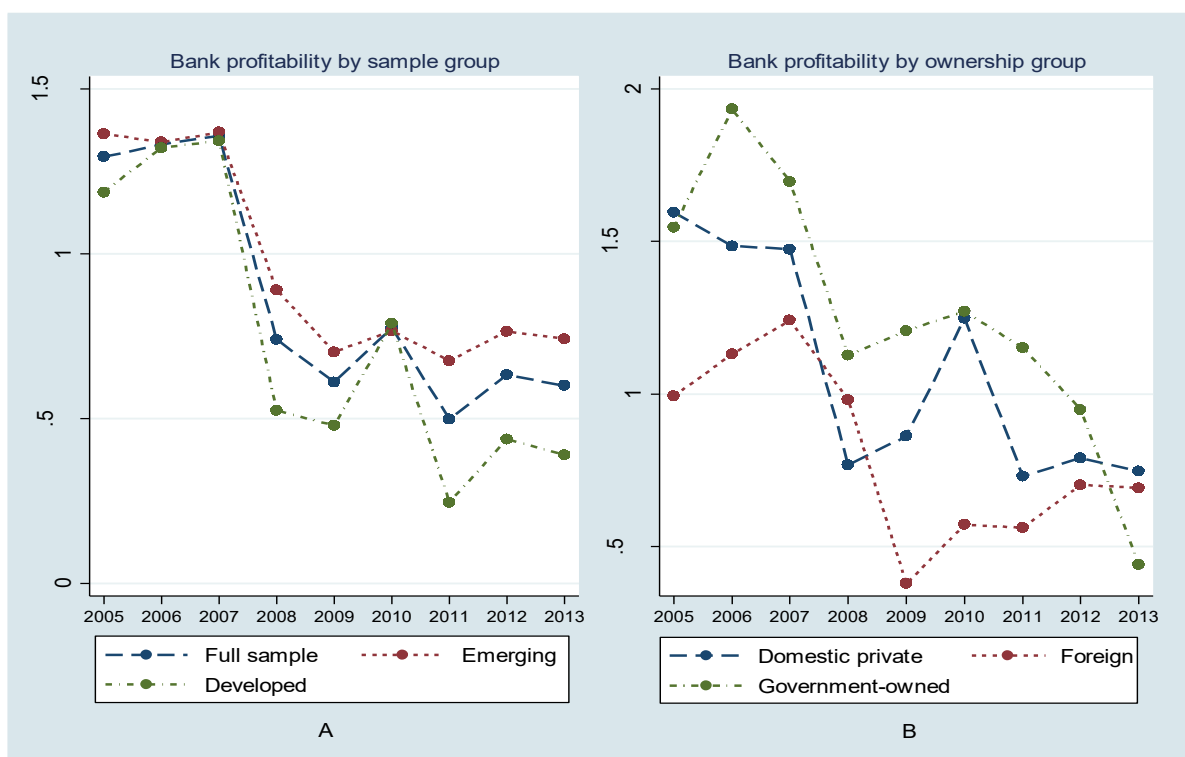


that the capitalisation rate for banks located in developed countries is considerably lower compared to banks in full and emerging countries samples. Panel B of Figure 3.4 shows the capitalisation rate of banks by the ownership group in the full sample. Similar to Panel A, the capitalisation rate for all types of banks declined during the pre-crisis period and then again started to rise during the crisis period. The interesting point here is that the rate for government-owned banks went up sharply compared to the other two groups of banks. The reason for this can be the result of the financial support injected by authorities to the banking sector, mainly through the state-owned banks. The data in Panel C and D of Figure 3.4 for emerging and developed countries samples respectively shows an almost similar picture of capitalisation for banks with different ownership types in these subsamples. Comparing these graphs, it can be seen that the capitalisation ratio for banks located in emerging countries increased relatively more sharply than those banks located in the developed countries sample. Furthermore, foreign banks in developed countries tend to have higher rates of capitalisation in contrast to counterparts located in emerging countries.

For the bank-specific characteristics, we include a return on average assets to control the impact of bank profitability on lending behaviour. The variable *Profitability* is measured as a return on the average asset in percentage terms. This indicator shows how a bank is efficiently managing its assets compared to other banks. Figure 3.5 describes bank profitability by sample and ownership groups for the full sample period.

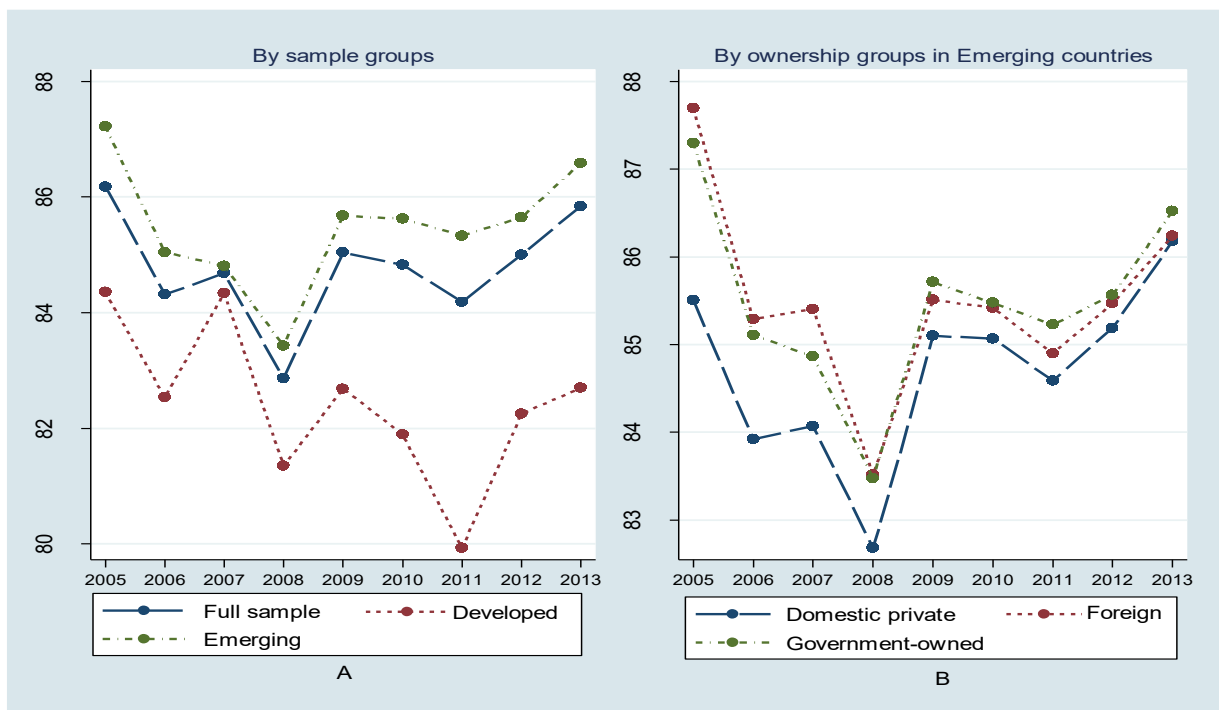
Panel A of Figure 3.5 shows that bank profitability during the pre-crisis period was between 1%-1.5% for all sample groups, whereas it considerably declined below 1% in the 2008 crisis year. Although there are some differences, the general picture shows that bank profitability remained around 0.5% during and after the crisis across all sample groups. Comparing the sample groups, it can be seen that banks in developed countries have a lower return on an average asset than banks in emerging countries. One possible explanation can be higher competition in the banking sector of developed countries. Specifically, higher competition for deposits and the loan markets decrease the interest income banks can charge for their intermediation activities. Furthermore, higher competition in the non-interest income market *also* adversely impacts bank profitability.

Figure 3.5. Bank profitability by sample group and ownership type



Panel B of Figure 3.5 also shows that banking sector profitability by ownership type dropped during the crisis period. However, when banks were classified according to the ownership type, the graph presents significant differences between banks' returns on the average asset. For instance, as Panel B of Figure 3.5 indicates, domestic-private and government-owned banks have considerably higher profits compared to foreign-owned banks. These average statistics contradict the findings in the relevant literature, which states that foreign banks are more efficient than other types of banks. Furthermore, the data for government ownership also contradicts the earlier findings that state-owned banks operate less profitably compared to other types of banks (Bonin et al., 2005; Cornett et al., 2010). However, on the other hand, the data for the crisis and post-crisis period in Panel B shows that the profitability of foreign-banks started to rise year by year, whereas the profitability of government-owned banks continuously declined. As discussed in the literature part of this thesis, some empirical papers found that government-owned banks increased their lending during the crisis period particularly to large state organisations to protect them from the adverse shocks of the global financial crisis (Choi et al., 2016; Cull & Peria, 2013). Consequently, this extensive loan supply to the state organisations, even though they were maybe not creditworthy, may have been the cause for the decrease in profit for government-owned banks.

Figure 3.6. Deposit funding ratio by bank ownership type and sample groups



Furthermore, the funding structure of banks is another important factor in determining bank lending behaviour. Therefore, we include the ratio of deposit funding to total liabilities to control the funding structure of banks. As discussed in the literature review, deposit funding is the primary source for banks in funding and shaping their lending behaviour, particularly during the crisis period. Figure 3.6 shows the deposit funding ratio by ownership type and sample groups for the period 2005-2013.

From Panel A of Figure 3.6, we can see that the deposit funding ratio for banks located in developed countries is noticeably lower compared to the counterparts located in emerging countries. This difference can be explained that due the well-developed capital and money markets in advanced economies, banks can raise financial resources by attracting additional funds from these markets. On the other hand, compared to the full sample, the primary source of funding for banks in emerging countries are attracted through deposits. The ratio of deposit funding for all sample groups declined until 2008 and started to recover afterwards. The data by bank ownership types as given in Panel B shows that the deposit funding ratio for foreign-owned banks was higher compared to the other types of banks until the crisis period. However, after the crisis period, the average statistic for the deposit funding ratio became higher for government-owned banks compared to foreign and domestic private banks. As discussed in the literature review, depositors might believe that in the case of bankruptcy during the crisis period, authorities will continue supporting government-owned banks and therefore will not withdraw deposits.

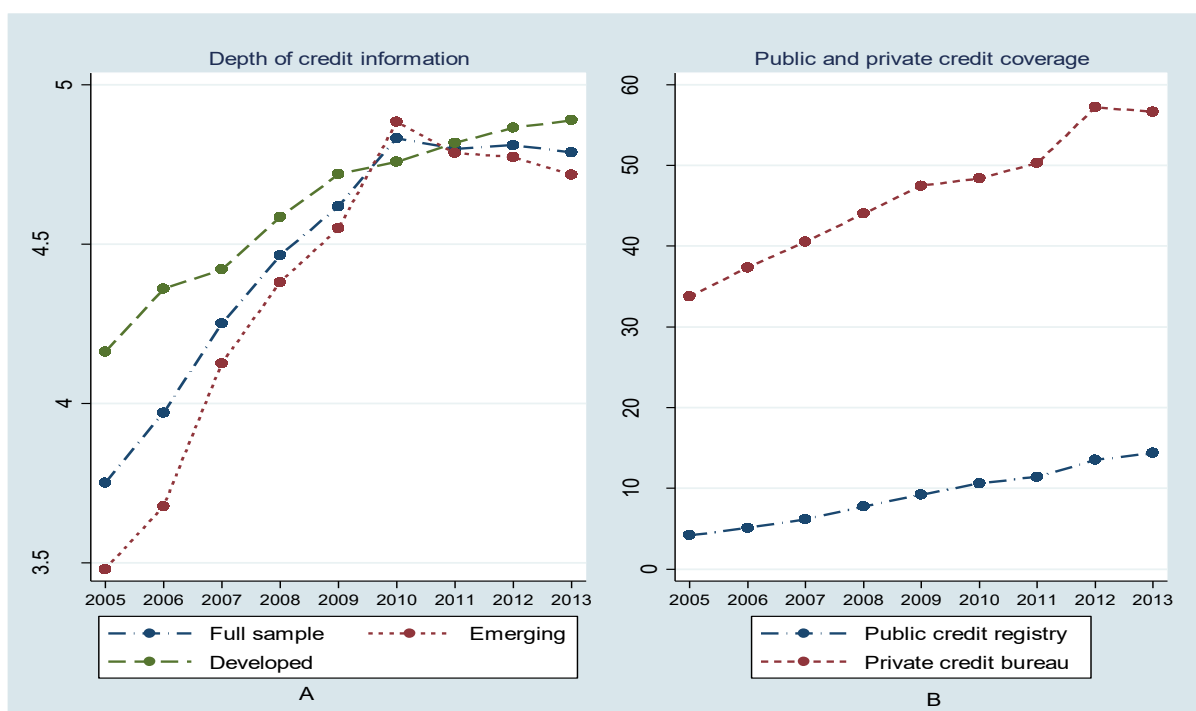
3.5.2 Information sharing and creditor rights protection variables

As we are interested in investigating bank lending behaviour during normal and crisis periods, Section 2.2 of the literature review discussed the theoretical background and empirical evidence on the impact of information sharing and creditor rights protection in bank lending. Below we will describe the variables we used in our empirical investigation.

Following the relevant literature, we use various proxies to measure information sharing among lenders (Djankov et al., 2007; J. F. Houston et al., 2010). Firstly, we use the depth of credit information sharing index, which measures the availability, scope, accessibility, and quality of information about potential borrowers. The index ranges from 0 to 6. Higher values of the index indicate the availability of more credit information and easy access to view this

data among lenders. Secondly, we also use the number of individuals and firms listed by the public credit registry and private credit bureau, which is measured as a percentage of the adult population. These credit institutions collect all the data about current information on outstanding credit, unpaid debts, and credit history. As the names indicate, a public credit registry is usually managed by the public sector or central banks, whereas a private credit bureau is a private firm or nonprofit organisation that collects, maintains, and shares information among lenders. Figure 3.7 below describes the average value of the depth of credit information index by sample group and public and private registry coverage for the full sample. Panel A of Figure 3.7 shows the average index for the depth of credit information continuously went up until 2010, followed by a levelling out. As expected, comparing the average values for emerging and developed countries reveals that the depth of information sharing in developed countries is considerably higher than the same indicator in emerging countries. Furthermore, the average statistics for the developed countries' sample groups shows that the depth of information sharing facilities increased throughout the full sample period. However, the same data for emerging countries show that although information sharing among lenders rose until 2010, it slightly decreased afterwards.

Figure 3.7. Depth of credit information and public and private credit registry coverage



On the other hand, Panel B of Figure 3.7 describes the average statistics for public credit registry and private credit bureau coverage for the full sample. Similar to Panel A, it can be seen clearly that over this period, coverage of individuals and firms increased in both of these institutions. Although both of the indicators rose continuously, there was a significant difference between the coverage level of these institutions. For example, the average statistics for public credit registry coverage of individuals and firms was about 5% in 2005, whereas it increased to around 15% in 2013. In contrast, the coverage by the private credit bureau has gone up from about 35% in 2005 to approximately 55% in 2013. According to the World Bank's definition, the primary purpose of establishing public credit registries is to support the state's role in supervising and monitoring the financial institutions. Therefore, public credit registries are usually managed by the central bank and by law, they collect data for loans above a certain amount. In some cases, this threshold is relatively high for some countries. As a result, these restrictions could be a possible explanation for the low levels of coverage for public credit registries.

In addition to information sharing facilities, in the literature review chapter, we also discussed the impact of creditor rights protection and the efficiency of contract enforcement on bank lending behaviour. Relevant theory and earlier empirical findings confirm that stronger creditor rights protection and better contract enforcement stimulate bank lending. Therefore, we use index data collected from the Doing Business database of the World Bank to empirically investigate the impact of these variables on bank lending.

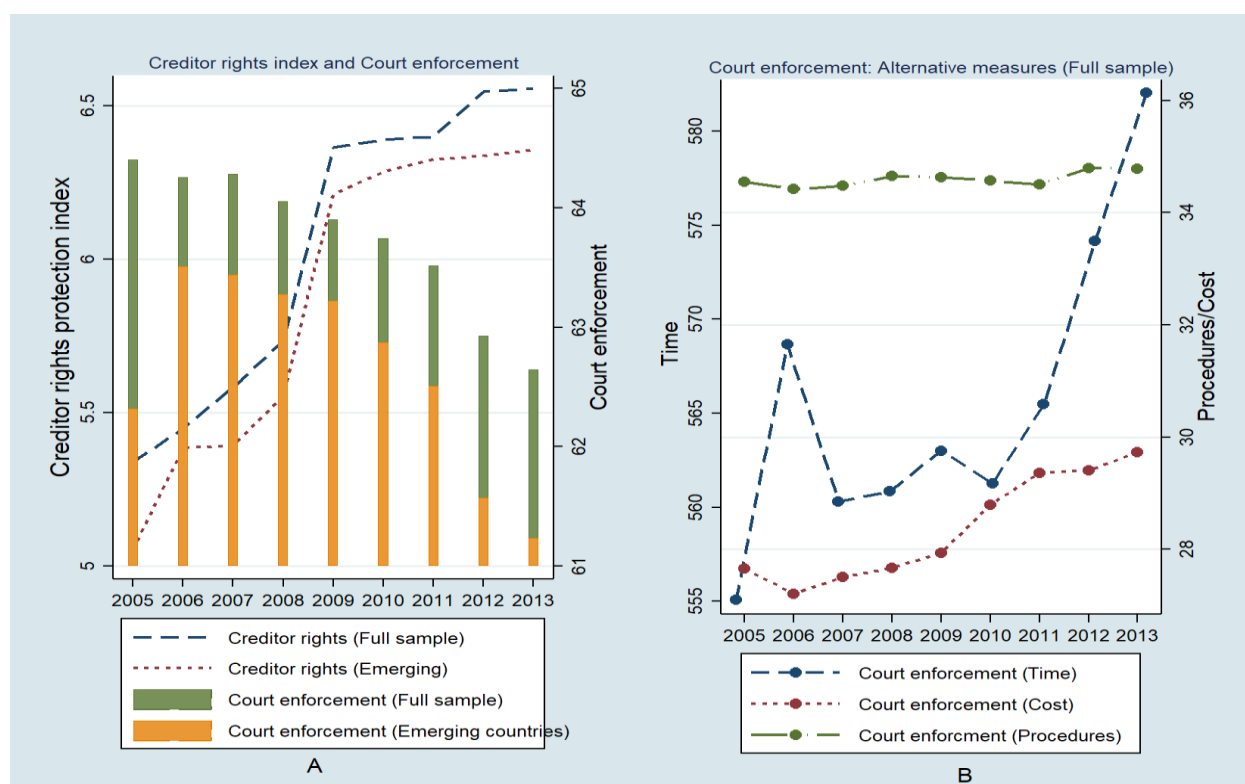
The legal rights index is used as a proxy to creditor rights protection. The legal rights index was developed¹⁴ based on the collateral and bankruptcy laws of each country. The higher the index value, the more protection there is for the rights of lenders which in turn stimulates lending. The variable ranges from 0 to 10, with higher values indicating better protection and greater access to credit.

To investigate the impact of the judicial system on bank lending behaviour, we use enforcing contracts indicators as a proxy. In general, this indicator measures the efficiency of the judicial system in resolving a commercial dispute. Specifically, the efficiency of contract

¹⁴ According to the World Bank's definition, the data on legal rights of lenders and borrowers are collected through a survey of financial lawyers and verified through analyses of laws on collateral and bankruptcy.

enforcement enhances predictability in credit relationships and reduces uncertainty in the future by enhancing creditor rights protection. To put it differently, inefficient contract enforcement by courts reduces a bank's ability to collect a debt and control the property pledged as collateral to the loan contract. In turn, this discourages bank incentives and decreases total lending rates. The enforcing contracts variable is measured based on (i) *Time*-days to resolve a commercial dispute in courts; (ii) *Cost*-cost of attorney, court, and enforcement (as a % of claim); and (iii) *Procedures*-procedural steps to file a claim, enforce the contract, and obtain a judgment. Figure 3.8 describes how these indicators behaved throughout the full sample period.

Figure 3.8. Creditor rights and court enforcement indicators



Panel A of Figure 3.8 shows average values for creditor rights protection index and court enforcement indicator for the full sample and emerging countries. As the line graph shows, the creditor rights protection index increased sharply until 2009, whereas the rise was not remarkable afterwards. Furthermore, it also indicates that the strength of creditor rights protection in emerging countries is lower than the full sample. In short, the average statistics for creditor rights index was about between 5-6 in 2005, whereas in 2013 it reached around 6.5 for both sample groups.

On the other hand, the bar graph describes the changes in court enforcement for the full sample and emerging countries. Different from the creditor rights index, the average values for court enforcement decreased throughout the entire sample period. A closer look shows that the decline was significant during and after the crisis period. Similarly, it seems that court enforcement efficiency in emerging countries was significantly lower throughout the sample period since the difference between emerging and full sample average values are considerable. According to the World Bank's Doing Business 2011¹⁵ report, because of the global financial crisis, the number of contract disputes increased causing the number of caseloads and backlogs in the court to increase as well. For example, in Denmark, the number of contract disputes in courts was 38% higher in 2009 than in 2007. On the other hand, in Serbia, the number of cases increased from 135,497 in 2008 to 165,013 in 2009. Consequently, this increase in the number of cases can be a good explanation for the decrease in court enforcement quality since the increased caseloads and backlogs require more extended periods of time and procedural steps to resolve a dispute.

Panel B of Figure 3.8 shows three alternative measures for court enforcement. As explained above, the line graph for *Time* shows that although it fluctuated around 560-565 days on average to resolve a dispute, it sharply went up after the crisis period. Similarly, the average statistics for variable *Cost* also shows that the cost to resolve a dispute measured as a percentage of a claim increased considerably during and after the crisis period. In contrast to *Time* and *Cost*, the procedural steps to file a claim and enforce contracts remained steady throughout the full sample period.

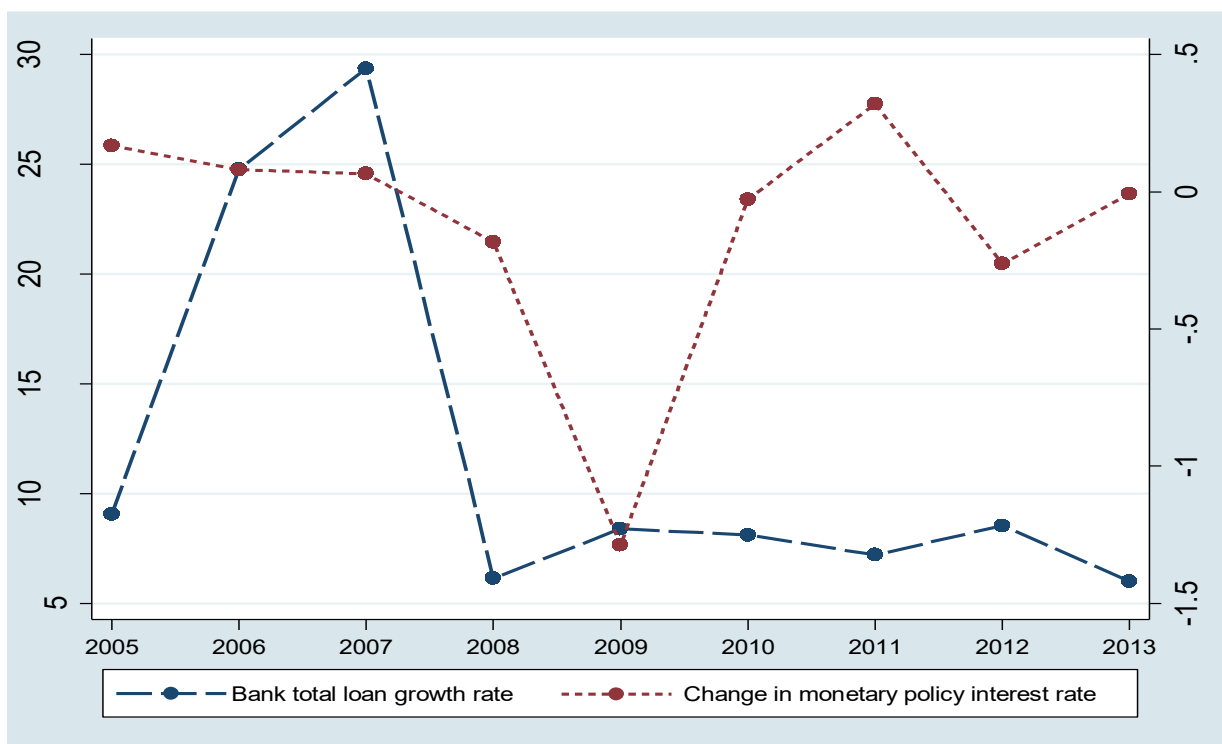
3.5.3 Monetary policy variables

This study also empirically investigates the role of the foreign and domestic bank in the monetary policy transmission process with a particular interest in the crisis period. Specifically, we examine the lending response of banks with different ownership types to changes in traditional and unconventional monetary policy. To measure these monetary policy tools, we use the central bank policy rate for conventional monetary policy and central bank asset to GDP ratio for unconventional monetary policy. The change in monetary policy interest rate for a

¹⁵ Please see for more details <http://www.doingbusiness.org/en/reports/global-reports/doing-business-2011>

particular year t is measured by the first-difference of interest rate in year t relative to the previous year's interest rate. Figure 3.9 presents the changes in the monetary policy interest rate and its relationship with total loans growth rates throughout the full sample period.

Figure 3.9. Change in monetary policy interest rate and total loans growth rate (Full sample)



As the average data in Figure 3.9 shows, change in monetary policy interest rate significantly dropped and remained negative during the 2008-2010 crisis period. This average statistic indicates that during this period, monetary authorities then acted considerably in decreasing the interest rate to support the financial sector with enough liquidity and stimulate bank lending.

Comparing the changes in monetary policy interest rate and total loans growth rate shows some relationship between these two variables until the year 2007. Specifically, a slight decrease in the average statistic for monetary policy interest rate stimulated bank lending in 2006 and 2007. However, further significant reductions in the interest rate during the crisis period did not lead to an expected increase in bank lending rates across the countries included in our sample. In other words, contradicting the theoretical prediction, banks' total lending rates decreased during the crisis period, even though the monetary authorities significantly lowered

the interest rate to stimulate bank lending. Although the expansionary monetary policy did not stimulate bank lending rates during the crisis period, the data for these variables shows that there was some correlation after 2010. However, this analysis is based on just the comparison of mean values for these two indicators and does not mean that this was the case. In the empirical analysis chapter, we investigate the relationship between bank lending and monetary policy, considering other bank-specific and macro-level control variables.

3.5.4 Macroeconomic country-level variables

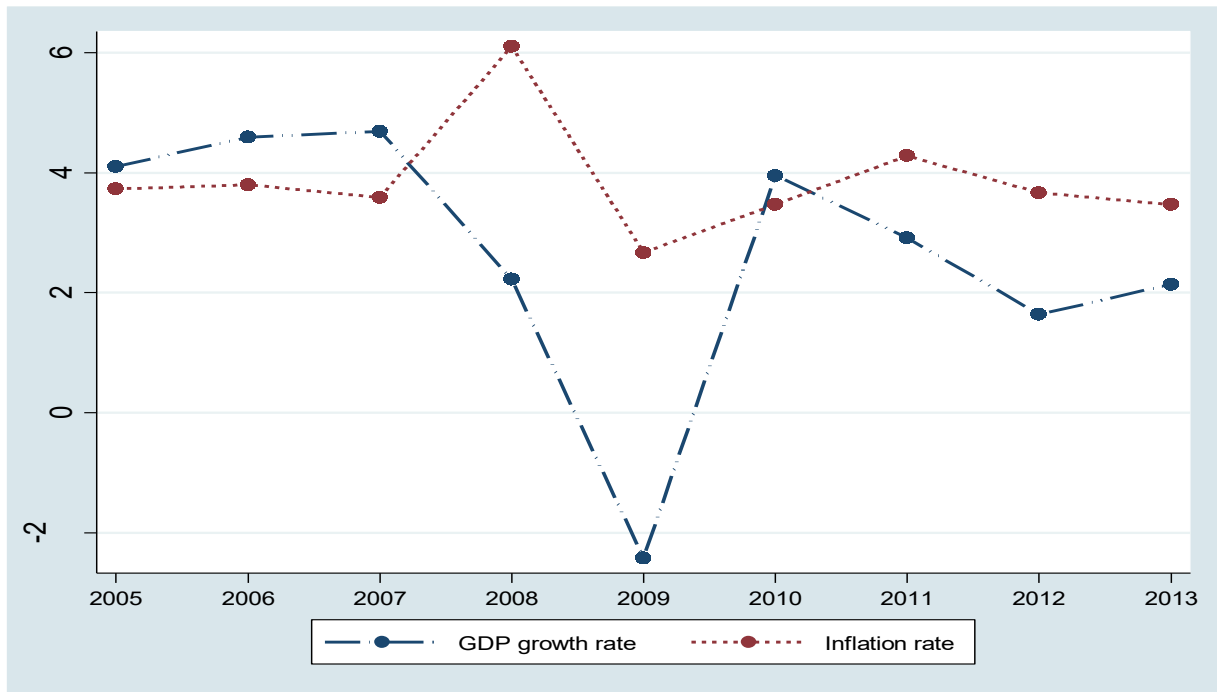
Furthermore, we also include macroeconomic country-level variables to control macroeconomic conditions in countries. For example, relevant literature confirms that economic growth and inflation rate play an important role in determining the demand for bank loans (Altunbaş et al., 2002; Dinç, 2005; Djankov et al., 2007). For example, Djankov *et al.* (2007) state that rapid economic growth could create more demand for bank loans. On the other hand, a high inflation rate increases the uncertainty in credit markets and therefore might influence the amount of loans supplied and demanded (Dinç, 2005; Leroy, 2014; Love & Mylenko, 2003). Therefore, we include the GDP growth rate measured as an annual percentage change in real GDP and inflation rate measured as an annual percentage change in the GDP deflator. Figure 3.10 describes the movements in GDP growth rate and the inflation rate in our full sample.

As Figure 3.10 shows, the mean GDP growth rate slightly increased year by year during the pre-crisis period, whereas it started to decline in 2008 and took a negative value in 2009. However, the average GDP growth rate remained positive during the post-crisis period, although there were some fluctuations. In contrast to the GDP growth rate, the inflation rate did not change significantly throughout the sample period. The only exception was in 2008 when the inflation rate jumped from about 3.8% in 2007 to around 6% in 2008. The inflation rate declined in the following years and stabilised afterwards. One possible explanation could be the expansionary monetary policy introduced by central banks to prevent the adverse impact of the global financial crisis lead to the high inflation rate in 2008.

In addition to variables that are intended to control for macroeconomic factors, we also include banking sector regulatory variables which might impact bank lending behaviour. Particularly, following the literature we include variables to control for banking sector

concentration (Black & Strahan, 2002; Fosu, 2014), capital regulation (De Nicolo, 2015; Deli & Hasan, 2017), and financial statement transparency (Barth et al., 2008).

Figure 3.10. Average of GDP growth rate and Inflation rate (Full sample)



We measure the *Bank concentration* variable based on the three largest banks assets. It is measured as a percentage of the three largest bank's assets to total banking sector assets. Next, *Overall capital stringency* is used as a proxy to measure banking sector capital regulation. The *Overall capital stringency* variable ranges between 0-7 with higher values indicating greater stringency. Finally, *Financial statement transparency* included as another banking sector regulatory control variable. This variable ranges between 0-6 with higher values indicating greater transparency. According to the Barth *et al.* (2008), transparency of bank financial statements allows creditors, depositors, and shareholders to access the bank's risk better and in turn enable them to benefit from the low cost of funds to finance their lending behaviour.

Furthermore, foreign bank entry and performance is significantly sensitive to political instability in the host country. Therefore, we include the *Political stability* variable to control for destabilisation, violence, and terrorism (Kaufmann et al., 2011). To measure *Political stability*, we use an index ranging from -2.5 (weak) to 2.5 (strong).

3.5.5 Crisis: Definitions, Measurements, and Dates

To examine the lending behaviour of banks during the recent global financial crisis, first, we will discuss the related literature on crisis definitions, dates, and measurement methods. The definition of the financial crisis varies considerably according to the causes, consequences, and measurement methods. Although the financial crises can take various forms, the related literature distinguishes between the most common two broad types of financial crises according to their definitions. The recent crisis started after problems in the subprime credit market during 2007 in the US created instabilities in the financial sectors of other countries. Consequently, deteriorations in the financial sectors of the US and other advanced economies resulted in the global financial crisis around the world. Claessens *et al.* (2010) define the recent global financial crisis as a cause of serious financial disruption, including credit crunches, and deteriorations in equity and house markets. These authors also compare the buildup to the recent global financial crisis to earlier episodes¹⁶ and claim the following similarities: (i) before the start of the crisis asset prices increased rapidly particularly in advanced economies; (ii) several countries as in earlier cases experienced credit booms; (iii) sudden expansion of marginal loans such as mortgage credit; and (iv) regulators and supervisors failed to keep up with recent development in the financial system. At the same time, Claessens (2010) mentions that the use of complex and opaque financial instruments, increased interconnectedness of financial markets within internal and international capital markets, and a sharp increase in the degree of leverage in financial institutions were the main differences of the recent global financial crisis from previous ones. According to Moshirian (2011) as a result of the global financial crisis, more financial institutions around the world failed, and some governments intervened to the market to rescue their banks through partial or full ownership. Furthermore, during the crisis period, many central banks and monetary authorities were more active in the market as financial system stabilisers. Allegret *et al.* (2017) argue that many governments and central banks massively intervened in the market to stimulate economic activity via supporting aggregate demand and contributing liquidity to insolvent financial institutions. As discussed, the interconnectedness of financial institutes was one of the main differences of the recent global financial crisis.

¹⁶ Earlier episodes here refer to previous financial and banking crises occurred until the recent 2008-2009 global financial crisis.

For example, Reinhart and Rogoff (2009) defined inflation crises and currency crashes by quantitative thresholds, whereas debt and banking crises by events. Jutasompakorn *et al.* (2014) emphasise that event-based literature focuses on the observation of events to determine a banking crisis ex-post. By concentrating our attention to the definition of the banking crisis, reviewing the related literature provides various definitions across studies. For instance, according to Caprio and Klingebiel (1996), a banking crisis is a ‘financial distress, in which the banking system has a negative net worth’. Chaudron and de Haan (2014) criticises Caprio and Klingebiel (1996)’s definition as a restrictive definition because they state that most crises rarely affect all banks to the same extent.

On the other hand, Reinhart and Rogoff (2009) mark a banking crisis as following: (i) bank runs that lead to the closure, merging, or takeover by the public sector of one or more financial institutions; and (ii) if there are no bank runs, the closure, merging takeover, or large-scale government assistance that marks the start of a string of similar outcomes for other financial institutions. Similarly, Laeven and Valencia (2018) define banking crisis as: (i) if there are significant bank runs, losses in the banking system, and bank liquidation; or (ii) if there are a government policy intervention measures in response to substantial losses in the banking system. Different from the above definitions, Baron *et al.* (2018) describe a potential banking crisis as an episode featuring a large crash in a country’s bank equity index.

Laeven and Valencia (2018) investigate the banking crisis episodes over the period 1970-2017. They define the banking crisis based on the following two conditions:

1. Significant signs of financial distress in the banking system (as indicated by significant bank runs, losses in the banking system, and bank liquidation).
2. Significant banking policy intervention measures in response to substantial losses in the banking system.

If both conditions hold in a particular year, they consider that year as the first sign of a systemic banking crisis. They consider the financial distress as a significant sign for a crisis when the share of nonperforming loans increases above 20% of total loans or at least 20% of banks closed measured against total banking sector asset. Banking sector losses are also considered severe when fiscal restructuring costs exceed 5% of that country’s GDP. They also considered the following categories in measuring the significance of policy intervention to be significant.

Specifically, if any three of the following policies are implemented by governments, the authors considered the policy interventions to be significant:

- a deposit freeze or bank payment holidays;
- significant bank nationalisation;
- bank restructuring fiscal cost exceeding 3% of GDP;
- extensive liquidity support
- significant guarantees put in place;
- significant asset purchases (at least 5% of GDP).

By measuring the banking sector losses and significant government policy interventions, the study identifies 151 banking crises, 236 currency crises, and 74 sovereign crises since 1970. Regarding the recent global financial crisis period, according to their dates, the banking crisis started in 2007 only for the US (not included in our sample) and the UK whereas, in all other countries which experienced a banking crisis, the financial crisis started in 2008. To measure the end dates for a crisis, they consider GDP growth and real credit growth¹⁷, which are positive for at least two consecutive years. According to the end dates definition, they conclude that about two-thirds of the crisis ended in less than 5 years. By classifying the sample into high-income and low and middle-income countries, they confirm that crisis episodes in high-income countries lasted on average 5 years or longer whereas it lasted about 4 years or less in low and middle-income countries.

Reinhart and Rogoff (2009) state that the relative price of bank stocks would be a logical indicator to examine dates of banking crises. However, they state the problems associated with this measure since some banks, particularly in developing countries, will not have had publicly traded equity for a long time period. In addition, they also consider changes in bank deposits as an alternative approach to estimate banking crises dates. However, the authors argue that banking problems not always arise from the liability side but can also be a result of sudden collapses in asset prices or changes in the volume of nonperforming loans. Given these data limitations, the study marks a banking crisis by two types of events such as systemic (severe) and financial distress (milder): (1) bank runs that lead to the closure, merging, or takeover by

¹⁷ Bank credit to the private sector (in national currency) and GDP in constant prices also in national currency. Both statistics collected from WEO.

the public sector of one or more financial institutions and (2) if there are no bank runs, the closure, merging takeover, or large-scale government assistance that marks the start of a string of similar outcomes for other financial institutions. Comparatively, Claessens and Kose (2013) define a financial crisis as a one or more of the following phenomena: a significant change in credit volume and asset prices; severe disruptions in financial intermediation and the supply of external financing; large-scale balance sheet problems and government support. Accordingly, authors state that a single indicator could not characterise financial crises, thus they are typically multidimensional.

Different from the above measures, Baron *et al.* (2018) measured banking crises episodes over the period 1870-2016 by using the information for bank equity prices and dividends for 46 advanced and emerging countries. The authors define a potential banking crisis as an episode if the economy experiences large crashes in its bank equity index. To verify this approach, by pooling roughly 300 banking crises across sample countries, they first check and establish a strong correlation with traditional symptoms of banking crises. Specifically, they confirm that a significant drop in bank equity returns predicts the following expanded government intervention with higher liquidity support and liability guarantees. They also establish that a large decline in bank equity returns is also significantly associated with increased non-performing loans and deposit runs. The authors also demonstrate by showing that the informativeness of bank equity is not driven by a general decline in the equity market. In other words, they claim that bank equity returns respond differently from nonfinancial equity to banking crises. Based on the investigations, they build a chronology of banking crises in these countries for 1870-2016. In countries that experienced a banking crisis during the recent global financial crisis, the crisis started mostly in 2008, with the only exceptions being the US, UK, and Ireland, where the crisis began in 2007. Across all crises, the average duration of the bank equity decline was about 18.82 month.

On the other hand, Romer and Romer (2017) use an alternative approach to measure financial crises in 24 advanced countries for the period 1967-2012. To measure the financial distress, they create a new semiannual series for the sample period. Authors define financial distress as an increase in the cost of credit intermediation. The reason they use this measure is to focus on disruptions in the credit supply side. Therefore, using the new measure of financial distress, the study investigates the typical aftermath of financial crises, by analysing the

response of real GDP, industrial production, and the unemployment rate to innovations in the financial distress variable. According to the main findings of the study, the real GDP falls significantly and persistently in the aftermath of the financial crisis. The decrease in industrial production and the rise in the unemployment rate are also statistically significant, but more modest in size. In short, the study concludes that during the recent global financial crisis period, every country included in the sample experienced at least some financial distress in this episode. The study also finds that the distress was very low in many countries by the end of 2012. Compared to these countries, the GIIPS countries that only experienced moderate distress in 2008, then began to witness a second rise of the financial distress in 2010 or 2011. This distress was still apparent in the data in these GIIPS countries towards the end of the sample period (2012).

Ambrosius (2017) investigates the factors that help countries to recover from the banking crisis (by examining the length of recovery). The study uses survival analysis to estimate the length of recovery from banking crises and the duration of post-crisis recessions by employing event-history analysis on 138 banking crises incidents over the period 1970-2012. He finds that 104 countries (=number of events) out of 138 had recovered to their pre-crisis level of per capita GDP by 2013, while 34 countries had not yet reached their pre-crisis level in 2013. He states that simultaneous currency crisis, large banking sector, overvalued currencies, large primary deficits, and indicators of uncertainty in financial markets are correlated with later recoveries and more prolonged post-crisis recessions.

Reinhart and Rogoff (2014) studied the recovery from the financial crisis to identify the approximate loss in living standards (measured by per capita real GDP) by investigating episodes from 100 systemic financial crises. Specifically, they aimed to approximate the duration of recovery from financial crises episodes to a pre-crisis level of income normalised by population growth. Following Caprio *et al.* (2005) they characterise modern system crises episodes as those where there are bank runs, a significant increase in non-performing assets, bank liquidations, and large scale policy interventions to support banks. They conclude that on average, it takes about 8 years to reach the pre-crisis level of income by 2014. Regarding the

recent global financial crisis episode, only Germany and United States¹⁸ have reached their pre-crisis peak in per capita GDP, whereas in Greece, Italy, the Netherlands, Portugal, and Spain it continued to contract through 2013. Different from Reinhart and Rogoff (2014), the NBER business cycle dating committee¹⁹ concluded that the last recession in the US ended in June 2009. Specifically, the committee confirmed that the recession lasted 18 months, beginning in December 2007. According to the committee definition, a recession is a period of falling economic activity for a longer period of time, which is visible in real GDP, industrial production, employment, and wholesale-retail sales. The difference of the NBER business cycle dating committee's conclusion from Reinhart and Rogoff (2014) is that they determined the beginning and end periods of recession (only for the US economy) whereas Reinhart and Rogoff (2014) studied the recovery of economies to reach its pre-crisis income level.

On the other hand, Bordo and Haubrich (2017) revisit the issue of whether business cycles with financial crises differ significantly using the historical data for the US. They examine 27 cycles starting in 1882 and employ several measures of financial crises. They compare the change in real output over the contraction period with the change in real output in the recovery period and perform a test for the difference between cycles with and without a financial crisis. The extent of contraction is measured by the percentage drop of quarterly real gross domestic product (from the peak to the trough), whereas the strength of the recovery is measured by the percentage change from the trough at two horizons that is four quarters after the cyclical trough. They find that steep expansions tend to follow deep contractions, mainly when the deep contractions are the result of a financial crisis. Indeed, on average, results for cycles without a financial crisis show a weak relation between contraction depth and recovery strength. By emphasising the importance of the monetary regime on recoveries from financial crises, they also state that higher bank lending is associated with a stronger recovery.

In many countries, during the recent global financial crisis period governments and central banks intervened in the financial sector to mitigate the macroeconomic consequences of financial distress. One of these government interventions was to increase bank capitalisation to

¹⁸ Out of 12 systemic crisis episodes which are France, Germany, Greece, Iceland, Ireland, Italy, the Netherlands, Portugal, Spain, Ukraine, the United Kingdom, and the United States.

¹⁹ Look for more details <http://www.nber.org/cycles/sept2010.html>

support liquidity in the financial sector. Homar and van Wijnbergen (2017) investigate the role of bank capitalisation on the economic recovery of 69 systemic banking crises across countries since 1980, of which 29 were part of the recent global financial crisis. In other words, they examine how government intervention through bank recapitalisation helps countries to recover (reduces recession duration) from systemic banking crises over the period 1980-2014. For the recent financial crisis, they consider September 2008 as the start date for the banking crisis for most of the countries in the investigation, only the US and UK experienced the crisis earlier, for them beginning in 2007. In short, they find that after the recapitalisation of banks, the severe recession is predicted to last two years less, down from 14 quarters to 6 quarters. Regarding the recent global financial crisis, the recession duration across countries ranges from 2 quarters in Kazakhstan to 27 quarters in Greece. For only a few countries, the latest recovery date was 2015Q1.

Some other research papers investigate the reductions in economic growth during the crisis episodes. These paper use different variables to measure the impact of crises on economic performance. For example, Fernández *et al.* (2013) analyse the impact of reductions in the amount of credit available (finance effect) and drops in the allocation of investable resources (asset allocation effect) on the decline of economic growth during banking crises periods. They investigated 19 systemic banking crises episodes which occurred in 18 developed and developing countries for the period between 1989 and 2007. The study provides empirical evidence that a banking crisis decreases industry and firm growth not only by limiting the amount of credit available for investment but by worsening the allocation of investable financial resources as well.

The literature on crises also investigates the relationship between the banking crisis and output losses by examining the severity of downturns after crises episodes. For example, Babecký *et al.* (2014) constructed a quarterly dataset to investigate the occurrence of banking, debt, and currency crisis in 40 developed countries for the period 1970-2010. Specifically, using the Bayesian model averaging method, they try to identify the leading indicators of the real costs of crises. To measure the output loss, they use the year-on-year growth rate of real GDP. The main conclusion of the study is that among the crisis types, banking crises are the most costly in terms of the overall output loss. Regarding the recovery period, they state that on average, it takes about six years to recover from the banking crisis. In contrast, Devereux and

Dwyer (2016) investigated 150 crisis episodes from 161 countries over the 1970-2011 period. Based on the findings, the authors state that many banking crises are not associated with a contraction at all. For example, from the 150 episodes, 54 banking crises do not have a contraction in real GDP in the crisis year or in the next two year period. Secondly, they also find important differences across countries in the variables which predict the severity of recessions. For instance, for the developed countries' cases, prior economic conditions were closely associated with changes in real GDP after a banking crisis, whereas with the middle-income countries prior economic conditions provide little correlation for any particular explanation of real GDP's behaviour. In contrast, the existence of a stock market and deposit insurance is associated with higher real GDP growth after a banking crisis in low-income countries.

Regarding the recent global financial crisis, Feldkircher (2014) identifies initial macroeconomic and financial market conditions that can help explain the distinct response of the real economy of a particular country to the recent global financial crisis. To do this, the authors analyse quarterly Real GDP data from 2007Q3 to 2011Q4 for 63 countries. The start period of the crisis is defined as the first quarter real GDP that fell below trend output²⁰ and the end period of the crisis is when the quarter real GDP had surpassed trend output again. According to this measure, the author states that the majority of the countries felt the real downturn during late 2008. It is also suggested that the average duration of the crisis is eleven quarters. However, 30 out of the 63 investigated countries fail to recover to their pre-crisis peak during the observation period.

Teimouri and Dutta (2016) investigate how investment-to-GDP and bank credit-to-GDP ratios adjust to the pre-crisis levels by analysing crises episodes in 79 developed and emerging countries over the 1973-2010 period. They also divided the sample into groups according to country and crisis characteristics to explain potential heterogeneity in the recovery in investment and bank credit ratios following the crisis episodes. Specifically, according to the crisis's characteristics, they split the sample into two categories: (i) preceded by a domestic credit boom or a surge in net capital inflows, and (ii) those that are not preceded by such booms. Based on

²⁰ Trend output calculated by means of the Hodrick-Prescott filter based on real seasonally adjusted quarterly real GDP. Seasonal adjustment carried out using the US Census X12 method.

estimation results, they claim that the investment ratio declines during the banking crisis and swiftly recovers to its pre-crisis level within two-three years, whereas the bank credit ratio drops significantly and remains stagnated even in the medium run. Regarding the country characteristics, both of the ratios decline significantly more in advanced countries and in countries with a higher level of financial openness. Regarding the crisis characteristics, they state that the length and depth of the decline in investment and bank credit ratios intensified during the crisis period that occurred as a result of a domestic credit boom or a surge in net capital inflows. However, they could not find a significant reduction following the crisis that was not preceded by a credit boom or a surge in net capital inflows.

Furthermore, some other studies investigate the relationship between bank lending and crises episodes. For example, Jordà *et al.* (2013) use data for 14 advanced economies between 1870 and 2008. The study examines the role of credit in the business cycle. The main finding of the research is that credit plays an important role in the intensity of recessions as well as the likelihood of a financial crisis. Regarding the recent global financial crisis, authors claim that countries with larger credit booms²¹ in the run-up to the 2008 collapse experienced more sluggish recoveries than countries that experienced smaller credit booms. In addition, Jordà *et al.* (2016) investigate the dynamic behaviour of mortgage lending on bank asset portfolio and its linkage to the crisis episodes during the post World War II period. They do this by using a long-run dataset on disaggregated bank credit for 17 advanced countries since 1870. The study shows that the sharp rise in the credit-to-GDP ratio has been the result of rapid growth in mortgage lending. Specifically, they state that the share of mortgage loans in an average total bank lending portfolio has increased from about 30% in 1900 to around 60% during the recent global financial crisis. The study also mentions the mortgage booms as an essential source of financial instability in the post-World War II period.

In short, from the above discussions, crisis periods and recovery dates significantly differ according to the definitions, indicator variables, and measurement methods. However, the majority of above discussions confirm that the recent global financial crisis started in most

²¹ Countries with larger credit booms in the run-up to the 2008 crisis are UK, Spain, US, Baltic countries, Ireland, whereas the countries with smaller credit booms prior to the crisis are Germany, Switzerland, and the Emerging Markets.

countries in 2008, the only exceptions being the US and UK and Ireland, where the first signs of the crisis started by the end of 2007. Regarding the end date of the recent crisis, the difference among dates depends on whether the research question is looking at crisis end date or the length of the recovery to the pre-crisis peak period. It also differs according to the indicator variables and measurement methods. In other words, findings indicate that the crisis period (recession period) was shorter than the recovery period, considering that even by 2012-2013 only a few countries had started to return to their pre-crisis peak.

Following above discussion, we use Laeven and Valencia (2018) systemic banking crisis dates (crises dates for countries in our sample is given in the Appendix 2) to investigate the impact of bank ownership on lending behaviour. Except for the aforementioned banking crisis classification, the global financial crisis of 2008 impacted many banking sectors without causing systemic banking crises. However, banking sector globalisation, the recent crisis had a strong negative impact on many banks throughout the world and hence, we use this global crisis dummy in our estimations. We classify the recent global financial crisis in two different ways. First, we use separate dummies for 2008 and 2009. Next, we use a single dummy for 2008-2009. These classifications of the crisis period allow us to compare obtained results.

3.6 Methodology

3.6.1 Introduction

Panel data include observations for cross-sectional units (such as individuals, firms, states, countries and so on) over different time periods (such as weekly, monthly, quarterly, yearly, and so on). Thus, a panel data set has multiple units, each of which has repeated observations (usually, but not necessarily) at different time periods. Panel data estimation is becoming a more efficient analytical method for analysing econometric data (Asteriou & Hall, 2015, pp. 441-442). A panel may be long or short and balanced or unbalanced. A *short panel* includes few time periods (small T) and has many entities (large N), whereas a *long panel* has many time periods (large T) but few entities. If all entities and variables in the panel have the same time periods and observations, then it is a *balanced panel*. Therefore, the total number of observations is NT . If each entity in the panel has a different number of time observations, it

is called an *unbalanced panel*. Thus, the total number of observations is not equal to NT (Asteriou & Hall, 2015, pp. 441-442; Gujarati, 2009; Wooldridge, 2010).

Asteriou and Hall (2015) explain the considerable advantages that panel data estimation can offer: (i) by pooling individual entities over time, sample size can be increased considerably, and therefore much better estimates can be obtained; and (ii) omitted variable problem that may result in biased estimations in a single individual regression, under certain circumstances may not occur in a panel context. Furthermore, Baltagi (2008, p. 6) also mentions the following advantages of panel data: (i) controlling for individual heterogeneity. Due to heterogeneity, cross-section and time-series studies run the risk of obtaining biased coefficients while panel data estimation techniques can take into account subject-specific variable heterogeneity; (ii) by pooling times-series and cross-section observations, panel data gives “more informative data, more variability, less collinearity among variables, more degrees of freedom and more efficiency”; (iii) repeated cross-section of observations means panel data techniques are better suited to study the dynamics of changes; (iv) panel data are better able to detect and measure effects that are simply not observable in pure cross-section and time-series data.

3.6.2 Linear panel data models

As discussed above a panel data set is formulated from a sample of observations for N cross-sectional units over T time periods. A simple linear panel data model with one explanatory variable can be shown as follows:

$$y_{it} = \alpha + \beta x_{it} + \varepsilon_{it} \quad (3.1)$$

where y_{it} denotes the observation of the dependent variable for an individual- i at the time- t ; α is an intercept; x_{it} is an independent variable, and ε_{it} is an error term. In this model α and β do not have any subscripts. This means that these coefficients will be the same for all units and all years. In general, pooled OLS, fixed effect, and random-effect methods can be used to estimate a simple linear panel data model.

3.6.3 Pooled OLS

In a pooled model, observations for individuals are pooled together, ignoring any varieties in different individuals. The pooled OLS method produces efficient and consistent parameter

estimates only if the individual effect u_i (time-specific or cross-sectional effect) does not exist ($u_i = 0$). Using two independent variables x_2 and x_3 , a pooled model can be expressed as follows:

$$y_{it} = \alpha + \beta_1 x_{2it} + \beta_2 x_{3it} + \varepsilon_{it} \quad (3.2)$$

From Eq. 3.2, the coefficients $(\alpha, \beta_1, \beta_2)$ do not have individual or time (*i or t*) subscripts. These coefficients are constant for all individuals and for all periods meaning that we assume there is not any heterogeneity for the different individuals across time.

According to the Asteriou and Hall (2015) pooled OLS (also known as the common constant method) produces a common constant α for all cross-sections. This means that in the sample, there is no difference between the estimated cross-sections. However, this is quite restrictive, with a large sample, such as our data which includes banks from different geographical locations. As a result, if we assume the presence of individual heterogeneity, panel data modelling using fixed effects or random effects produces more efficient and consistent results.

3.6.4 Dynamic panels and GMM

Endogeneity is a methodological concern in the bank lending literature as in many areas of economics and business. According to Roberts and Whited (2013) endogeneity is ‘a correlation between the explanatory variables and the error term in a regression’. Thus, endogeneity bias in regression analyses results to inconsistent estimates. This, in turn, leads to inaccurate theoretical interpretations, incorrect inferences and conclusions. Due to the existence of endogeneity problems causes OLS estimates to be biased and inconsistent. Endogeneity usually arises as a result of omitted variables, measurement errors, or simultaneity. Below we will discuss these three sources of endogeneity, followed by econometric techniques that aimed at addressing the endogeneity in empirical analyses.

The omitted variable problem occurs when a variable, observed or unobserved, is correlated with at least one of the regressors but not included in regression equations. Assuming that the true model in bank lending to be estimated as follows:

$$y_i = \alpha + \beta x_i + \gamma z_i + u_i \quad (3.3)$$

where y is bank loan growth rates, x is bank ownership and z is bank capitalization. If bank size variable is correlated with bank ownership (assuming that some government banks' capitalization is usually higher compared to types of banks because of government financial support or liquidity injection) and at the same time bank capitalization separately affects bank lending rates. However, we estimated the true model (Eq. 3.3) by excluding the bank capitalization variable (z) as follows:

$$y_i = \alpha + \beta x_i + \varepsilon_i \quad (3.4)$$

where $\varepsilon_i = \gamma z_i + u_i$ thus, bank capitalization variable is now combined in the error term. Following the above assumption, we now can see that bank ownership variable x is correlated with the error term ε . Therefore, the estimation of Eq. 3.4 produces biased and inconsistent results.

The other source of the endogeneity is measurement error. The measurement error occurs in situations when the perfect measure of a regressor is impossible. Continuing the bank lending example, assume that we could not obtain a perfect measure of bank ownership variable x_i^* (because of mergers and acquisitions, bankruptcies, technical failures, and bailouts that are common in the banking industry²²), but we actually measured $x_i = x_i^* + v_i$ where v_i is the measurement error. Therefore, a model is given by

$$y_i = \alpha + \beta x_i^* + \varepsilon_i \quad (3.5)$$

can be transformed as following

$$y_i = \alpha + \beta(x_i - v_i) + \varepsilon_i \quad (3.6)$$

$$y_i = \alpha + \beta x_i + (\varepsilon_i - \beta v_i) \quad (3.7)$$

$$y_i = \alpha + \beta x_i + u_i \quad (\text{where } u_i = \varepsilon_i + \beta v_i) \quad (3.8)$$

It can be seen that x_i and u_i depend on v_i . In other words, we are necessarily putting the measurement error into u , which leads to biased estimates.

Simultaneity is an another source of endogeneity and it arises when a regressor is determined simultaneously along with the dependent variable. For example, if z_i is determined partly as a function of y , then z_i and error terms are generally correlated. In our example, it means that bank capitalization z_i – is partly determined by the bank lending rates. In other

²² In our sample we classified all banks using the ownership information from BankScope, Claessens and Horen (2014), Bertay et al. (2015), and other related bank information sources.

words, if bank lending rates increase, it leads to a rise in bank profitability. As the retained earnings increase, banks may direct these added earnings to improve its capitalization level. The problem can be addressed using a two-stage or three-stage instrumental variable approach, however, it is not easy to find a valid instrument or sometimes it is impossible. Blundell and Bond (1998) offer the generalized method of moments as a system (System GMM) method which corrects the endogeneity problem in dynamic panel data models. Unlike, two-stage or three-stage instrumental variables approach, system GMM does not rely on external exogenous instruments. In dynamic panel data, the cause and effect relationship is generally dynamic over time. For instance, in bank lending examples, it may not be the current year's deposit funding that is affecting bank lending behaviour, but rather the previous year's deposits that could significantly contribute to bank lending rates.

To solve these problems, the dynamic panel data method uses the lags of the dependent variables as an explanatory variable. In other words, to control the endogenous relationship, dynamic panel data technique uses lagged values as instruments. Thus, the GMM model by using internal instruments provides consistent results in the presence of different sources of endogeneity (Wintoki, Linck, & Netter, 2012, p. 588). To employ internal instruments, the GMM model subtracts the past value of a variable from its current value which is called 'internal transformation of data'. There are two kinds of transformation methods: (i) first-difference transformation (one-step GMM); and (i) second-order transformation (two-step GMM). The limitation of the first-order transformation is that if a variable's recent value is missing, it leads to the loss of too many observations (Roodman, 2009). To avoid this data loss problem, Arellano and Bover (1995) offer a two-step GMM method which uses a second-order transformation. The internally transformed instruments can be tested for validity using a Sargan (1958) test and Hansen (1982) J test.

Related empirical literature emphasises that bank loan supply is correlated with its own lag values and other bank-specific characteristics. This creates an endogeneity problem that possibly leads to biased estimates. For example, bank loans are an integral part of total assets which are used to measure bank size in our estimations. Furthermore, the bank capitalisation ratio differs according to the variability in total assets and therefore plays an essential role in bank lending behaviour. Similarly, deposits are the primary source of banks to fund their lending. Hence, to deal with possible endogeneity problems, we also employ the dynamic panel

estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998), a method which is designed for situations with ‘small T’ time periods and ‘large N’ cross-sections where the independent variables are not strictly exogenous. Moreover, this method also allows for time-invariant individual FE and heteroscedasticity presence along with possible autocorrelation within units but not across them. In this chapter, we first discuss the bias in dynamic panel data and instrumental variables method, then move to the Arellano and Bond estimator, and finalise with the Blundell and Bond system GMM estimator.

3.6.5 The bias in dynamic panel data and instrumental variable (IV) estimator

First, we consider the simple dynamic linear model.

$$y_{it} = \gamma y_{i,t-1} + \beta x'_{it} + u_{it} \quad (3.9)$$

for $i=1, \dots, N$ and $t=1, \dots, T$ for a dataset with large N and fixed T . The γ is a scalar, x'_{it} is $1 \times K$, and β is $K \times 1$. We also assume that

$$u_{it} = \eta_i + v_{it} \quad (3.10)$$

where $\eta_i \sim IID(0, \sigma_\eta^2)$ and $v_{it} \sim IID(0, \sigma_v^2)$ are independent of each other and among themselves. The above dynamic panel data regression Eq. 3.9 suffers from the autocorrelation due to the presence of lagged dependent variable as a regressor and the heterogeneity among individuals. This is because, since y_{it} is a function of η_i , y_{it-1} is also a function of η_i . This indicates that the inclusion of one-period lag of the dependent variable- y_{it-1} as a regressor in Eq. 3.9 is correlated with the error term. Thus, even v_{it} are not serially correlated, the estimation of Eq. 3.9 using the OLS estimator produces biased and inconsistent results. Although employing the within transformation fixed effects to the Eq. 3.9 wipes out the η_i , the correlation between $(y_{it-1} - \bar{y}_{it-1})$ and $(v_{it} - \bar{v}_{it})$ remains. As Nickell (1981) suggested, the resulting correlation creates a bias in estimated coefficients for the lagged dependent variable. The bias will not reduce as the number of individual units (N) increases. Furthermore, if the additional regressor x'_{it} is also related to some degree with the lagged dependent variable, its coefficient may be biased as well.

A possible solution to this problem, according to Anderson and Hsiao (1982) would be first-differencing of Eq. 3.9. The first difference transformation of the model wipes out the individual effects:

$$\Delta y_{it} = \gamma \Delta y_{it-1} + \beta \Delta x'_{it} + \Delta v_{it} \quad (3.11)$$

As suggested by Anderson and Hsiao (1982) after removing the individual effects, $\Delta y_{it-2} = y_{it-2} - y_{it-3}$ can be used as an instrument for $\Delta y_{it-1} = y_{it-1} - y_{it-2}$. This is because, $\Delta y_{it-2} = y_{it-2} - y_{it-3}$ will not be correlated with $\Delta v_{it} = v_{it} - v_{it-1}$, only if v_{it} are not serially correlated among themselves. Although this instrumental variable method produces consistent estimates of the parameters, it is not an efficient one.

3.6.6 The Arellano and Bond estimator

An alternative approach developed by Arellano and Bond (1991) is a generalised method of moments (GMM) procedure, which is more efficient than simple instrumental variable method. According to Arellano and Bond (1991), by using the orthogonality conditions in dynamic panel data, one can obtain additional instruments. Using the simple autoregressive form of Eq. 3.9, the Arellano and Bond (1991) estimator can be demonstrated as follows:

$$y_{it} = \gamma y_{i,t-1} + u_{it} \quad (3.12)$$

To obtain a consistent estimate of γ when T is fixed and $N \rightarrow \infty$, we first remove the individual effects by first-differencing Eq. 3.12,

$$y_{it} - y_{it-1} = \gamma(y_{it-1} - y_{it-2}) + (v_{it} - v_{it-1}) \quad (3.13)$$

where $v_{it} - v_{it-1}$ is MA(1) with a unit root. For the $t = 3$,

$$y_{i3} - y_{i2} = \gamma(y_{i2} - y_{i1}) + (v_{i3} - v_{i2})$$

Accordingly, here we can use y_{i1} as an instrument for $y_{i3} - y_{i2}$, since they are not correlated with $v_{i3} - v_{i2}$. The instrument will be valid only if v_{it} are not serially correlated. Similarly, for $t = 4$, we can write Eq. 3.13 as follows,

$$y_{i4} - y_{i3} = \gamma(y_{i3} - y_{i2}) + (v_{i4} - v_{i3}),$$

However, different from the above case, here we can use y_{i2} and y_{i1} as valid instruments for $y_{i3} - y_{i2}$, since both of these values are not correlated with $v_{i4} - v_{i3}$. Similarly, the valid instruments for the period T will be $(y_{i1}, y_{i2}, \dots, y_{iT-2})$. Hence, a matrix that contains all valid instruments would be:

$$W_i = \begin{pmatrix} [y_{i1}] & 0 & \dots & 0 \\ 0 & [y_{i1}, y_{i2}] & \dots & \vdots \\ \vdots & \vdots & \ddots & \vdots \\ 0 & \dots & \dots & [y_{i1}, \dots, y_{iT-2}] \end{pmatrix} \quad (3.14)$$

But we still need to account for the differenced error term $(v_{it} - v_{it-1})$ in Eq. 3.13. The variance-covariance matrix of the error is $E(\Delta v_i \Delta v_i') = \sigma_v^2 G$, where

$$G = \begin{pmatrix} 2 & -1 & 0 & \dots & 0 & 0 & 0 \\ -1 & 2 & -1 & \dots & 0 & 0 & 0 \\ 0 & -1 & 2 & \dots & 0 & 0 & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots & \vdots & \vdots \\ 0 & 0 & 0 & \dots & 2 & -1 & 0 \\ 0 & 0 & 0 & \dots & -1 & 2 & -1 \\ 0 & 0 & 0 & \dots & 0 & -1 & 2 \end{pmatrix}.$$

Since the matrix of instruments $W = [W_1', \dots, W_N']'$ is orthogonal to the error term, we have the moment condition $E(W_i' \Delta v_i) = 0$. Premultiplying the Eq. 3.13 by W' can be written as the following vector form,

$$W' \Delta y = W' (\Delta y_{-1}) \gamma + W' \Delta v \quad (3.15)$$

In turn, by using the GLS on Eq. 3.15, we get Arellano and Bond (1991) one-step, a consistent estimator

$$\gamma_1 = [(\Delta y_{-1})' W (W' (I_N \otimes G) W)^{-1} W' (\Delta y_{-1})]^{-1} [(\Delta y_{-1})' W (W' (I_N \otimes G) W)^{-1} W' (\Delta y)] \quad (3.16)$$

Hence, using the above moment restrictions, the optimal GMM estimator of γ for $N \rightarrow \infty$ and T fixed is the same as in Eq. 3.16 except replacing

$$W' (I_N \otimes G) W \text{ by } V_n = \sum_{i=1}^N W' (\Delta v_i) (\Delta v_i)' W_i$$

where Δv are obtained from the residuals in the one-step estimation. Thus, the Arellano and Bond (1991) two-step estimator is given by

$$\hat{\gamma}_2 = [(\Delta y_{-1})' W \hat{V}_N^{-1} W' (\Delta y_{-1})]^{-1} [(\Delta y_{-1})' W \hat{V}_N^{-1} W' (\Delta y)] \quad (3.17)$$

If the model contains some additional strictly exogenous regressor x_{it} with $E(x_{it}v_{is}) = 0$ for each s and t , then $x_{i1}, \dots, x_{iT}$ can be added as valid instruments to the first-difference equations in each period. However, if x_{it} are predetermined regressors rather than strictly exogenous with $E(x_{it}v_{is}) \neq 0$ for $s < t$ and 0 otherwise, then $x_{i1}, \dots, x_{i(s-1)}$ are only valid instruments for the first-differenced equation in the period s . Hence, we get

$$W_i = \begin{pmatrix} [y_{i1}, x'_{i1}, x'_{i2}] & 0 & \dots & 0 \\ 0 & [y_{i1}, y_{i2}, x'_{i1}, x'_{i2}, x'_{i3}] & \dots & \vdots \\ \vdots & \vdots & \ddots & \vdots \\ 0 & \dots & \dots & [y_{i1}, \dots, y_{iT-2}, x'_{i1}, \dots, x'_{iT-1}] \end{pmatrix} \quad (3.18)$$

Testing for over-identification of the restrictions

The simple implication of the test of over-identification restrictions can be demonstrated using the autoregressive model as in Eq. 3.12. If we assume that $T = 4$, then according to Arellano and Bond (1991) there are three-moment conditions to identify one parameter:

$$E[y_{i,1}(u_{i3} - u_{i2})] = 0, \quad (3.19)$$

$$E[y_{i,1}(u_{i4} - u_{i3})] = 0, \quad (3.20)$$

$$E[y_{i,2}(u_{i4} - u_{i3})] = 0, \quad (3.21)$$

To estimate γ any of these moment conditions can be applied whereas the remaining two others are over-identification restrictions. Since the moment conditions are $E(W_i' \Delta v_i) = 0$, whereas W_i is as in Eq. 3.14, the following *Sargan test* for over-identification restrictions proposed by Arellano and Bond (1991):

$$m = \Delta \hat{v}' [\sum_{i=1}^N W_i' (\Delta \hat{v}_i) (\Delta \hat{v}_i)' W_i] (\Delta \hat{v}) \sim \chi_{p-K-1}^2,$$

where $\Delta \hat{v}$ is the residuals obtained from two-step estimator and p is the number of columns in W .

Testing for second-order serial correlation

The consistency of the GMM estimator depends on the fact that $E(\Delta v_{it} \Delta v_{it-2}) = 0$. However, since the panel data includes not only cross-section but also time-series, there is a high probability of second-order serial correlation presence. Thus, to check the disturbances of the first-differenced equation for the absence of the second-order serial correlation, Arellano and Bond (1991) developed a test. They hypothesised that there is no second-order serial correlation. The hypotheses only became true when v_{it} are not serially correlated or follow a random walk.

3.6.7 The Blundell and Bond system GMM estimator

When the series is persistent and γ is close to one, the first-differenced GMM estimator can result in large finite sample bias and poor precision in simulation studies and lagged levels of the series will be very weak predictors (Ahn & Schmidt, 1995; Alonso-Borrego & Arellano, 1999). Blundell and Bond (1998) proposed an alternative approach designed to improve generating efficient estimators of the dynamic panel data model. In their work, they use the following simple autoregressive panel data model:

$$y_{it} = \gamma y_{it-1} + \eta_i + v_{it} \quad (0.1) \quad (3.22)$$

with $E(\eta_i) = 0$, $E(v_{it}) = 0$, and $E(\eta_i v_{it}) = 0$ for $i = 1, \dots, N$ and $t = 1, \dots, T$.

Considering the case with $T = 3$, the authors prove that the moment conditions reduce to a single orthogonality condition given as $E(y_{it} \Delta v_{it}) = 0$, hence, γ is just-identified. Thus, the first stage of IV regression, in this case, can be obtained using Eq. 3.22 evaluated at $t = 2$. Specifically, subtracting y_{it} from both sides produces the following equation:

$$\Delta y_{it} = (\gamma - 1)y_{it} + \eta_i + v_{it} \quad (3.23)$$

Thus, since we expect $E(y_{it} \eta_i) > 0$, the least-squares estimator of $(\gamma - 1)$ in Eq. 3.23 is generally biased upwards with

$$\text{plim}(\gamma - 1) = (\gamma - 1) \frac{k}{(\sigma_\eta^2 / \sigma_v^2) + k} \quad (3.24)$$

where $k = \frac{(1 - \gamma)}{(1 + \gamma)}$. The bias term effectively scales the estimated coefficient on the instrumental

variable y_{it} towards zero. Thus, if $\sigma_\eta^2 / \sigma_v^2 \rightarrow \infty$ or $\gamma \rightarrow 1$ then $\text{plim}(\gamma - 1) \rightarrow 0$. The authors

also found that the F-statistic for the first stage IV regression converges to a noncentral chi-squared with one degree of freedom. Then the corresponding noncentrality parameter is

$$\tau = \frac{(\sigma_v^2 k)^2}{\sigma_\eta^2 + \sigma_v^2 k} \rightarrow 0 \quad \text{as } \gamma \rightarrow 1 \quad (3.25)$$

Hence, the instrumental variable estimator performs poorly when $\gamma \rightarrow 1$ as well as for increasing values of σ_η^2 and for decreasing values of σ_v^2 .

Therefore, Blundell and Bond (1998) consider an additional but relatively mild stationarity restriction on the initial conditions process, which allows the use of an extended system GMM estimator. In this estimator, in addition to the lagged levels of y_{it} for differenced equations, the lagged differences of y_{it} will be used for level equations. The stationarity condition on y_{it} requires $E\{[y_{it} - \eta_i / (1 - \gamma)]\eta_i\} = 0$, hence for each individual starting from period $t = 2$ onward, y_{it} converges towards its mean value $\eta_i / (1 - \gamma)$. Consequently, this produces the condition $E(\eta_i \Delta y_{it-1}) = 0$ for $i = 1, 2, \dots, N$. Following the usual mild assumption, one can obtain additional $T - 2$ linear moment conditions $E[\Delta y_{it-1}(\eta_i + v_{it})] = 0$ for $t = 3, 4, \dots, T$. These moment conditions, together with the (Arellano & Bond, 1991) conditions on the first-differenced equation produce the system GMM estimator.

3.7 Conclusions

In this chapter, we discussed the relevant information about the sample data and sources. Second, it also provides some detailed discussion of summary statistics for both bank-level and macro-level variables. Next, it reviews the relevant literature to justify the choice of the bank-specific variables for empirical investigation and their preliminary analysis. Furthermore, this chapter also critically reviewed the endogeneity problem in bank lending practices. In order to justify the crisis period for our empirical analysis, we broadly discussed the literature in crisis measurements and dates. Finally, considering the dynamic nature of bank lending behaviour, we explored the dynamic panel data methods. We further discussed the bias in dynamic panel data and issues related to the instrumental variable approach. Next, we investigated the GMM procedure developed by Arellano and Bond (1991) and finalised our review by focusing on the system GMM estimator proposed by (Blundell & Bond, 1998). In the next chapter, by

employing the panel data methods, we will undertake an empirical investigation of our questions discussed in the literature review.

CHAPTER 4: BANK OWNERSHIP AND LENDING BEHAVIOUR

4.1 Introduction

As discussed in Chapter 2, the literature in development economics emphasises the vital role that financial intermediaries have on economic growth²³. It has been argued that well-functioning banks encourage the production process and economic growth by mobilising savings and funding new technological innovations (Claessens & Laeven, 2005; Clarke et al., 2003; Levine, 1996, 1997).

Many countries have undertaken economic reforms by introducing market principles to the financial sector. These countries have also allowed foreign bank entry. In turn, increased foreign and domestic-private bank participation improved financial stability through smoothing aggregate loan supply volatility (Crystal, Dages, & Goldberg, 2002; De Haas & Van Lelyveld, 2006; Goldberg, 2002; Martinez Peria, Powell, & Vladkova Hollar, 2002). However, the 2008 financial crisis resulted in severe instability for banking systems and high volatility in capital markets around the world. Credit market liquidity dropped significantly, even in countries with the highly liberalised banking sector, thus causing financial sector instability in several economies²⁴ (Ivashina & Scharfstein, 2010). Consequently, the decreased levels of loan supply reduced the availability of production capital to firms. Thus, the credit market illiquidity and the shortage of capital led to macroeconomic stagnation in many countries²⁵ (Bertay et al., 2015; Cull & Peria, 2013; De Haas & Van Horen, 2013; Frey & Kerl, 2015). Motivated by this, in this chapter, we will empirically investigate the lending behaviour of banks with different types of ownership (i.e. foreign-owned, domestic private owned, and government-owned banks) before and after the 2008 financial crisis period.

²³ A considerable amount of literature has been published on the relationship between the financial sector development and economic growth. For more see Claessens and Laeven (2005), King and Levine (1993), Pagano (1993), Rajan and Zingales (1996).

²⁴ The World Bank's "World Development Indicators" database for '*Bank Loans to the private sector as a % of GDP*' provides data for this analysis.

²⁵ Also see the World Bank (2010) report for detailed information about the fall in GDP growth rates by regions: <http://siteresources.worldbank.org/EXTANNREP2010/Resources/WorldBank-AnnualReport2010.pdf>

As a result of banking sector globalisation and easing entry barriers foreign-owned and domestic private banks are playing an important role in the financial section²⁶. Prior research emphasises the positive effect of foreign bank entry on financial stability through smoothing aggregate loan supply in the host country. Although the related research confirms the positive role of foreign banks in smoothing total loan supply, there is limited theoretical views how foreign banks' characteristics or lending behaviour differ from local banks during normal and crisis periods. Several studies emphasise some mechanisms through which foreign banks may affect the credit market in the host country (Adams-Kane et al., 2017; De Haas & Van Lelyveld, 2006; Giannetti & Laeven, 2012b). These findings are mainly based on the theoretical view that being a part of the larger bank holding company (the parent bank) foreign banks has access to more stable financial resources, especially during the period of economic difficulties in host countries. In other words, parent banks can provide financial sources to their subsidiaries as a lender of last resort. Furthermore, foreign banks have access to international capital markets through which they can smooth their loan supply policies. There are some empirical studies as well that support the theoretical view that parent banks usually efficiently allocate capital and liquidity through their internal capital markets to financially support their subsidiaries (Ashcraft, 2008; De Haas & Van Lelyveld, 2010). However, on the other side, some argue that the increased presence of foreign banks and their tight relationship with parent banks played a vital role in transferring financial shock from advanced economies to developing countries.

Additionally, public banks can also play an important role in the financial sector. Brei and Schclarek (2015) developed a theoretical model which analyses the lending behaviour of public banks during the normal and crisis periods. This theory predicts that government banks provide more stable loans during the crisis period, whereas private banks cut back their lending and increase liquidity holdings. The following possible reasons may explain such heterogeneous behaviour. First, in contrast to the private banks, the objective of government-owned banks is to stabilise the financial market and promote economic recovery. Second, potential financial support from the state may prevent government banks from suffering from deposit withdrawals, which are an indispensable source of funding during the crisis period.

²⁶ According to the Claessens and Horen (2014) foreign bank presence increased from a share of 20% in 1995 to 34% in 2009.

Prior empirical results found that government-owned banks are less efficient and underperform foreign-owned and domestic private banks (Mian, 2003; Shen & Lin, 2012). According to the related literature, authorities and political bureaucrats have extremely concentrated control over state-owned banks, and therefore, loan supply policy of these banks are less responsive to the macroeconomic fluctuations in the economy (Dinç, 2005; Micco & Panizza, 2006; Sapienza, 2004). However, the papers that investigated the lending policy of banks during the recent global financial crisis period conclude that compared to foreign-owned and domestic private banks, government banks played a vital role in stabilising aggregate loan supply. Thus, banks with different ownership types may change their lending behaviour according to their own market objectives during the crisis and normal periods.

To better understand the impact of ownership structure on lending behaviour, we investigate how the lending behaviour of banks differs under different ownership types (i.e., foreign, domestic- private, and government-owned) and across loan types (i.e., total gross loans, consumer and retail loans, and corporate and commercial loans). We use a rich set of bank-level panel data from a total of 64 countries located in Europe, East Asia and Pacific, South Asia, the Middle East, and Africa for the 2004-2013 period. Our sample includes the post-crisis period, thus allowing us to compare the lending behaviour of banks during the crisis period not only to the pre-crisis period but also to the post-crisis period. We split our sample into sub-groups of emerging and developed economies to achieve a greater degree of homogeneity in our panel results which allows us to also investigate for the possibility of differences in the lending behaviour of banks given different levels of economic development. Finally, from a methodological point of view, we employ the powerful system GMM methodology (Arellano & Bover, 1995; Blundell & Bond, 1998) to control for possible endogeneity in bank loan growth rates as discussed in 3.6.4 sub-section.

4.2 Empirical methodology

To investigate the lending behaviour of banks, our baseline empirical model takes the following form:

$$\begin{aligned} \Delta L_{ij,t} = & a + \beta_0' \Delta L_{ij,t-1} + \beta_1' Foreign_{i,j} + \beta_2' Government_{ij} + \gamma_2' Crisis2008_t + \gamma_2' Crisis2009_t + \\ & + \gamma_3' Crisis2008_t \times Foreign_{ij} + \gamma_4' Crisis2009_t \times Foreign_{ij} + \gamma_5' Crisis2008_t \times Government_{ij} + \\ & + \gamma_6' Crisis2009_t \times Government_{ij} + \delta_j' \mathbf{X}_{ij,t-1} + \theta_{1i}' GDPgrowth_{j,t} + \theta_{2i}' Inflation_{j,t} + u_{i,t} \end{aligned} \quad (4.1)$$

where ΔL is the growth rate of loans (L) that takes three different forms: (i) total loans, (ii) corporate and commercial loans, and (iii) consumer and retail loans, for a bank i in country j at time t . The Foreign and Government variables are dummy variables that take the value of 1 for foreign-owned and government banks, respectively, and the value of zero otherwise. Including Foreign and Government in the estimations allow us to assess the lending behaviour of these banks compared to domestic private banks for the sample period. $\mathbf{X}$ is a set of independent variables for bank-specific characteristics such as size (*Size*), capitalisation ratio (*Capitalization*), profitability (*Profitability*), and deposit funding to total liabilities ratio (*DepFunding*). These variables will allow us to control for bank-specific characteristics that can also influence bank lending behaviour. Furthermore, we also include *GDPgrowth* in the annual growth rate of GDP to control for loan demand and *Inflation* in annual percentage change in the GDP deflator to control for the uncertainty in the credit market.

To investigate the impact of the crisis on bank lending behaviour, we measure crisis periods based on the following methods. First, we include two dummy variables, *Crisis2008* and *Crisis2009* for the 2008 and 2009 crisis years, respectively; both take the value of 1 for each year respectively and zero otherwise. We use both dummies for two reasons. Figure 3.10 suggests that the mean GDP growth rate started to decline in 2008 and takes negative value in 2009, so both years can be considered as crisis years. Furthermore, using the dummies allows us to detect better what were the actual effects of the subprime crisis on this prolonged crisis period (Bonin & Louie, 2016; Choi et al., 2016; Cull & Peria, 2013). Second, we re-estimated the above model using a single dummy for the 2008-2009 crisis period. This will allow us to compare the coefficients for crisis dummy with those of previous ones and make conclusions. We also classified crisis period based on Laeven and Valencia (2018) banking crisis data. Crisis dates for the countries in our sample according to Laeven and Valencia (2018) is provided in Appendix 2.

We interact the crisis dummies with the Foreign and Government ownership dummies to investigate how the lending behaviour of these banks differed from domestic-private banks during the crisis period, all else being equal. For this purpose, as the base category, we use the interaction term of the crisis dummies with domestic-private banks. Moreover, in several of our specifications, we also include the interaction term of bank-specific variables with the two crisis dummies. This allows us to capture the impact of bank characteristics on lending behaviour

during the crisis period. In all estimations, bank-specific variables except the bank ownership dummies and *DepFunding* are included with one-period lag.

Regarding the estimation method, we employ dynamic GMM panel estimators that are widely used in bank lending empirical literature. Since we are using bank-level data, the endogeneity problem could mean there is a possibility of biased estimates. As discussed in 3.6.4 sub-section omitted variables, measurement errors, and simultaneity problems can cause endogeneity in empirical analyses. For example, bank loans are an integral part of total assets which are used to measure bank size in our estimations. In other words, a bank's total asset portfolio includes the amount of loans supplied to customers and other assets. Thus, if a bank decides to increase its loan supply it will directly impact bank total assets. From a theoretical point of view, this simultaneity can lead to biased estimates in our estimations. Furthermore, the bank capitalisation ratio differs according to the variability in total assets and accordingly plays an essential role in bank lending behaviour. Furthermore, bank capitalization rate through the profitability level directly related to its lending policy. Similarly, deposits are the primary source of banks to fund their lending. Consequently, bank-specific characteristics such as size (*Size*), capitalisation ratio (*Capitalization*), profitability (*Profitability*), and the deposit funding to total liabilities ratio (*DepFunding*) can be endogenous and may be affected by the current and previous values of our dependent variable or be predetermined.

Following above discussion, we consider these bank-specific characteristics as predetermined endogenous, and we treat all other variables as exogenous. Roodman (2009) states that for a variable that is predetermined but not strictly exogenous, a lag of order 1 is valid. Hence, in order to mitigate a possible endogeneity problem, we lag once ($t-1$) all bank specific variables in all our models. To test the relevance of instruments, we use the Hansen (1982) over-identification test where the null hypothesis is that the instruments are exogenous while a rejection of the null hypothesis implies that they are not valid. Furthermore, the tests for the first order (AR1) and second order (AR2) serial correlation are performed among residuals. If the test results indicate existence of second order autocorrelation, then this means that estimates are inconsistent, while the existence of first order autocorrelation is expected (Arellano & Bond, 1991).

The dynamic panel estimator was developed by Arellano and Bover (1995) and Blundell and Bond (1998) for situations with 'small T' time periods and 'large N' cross-sections where

the independent variables are not strictly exogenous. Moreover, this method also allows for time-invariant individual fixed effects and heteroscedasticity presence along with possible autocorrelation within units but not across them. We estimate the two-step system GMM estimator with Windmeijer (2005) finite-sample correction which is consistent to the presence of heteroskedasticity and autocorrelation a correction method that adjusts the covariance matrix for finite samples to minimise the downward bias in standard errors.

4.3 Results

Table 4.1 to Table 4.3 show our baseline regression results for foreign-owned and government banks' relative to the domestic-private banks, using as a dependent variable the total loans growth rate (Table 4.1), the corporate and commercial loans growth rate (Table 4.2), and the consumer and retail loans growth rate (Table 4.3), respectively. We have also performed a robustness test excluding GIIPS countries to check whether our main results are not driven from a sovereign crisis in these countries. All specifications are estimated using the two-step system GMM with the Windmeijer (2005) correction and include the GDP growth rate and inflation to control for the factors which might influence bank lending rates at the macro level. The Hansen (1982) and the Arellano and Bond (1991) AR(2) tests provide reassuring diagnostics and confirm that the proposed dynamic specifications are adequate for valid inference.

4.3.1 Results for the total loans growth rate

Table 4.1 shows the results for the total loans growth rate. Equations 1-3 are estimated with separate dummies (*Crisis2008* and *Crisis2009*) for crisis period while equations 4-6 are obtained with a single dummy for the 2008-2009 period, and finally equations 7-9 are estimated with crisis dates from Laeven and Horen (2018). The results for all crisis classification indicate that bank lending rates across sample groups and loan type series declined during the crisis period.

The results for *Crisis2008* dummy in columns 1-3 are found to be statistically significant and negative indicating that the total loan growth rates declined during the 2008 crisis period. Compared to 2008, there are some differences in bank lending behaviour across sample groups. For instance, the results for the *Crisis2009* dummy shows that total lending by banks in developed countries decreased during 2009 whereas total bank lending in emerging countries increased for the same period. These findings are consistent with previous findings in the

relevant literature (Bonin & Louie, 2016; Choi et al., 2016; Cull & Peria, 2013). For example, according to Teimouri and Dutta (2016), the bank credit ratio declined significantly more in developed countries and countries with financial openness. Another explanation to this quick recovery in emerging countries can be the fact that as shown in the summary statistics Table 3.3 the share of government banks in emerging countries is higher compared to the other sample groups. Consequently, a consistent loan supply by government banks²⁷ in emerging countries might have enabled the banking sector to recover more quickly after the start of the 2008 financial crisis. These findings indicate that even though the recent financial crisis started in developed countries, firms and companies in emerging countries also observed the negative shock, as bank lending rates declined during crisis period. However, positive and significant coefficients of *Crisis2009* across all loan series for emerging countries suggest that these countries started to recover faster from the crisis.

The results for bank ownership and the crisis dummies interaction terms suggest some interesting differences in how banks with different ownership types behaved during the crisis period across our sample groups. For example, the interaction term for foreign banks with the 2008 crisis dummy shows that bank lending rates exceeded domestic-private bank lending in the full sample and emerging countries during 2008 [columns 1, 2], whereas the lending rates of foreign-owned banks in developed countries were not significantly different from domestic-private banks during 2008 [column 3]. However, obtained coefficients for the full sample and developed countries are not statistically significant. Next, to compare government bank lending behaviour with domestic-private banks, we multiplied crisis dummies with the *Government* dummy in full and emerging countries samples. As mentioned above, we do not include the *Government* dummy in developed countries' sample since the share of state banks in these groups of countries is very low [Table 3.3]. The results for the interaction terms of the *Government* dummy with crisis dummies in columns [1] and [2] show that the total lending of government-owned banks exceeded domestic private bank lending rates during the crisis period. Specifically, government-owned banks were able to increase lending rates compared to the

²⁷ Indeed, the results show that the government banks' lending rates exceeded domestic-private bank lending rates during the crisis period. Furthermore, Figure 3.2 shows that the government banks' average loans supply increased significantly from 2008 to 2009.

domestic-private banks by 12% more in 2008 and about 10% more in 2009 in emerging and the full sample countries, respectively. These findings are consistent with Choi *et al.* (2016), who found that government bank lending rates increased during the crisis period, likewise, Cull and Peria (2013) found similar results for Latin America. To summarise, government banks in emerging countries helped to sustain the liquidity in credit market and support the economy to recover from the crisis. Bertay *et al.* (2015) suggests that state banks can play a useful role in stabilising credit volatility during crisis periods.

The results for a single dummy for 2008 and 2009 crisis years are given in columns 4-6. As the results show the coefficients for *Crisis208_2009* are negative and statistically significant across all sample groups. These results also confirm that bank lending rates during the recent global financial crisis decreased significantly.

Results for *Foreign*Crisis2008_2009* shows that the lending behaviour of foreign-owned banks was not significantly different from domestic private bank lending rates in the full sample and emerging countries [columns 4 and 5], while they exceeded domestic private bank lending rates in developed countries during the crisis period [column 6]. These results contradict those obtained using separate dummies for crisis periods. Specifically, when we investigated bank lending rates using separate dummies for the crisis period, foreign-owned bank lending rates exceeded domestic-private bank lending rates during 2008, while it decreased in 2009 in emerging countries. Compared to foreign-owned banks, the results for *Government*Crisis2008_2009* indicates that government-owned banks' lending rates exceeded domestic-owned bank lending rates in the full sample and emerging countries during the 2008-2009 crisis period.

Turning our attention to the results for the crisis period defined by Laeven and Valencia (2018) [columns 7-9], we can see that bank total lending rates decreased in the full sample and developed countries during the crisis period. As given in Appendix 2, the crisis dates from Laeven and Valencia (2018) indicate that most crisis episodes occurred in developed countries. The results for *LV_Crisis* in columns [7] and [9] show that bank lending rates decreased significantly during the banking crisis period in the full sample and developed countries cases, respectively.

Table 4.1 Determinants of the total loans growth rate

	Crisis2008 and Crisis2009			Crisis2008 2009			LV Crisis		
	Full sample	Emerging	Developed	Full sample	Emerging	Developed	Full sample	Emerging	Developed
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Total Loans _{t-1}	0.209** [0.097]	0.503*** [0.128]	0.500* [0.276]	0.142 [0.100]	0.259*** [0.087]	0.374* [0.226]	0.064 [0.080]	0.233*** [0.078]	0.219 [0.164]
Foreign	-4.205 [3.013]	-1.449 [4.226]	-2.687 [4.053]	-1.603 [2.550]	-2.091 [3.206]	-3.294 [4.205]	-7.724 [4.866]	1.321 [6.439]	-8.629* [4.694]
Government	0.700 [3.831]	1.240 [5.455]		7.115 [5.126]	3.303 [5.494]		8.415 [9.487]	5.402 [16.278]	
Crisis2008	-12.607*** [1.959]	-26.593*** [3.696]	-17.113*** [3.173]						
Crisis2009	0.104 [2.600]	6.565* [3.532]	-9.905* [5.765]						
Foreign*Crisis2008	6.439** [2.874]	11.136** [4.809]	1.402 [5.091]						
Foreign*Crisis2009	-1.000 [2.489]	-10.249** [4.572]	5.124 [3.919]						
Government*Crisis2008	4.416 [3.538]	12.594*** [4.123]							
Government*Crisis2009	10.505** [4.495]	9.674** [4.806]							
Crisis2008_2009				-9.574*** [1.980]	-13.606*** [3.155]	-15.377*** [3.080]			
Foreign*Crisis2008_2009				5.204 [3.257]	5.957 [4.286]	8.388** [3.797]			
Government*Crisis2008_2009				17.336*** [5.616]	24.033*** [5.754]				
LV_Crisis							-6.861** [2.717]	2.995 [5.510]	-14.172*** [3.048]
Foreign*LV_Crisis							10.057*** [3.107]	-0.915 [6.044]	12.176*** [3.979]
Government*LV_Crisis							6.342 [6.653]	-11.950 [11.085]	
Size _{t-1}	-8.484** [3.451]	-7.453** [3.094]	0.101 [5.991]	-13.782*** [4.296]	-10.007*** [2.770]	-2.643 [4.952]	-12.414*** [2.759]	-6.014** [2.379]	-4.882 [3.201]
Capitalisation _{t-1}	-0.823 [0.565]	-0.751 [0.773]	0.129 [0.508]	-1.365** [0.560]	-0.593 [0.524]	-0.181 [0.794]	-0.042 [0.752]	0.539 [0.547]	-0.324 [0.630]
Profitability _{t-1}	4.760*** [1.582]	3.747** [1.782]	3.084 [2.365]	7.457*** [1.859]	5.353*** [1.616]	3.084* [1.678]	4.122*** [1.433]	2.363** [1.091]	1.908 [3.561]
DepFunding	-0.282 [0.189]	-0.425 [0.259]	0.076 [0.323]	-0.192 [0.161]	-0.306 [0.238]	0.247 [0.245]	-0.261 [0.160]	-0.193 [0.222]	-0.366 [0.236]
GDPgrowth	0.671* [0.348]	1.367*** [0.491]	-1.054 [0.752]	0.689* [0.382]	0.607 [0.527]	-1.388* [0.818]	0.236 [0.272]	1.409*** [0.349]	-1.001 [0.700]
Inflation	-0.478** [0.230]	-0.734* [0.427]	-2.123*** [0.799]	-0.652** [0.262]	0.035 [0.465]	-2.118*** [0.664]	-0.569** [0.251]	-1.099*** [0.317]	2.545 [1.808]
Constant	109.163*** [33.119]	106.407** [42.040]	0.837 [75.222]	148.806*** [41.912]	112.983*** [35.856]	15.269 [61.691]	134.676*** [28.863]	63.265** [31.495]	84.879** [37.761]
Observations	7,933	4,674	3,259	7,933	4,674	3,259	7,933	4,674	3,259
Number of banks	1312	800	512	1312	800	512	1312	800	512
AR[1] p-value	0.000	0.000	0.010	0.011	0.000	0.007	0.000	0.000	0.000
AR[2] p-value	0.133	0.345	0.157	0.214	0.172	0.186	0.958	0.091	0.436
Hansen p-value	0.259	0.145	0.555	0.660	0.078	0.979	0.315	0.273	0.796
No. of instruments	81	79	44	70	68	37	99	90	47

Note: All specifications are estimated using the two-step system GMM. * denotes the interaction terms and Windmeijer-corrected SEs are reported in square brackets for the two-step system GMM specifications. Due to limited data availability, the government ownership variable and its interactions with the crisis dummies are excluded in models for developed countries. ***, **, and * indicate the 1%, 5%, and 10% level of significance, respectively.

Results for *Foreign*Crisis_LV* in columns [7] and [9] show that foreign bank lending rates exceeded domestic-private bank lending rates in the full sample and developed countries samples. The obtained coefficient of *Foreign*Crisis_LV* for emerging countries is negative, however, this was found to not be significant.

Turning our attention to the other variables, we notice that *Size* is negatively and significantly related to bank lending rates. The only exceptions here are the results for developed countries across all crisis specifications where the coefficient of *Size* has not been significant at any conventional level of significance. The adverse effect of *Size* is well explained in the relevant bank lending literature; smaller banks tend to supply relatively more lending to their clients than larger banks. Therefore, our results also confirm the existence of a strong lending relationship between small banks and firms in the full sample and emerging countries as in Ehrmann and Worms (2004), Gambacorta (2005), and Matousek and Sarantis (2009).

The results for bank *Capitalization* across all crisis specifications indicate that there is not a significant difference between lending rates of solvent banks compared to banks with low equity ratios. However, the results are not consistent across sample groups and estimation methods. One possible explanation for this finding can be found in Gambacorta and Mistrulli (2004) who suggested that the capital-to-asset ratio may poorly approximate relevant bank capitalisation, which is generally used in bank lending empirical literature.

Furthermore, the positive and significant results for *Profitability* across all crisis period specifications in Table 4.1 show that banks with higher rates of profit provided more loans compared to those banks with low rates mostly in emerging countries and full sample groups. These results also confirm the existence of a relationship between bank profitability and bank lending behaviour as in (Ramadan, Kilani, & Kaddumi, 2011; Vinh, 2017).

Finally, the results for one-period-lagged total loans growth rates are positive and significant in most of the model specifications [columns 1, 2, 3, 5, 6, and 8] indicating the validity of our dynamic specification. Furthermore, the results for the full and emerging countries samples in models [1], [2], and [8] respectively, show that GDP growth rate has a positive relationship with loan growth rates, a finding that is consistent with the finance-growth nexus literature, which suggests that well-functioning or growing economies provide better financial services (King and Levine, 1993; Pagano, 1993). The variable *Inflation* is found to have a negative and significant coefficient in almost all equations, a result which is consistent with

Boyd *et al.* (2001) who found that bank loan supply is strongly related with inflation. In other words, a more inflationary environment discourages banks' lending through the adverse impact on credit market frictions. Overall, the results for total loans growth rates in both estimation methods are consistent and comparable regarding magnitudes and significance.

4.3.2 Results for the corporate and commercial loans growth rate

Following the same procedure as above, Table 4.2 presents our estimation results for the bank lending behaviour in the corporate and commercial sector. The results for *Crisis2008* dummy in columns [1] and [2] are found to be statistically significant and negative. These results indicate that bank lending rates in the corporate and commercial sector in the full sample and emerging countries declined significantly during the 2008 crisis period. In contrast to the 2008 crisis period, positive and significant results for *Crisis2009* in column 1-3 indicate that banks started to increase lending rates in the corporate and commercial sector in 2009. The results for a single dummy for 2008 and 2009 crisis years are given in columns 4-6.

As in the case of the total loan, we also tested the impact of the global financial crisis on bank lending behaviour in the corporate and commercial sector using a single dummy for 2008-2009. The results for *Crisis2008_2009* are given in columns 4-6. As the results show, the coefficients for *Crisis2008_2009* are negative and statistically significant across all sample groups. These results also confirm that bank lending rates during the recent global financial crisis decreased significantly.

Compared to *Crisis2008_2009*, the results for crisis dummy *LV_Crisis* defined by Laeven and Valencia (2018) crisis dates in columns 7-9 shows that bank lending rates in the corporate and commercial sector declined in the full sample group. However, the obtained coefficients for emerging and developed countries are not significantly different from normal times.

Turning our attention to the lending behaviour of foreign banks, the results for *Foreign*Crisis2008* and *Foreign*Crisis2009* in columns 1-3 indicate that compared to the domestic-private banks, foreign-owned banks have not significantly decreased their lending rates during the 2008 and 2009 crisis period. However, positive and significant results for *Government*Crisis2008* in the same equations reveal that government-owned banks

Table 4.2 Determinants of the corporate and commercial loans growth rate

Variables	Crisis2008 and Crisis2009			Crisis2008 2009			LV Crisis		
	Full sample	Emerging	Developed	Full sample	Emerging	Developed	Full sample	Emerging	Developed
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Corporate Loans _{t-1}	0.283**	0.285***	0.162	0.261***	0.207**	0.337	0.176*	0.014	-0.043
Foreign	[0.111]	[0.101]	[0.124]	[0.084]	[0.081]	[0.335]	[0.092]	[0.044]	[0.048]
	1.299	-1.086	-1.676	-11.303**	-8.581	-22.438	-10.353	4.786	-8.609
Government	[4.053]	[4.195]	[6.241]	[5.235]	[6.267]	[18.423]	[6.772]	[9.507]	[9.721]
	3.539	3.482		-5.356	-3.467		-9.549	3.413	
	[7.443]	[5.887]		[9.530]	[9.471]		[6.296]	[20.195]	
Crisis2008	-14.671***	-17.440***	0.186						
	[3.766]	[5.776]	[3.434]						
Crisis2009	9.066**	11.283**	18.263***						
	[4.088]	[4.811]	[6.870]						
Foreign*Crisis2008	3.821	7.094	-3.106						
	[4.603]	[5.662]	[7.979]						
Foreign*Crisis2009	-5.181	-5.429	0.641						
	[3.822]	[5.235]	[6.307]						
Government*Crisis2008	12.223**	15.967**							
	[5.638]	[7.364]							
Government*Crisis2009	-3.737	-3.456							
	[6.010]	[7.230]							
Crisis2008_2009				-10.990***	-12.062***	-12.284**			
				[3.414]	[4.611]	[5.196]			
Foreign*Crisis2008_2009				9.711**	10.761**	9.242			
				[4.030]	[5.444]	[6.938]			
Government*Crisis2008_2009				10.228**	11.484**				
				[4.852]	[5.671]				
LV_Crisis							-7.335**	8.330	-2.189
							[3.446]	[6.613]	[4.228]
Foreign*LV_Crisis							9.472	-11.399	-5.612
							[6.897]	[11.055]	[10.869]
Government*LV_Crisis							-5.814	-9.025	
							[14.967]	[12.371]	
Size _{t-1}	-12.984***	-11.185***	1.605	-2.957	-6.192	6.777	-4.786*	-13.003***	-1.010
	[4.082]	[3.609]	[4.231]	[4.281]	[4.688]	[11.860]	[2.714]	[3.442]	[5.346]
Capitalisation _{t-1}	-1.379*	-0.985	-0.417	0.380	0.155	1.216	0.091	-0.963	0.406
	[0.757]	[0.855]	[0.637]	[0.922]	[1.052]	[2.997]	[0.583]	[0.829]	[1.055]
Profitability _{t-1}	5.490**	5.581***	0.367***	3.527*	4.927*	0.873	3.050*	5.676***	1.190**
	[2.135]	[1.946]	[0.104]	[1.979]	[2.852]	[1.297]	[1.572]	[1.232]	[0.584]
DepFunding	-0.362	-0.449	-0.145	-0.395*	-0.318	0.040	-0.419**	-0.359	-0.043
	[0.303]	[0.360]	[0.300]	[0.228]	[0.323]	[0.597]	[0.203]	[0.326]	[0.396]
GDPgrowth	2.319***	2.533***	5.294***	1.195**	1.422***	0.152	0.895	1.528***	0.967
	[0.637]	[0.659]	[1.147]	[0.525]	[0.544]	[1.182]	[0.685]	[0.345]	[0.744]
Inflation	-1.055	-1.163**	-0.002	-1.371**	-1.186**	-1.390	-0.982*	-1.176**	-0.433
	[0.644]	[0.593]	[1.789]	[0.684]	[0.594]	[1.550]	[0.507]	[0.490]	[0.663]
Constant	151.604***	138.438***	-2.677	67.332	85.391	-57.345	86.442**	150.410***	19.001
	[49.711]	[53.717]	[47.762]	[43.587]	[63.514]	[159.836]	[35.998]	[45.150]	[64.304]
Observations	3,200	2,221	979	3,200	2,221	979	3,200	2,221	979
Number of banks	707	472	235	707	472	235	707	472	235
AR[1] p-value	0.024	0.000	0.002	0.000	0.000	0.077	0.000	0.000	0.004
AR[2] p-value	0.203	0.331	0.560	0.172	0.385	0.957	0.395	0.718	0.796
Hansen p-value	0.073	0.289	0.456	0.855	0.698	0.945	0.937	0.312	0.709
No. of instruments	90	88	50	69	66	33	77	99	55

Notes: All specifications are estimated using the two-step system GMM. * denotes the interaction terms and Windmeijer-corrected SEs are reported in square brackets for the two-step system GMM specifications. Due to limited data availability, the government ownership variable and its interactions with the crisis dummies are excluded in models for developed countries. ***, **, and * indicate the 1%, 5%, and 10% level of significance, respectively

considerably increased their lending rates compared to the domestic private banks during 2008. These findings are consistent with Cull and Peria (2013), who found similar results for Latin America. To summarize, government-owned bank in emerging countries by providing stable loan supply in corporate and commercial sector, played an important role to support corporations and commercial sector participants with working capital during the crisis period. Although the related literature highlights poor performance of state banks compared to domestic-private and foreign banks, our findings suggest that governments banks can play a useful role in stabilising the loan market volatility in corporate and commercial sector, particularly during the periods of financial instability.

In contrast, the results for multiplication of bank-ownership dummies with a single dummy variable of *Crisis2008_2009* in columns 4-6 show that the loan growth rate of foreign-owned and government-owned banks exceeded domestic-private bank lending rates during the 2008-2009 period. These findings are consistent with results obtained in columns 1-3 for government-owned banks. However, the results with a single dummy variable for foreign-owned banks indicate that compared to the domestic-private banks they started to increase their lending rates from 2009 in the corporate and commercial sector. In other words, we can conclude that by increasing their lending rates foreign-owned banks started to build their relationship with firms and companies in the corporate and commercial sector, while their domestic counterparts retrenched their lending during the crisis period.

Compared to the results for total loans in Table 4.1, bank *Size* is strongly and negatively related to corporate and commercial lending in 4 out of 9 equations. Results for another bank-specific variable-*Profitability* across all sample groups and crisis classifications indicate that bank profitability positively contributed to bank lending throughout the whole period.

Furthermore, results for *GDPgrowth* for all the emerging countries sample across all crisis specifications demonstrate that bank lending rates in the corporate and commercial sector have a positive relationship with GDP growth rates, confirming the existence of a positive relationship between finance and growth (King and Levine, 1993; Levine, 1999; Pagano, 1993). In contrast to emerging countries, the results for developed countries in *Crisis2008-2009* and *Crisis_LV* classifications are not significantly related to GDP growth rate columns 6 and 9. One possible explanation for this could be the existence of a well-developed stock exchange and capital markets in these countries through which large companies and corporations may find

external funding. Hence, the presence of an alternative financing source in industrialised countries might weaken the impact of banks' corporate lending has on macroeconomic performance. The variable *Inflation* is found to have a negative and significant coefficient in 5 out of 9 equations indicating that a more inflationary environment discourages banks' lending through the adverse impact on credit market frictions.

4.3.3 Results for the consumer and retail loans growth rate

Table 4.3 presents the estimations for the growth rate of consumer and retail loans with the results being quite similar to the other loan series and suggesting that bank lending rates in this sector also declined during the crisis period. Specifically, the results for *Crisis2008* in columns 1 and 2 indicate that bank lending rates in the consumer and retail sector declined significantly compared to the non-crisis period in the full sample and emerging countries. However, compared to the *Crisis2008*, the obtained coefficients for *Crisis2009* in columns 1-3 are positive and statistically significant indicating that the banking sector started to increase their lending in the consumer and retail sector across all sample groups.

Regarding the results for the crisis period classified by single dummy *Crisis2008_2009* in columns 4-6, the obtained negative and significant coefficients indicate that banks reduced their lending rates during the 2008-2009 crisis period in consumer and retail sector across all sample groups. As in the total loans and corporate and commercial loans cases, these results also confirm that bank lending rates during the recent global financial crisis decreased significantly in the consumer and retail sector.

Compared to the *Crisis2008_2009*, the results for the crisis period classified using *Crisis_LV* show that bank lending rates during this period have not significantly differed from the lending rates of the non-crisis period. As discussed in crisis classification, crisis episodes according to the Laeven and Valencia (2018) mostly occurred in advanced economies. As a result, this finding indicates that although total loan lending rates decreased in developed countries, according to the results for *Crisis_LV* in Table 4.1, banks have not reduced their lending rates in the consumer and retail sector in these countries' sample during the recent global financial crisis period.

Table 4.3 Determinants of the consumer and retail loans growth rate

Variables	Crisis 2008 and Crisis 2009			Crisis 2008 2009			LV Crisis		
	Full sample	Emerging	Developed	Full sample	Emerging	Developed	Full sample	Emerging	Developed
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Consumer Loans _{t-1}	0.233**	0.170*	-0.027	0.132***	0.182***	-0.033	0.184***	0.216***	-0.055
Foreign	[0.118]	[0.098]	[0.104]	[0.050]	[0.056]	[0.067]	[0.057]	[0.059]	[0.114]
	1.971	2.182	2.908	-8.770**	-7.705*	-9.047	7.151	16.518	-12.487
Government	[3.355]	[4.043]	[4.758]	[4.332]	[4.152]	[8.373]	[9.180]	[10.891]	[16.688]
	-8.745	-4.827		-8.968*	-7.952		14.910	-27.363	
	[7.134]	[7.203]		[5.172]	[5.143]		[13.449]	[37.639]	
Crisis2008	-13.771***	-13.780***	-0.408						
	[4.041]	[5.137]	[7.005]						
Crisis2009	10.823**	10.818***	22.626*						
	[4.225]	[3.915]	[12.632]						
Foreign*Crisis2008	3.754	5.320	-15.002*						
	[5.535]	[5.430]	[7.920]						
Foreign*Crisis2009	-6.814*	-8.677*	-4.439						
	[4.133]	[4.609]	[7.490]						
Government*Crisis2008	15.254**	12.979*							
	[6.914]	[7.270]							
Government*Crisis2009	1.225	-0.404							
	[5.923]	[5.416]							
Crisis2008_2009				-11.809***	-9.635**	-13.638**			
				[3.124]	[4.136]	[6.100]			
Foreign*Crisis2008_2009				9.182**	9.332*	12.429*			
				[3.689]	[4.849]	[7.258]			
Government*Crisis2008_2009				10.306**	12.454**				
				[4.468]	[5.265]				
LV_Crisis							6.667	9.754	-4.837
							[4.730]	[6.912]	[6.608]
Foreign*LV_Crisis							-24.620**	-28.263**	-17.690
							[9.559]	[12.041]	[14.024]
Government*LV_Crisis							-16.191	6.769	
							[11.733]	[34.074]	
Size _{t-1}	-12.246***	-13.825***	-5.025	-10.028**	-6.236	3.327	-12.594***	-8.512***	-10.805*
	[4.183]	[4.101]	[4.483]	[4.919]	[4.603]	[5.167]	[2.246]	[2.543]	[5.696]
Capitalisation _{t-1}	-1.203**	-1.188**	-1.251	0.500	0.081	-0.537	-0.590	-0.120	-0.127
	[0.515]	[0.563]	[1.002]	[0.659]	[0.818]	[1.715]	[0.887]	[0.762]	[0.987]
Profitability _{t-1}	4.257**	4.503**	4.206**	2.829*	2.567	-8.871	4.488***	4.365***	5.503**
	[1.974]	[1.842]	[1.920]	[1.569]	[1.618]	[9.611]	[1.292]	[1.349]	[2.327]
DepFunding	0.428	0.265	0.552	0.146	0.091	0.679*	0.152	-0.077	1.324*
	[0.299]	[0.277]	[0.415]	[0.274]	[0.251]	[0.383]	[0.257]	[0.337]	[0.681]
GDPgrowth	2.221***	1.922***	4.622**	0.791*	1.311***	0.280	1.744***	1.583***	1.938***
	[0.543]	[0.477]	[2.197]	[0.432]	[0.452]	[0.935]	[0.292]	[0.265]	[0.652]
Inflation	-0.806*	-0.572	-0.335	-0.696*	-0.712	0.539	-1.454**	-0.777**	-0.194
	[0.421]	[0.389]	[1.401]	[0.392]	[0.439]	[1.434]	[0.570]	[0.380]	[0.949]
Constant	80.279**	102.348**	6.237	79.181	52.729	-62.120	102.285***	75.939*	0.125
	[40.236]	[41.648]	[71.688]	[50.260]	[47.804]	[79.996]	[36.067]	[39.249]	[67.456]
Observations	2,491	1,921	570	2,491	1,921	570	2,491	1,921	570
Number of banks	587	437	150	587	437	150	587	437	150
AR[1] p-value	0.000	0.000	0.045	0.000	0.000	0.040	0.000	0.000	0.020
AR[2] p-value	0.190	0.402	0.093	0.181	0.480	0.369	0.199	0.497	0.252
Hansen p-value	0.121	0.064	0.916	0.648	0.318	0.985	0.208	0.149	0.918
No. of instruments	88	88	48	68	68	28	107	90	57

Notes: All specifications are estimated using the two-step system GMM. * denotes the interaction terms and Windmeijer-corrected SEs are reported in square brackets for the two-step system GMM specifications. Due to limited data availability, the government ownership variable and its interactions with the crisis dummies are excluded in models for developed countries. ***, **, and * indicate the 1%, 5%, and 10% level of significance, respectively.

Turning our attention to the lending behaviour of foreign banks, it can be seen that the results for *Foreign*Crisis2008* and *Foreign*Crisis2009* in columns 1 and 2 indicate that foreign-owned banks have not significantly decreased their lending rates during 2008 compared to the domestic-private banks, whereas their lending rates in 2009 fell more than domestic-private banks in the full sample and emerging countries. In contrast, foreign bank lending rates in developed countries decreased in 2008 [column 3] compared to the domestic-private banks. Regarding the government-owned banks, the results for *Government*Crisis_2008* in columns 1 and 2 reveals that their lending rates in the consumer and retail sector exceeded domestic-private banks' lending rates during the 2008 crisis period in the full sample and emerging countries. This finding also confirms that government banks, mostly observed in emerging countries, increased their lending rates to prevent the negative impacts of the global financial crisis being inflicted on the economy. They did this by financially supporting consumers and retail sector participants.

Compared to the individual dummies for the crisis period, the results for a single dummy for 2008-2009 for *Foreign*Crisis2008_2009* and *Government*Crisis2008_2009* in columns 4-5 show that both foreign-owned and government-owned banks lending rates in the consumer and retail loan sector exceeded domestic-private bank lending rates during the global financial crisis period across all sample groups.

However, concentrating our attention to the *Crisis_LV* results in columns 7-8 show that foreign banks in the full sample and emerging countries considerably reduced their lending rates compared to the domestic-private banks. In other words, as discussed above according to the Laeven and Valencia (2018)'s crisis classifications, most of the crisis episodes in the banking sector occurred in developed countries²⁸. Therefore, we can conclude that during the recent global financial crisis period, foreign banks in these developed countries reduced their lending rates more than domestic-private banks lending to consumer and retail sector borrowers.

Although the foreign bank lending rates exceeded domestic private bank lending rates the crisis defined by single dummy *Crisis2008_2009*, using the separate dummies for both years *Crisis2008* and *Crisis2009* or *LV_Crisis* classifications show that these banks reduced loan supply faster than domestic banks during the crisis. Hence, to retain the stable loan supply for

²⁸ According to Laeven and Valencia (2018), from a total of 15 crisis episodes, 11 occurred in developed countries.

borrowers in consumer and retail sector during the economic downturn periods financial sector regulators need cautiously consider these negative impacts of foreign banks when they are restructuring the banking sector.

Similar to the results in Table 4.1 and Table 4.2, bank *Size* is strongly and negatively related to corporate and commercial lending in 6 out of 9 equations. Results for another bank-specific variable-*Profitability* across all sample groups and crisis classifications-indicate that bank profitability positively contributed to bank lending throughout the whole period.

The results for *GDPgrowth* for all the emerging countries across all crisis specifications demonstrate that bank lending rates in the corporate and commercial sector have a positive relationship with GDP growth rates confirming the existence of a positive relationship between finance and growth (King and Levine, 1993; Levine, 1999; Pagano, 1993). In contrast to emerging countries, the results for developed countries in *Crisis2008-2009* and *Crisis_LV* classifications are not significantly related to GDP growth rate columns 6 and 9. One possible explanation for this, as stated before, could be the existence of a well-developed stock exchange and capital markets in these countries through which large companies and corporations may find external funding. Hence, the presence of an alternative financing source in industrialised countries might weaken the role of banks' corporate lending on macroeconomic performance. The variable *Inflation* is found to have a negative and significant coefficient in 4 out of 9 equations indicating that a more inflationary environment discourages banks' lending through the adverse impact inflation has on credit market frictions.

4.3.4 Robustness test: excluding GIIPS countries

To further investigate the lending behaviour of banks with different ownership types, we exclude the GIIPS countries that experienced sovereign debt problems starting from 2009 to 2012. This alternative estimation allows us to test whether our main results are not driven by the lending behaviour of banks located in GIIPS countries. According to Acharya *et al.* (2018) sovereign debt crisis in GIIPS countries increased the indebtedness, making it difficult to refinance their outstanding debt. As a result, the worsening of creditworthiness of these countries quickly transferred to the

Table 4.4 Determinants of the total loans growth rate excluding GIIPS countries

Variables	Crisis 2008 and Crisis 2009			Crisis2008 2009			LV Crisis		
	Full sample	Emerging	Developed	Full sample	Emerging	Developed	Full sample	Emerging	Developed
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Total Loans _{t-1}	0.321**	0.440***	0.435*	0.188*	0.285***	0.542**	0.076	0.208***	0.197
Foreign	[0.132]	[0.134]	[0.262]	[0.100]	[0.084]	[0.254]	[0.087]	[0.080]	[0.155]
Government	-1.164	1.938	1.035	-0.664	2.475	1.786	-6.947	4.956	-8.712**
	[3.618]	[5.242]	[4.450]	[2.865]	[4.110]	[3.985]	[4.791]	[8.239]	[4.436]
Crisis2008	2.133	4.852		9.475	8.097		9.027	6.444	
	[5.056]	[6.434]		[6.041]	[6.493]		[11.697]	[22.770]	
Crisis2009	-19.502***	-22.507***	-17.022***						
	[2.380]	[4.063]	[4.761]						
Foreign*Crisis2008	-1.373	8.253**	-9.749						
	[2.913]	[3.594]	[9.823]						
Foreign*Crisis2009	8.474**	6.344	0.046						
	[4.186]	[4.439]	[4.368]						
Government*Crisis2008	-2.176	-11.625**	2.864						
	[3.114]	[5.327]	[3.545]						
Government*Crisis2009	10.655**	10.446***							
	[4.725]	[3.800]							
Crisis2008_2009	13.725***	9.024*							
	[4.373]	[5.322]							
Foreign*Crisis2008_2009				-10.001***	-16.550***	-17.062***			
				[2.145]	[3.499]	[5.330]			
Government*Crisis2008_2009				5.623	7.336	8.352*			
				[3.637]	[4.539]	[4.322]			
LV_Crisis				18.561***	28.615***		-8.744***	-4.079	-14.130***
				[6.008]	[6.819]		[2.554]	[7.049]	[3.056]
Foreign*LV_Crisis							11.487***	6.643	11.208***
							[3.184]	[7.481]	[3.847]
Government*LV_Crisis							8.745	-5.722	
							[7.707]	[22.333]	
Size _{t-1}	-8.052*	-8.275***	-7.892*	-13.589***	-10.867***	-10.756**	-11.389***	-7.532***	-3.787
	[4.204]	[3.036]	[4.283]	[4.971]	[3.013]	[4.425]	[2.632]	[2.447]	[3.024]
Capitalisation _{t-1}	-1.362**	-0.979	-0.860	-1.210**	-0.637	-1.226	0.036	-0.131	-0.056
	[0.655]	[0.774]	[0.678]	[0.575]	[0.603]	[0.849]	[0.647]	[0.653]	[0.536]
Profitability _{t-1}	4.733**	4.341**	5.003	6.991***	6.454***	3.841	3.591**	3.505**	1.532
	[2.070]	[1.939]	[4.081]	[2.199]	[1.790]	[2.451]	[1.401]	[1.617]	[2.601]
DepFunding	-0.250	-0.388	0.058	-0.186	-0.394*	0.111	-0.217	-0.417*	-0.341
	[0.194]	[0.250]	[0.243]	[0.164]	[0.238]	[0.211]	[0.188]	[0.225]	[0.244]
GDPgrowth	0.461	1.546***	-1.236	0.718*	0.540	-1.705	0.228	1.503***	-1.155
	[0.504]	[0.479]	[1.483]	[0.398]	[0.574]	[1.253]	[0.310]	[0.357]	[0.754]
Inflation	-0.471	-0.612	1.558	-0.670**	0.301	0.196	-0.494*	-1.074***	2.554
	[0.505]	[0.448]	[3.230]	[0.266]	[0.480]	[2.686]	[0.256]	[0.332]	[2.281]
Constant	107.611***	108.219**	76.313*	143.553***	120.673***	102.466**	120.707***	99.225***	71.137**
	[39.516]	[42.597]	[43.709]	[46.859]	[38.740]	[46.827]	[29.158]	[34.744]	[35.339]
Observations	7,504	4,376	3,128	7,504	4,376	3,128	7,504	4,376	3,128
AR[1] p-value	0.001	0.000	0.046	0.000	0.000	0.009	0.000	0.000	0.000
AR[2] p-value	0.249	0.257	0.139	0.086	0.093	0.127	0.872	0.093	0.538
Hansen p-value	0.173	0.143	0.989	0.397	0.173	0.994	0.129	0.728	0.785
No. of instruments	74	78	43	67	68	37	97	88	47

Notes: All specifications are estimated using the two-step system GMM. * denotes the interaction terms and Windmeijer-corrected SEs are reported in square brackets for the two-step system GMM specifications. Due to limited data availability, the government ownership variable and its interactions with the crisis dummies are excluded in models for developed countries. ***, **, and * indicate the 1%, 5%, and 10% level of significance, respectively.

Financial sector due to banks' large sovereign exposures²⁹ by decreasing their lending rates substantially. Thus, considering that the sovereign debt crisis might negatively contribute to bank lending, we exclude banks located in the GIIPS countries from our full sample to test the robustness of our main results. For this purpose, we reproduce the results in Table 4.4. By using the same methodology but excluding the GIIPS countries.

Table 4.4 above shows the results for total loans growth rates excluding GIIPS countries. As can be seen from columns 1-3, the results for *Crisis2008* reveal that bank total lending rates significantly decreased during the 2008 crisis period. The results for *Crisis2008* dummy in columns 1-3 are found to be statistically significant and negative indicating that the total loan growth rates declined during the 2008 crisis period. Compared to the 2008 period, the results for *Crisis2009* indicate that the banks total lending rates were not significantly different in full sample and developed countries cases, whereas it increased in emerging countries.

The results for bank ownership and the crisis dummies show that compared to the domestic-private banks, foreign-owned bank lending rates decreased in emerging countries during the 2009 crisis period, whereas government-owned bank lending rates exceeded domestic-private bank lending rates in 2008 and 2009 period. As the share of government-ownership in developed countries is very low [Table 3.3] we exclude *Government* dummy in equations for these sample groups in columns 3, 6, and 9. The results for *Crisis2008* and *Crisis2009* and their interaction terms with bank ownership dummies in columns 1-3 do not significantly differ from the main results in Table 4.1 when we exclude the GIIPS countries.

The equations for a single dummy for 2008 and 2009 crisis years are given in columns 4-6. As it can be seen from the results, the *Crisis2008_2009* dummy variable obtained negative and statistically significant coefficients across all sample groups. The coefficients for *Crisis2008_2009* dummy for estimations in Table 4.1 were between 9.5% and 15.3% points, whereas the coefficients for the same variable in Table 4.4 without the GIIPS countries range between 10.0% and 17.0% points. These findings also confirm that the exclusion of the GIIPS countries from our sample countries has not significantly changed our main results. The result for the interaction term of *Crisis2008_2009* with bank ownership dummy variables in columns 4-6 is also consistent with those obtained in Table 4.1.

²⁹ Look for more information Acharya et. al., (2014) and Acharya and Steffen (2015).

Results for another crisis classification dummy variable – *LV_Crisis* in Table 4.4 also did not change significantly after exclusion of the GIIPS countries confirming the reductions in bank lending rates during the crisis period. The sign and significance of interaction terms for crisis dummies and bank ownership variables in columns 7-9 retained their sign and significance. Furthermore, other bank-specific variables such as Size, Capitalisation, and Profitability and macro-level control variables GDP growth and Inflation rate have also retained their sign and significance. Thus, in short, the results in Table 4.4 revealed that our main findings are robust once we exclude the countries that experienced a sovereign debt crisis from our full sample.

4.4 Conclusions

We empirically investigated the lending behaviour of banks with different ownership types for the 2004-2013 period with a special focus on the recent global financial crisis using data for banks from 64 countries. To measure bank lending behaviour, we used [1] the total loans growth rate, [2] the corporate and commercial loans growth rate, and [3] the consumer and retail loans growth rate. We also used three different methods to classify crisis periods in our estimations. Firstly, we used a single crisis dummy for the 2008 and 2009 period. Secondly, following Cull and Peria (2013) and Choi *et al.* (2016) we also used separate crisis dummies for 2008 and 2009 years in an alternative estimation for all specifications. Finally, we performed estimations by classifying crisis periods according to the Laeven and Valencia (2018) data. As an estimation method, we employed a two-step dynamic GMM panel estimators. To further analyse the potential impact of bank ownership in lending behaviour according to the level of economic development of a country, we split our sample into two sub-samples; one for emerging economies and one for developed. Finally, to test the robustness of our results we excluded the GIIPS countries that experienced a sovereign debt crisis from our full sample.

In line with earlier studies, we find robust evidence that overall banking sector lending growth rates across all types of loans and sample groups declined during the 2008-2009 crisis period. This finding is confirmed by the results obtained for all crisis definitions: *Crisis2008* and *Crisis2009*, *Crisis2008_2009*, and *LV_Crisis*. The results also indicate that there are significant differences between loan series and sample groups. In addition, we excluded the

GIIPS countries from full sample and reestimated the equations for bank total lending growth rates. This alternative test does not change our main conclusions.

Our results confirm that foreign banks in emerging and developed countries behaved differently during the 2008-2009 crisis period according to their crisis period classifications. Specifically, although foreign banks lending rates in emerging countries exceeded domestic private bank lending in 2008, as the crisis continued to the following year, foreign banks curtailed their lending rates far faster than domestic-private banks during the 2009 crisis period. These findings have important policy implications. In other words, to retain the stable loan supply in consumer and retail sector during the economic downturn periods financial sector regulators need cautiously consider these negative impacts of foreign banks when they are restructuring the banking sector. On the contrary, the lending rates of foreign banks in developed countries exceeded their domestic counterparts lending during the crisis period.

Our results also show that government-owned banks increased their lending rates faster than domestic-private banks, particularly during the 2009 crisis year. This result is consistent with previous empirical research, which found a similar stabilising influence during the financial crisis (Bertay *et al.*, 2012; Brei and Schclarek, 2013; Cull and Peria, 2013). This result was even stronger for emerging countries, an outcome which is expected since government intervention in the banking sector is considerably higher in emerging countries. These findings suggest that governments banks can be considered as a stabilizer of loan supply in corporate and commercial sector, particularly during the periods of financial instability.

Our results reveal that the lending behaviour of banks according to their ownership type and sampling group differs during the normal and crisis periods. These empirical findings have significant policy implications. In particular, given that the difference in bank lending rates is statistically significant for emerging economies, we can conclude that the relevance of our findings is more important for emerging countries rather than developed countries.

Furthermore, considering that the sovereign debt crisis in the GIIPS countries negatively contributed to the banking sector, we excluded banks located in these countries from our full sample to test the robustness of our main results. Alternative test results for total loans growth rates across all sample groups and crisis classifications revealed that our main findings are robust once we exclude the countries that experienced a sovereign debt crisis from our full sample.

In short, our findings suggest that one should take into account the different response of banks to crisis episodes according to their ownership type. Furthermore, the results also indicate that regulators should take into account differences in bank lending behaviour among different sampling groups and time periods. Finally, our results demonstrate that bank-specific characteristics such as bank size, profitability, and in some cases, bank deposit funding, are also important factors in determining bank lending behaviour. Accordingly, more careful consideration of the balance sheet conditions and the overall financial health of the banking sector has additional value in attempting to prevent or mitigate adverse impacts stemming from future financial crises.

CHAPTER 5: INFORMATION SHARING, CREDITOR RIGHTS, AND BANK LENDING

5.1 Introduction

This chapter analyses the relationship between information sharing, creditor rights, and bank lending behaviour. The information asymmetry theory suggests that adverse selection and moral hazard problems in credit markets may lead to credit rationing and suboptimal allocation of capital (Stiglitz & Weiss, 1981). Specifically, lenders are not always able to obtain reliable information about the characteristics of borrowers and their creditworthiness. Therefore, lenders may not be able to differentiate good borrowers from risky loan applicants. Lenders may also face moral hazard problems if borrowers engage in more risky activities after obtaining loans. Therefore, adverse selection and moral hazard problems in credit markets may mean credit rationing is required. In this case, information sharing among lenders facilitates lending and reduces the credit default (Bennardo *et al.*, 2015; Pagano & Jappelli, 1993). On the other side, when borrowers know that their default information will be disclosed among lenders through information sharing, this may induce them to repay their debt. In turn, this will decrease the default rate, which subsequently reduces the costs associated with future borrowing and stimulates bank lending (Padilla & Pagano, 1997).

We investigate the following research question: Do the level of credit information sharing among lenders stimulates bank lending? We test the lending behaviour of banks during the recent crisis period by comparing banks' lending rates in countries with different levels of information sharing. It is possible that although the total loan supply decreased during the crisis period, the decline in the countries with higher information sharing was not very significant. Furthermore, banks with different ownership types [foreign vs domestic] may respond differently to the changes in information sharing.

According to the legal view theory, legal rights and well-developed creditor protection are fundamental to credit market development and efficiency (Aghion & Bolton, 1992; La Porta *et al.*, 1997). Improved creditor rights protection and court efficiency allow lenders to enforce their rights to debt repayment and seize the collateral, which in turn increases bank willingness to provide loans to potential borrowers. To put it differently, banks operating in a poor legal

system charge a higher interest rate, demand more collateral and shorten credit maturity eventually reducing the overall investment into the real business sector in the economy (Bae & Goyal, 2009).

The strength of creditor rights protection and court enforcement plays an essential role in determining the volume, price, and structure of the loans provided by lenders. We hypothesise that stronger creditor rights and well-developed court systems positively impact bank loan supply. During a crisis period, expected returns from investment projects decline, leading to credit rationing in loan markets. In the event of imperfect information and uncertainty, firms in countries with a weak legal environment, may face reduced credit volumes and shortened loan maturities during the crisis period. As a result, we also expect that banks' lending rates will be higher in countries with the improved legal system compared to the countries with the poor legal environment during the 2008-2009 crisis period.

The relevant literature suggests that foreign banks may face adverse-selection and moral hazard problems in host countries when they are making credit decisions (Brown *et al.*, 2009; Pagano & Jappelli, 1993). Due to limited credit information, foreign banks are unable to distinguish risky borrowers from those with a good credit score. On the other hand, relevant theory also argues that cultural know-how and distance makes foreign-owned banks more dependent on “hard” information such as financial accounting and credit history rather than “soft” information such as business ability and trustworthiness of the potential borrower. Compared to domestic banks, foreign banks are reluctant to lend to informationally opaque firms, and in turn tend to lend large corporations or foreign companies (Berger, Klapper, & Udell, 1999; Buch, 2003; Dell'Ariccia, Friedman, & Marquez, 1999; Giannetti & Ongena, 2009; Sengupta, 2007). Therefore, the existence of public and private credit registries and depth of information sharing stimulates increased foreign bank lending in host countries.

The literature also states that the lack of credit information sharing facilities and cultural know-how make foreign banks more sensitive to the legal system of the host country. The strength of creditor rights protection and efficient contract enforcement will enable foreign banks to overcome these cultural and informational barriers in the host country's credit markets. Consequently, these stronger creditor rights and efficient contract enforcement being substitutes for the local cultural knowledge and information shortage allow foreign banks to ensure that they are protected against unexpected borrower default (Detragiache *et al.*, 2008; Esty &

Meggins, 2003; Haselmann et al., 2009; Khanna & Palepu, 1999, 2000; Qian & Strahan, 2007).

Therefore, we hypothesise that foreign bank total lending rates in countries with better information sharing and stronger creditor rights protection are higher than the loan supply of counterparts in countries with poor information sharing and a weak legal system. Foreign banks may maintain more robust loan growth in countries with a higher level of information sharing and creditor rights protection than in countries with low levels of credit information and legal rights. Finally, we also test the response of domestic banks to information sharing and creditor rights protection comparison to the responses of the foreign banks' to these indicators.

5.2 Empirical methodology

To investigate the lending behaviour of banks in countries with different level of information sharing, creditor rights protection, and court enforcement, we will use the following dynamic model:

$$\Delta L_{i,j,t} = a + \beta_1 \Delta L_{i,j,t-1} + \gamma_1 \text{Information Sharing}_{j,t} + \gamma_2 \text{Crisis}_t + \gamma_3 \text{Information Sharing}_{j,t} * \text{Crisis}_t + \delta_j \mathbf{X}_{i,j,t-1} + \lambda_j \mathbf{Z}_{j,t} + \theta_j \mathbf{Y}_{j,t} + u_{i,t} \quad (5.1)$$

where, $\Delta L_{i,j,t}$ is the growth rate of total loans for a bank i in country j at time t . $\text{Information}_{j,t}$ is one of the information sharing variables in a country j at time t . Information sharing is measured using the following two measures: the first one is the depth of credit information sharing index [*Depth of credit information*]. The second one is either a public credit registry coverage [*Public credit registry*] or private credit registry coverage [*Private credit bureau*]³⁰. Crisis is a dummy variable which takes the value 1 if the year is 2008 or 2009, and 0 otherwise. $\mathbf{X}_{i,j,t-1}$ contains bank-specific control variables such as *Size*, *Capitalisation*, *Profitability*, and *Depfunding*. $\mathbf{Z}_{j,t}$ contains bank regulation control variables such as *Bank concentration*,

³⁰ Depth of information sharing is measured as an index which ranges from 0 to 6, with higher values indicating availability of more credit information. The public and private credit registries provide information as a percentage coverage of individuals and firms and their credit history, current debt, and outstanding loans. Both data collected from the World Bank 'Doing Business' database.

Overall capital stringency, and *Financial statement transparency*. $\mathbf{Y}_{j,t}$ contains macro-control variables such as *GDP growth rate* and *Inflation*.

To estimate the impact of creditor rights and court enforcement, we use the following equation:

$$\begin{aligned} \Delta L_{i,j,t} = & a + \beta_1 \Delta L_{i,j,t-1} + \gamma_1 \text{Legal rights}_{j,t} + \gamma_2 \text{Crisis}_t + \gamma_3 \text{Legal rights}_{j,t} * \text{Crisis}_t + \\ & + \delta_j \mathbf{X}_{i,j,t-1} + \lambda_j \mathbf{Z}_{j,t} + \theta_j \mathbf{Y}_{j,t} + u_{i,t} \end{aligned} \quad (5.2)$$

where *legal rights* is either *creditor rights protection* or *court enforcement*.

To investigate the response of foreign bank lending to the changes in information sharing, creditor rights protection, and court enforcement, we use Eq. 5.1 and Eq. 5.2 respectively. First, we start of by empirically examining the impact of these variables on bank lending during normal and crisis periods. Next, using a similar approach, we perform a separate test for the foreign-owned and domestic banks. In the equation to test foreign bank lending, we include *Political stability*, *GDPgrowth_{HOME}*, and *Inflation_{HOME}* to control for political stability in the host country and the overall macroeconomic situation in the home country. Finally, to compare the response of foreign bank lending to the changes in domestic bank lending we include a dummy variable.

5.3 Empirical Results

5.3.1 The impact of information sharing on bank lending

Table 5.1 presents the results for information sharing and bank lending for the full sample and for the sub-sample of the emerging countries. The dependent variable is the annual growth rate of the bank total loan. To measure information sharing, we use one of the following variables: (1) the depth of credit information sharing index; (2) the coverage of public credit registry; and (3) private credit bureau. The full sample result for *Depth of credit information* [column 1] is positive and significant, indicating that the lending rates of banks in countries with a higher index of credit information sharing exceed their counterparts lending rates with a lower depth of information sharing. The data suggest that, holding all other variables at their sample mean, a one-unit rise in the depth of information sharing increases lending rates by approximately 1.9%. In other words, if a country moves from the lowest credit information sharing regime to the full information sharing regime, the banking sector total lending rates would increase by up to 11.4%. Considering the importance of the banking sector credit on economic growth, the

result is economically significant. When we separate emerging countries from the full sample, the coefficient for the *depth of credit information* [column 4] becomes larger and significant at the 1% significance level. This indicates that the impact of depth of credit information sharing on total lending rates is larger for banks located in emerging countries; a one-unit rise in the depth of credit information sharing in emerging countries leads to an increase in lending rates by about 3.3%. Considering the impact of bank credit³¹ on economic growth, improving the information sharing facilities is important for countries to sustain stable banking sector loan supply. This finding is consistent with Jappelli and Pagano (2002) who find that the depth of credit market is associated with information sharing.

The results for *Public credit registry*³² are presented in column 2 for the full sample and in column 5 for emerging economies. Both coefficients for public credit registries have negative signs, however, they are not statistically significant. According to the World Bank's definition, the primary purpose of establishing public credit registries is to support the state's role in supervising and monitoring the financial institutions. Therefore, public credit registries are usually managed by the central bank of a country or other banking sector supervision agencies. By law, public credit institutions should register all loans above a certain amount, and in some cases, this threshold is relatively high for some countries. Therefore, one possible explanation for the insignificant impact of information sharing through the public credit registries can be concentrated credit information above a certain amount. Secondly, public credit registries were initially developed to contribute to the banking sector stability by sorting out risky borrowers from safe ones. Therefore, bank supervisors closely monitor bank lending activity and if needed, may enforce them to diversify loan portfolios by decreasing loan supply to riskier borrowers. They do this to maintain market stability. Hence, this limited ability of banks to grant loans to riskier borrowers may be another explanation for the insignificant impact of information sharing through public credit registries on bank loan supply.

³¹ Korkmaz (2015) provides detailed information about the impact of bank credit on economic crisis.

³² We use public credit registry coverage or private credit bureau coverage to measure the level of information sharing among banks. Most papers use the dummy variable if a country has either public or private credit information coverage. Currently, most of the countries have at least one of these institutions and using a dummy variable may not produce a reliable outcome.

Table 5.1 The impact of credit information sharing on bank lending rates

Variables	Full sample			Emerging economies		
	[1]	[2]	[3]	[4]	[5]	[6]
<i>Total loans growth rate_{t-1}</i>	0.0982** [0.0387]	0.102*** [0.0387]	0.103*** [0.0388]	0.118*** [0.0455]	0.119*** [0.0457]	0.125*** [0.0462]
<i>Depth of credit information</i>	1.920** [0.806]			3.381*** [1.256]		
<i>Public credit registry</i>		-0.0445 [0.0723]			-0.0764 [0.104]	
<i>Private credit bureau</i>			0.106** [0.0420]			0.0744* [0.0389]
<i>Size_{t-1}</i>	-19.34*** [5.221]	-18.78*** [5.093]	-18.64*** [5.140]	-17.29*** [4.701]	-15.10*** [4.190]	-15.09*** [4.433]
<i>Capitalisation_{t-1}</i>	-0.918 [1.930]	-0.850 [1.821]	-0.860 [1.836]	0.0509 [0.947]	-0.301 [1.061]	0.0808 [1.038]
<i>Profitability_{t-1}</i>	0.318 [0.306]	0.336 [0.295]	0.294 [0.304]	-1.502 [1.406]	-1.173 [1.490]	-1.246 [1.539]
<i>Deposit Funding_{t-1}</i>	0.0521 [0.298]	0.0147 [0.292]	0.0807 [0.302]	-0.147 [0.410]	-0.140 [0.384]	-0.195 [0.427]
<i>Bank concentration</i>	-0.363*** [0.130]	-0.377*** [0.128]	-0.348*** [0.127]	-0.241** [0.118]	-0.221** [0.0969]	-0.281** [0.111]
<i>Overall capital stringency</i>	-1.127** [0.517]	-0.902* [0.481]	-0.745* [0.428]	-2.252** [0.880]	-1.540** [0.686]	-1.455** [0.725]
<i>Financial statement transparency</i>	3.013*** [1.143]	3.044*** [1.113]	3.611*** [1.264]	5.123*** [1.957]	4.980*** [1.815]	5.212*** [2.005]
<i>GDP growth rate</i>	3.730*** [1.118]	3.366*** [1.096]	3.916*** [1.184]	5.907*** [1.632]	4.939*** [1.555]	5.282*** [1.628]
<i>Inflation</i>	-1.743** [0.739]	-1.842*** [0.699]	-1.717** [0.719]	-1.853*** [0.596]	-1.821*** [0.610]	-1.907*** [0.589]
Constant	172.5*** [46.64]	180.9*** [47.91]	161.4*** [44.58]	133.8*** [45.74]	137.1*** [42.10]	134.0*** [44.48]
Observations	10,802	10,802	10,802	6,312	6,312	6,312
Number of id	1,904	1,904	1,904	1,109	1,109	1,109
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
AB test for AR[1] p-value	0.000	0.000	0.000	0.000	0.000	0.000
AB test for AR[2] p-value	0.646	0.514	0.571	0.132	0.280	0.268
Hansen test p-value	0.177	0.154	0.146	0.567	0.292	0.387
No. of instruments	39	39	39	39	39	39

Notes: The dependent variable is the annual total loans growth rate. All specifications estimated using two-step system GMM. Robust (Windmeijer, 2005) finite-sample corrected standard errors are in brackets. × indicates an interaction term. ***, **, and * indicate the 1%, 5%, and 10% level of significance, respectively.

Another proxy to measure information sharing among lenders is through private credit bureaus. The results for the *Private credit bureau* for the full sample [column 3] and emerging economies [column 6] are positively significant. This indicates that in comparison to the public credit registries information sharing through private credit bureau positively contributes to bank lending behaviour. For instance, a one-percentage rise in private credit bureau coverage leads to a 0.10% increase in bank lending rates in full sample countries. Overall, the results for the *Depth of credit information* and *Private credit bureau* show that information sharing among the lenders stimulate the total volume of bank loan supply. These results are largely consistent with

empirical evidence provided in other studies (Brown et al., 2009; Djankov et al., 2007; Fosu, 2014; Grajzl & Laptieva, 2016; Jappelli & Pagano, 2002). As the theory predicted, credit information sharing reduces adverse selection in loan market (Pagano & Jappelli, 1993), increases borrower effort (Padilla & Pagano, 1997, 2000), and decrease credit rationing in multiple bank lending (Bennardo, Pagano, & Piccolo, 2014). Thus, regulatory reforms to improve information sharing facilities boost credit market performance across countries.

Among the bank-specific control variables, only bank *Size* is negative and significant in all equations. In the bank lending literature, the negative effect of size can be explained by the fact that the small banks tend to supply a proportionally higher amount of lending compared to their counterparts. In other words, the results confirm the existence of a strong lending relationship between small banks and firms in many countries (Ehrmann & Worms, 2004; Gambacorta, 2005; Matousek & Sarantis, 2009).

Regarding the bank regulation control variables, the results for *Bank concentration* are negative and significant in all specifications. This indicates that market concentration impedes bank lending rates. These results are in line with earlier findings, such as (Black & Strahan, 2002; Fosu, 2014). We also include *Overall capital stringency* to control the impact of bank capital regulation on loan supply. The results show that overall, capital stringency is significantly negatively related to lending rates. The coefficients for emerging countries are slightly larger in absolute term compared to the full sample. The results show that a one-point increase in overall capital stringency leads to a decrease in bank lending rates by 1.12% [column 1] or by 2.25% in emerging countries specifically [column 4]. These results are largely consistent with earlier findings in the literature (De Nicolo, 2015; Deli & Hasan, 2017). In addition, we also include *Financial statement transparency* as a bank regulatory control variable. According to Barth *et al.* (2008), transparency of bank financial statements allows creditors, depositors, and shareholders to access the bank's risk better. Therefore, a higher level of bank financial transparency will enable them to benefit from the low cost of funds to finance their lending behaviour. Put it differently, weak transparency of financial statements for a bank may lead the wider market to conclude that this bank has bad news or financial problems to hide. Hence, these banks must pay higher premiums to attract additional funds, which in turn, shrinks bank lending. Our results for *Financial statement transparency* are positive and significant in the full sample and emerging economies. Again, coefficients are larger for

emerging economies, indicating that the impact of financial statement transparency in these countries is more economically significant. Considering primary role of banks' and their deposit base as a main source of funding, government policies that encourage commercial banks to publish their statement periodically stimulate intermediation of additional financial resources from savers to borrowers. This in turn, by positively contributing to banking sector performance and efficiency of credit market accelerates economic growth.

The coefficients for macro control variables obtained are expected to be significant in all specifications. As can be seen, the GDP growth rate has a significant positive effect on loan growth rates. This finding is consistent with the finance-growth nexus literature, which suggests that well-functioning or growing economies provide better financial services as well (King & Levine, 1993; Pagano, 1993). The results for inflation are negative and significant in all specifications indicating that a more inflationary environment discourages bank lending. This result is consistent with Boyd *et al.* (2001) who find that bank loan supply is strongly related to inflation.

Finally, the results for the one-period-lagged total loans growth rates are positive and significant in all models for the full sample and emerging economies. This significant positive correlation confirms the appropriateness of our dynamic modelling approach. Regarding our instruments, the p-values for the Arellano-Bond AR[2] and Hansen test show that there is not a second-order serial correlation and that our instruments are valid.

Table 5.2 presents the results of the impact of information sharing on bank lending rates during the recent crisis period. To test the effect of the level of information sharing on bank lending during the recent financial crisis, we multiplied our information sharing variables with the crisis dummy for 2008-2009. In the previous chapter, when we examined bank lending behaviour separately, including crisis dummies for 2008 and 2009, we found that bank total lending rates decreased by 7.2% and 2.1% respectively. Since our main interest in the current analyses is to examine the impact of information sharing and legal writes on bank lending, we include one crisis dummy for 2008-2009 years. Secondly, this alternative classification also allows us to test bank lending behaviour during the recent crisis period with a different approach. Thus, the results for the *Crisis* dummy in models 1, 3, and 5 in Table 5.2 shows that bank total lending rates decreased by about 6.5%, 3.9%, and 5.7% respectively during the crisis period. The results are consistent with our previous findings.

Table 5.2 The impact of credit information sharing on bank lending rates during the 2008-2009 crisis period

Variables	[1]	[2]	[3]	[4]	[5]	[6]
<i>Total loans growth rate_{t-1}</i>	0.135*** [0.0404]	0.120*** [0.0357]	0.0957*** [0.0367]	0.124*** [0.0354]	0.0817** [0.0361]	0.126*** [0.0350]
<i>Depth of credit information</i>	2.817** [1.311]	1.839* [1.060]				
<i>Public credit registry</i>			-0.154 [0.122]	-0.0916 [0.0859]		
<i>Private credit bureau</i>					0.196*** [0.0592]	0.0872** [0.0378]
<i>Crisis</i>	-6.572** [2.696]		-3.980** [1.877]		-5.791*** [2.134]	
<i>Depth of credit information × Crisis</i>		2.461*** [0.851]				
<i>Public credit registry × Crisis</i>				0.00310 [0.0334]		
<i>Private credit bureau × Crisis</i>						0.0516** [0.0262]
<i>Size_{t-1}</i>	-45.18*** [4.991]	-18.39*** [5.755]	-38.43*** [4.283]	-15.94*** [5.361]	-42.20*** [3.759]	-17.68*** [5.520]
<i>Capitalisation_{t-1}</i>	1.168 [2.381]	-0.296 [1.713]	-1.601 [2.128]	-0.210 [1.648]	-1.955 [2.073]	-0.580 [1.776]
<i>Profitability_{t-1}</i>	0.224 [0.376]	0.389 [0.263]	0.506 [0.337]	0.385 [0.260]	0.567* [0.304]	0.430 [0.265]
<i>Deposit Funding_{t-1}</i>	-0.146 [0.291]	-0.106 [0.302]	-0.0361 [0.296]	-0.0921 [0.286]	-0.174 [0.322]	-0.0628 [0.303]
<i>Bank concentration</i>	-1.211*** [0.205]	-0.324*** [0.107]	-0.896*** [0.159]	-0.274*** [0.102]	-0.783*** [0.151]	-0.312*** [0.103]
<i>Overall capital stringency</i>	-2.423*** [0.689]	-1.426** [0.573]	-2.465*** [0.743]	-1.177** [0.566]	-2.360*** [0.782]	-0.954* [0.528]
<i>Financial statement transparency</i>	5.683** [2.552]	3.711** [1.567]	9.502*** [2.408]	3.208** [1.441]	9.554*** [2.451]	4.068** [1.667]
<i>GDP growth rate</i>	-0.800 [0.580]	2.583*** [0.719]	0.260 [0.371]	2.683*** [0.653]	-0.161 [0.529]	2.470*** [0.703]
<i>Inflation</i>	-4.298*** [0.913]	-0.653 [0.742]	-2.637*** [0.855]	-0.687 [0.692]	-0.410 [0.644]	-0.615 [0.720]
Constant	423.4*** [52.26]	156.8*** [53.39]	359.5*** [40.66]	147.1*** [52.41]	379.5*** [43.52]	153.2*** [50.93]
Observations	10,802	10,802	10,802	10,802	10,802	10,802
Number of id	1,904	1,904	1,904	1,904	1,904	1,904
Year dummies	No	Yes	No	Yes	No	Yes
AB test for AR[1] p-value	0.000	0.000	0.000	0.000	0.000	0.000
AB test for AR[2] p-value	0.413	0.414	0.976	0.330	0.826	0.262
Hansen test p-value	0.443	0.111	0.060	0.158	0.078	0.118
No. of instruments	33	40	33	40	33	40

Notes: The results for the full sample. The dependent variable is the annual total loans growth rate. All specifications estimated using two-step system GMM. Robust (Windmeijer, 2005) finite-sample corrected standard errors are in brackets. × indicates an interaction term. ***, **, and * indicate the 1%, 5%, and 10% level of significance, respectively.

The result for the interaction term for *Depth of credit information* and *Crisis* in model 2 is positive and significant at the 1% level. This result provides strong evidence that bank lending rates responded to the different levels of *Depth of credit information* during the crisis period. In

other words, lending rates of banks in economies with higher levels of credit information sharing exceeded lending rates of banks located in countries with a lower level of credit information during the recent crisis period.

Models 3 and 4 present the results for information sharing through the public credit registry. The coefficient for the interaction term with the *Crisis* dummy has an expected sign, however the coefficient was found to be not significant. Results for the *Private credit bureau* are presented in specification 5 and 6. Compared to public credit registries, information sharing through a private credit bureau has a positive and significant impact on bank lending during the crisis period. The result for the main effect of *Private credit bureau* shows that during the normal time's information sharing through these bureaus stimulate bank lending. The coefficient in model 5 is considerably larger than the coefficient in model 6. Due to the crisis dummy in model 5, we do not include year dummies in this model, whereas we control for year effects in model 6. The result for the interaction term between *Private credit bureau* and *Crisis* dummy [column 6] is positive and significant. Similarly, this result also confirms that banks in countries with higher coverage of private credit bureau were able to grow their lending rates faster than those banks located in countries with lower coverage of private credit bureaus during the recent financial crisis period. To summarise, banks located in countries with lower credit information coverage reduced their lending rates faster than their counterparts, who benefited from higher levels of credit information coverage during the crisis period.

It can be concluded that higher levels of information sharing among banks stimulated lending rates during the crisis period. Specifically, the lending rates of banks located in countries with higher values of depth of credit information and private credit bureau coverage were able to increase their lending rates compared to the banks located in countries with limited information sharing. Considering the significant drops in loan supply by banks³³ during the recent global financial crisis period, our findings have important policy implications. In other words, policy regulations to stimulate information sharing among lenders and to improve coverage of borrower credit history allow countries to minimize the negative impact of reductions in bank lending rates particularly during the crisis period.

³³ Ivashina & Scharfstein (2010) provides detailed information about bank lending rates during the recent global financial crisis.

However, information sharing through the public credit registry does not significantly contribute to bank lending behaviour, in neither normal nor crisis periods. All other bank-specific, banking sector regulatory, and macro-control variables retain their sign and significance. There are some changes in the significance of macro-control variables, possibly due to the model specification, where some models were estimated without year dummies. The one-period lag of the dependent variable being positively significant in all models supports the dynamic behaviour of bank lending policy.

5.3.2 The impact of creditor rights protection and contract enforcement on bank lending

Table 5.3 presents the regression results for the impact of creditor rights and court efficiency on bank lending behaviour. As in information sharing, we run separate regressions for the emerging countries to find out whether these variables have a marginally different impact on bank lending policy. Theoretically, better protection of creditor rights stimulates bank lending. However, the estimated coefficients for *Creditor rights* has obtained a negative sign in both full sample and emerging economies cases [columns 1 and 3], but neither of them is statistically significant. There are two possible explanations for this insignificant correlation between creditor rights and bank lending. The first one is that most of the empirical papers in the literature use the creditor rights index developed by (La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1997; La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1998). This index ranges from zero to four. There is a value of one added to the index if there is a restriction on reorganisation; no automatic stay, secured creditors paid first, and no management stay. In our estimations, we use the strength of legal rights index as a proxy for creditor rights. The index obtained from World Banks ‘Doing Business’ report and ranges from zero to ten with a higher index indicating better protection of borrower’s and lender’s rights. According to the World Bank methodology, the index measures how collateral and bankruptcy laws protect borrower and lender rights and in turn stimulate bank lending. Therefore, this difference in measuring the creditor rights may be one possible explanation. The other explanation is that according to Bae and Goyal (2009) it is not the existence of the creditor rights, but the enforceability that is important in loan contracts. In other words, banks may simply not respond to the strength of creditor rights when they are making loan decisions if these rights are not effectively enforced by courts. On the other hand, Safavian

and Sharma (2007) also suggest that the relationship between bank loans and creditor rights is much weaker in countries with inefficient contract enforcement.

Table 5.3 The impact of creditor rights and court enforcement on bank lending rates

Variables	Full sample		Emerging economies	
	[1]	[2]	[3]	[4]
<i>Total loans growth rate_{t-1}</i>	0.101*** [0.0386]	0.0987** [0.0387]	0.118*** [0.0459]	0.137*** [0.0444]
<i>Creditor rights</i>	-0.693 [0.542]		-0.932 [0.827]	
<i>Court enforcement</i>		0.213* [0.109]		0.594*** [0.199]
<i>Size_{t-1}</i>	-18.20*** [4.960]	-18.03*** [4.908]	-14.45*** [4.093]	-11.52*** [3.902]
<i>Capitalisation_{t-1}</i>	-0.745 [1.801]	-0.814 [1.879]	0.0491 [1.062]	0.624 [0.913]
<i>Profitability_{t-1}</i>	0.315 [0.296]	0.300 [0.306]	-1.129 [1.539]	-1.196 [1.544]
<i>Deposit Funding_{t-1}</i>	0.0403 [0.297]	0.0594 [0.296]	-0.184 [0.445]	-0.222 [0.436]
<i>Bank concentration</i>	-0.354*** [0.128]	-0.404*** [0.130]	-0.254** [0.110]	-0.368*** [0.112]
<i>Overall capital stringency</i>	-0.885** [0.449]	-0.883* [0.459]	-1.300** [0.656]	-1.178* [0.666]
<i>Financial statement transparency</i>	2.939*** [1.109]	3.316*** [1.130]	4.663** [1.831]	4.451** [1.787]
<i>GDP growth rate</i>	3.588*** [1.076]	3.975*** [1.202]	5.058*** [1.582]	5.990*** [1.785]
<i>Inflation</i>	-1.989*** [0.696]	-1.708** [0.712]	-2.083*** [0.612]	-1.521*** [0.532]
Constant	175.6*** [46.57]	153.9*** [43.44]	139.8*** [43.81]	69.07 [49.59]
Observations	10,802	10,802	6,312	6,312
Number of id	1,904	1,904	1,109	1,109
Year dummies	Yes	Yes	Yes	Yes
AB test for AR[1] p-value	0.000	0.000	0.000	0.000
AB test for AR[2] p-value	0.530	0.703	0.311	0.185
Hansen test p-value	0.139	0.169	0.382	0.414
No. of instruments	39	39	39	39

Notes: The dependent variable is the annual total loans growth rate. All specifications estimated using two-step system GMM.

Robust (Windmeijer, 2005) finite-sample corrected standard errors are in brackets. × indicates an interaction term. ***, **, and * indicate the 1%, 5%, and 10% level of significance, respectively.

Indeed, compared to creditor rights, better contract enforceability seems to stimulate a higher volume of bank lending. The results in models 2 and 4 show that Court enforcement positively and significantly related to bank lending rates. The higher coefficient for the emerging economies sub-sample indicates that the importance of contract enforceability by courts in these countries is more economically significant, compared to the full sample case. A one-unit increase in *Court enforcement* leads to a 0.594% increase in bank lending rates in emerging countries. The results are consistent with earlier findings which found a similar impact of

contract enforcement on bank loans (Bae & Goyal, 2009; Djankov et al., 2007; Safavian & Sharma, 2007). For example, Djankov *et al.* (2007) uses the number of days as a proxy to measure court enforcement of the contract and concludes that the quality of courts is a significant predictor of credit market development.

We also use court time, cost, and procedures as an alternative indicator to measure judicial system efficiency. The indicator is measured using the time [calendar days], cost [as a percentage of claim value], and procedures [procedural steps to file, serve, and enforce the judgment]. We use these indicators separately as a proxy for *Court enforcement*, and Table 5.4 shows the results. From the Model 1, we can see that the coefficient for *Time* is negative, but it is not statistically significant. However, when estimated separately for emerging economies, the coefficient becomes significant at a 1% significance level. This indicates that an increase in time measured as a calendar day shrinks bank lending in emerging countries. In other words, as the time period spent by banks to enforce contracts goes up, this will adversely impact bank lending behaviour and decrease loan growth rates. The results for *Cost* and *Procedures* show that these indicators acting as a proxy for court enforcement are important in determining bank lending. Specifically, both indicators are negatively and significantly related to lending rates in the full sample and emerging countries. This reveals that higher costs associated with enforcing contracts and complicated procedural steps impede bank lending. This finding is consistent with theoretical view that predicted improvements in judicial efficiency reduce credit constraints and increase the volume of lending (Bianco, Jappelli, & Pagano, 2002). Considering the importance of well-developed legal rights and strengthened creditor protection in credit market development and efficiency, our finding is important policy implication. Jappelli et al. (2005) state that judicial inefficiency has high economic costs in credit markets, and accordingly, improving the efficiency of courts increases the volume of loans supplied by banks by reducing the credit constraints. Following this point, our results indicate that supervisors and regulators in countries should consider the importance of the efficiency of judicial system and take steps to improve legal rights of creditors. These regulations help to prevent credit rationing by banks in the credit market. This happens because, improved efficiency of judicial system opens up the credit market to those low-grade borrowers that previously considered not creditworthy. In addition, improved legal environment and efficient courts decreases the costs associated with procedures to enforce the rule by creditors.

Table 5.4 The impact of alternative measures of court enforcement on bank lending rates

Variables	Full sample			Emerging economies		
	[1]	[2]	[3]	[4]	[5]	[6]
<i>Total Loans growth rate_{t-1}</i>	0.101*** [0.0385]	0.0981** [0.0394]	0.0951** [0.0388]	0.130*** [0.0446]	0.127*** [0.0468]	0.129*** [0.0466]
<i>Court enforcement [Time]</i>	-0.000865 [0.00365]			-0.0216*** [0.00801]		
<i>Court enforcement [Cost]</i>		-0.445* [0.254]			-0.735** [0.297]	
<i>Court enforcement [Procedures]</i>			-0.856** [0.363]			-1.639*** [0.442]
<i>Size_{t-1}</i>	-18.61*** [5.073]	-19.12*** [5.218]	-17.65*** [4.882]	-12.38*** [4.026]	-13.90*** [4.439]	-13.19*** [4.176]
<i>Capitalisation_{t-1}</i>	-0.901 [1.883]	-0.745 [1.869]	-0.662 [1.844]	0.507 [0.924]	0.138 [1.036]	0.499 [0.917]
<i>Profitability_{t-1}</i>	0.336 [0.298]	0.276 [0.314]	0.250 [0.313]	-1.246 [1.507]	-1.283 [1.581]	-1.516 [1.489]
<i>Deposit Funding_{t-1}</i>	0.0447 [0.293]	0.0327 [0.297]	0.0653 [0.287]	-0.220 [0.435]	-0.161 [0.422]	-0.202 [0.429]
<i>Bank concentration</i>	-0.368*** [0.125]	-0.500*** [0.171]	-0.405*** [0.133]	-0.327*** [0.110]	-0.357*** [0.123]	-0.348*** [0.118]
<i>Overall capital stringency</i>	-0.950** [0.471]	-0.453 [0.485]	-0.845* [0.472]	-1.203* [0.670]	-1.794** [0.784]	-1.185* [0.718]
<i>Financial statement transparency</i>	3.039*** [1.115]	3.532*** [1.266]	3.550*** [1.136]	4.686** [1.845]	3.878** [1.828]	5.547*** [1.915]
<i>GDP growth rate</i>	3.517*** [1.103]	4.013*** [1.278]	4.403*** [1.204]	5.901*** [1.751]	5.403*** [1.663]	6.333*** [1.699]
<i>Inflation</i>	-1.836** [0.735]	-1.537** [0.642]	-1.657*** [0.616]	-1.654*** [0.585]	-1.862*** [0.556]	-1.602*** [0.489]
Constant	176.9*** [46.57]	191.5*** [50.34]	188.4*** [47.59]	125.1*** [44.36]	153.1*** [43.95]	170.4*** [46.26]
Observations	10,802	10,802	10,802	6,312	6,312	6,312
Number of id	1,904	1,904	1,904	1,109	1,109	1,109
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
AB test for AR[1] p-value	0.000	0.000	0.000	0.000	0.000	0.000
AB test for AR[2] p-value	0.558	0.735	0.889	0.185	0.248	0.141
Hansen test p-value	0.150	0.165	0.195	0.430	0.380	0.533
No. of instruments	39	39	39	39	39	39

Notes: The results for the full sample. The dependent variable is the annual total loans growth rate. All specifications estimated using two-step system GMM. Robust (Windmeijer, 2005) finite-sample corrected standard errors are in brackets. × indicates an interaction term. ***, **, and * indicate the 1%, 5%, and 10% level of significance, respectively.

All other bank-specific, banking sector regulatory, and macro-level control variables in Table 5.3 and Table 5.4 retain their sign and significance. In all estimations, the one-period lag of the dependent variable is positive and significant. The Arellano-Bond AR[2] test p-values show the absence of second-order serial correlation and the Hansen test p-values are all above 0.1, confirming the validity of our instruments.

As discussed above, in the event of imperfect information and increased uncertainty during the crisis period, the firms in those countries with a weak legal environment may face reduced credit volumes and shortened loan maturities (Bae & Goyal, 2009; Johnson, Boone,

Breach, & Friedman, 2000). As a result, we also expect that banks' lending rates were higher in the countries with stronger creditor rights protection and efficient court enforcement compared to the economies with a poor legal system during the 2008-2009 crisis period. To detect any differential impact of *Creditor rights* and *Court enforcement* on bank lending during the crisis, we include the interaction term of these variables with the *Crisis* dummy in our regression analysis.

Table 5.5 shows the results for the impact of our interested variables on bank lending during the crisis period for the full sample. The results for *Crisis* dummy in models 1 and 3 shows that bank lending rates decreased during the crisis period compared to normal times. This is consistent with our earlier findings. The result of *Creditor rights* in model 1 is negative and insignificant. In model 2, when we introduce the interaction term for *Creditor rights* and *Crisis* dummy, it reversed the sign from negative to positive. However, it does not have a significant impact on bank lending rates during the whole sample period. In contrast, the positive and highly significant coefficient for interaction between *Creditor rights* and *Crisis* dummy indicates that stronger creditor rights stimulated bank lending during the recent crisis period compared to the normal time. In other words, this happens due to the bank lending rates in the countries with stronger creditor rights protection exceeding the bank lending rates in countries with poor creditor protection during the crisis period. For example, according to the results, a one-unit rise in creditor right protection leads to 2.5% points increase in bank lending rates during the crisis period.

From Table 5.3, we have seen that efficient court enforcement has a positive and significant impact on bank lending rates in the full sample and emerging countries. The result for *Court enforcement* in model 3 of Table 5.5 is not statistically significant for a full sample case. One possible reason is that, since the model includes the *Crisis* dummy, it is estimated without controlling for year fixed effects which captures possible aggregate trends in data.

Nevertheless, when controlled for year fixed effects in model 4, the main effect of *Court enforcement* on bank lending rates is weakly significant. This indicates that bank lending rates in countries with better court systems have higher lending rates compared to the banks located in economies with poor court enforcement throughout the sample period. In addition, when multiplied with the *Crisis* dummy in model 4, the result shows that *Court enforcement* has a strong positive impact on bank lending rates during the recent global financial crisis period.

Table 5.5 The impact of creditor rights and court enforcement on bank lending rates during the 2008-2009 crisis period

Variables	[1]	[2]	[3]	[4]
<i>Total loans growth rate_{t-1}</i>	0.136*** [0.0401]	0.129*** [0.0355]	0.137*** [0.0402]	0.116*** [0.0363]
<i>Creditor rights</i>	-0.383 [1.141]	0.212 [1.080]		
<i>Court enforcement</i>			0.104 [0.212]	0.238* [0.143]
<i>Crisis</i>	-6.561** [2.710]		-6.621** [2.653]	
<i>Creditor rights</i> × <i>Crisis</i>		2.520*** [0.626]		
<i>Court enforcement</i> × <i>Crisis</i>				0.282*** [0.0864]
<i>Size_{t-1}</i>	-44.10*** [4.770]	-16.30*** [5.195]	-43.43*** [4.727]	-16.55*** [5.438]
<i>Capitalisation_{t-1}</i>	1.166 [2.341]	0.176 [1.616]	1.147 [2.304]	-0.181 [1.672]
<i>Profitability_{t-1}</i>	0.223 [0.371]	0.318 [0.260]	0.239 [0.367]	0.369 [0.265]
<i>Deposit Funding_{t-1}</i>	-0.121 [0.296]	-0.178 [0.313]	-0.134 [0.278]	-0.127 [0.297]
<i>Bank concentration</i>	-1.187*** [0.202]	-0.297*** [0.102]	-1.210*** [0.222]	-0.389*** [0.114]
<i>Overall capital stringency</i>	-2.284*** [0.665]	-1.451*** [0.526]	-2.308*** [0.673]	-1.185** [0.587]
<i>Financial statement transparency</i>	5.725** [2.499]	3.443** [1.480]	5.825** [2.507]	4.123*** [1.538]
<i>GDP growth rate</i>	-0.765 [0.579]	2.989*** [0.648]	-0.764 [0.568]	2.891*** [0.701]
<i>Inflation</i>	-4.483*** [0.888]	-0.694 [0.734]	-4.336*** [0.885]	-0.592 [0.758]
Constant	426.5*** [51.40]	147.4*** [50.61]	413.8*** [50.19]	136.0*** [51.87]
Observations	10,802	10,802	10,802	10,802
Number of id	1,904	1,904	1,904	1,904
Year dummies	No	Yes	No	Yes
AB test for AR[1] p-value	0.000	0.000	0.000	0.000
AB test for AR[2] p-value	0.505	0.260	0.518	0.388
Hansen test p-value	0.428	0.118	0.376	0.114
No. of instruments	33	40	33	40

Notes: The results for the full sample. The dependent variable is the annual total loans growth rate. All specifications estimated using two-step system GMM. Robust (Windmeijer, 2005) finite-sample corrected standard errors are in brackets. × indicates an interaction term. ***, **, and * indicate the 1%, 5%, and 10% level of significance, respectively.

In other words, the result indicates that the bank loan supply in countries with well-developed and efficient court systems exceeded the lending rates of banks in environments with poor performing court systems during the recent crisis period.

In general, the result for the interaction of *Creditor rights* and *Court enforcement* with *Crisis* dummy confirms our expectations that banks in the countries with stronger creditor rights

and well-functioning courts would lend relatively more compared to banks located in countries with a weak legal system during the crisis period. To put it another way, we know that total bank lending rates decreased during the 2008-2009 crisis years. However, the fall in bank lending rates in the countries with a well-developed legal system is relatively smaller in magnitude than the reduction in bank lending rates located in a country with a weak legal environment. Mora-Sanguinetti *et al.* (2017) emphasize that if a judge enforces the repayment of a debt this will stimulate lending and rises the ratio of total loans to GDP. Hence, our results suggest that strengthened creditor rights and efficient courts are important on the credit market performance particularly during the crisis period. Because of firms and companies that significantly suffered from the shortage of external funds during the recent global financial crisis, regulatory policies to create creditor friendly legal environment is important in preventing significant drops in bank loans supply during the periods of economic downturns.

Among the bank-specific control variables, *Size* is significantly negatively related to bank total lending rates. This indicates that smaller banks have higher lending rates compared to the larger banks. From the banking sector regulatory control variables, *Bank concentration* and *Overall capital stringency* have a significant adverse impact on bank lending behaviour. Specifically, the results indicate that higher concentration in the banking sector and regulatory capital requirements impede bank total lending rates. On the contrary, all else being equal, banking sector financial accounts transparency seems to stimulate bank lending. As discussed above, a higher level of bank financial accounts transparency allows these banks to benefit from the low cost of funds to finance their lending behaviour. From the macro-control variables, GDP growth rates have a positive and significant relation with bank lending, as shown in models 2 and 4. The other macro-control variable-inflation rate-has an expected sign in all specifications, although it is statistically significant only in models 1 and 4. On the other hand, the lag of dependent variables is positive and highly significant in all models. The statistics of the Arellano-Bond test for AR[2] p-values and Hansen test p-values are again confirming the validity of our instruments.

5.3.3 The impact of information sharing and creditor rights protection on bank lending when banks are owned by foreign investors.

As discussed, the lack of credit information, cultural and local knowledge makes foreign banks more sensitive to information sharing when they are making loan supply decisions. It is also argued that foreign banks tend to supply relatively more loans to borrowers with ‘hard’ information than ‘soft’ information. Therefore, we expect that the lending rates of foreign banks are higher in the countries with better information sharing facilities compared to those banks located in the countries with poor information sharing environment (Berger et al., 1999; Dell’Ariccia et al., 1999; Giannetti & Ongena, 2009; Sengupta, 2007). To test how information sharing impacts foreign bank lending, we separate foreign banks from full samples and perform two-step system GMM estimation.

Table 5.6 presents the regression result of foreign bank lending responses to information sharing in host countries. As above, we use the depth of credit information index and public and private credit registry coverage to measure our information sharing variable. Column 1 presents the result for the impact of *Depth of credit information* on bank lending rates. The positive and significant coefficient for *Depth of credit information* indicates that foreign-owned bank’s total loan growth rates in the countries with better information sharing exceed the lending rates of foreign banks in environments with poor information sharing. It suggests that foreign banks in the countries with a higher index of depth of credit information lend approximately about 3.2% more than their counterparts in the countries with a lower index of depth of credit information. Since the results are positive and significant, it can be concluded that the countries can benefit from increased foreign bank loan supply once they improve the quality, scope, and accessibility of credit information sharing. The results in model 3 show that although the *Depth of credit information* sharing had a significant positive impact on foreign bank lending rates throughout the sample period, its interaction with the *Crisis* dummy is negative and statistically not significant.

Columns 4, 5, and 6 represent the estimation results for public credit registry coverage. As in the full sample case, the results for *Public credit registry* show that the information sharing through the public credit registry has no significant impact on bank lending rates. The estimated coefficients for the full sample period show that although it is not significant, *Public credit registry* is negatively related to bank lending rates. However, when it multiplied with the *Crisis*

dummy [column 6], the coefficient reversed the sign to positive, but it remained statistically insignificant.

Table 5.6 The impact of credit information sharing on foreign bank lending during normal and crisis periods

Variables	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
<i>Total Loans growth rate_{t-1}</i>	0.107** [0.0515]	0.466*** [0.117]	0.108** [0.0507]	0.102** [0.0507]	0.484*** [0.118]	0.100** [0.0504]	0.100** [0.0511]	0.440*** [0.123]	0.0964* [0.0518]
<i>Depth of credit information</i>	3.195*** [0.936]	0.782 [1.372]	3.688*** [0.956]						
<i>Public credit registry</i>				-0.161 [0.118]	-0.0682 [0.127]	-0.169 [0.112]			
<i>Private credit bureau</i>							0.00713 [0.0384]	0.00664 [0.0387]	0.0263 [0.0582]
<i>Crisis</i>		-5.464* [3.300]			-7.126** [3.218]			-7.932*** [2.846]	
<i>Depth of credit information × Crisis</i>			-1.245 [1.021]						
<i>Public credit registry × Crisis</i>						0.0342 [0.0834]			
<i>Private credit bureau × Crisis</i>									0.0911* [0.0480]
<i>Size_{t-1}</i>	-17.19* [10.13]	-6.270** [2.579]	-16.87* [9.558]	-15.85** [8.083]	-6.480*** [2.417]	-16.07** [8.058]	-14.08 [9.403]	-9.456*** [3.332]	-17.35* [9.987]
<i>Capitalisation_{t-1}</i>	-0.413 [0.542]	0.463 [0.484]	-0.417 [0.538]	-0.422 [0.568]	0.352 [0.471]	-0.420 [0.572]	-0.276 [0.528]	0.0999 [0.562]	-0.415 [0.527]
<i>Profitability_{t-1}</i>	0.355 [0.924]	2.691** [1.173]	0.404 [0.898]	0.243 [0.886]	2.906** [1.216]	0.233 [0.883]	0.167 [0.940]	4.417** [1.818]	0.246 [0.967]
<i>Deposit Funding_{t-1}</i>	-0.548 [0.411]	0.0661 [0.167]	-0.553 [0.409]	-0.605 [0.419]	0.0499 [0.186]	-0.619 [0.416]	-0.615 [0.397]	0.0104 [0.183]	-0.612 [0.424]
<i>Political stability</i>	8.397** [3.784]	3.602* [1.931]	8.120** [3.560]	7.619*** [2.786]	3.515* [2.000]	7.846*** [2.914]	8.811*** [3.395]	4.677* [2.790]	8.930** [3.944]
<i>Financial statement transparency</i>	1.145 [1.830]	0.00293 [0.770]	1.014 [1.711]	0.580 [1.301]	-0.0536 [0.747]	0.816 [1.547]	0.462 [1.605]	0.562 [0.960]	1.111 [1.754]
<i>GDP growth rate_{HOST}</i>	3.073** [1.305]	1.802** [0.727]	3.095** [1.283]	2.768** [1.262]	1.558** [0.727]	2.825** [1.264]	3.332*** [1.270]	1.298 [1.052]	3.056** [1.292]
<i>Inflation_{HOST}</i>	0.0892 [0.770]	-0.737 [0.585]	0.0545 [0.752]	-0.0792 [0.772]	-0.696 [0.595]	-0.101 [0.764]	0.123 [0.731]	-0.690 [0.604]	0.0506 [0.758]
<i>GDP growth rate_{HOME}</i>	0.657 [1.007]	-0.301 [0.812]	0.672 [0.962]	0.680 [0.779]	-0.314 [0.877]	0.673 [0.776]	0.786 [0.943]	-0.625 [1.145]	0.627 [1.010]
<i>Inflation_{HOME}</i>	-0.0500* [0.0280]	0.0151 [0.0142]	-0.0500* [0.0278]	-0.0504* [0.0267]	0.0155 [0.0143]	-0.0510* [0.0266]	-0.0466* [0.0267]	0.00823 [0.0167]	-0.0507* [0.0278]
Constant	186.9* [102.6]	32.19 [27.59]	189.0* [100.1]	200.8** [92.10]	41.90 [26.46]	202.5** [91.08]	184.1* [96.72]	69.65** [34.28]	199.8* [105.7]
Observations	2,912	2,912	2,912	2,912	2,912	2,912	2,912	2,912	2,912
Number of id	529	529	529	529	529	529	529	529	529
Year dummies	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
AB test for AR[1] p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AB test for AR[2] p-value	0.327	0.232	0.314	0.340	0.233	0.331	0.269	0.099	0.275
Hansen test p-value	0.408	0.299	0.423	0.557	0.197	0.565	0.493	0.100	0.378
No. of instruments	50	39	51	50	39	51	50	39	51

Note: The dependent variable is the annual total loans growth rate. All specifications estimated using two-step system GMM. Robust (Windmeijer, 2005) finite-sample corrected standard errors are in brackets. $\times$ indicates an interaction term. ***, **, and * indicate the 1%, 5%, and 10% level of significance, respectively.

Similarly, the results for the private credit bureau reveals [column 7, 8, and 9] that the relationship between *Private credit bureau* is positive but not statistically significant. However,

differently, from the results for *Public credit registry*, the interaction term for *Private credit bureau* and *Crisis* dummy provides some evidence that foreign bank lending rates in countries with a higher coverage of private credit bureau exceeded their counterparts lending rates in countries with a lower coverage of private credit information during the 2008-2009 crisis period.

Negative and significant coefficients for the *Crisis* dummy in column 2, 5, and 8 indicate that foreign bank lending rates decreased during the crisis period compared to the normal periods. This result also confirms our findings in the previous chapter. Among the bank-specific control variables, bank size has a significant negative impact on bank lending behaviour. Furthermore, models 2, 5, and 8 provide some indication that higher profits allowed foreign banks to increase their lending rates faster compared to foreign bank with less profit. However, once we introduce year fixed effects to the models, its significance disappears, so the results are not consistent.

Since foreign bank entry and performance is significantly sensitive to political instability in the host country, we include a political stability variable to control for destabilisation, violence, and terrorism. The data is collected from Kaufmann *et al.* (2011) who developed a political stability index ranging from -2.5 [weak] to 2.5 [strong]. The results for *Political stability* in all specifications are positive and statistically significant indicating that foreign bank's lending rates in countries with more political stability exceeded lending rates of their counterparts in countries with less political stability. The results are consistent across all specifications regardless of the inclusion or exclusion of years fixed effects, although the magnitude of the coefficients is smaller in models without year dummies.

Foreign bank lending behaviour is positively related to the home country business cycle (De Haas & Van Lelyveld, 2006). Hence, to control for home country macroeconomic conditions, we include GDP growth rate and inflation in the foreign bank parent country. As expected, the results for home country GDP growth rate are positive and significant in all specifications except model 8. This significant impact on bank lending rates can be explained as follows: economic growth in the home country improves the financial health of the parent bank, which in turn allows them to expand lending activities through their foreign affiliates. Regarding the home country inflation rate, the results reveal that foreign bank lending behaviour is not significantly sensitive to the inflationary environment of the home country.

In addition to the home country business cycle conditions, we also control for the host country *GDP growth rate* and *Inflation* variable which may influence foreign bank lending behaviour. The host country *GDP growth rate* is positively correlated with foreign bank lending rates in models with year fixed effects, conversely it is negatively related in the specification without year fixed effects. However, in both cases, the host country *GDP growth rate* is not statistically significant. On the other hand, there is some evidence that foreign bank lending might be sensitive to the host country's inflation rate. The negative and significant results indicate that foreign banks reduce their lending in a host country if there is a higher inflationary environment.

Likewise, in the full sample, foreign bank lending rates are a positive and significant correlation with its previous values in all specifications. This also confirms that bank lending is subject to dynamic behaviour.

Table 5.7 presents the estimation result for the relationship between *Creditor rights* and *Court enforcement* with bank lending rates. The results for Creditor rights in column 1, 2, and 3 shows that the relationship between creditor rights protection and foreign bank lending is not statistically significant. In other words, foreign bank lending rates are not responsive to the changes in legal rights index throughout the sample period. However, when interacting with the *Crisis* dummy in model 3, *Creditor rights* have a positive and significant impact on foreign bank lending rates during the crisis period. Although the significance is weak, this finding indicates that foreign banks in the countries with stronger creditor rights protection maintained a more robust loan supply compared to the foreign banks in countries with poor creditor rights. Hence, the results reveal that foreign bank lending behaviour is unresponsive to the changes in creditor rights protection throughout the sample period. However, there is weak evidence that the changes in creditor rights protection might play some positive role in stimulating foreign bank lending during the crisis period.

On the other hand, the result for *Court enforcement* in column 4 shows that the efficiency of contract enforcement facilitates foreign bank lending. For instance, it indicates that a one-unit increase in *Court enforcement* leads to about a 0.35% rise in foreign bank lending rates. Furthermore, when interacting with the *Crisis* dummy in column 6, the magnitude and significance of the coefficient for *Court enforcement* increased. This indicates that the efficiency of the court system is more important for foreign banks during the crisis period. To

summarise, it can be explained that foreign bank lending rates are higher in countries with efficient court enforcement during the crisis period.

Table 5.7 The impact of creditor rights and court enforcement on foreign bank lending during normal and crisis periods

Variables	[1]	[2]	[3]	[4]	[5]	[6]
<i>Total Loans growth rate_{t-1}</i>	0.127*** [0.0465]	0.468*** [0.112]	0.114** [0.0486]	0.0972* [0.0523]	0.462*** [0.109]	0.106** [0.0511]
<i>Creditor rights</i>	1.282 [0.955]	-0.134 [0.442]	0.0261 [0.600]			
<i>Court enforcement</i>				0.351* [0.211]	0.0917 [0.111]	0.183 [0.173]
<i>Crisis</i>		-6.139* [3.316]			-6.212* [3.442]	
<i>Creditor rights × Crisis</i>			1.484* [0.832]			
<i>Court enforcement × Crisis</i>						0.443** [0.202]
<i>Size_{t-1}</i>	-14.30* [8.542]	-6.023** [2.595]	-13.22* [7.828]	-13.24 [9.036]	-6.449** [2.559]	-13.61 [9.172]
<i>Capitalisation_{t-1}</i>	-0.398 [0.564]	0.456 [0.485]	-0.275 [0.558]	-0.271 [0.518]	0.387 [0.460]	-0.361 [0.531]
<i>Profitability_{t-1}</i>	0.233 [0.855]	2.585** [1.201]	0.393 [0.849]	0.230 [0.945]	2.785** [1.203]	0.469 [0.882]
<i>Deposit Funding_{t-1}</i>	-0.524 [0.395]	0.0483 [0.165]	-0.488 [0.407]	-0.615 [0.407]	0.0481 [0.158]	-0.527 [0.404]
<i>Political stability</i>	5.050* [3.075]	4.094** [1.791]	7.608*** [2.629]	6.202** [2.556]	3.519** [1.649]	6.073** [2.523]
<i>Financial statement transparency</i>	0.587 [1.429]	-0.450 [0.803]	0.516 [1.280]	0.591 [1.648]	-0.324 [0.817]	0.629 [1.685]
<i>GDP growth rate_{HOST}</i>	2.013*** [0.677]	1.716** [0.718]	2.775** [1.237]	3.603*** [1.384]	1.801** [0.721]	3.054** [1.263]
<i>Inflation_{HOST}</i>	-0.0827 [0.560]	-0.597 [0.593]	0.214 [0.711]	0.302 [0.697]	-0.515 [0.581]	0.283 [0.703]
<i>GDP growth rate_{HOME}</i>	0.0789 [0.721]	-0.335 [0.809]	0.721 [0.785]	0.826 [0.958]	-0.473 [0.812]	0.759 [0.994]
<i>Inflation_{HOME}</i>	-0.0153 [0.0147]	0.0147 [0.0140]	-0.0478* [0.0257]	-0.0523* [0.0273]	0.0125 [0.0141]	-0.0479* [0.0265]
Constant	163.4* [90.53]	38.48 [26.84]	156.0* [81.92]	156.3* [85.96]	35.64 [24.05]	147.2 [91.15]
Observations	2,912	2,912	2,912	2,912	2,912	2,912
Number of id	529	529	529	529	529	529
Year dummies	Yes	No	Yes	Yes	No	Yes
AB test for AR[1] p-value	0.000	0.000	0.000	0.000	0.000	0.000
AB test for AR[2] p-value	0.713	0.234	0.442	0.208	0.243	0.431
Hansen test p-value	0.307	0.254	0.484	0.494	0.294	0.423
No. of instruments	50	39	51	50	39	51

Notes: The dependent variable is the annual total loans growth rate. All specifications estimated using two-step system GMM. Robust (Windmeijer, 2005) finite-sample corrected standard errors are in brackets. × indicates an interaction term. ***, **, and * indicate the 1%, 5%, and 10% level of significance, respectively.

In short, the results indicate that foreign banks' loan supply is not responsive to creditor rights protection. However, there is some evidence that they may increase their lending rates in

countries with efficient court enforcement. Although our expectation regarding the positive impact of creditor rights on foreign bank lending is not confirmed, the efficiency of court enforcement has had the expected influence on foreign bank lending behaviour. These results are consistent with earlier empirical findings in the relevant literature. For instance, Bae and Goyal (2009) and Bhattacharya and Daouk (2009) emphasize that it is the efficiency of contract enforcement that is important for bank lending, not the existence of laws. However, the results regarding the bank lending volume responding to the creditor rights and court enforcement during the crisis period support our expectations. Specifically, the findings suggest that foreign bank lending rates in countries with well-developed legal systems exceeded the lending rates of foreign banks in countries with a poor legal environment during the recent global financial crisis period.

Related literature states that foreign bank entry and easing the entry barriers positively contribute to the local credit market performance and its stability. For example, Bruno and Hauswald (2014) the presence of foreign banks consistently and significantly alleviate financial dependence, especially in developing countries where informational and legal frictions often hinder access to loan. On the other hand, Demirgüç-Kunt *et al.* (1998) emphasize that foreign bank participation accelerates overall economic growth by boosting banking sector efficiency. Considering the positive role of foreign banks in credit market performance and economic growth our findings have crucial policy recommendations. In other words, supervisory and regulatory committees in countries, particularly in developing world should improve information sharing facilities and strengthen the legal rights in order to encourage foreign bank participation in local banking sector. This in turn, by increasing the efficiency of credit market performance, accelerates overall economic growth in these countries. Furthermore, Haselmann and Wachtel (2010) concludes that if a bank is in a better legal system, its willingness to accept different assets as collateral and to lend to information opaque firms is higher. The authors also state that banks provide relatively more SME and mortgages loans if they are operating in an improved legal system. Thus, our findings have important implications for understanding how improved legal systems with efficient contract enforcement encourage SME and mortgage lending by foreign banks, particularly in countries with limited information sharing facilities.

The negative and significant coefficients for the *Crisis* dummy in models 2 and 5 are consistent with our previous findings. All other bank-specific and macro-control variables

largely remained with the same signs and significances, as in Table 5.3. The Hansen and Arellano-Bond AR[2] tests in all specifications confirm that our instruments are valid and that there is no second-order serial correlation.

5.3.4 The impact of information sharing and creditor rights protection on bank lending when banks are owned by domestic investors

Table 5.8 presents the results for the impact of credit information sharing on domestic bank lending behaviour. The results for *Depth of credit information* in columns 1-3 are positive and highly significant. This significance indicates that a higher level of depth of credit information index has a positive impact on domestic bank loan supply. In other words, a one-unit rise in the depth of credit information leads to an increase of 1.15% in domestic bank lending rates. To test how the *Depth of credit information* impacts on domestic bank lending during the crisis period, we multiplied it with the *Crisis* dummy. The result for the interaction term of the *Depth of credit information* with the *Crisis* dummy in column 3 shows that domestic bank lending rates in countries with higher levels of depth of credit information exceeded the lending rates of their counterparts in countries with lower levels of information sharing.

Columns 4-6 presents the regression results for *Public credit registry*. The coefficients are not statistically significant, indicating that domestic bank lending is not responsive to the changes in public credit registry coverage. As discussed above, public credit institutions usually register all loans above a certain amount, and in some cases, this threshold is relatively high for some countries. Concentrated credit information above a certain amount could be one of the possible explanations for the insignificant impact of information sharing on domestic bank lending. Secondly, the main purpose of public credit registries is to contribute to the banking sector stability by sorting out risky borrowers from the safe ones. Therefore, bank supervisors enforce domestic banks to diversify their loan portfolio by reducing loan supply to a risky borrower. This, in turn, contributes to the limitations of bank lending behaviour.

The results for the impact of *Private credit bureau* on domestic bank lending are presented in columns 7-9 of Table 5.8. In the previous sub-chapter, we found that foreign bank lending behaviour does not become responsive to the changes in private credit bureau coverage throughout the sample period. However, different from foreign banks, domestic banks lending behaviour is significantly positively related to the private credit bureau coverage. Although the

Private credit bureau has a significant positive impact on domestic bank lending during the business cycle, the interaction term of it with *Crisis* dummy reveals that its significant impact on lending disappears during the crisis period. In other words, domestic banks lending rates in countries with different levels of private credit bureau coverage did not significantly differ from

Table 5.8 The impact of credit information sharing on domestic bank lending during normal and crisis periods

Variables	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
<i>Total loans growth rate_{t-1}</i>	0.120*** [0.0320]	0.124* [0.0680]	0.121*** [0.0319]	0.114*** [0.0318]	0.132* [0.0703]	0.115*** [0.0317]	0.121*** [0.0320]	0.133* [0.0713]	0.119*** [0.0318]
<i>Depth of credit information</i>	1.156*** [0.391]	5.938*** [2.104]	0.837** [0.362]						
<i>Public credit registry</i>				-0.0572 [0.0407]	-0.0570 [0.209]	-0.0542 [0.0398]			
<i>Private credit bureau</i>							0.0418** [0.0175]	0.281** [0.122]	0.0390** [0.0179]
<i>Crisis</i>		-8.211** [4.101]			-7.524* [4.007]			-4.334 [4.557]	
<i>Depth of credit information</i> × <i>Crisis</i>			1.233** [0.537]						
<i>Public credit registry</i> × <i>Crisis</i>						-0.0120 [0.0423]			
<i>Private credit bureau</i> × <i>Crisis</i>									0.0144 [0.0156]
<i>Size_{t-1}</i>	-9.373*** [2.369]	-47.37*** [6.361]	-9.161*** [2.344]	-9.456*** [2.314]	-43.89*** [6.337]	-9.494*** [2.310]	-8.929*** [2.254]	-53.69*** [7.957]	-9.000*** [2.259]
<i>Capitalisation_{t-1}</i>	-0.294 [0.330]	0.783 [2.201]	-0.268 [0.335]	-0.310 [0.334]	0.682 [2.320]	-0.304 [0.334]	-0.290 [0.330]	0.928 [2.197]	-0.292 [0.330]
<i>Profitability_{t-1}</i>	0.640*** [0.141]	-0.0171 [0.277]	0.643*** [0.142]	0.631*** [0.140]	0.0272 [0.285]	0.632*** [0.141]	0.635*** [0.140]	-0.0999 [0.278]	0.635*** [0.140]
<i>Deposit Funding_{t-1}</i>	0.0413 [0.133]	0.174 [0.367]	0.0317 [0.133]	-0.00819 [0.133]	0.242 [0.371]	-0.00705 [0.134]	0.0192 [0.131]	0.269 [0.395]	0.0203 [0.131]
<i>Bank concentration</i>	-0.153*** [0.0550]	-0.911*** [0.262]	-0.147*** [0.0546]	-0.163*** [0.0549]	-0.833*** [0.226]	-0.164*** [0.0549]	-0.163*** [0.0557]	-1.049*** [0.290]	-0.163*** [0.0560]
<i>Overall capital stringency</i>	-0.315 [0.335]	-2.264* [1.206]	-0.346 [0.336]	-0.345 [0.338]	-2.046* [1.113]	-0.340 [0.339]	-0.119 [0.329]	-1.838 [1.237]	-0.130 [0.329]
<i>Financial statement transparency</i>	2.229** [0.964]	5.830 [4.485]	2.207** [0.958]	2.210** [0.943]	6.443* [3.833]	2.240** [0.954]	2.321** [0.963]	8.518* [4.679]	2.307** [0.973]
<i>GDP growth rate</i>	1.409*** [0.165]	-1.043 [0.903]	1.436*** [0.160]	1.352*** [0.172]	-0.881 [0.886]	1.348*** [0.172]	1.426*** [0.164]	-0.359 [0.962]	1.438*** [0.167]
<i>Inflation</i>	-0.602*** [0.163]	-4.872*** [1.103]	-0.596*** [0.161]	-0.614*** [0.161]	-4.855*** [1.029]	-0.618*** [0.161]	-0.605*** [0.164]	-5.870*** [1.277]	-0.612*** [0.163]
Constant	75.76*** [24.62]	414.9*** [60.73]	75.88*** [24.83]	88.01*** [25.95]	398.5*** [59.38]	90.9*** [25.94]	76.38*** [24.21]	465.5*** [71.99]	77.19*** [24.27]
Observations	4,857	4,857	4,857	4,857	4,857	4,857	4,857	4,857	4,857
Number of id	797	797	797	797	797	797	797	797	797
Year dummies	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
AB test for AR[1] p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AB test for AR[2] p-value	0.171	0.644	0.177	0.190	0.973	0.189	0.149	0.530	0.155
Hansen test p-value	0.187	0.240	0.167	0.219	0.108	0.214	0.145	0.382	0.144
No. of instruments	54	33	55	54	33	55	54	33	55

Note: The dependent variable is the annual total loans growth rate. All specifications estimated using two-step system GMM. Robust (Windmeijer, 2005) finite-sample corrected standard errors are in brackets. × indicates an interaction term. ***, **, and * indicate the 1%, 5%, and 10% level of significance respectively.

each other during the 2008-2009 crisis period. In short, the results show that an improved information sharing environment measured as the depth of credit information and private credit

bureau coverage stimulates domestic bank lending during the business cycle. However, for the crisis period, countries with higher levels of depth of credit information seem to benefit from more robust domestic bank lending.

Bank size has a significant negative impact on bank lending, indicating that as the bank becomes larger, the lending rates decrease. In the bank lending literature, the negative effect of *Size* can be explained due to the fact that the small banks tend to supply relatively more lending to their clients. In other words, the results confirm the existence of a strong lending relationship between small banks and firms in many countries (Ehrmann & Worms, 2004; Gambacorta, 2005; Matousek & Sarantis, 2009). Furthermore, positive, and significant results for *Profitability* in models controlled for year-fixed effects indicate that domestic banks with higher profitability were able to increase the growth rate of total loan supply compared to those banks with lower levels of profit.

From the bank regulation control variables, the *Bank concentration* has a negative and significant impact on domestic bank lending behaviour. The results are consistent across all specifications with or without year dummies. This finding indicates that as the banking sector becomes more concentrated, the lending rates of domestic banks decrease. These results are in line with earlier findings, such as (Black & Strahan, 2002; Fosu, 2014). In addition, we also include *Financial statement transparency* as a bank regulatory control variable. The results show that the transparency of bank financial statements has a positive impact on bank lending. According to Barth *et al.* (2008), transparency of bank financial statements allows creditors, depositors, and shareholders to assess the bank's risk better. Therefore, a higher level of bank financial transparency allows them to benefit from the low cost of funds to finance their lending behaviour.

The results for macro control variables show that the GDP growth rate has positive and significant coefficients across all specifications. This significant correlation between GDP growth rate and bank lending rates is consistent with the finance-growth nexus literature, which suggests that well-functioning or growing economies provide better financial services as well (King & Levine, 1993; Pagano, 1993). Furthermore, the inflation rate has an expected negative and significant impact on domestic bank loan supply throughout the sample period. This indicates that a more inflationary environment discourages bank lending. This result is

consistent with Boyd *et al.* (2001) who found that bank loan supply strongly correlated with inflation.

Finally, our dependent variable growth rate of total loans positively and significantly related to its one-period lag values. The results are significant and consistent across all specifications confirming the appropriateness of our dynamic modelling approach. Regarding

Table 5.9 The impact of creditor rights and court enforcement on domestic bank lending during normal and crisis periods

	[1]	[2]	[3]	[4]	[5]	[6]
<i>Total loans growth rate_{t-1}</i>	0.120*** [0.0316]	0.138** [0.0700]	0.124*** [0.0313]	0.120*** [0.0319]	0.138* [0.0710]	0.119*** [0.0323]
<i>Creditor rights</i>	0.00896 [0.343]	0.0423 [1.755]	-0.248 [0.326]			
<i>Court enforcement</i>				0.0494 [0.0465]	0.0149 [0.297]	0.0416 [0.0459]
<i>Crisis</i>		-8.043** [4.012]			-8.210** [4.124]	
<i>Creditor rights × Crisis</i>			1.145*** [0.411]			
<i>Court enforcement × Crisis</i>						0.0340 [0.0533]
<i>Size_{t-1}</i>	-8.796*** [2.206]	-45.20*** [5.927]	-8.603*** [2.184]	-8.895*** [2.249]	-44.96*** [5.904]	-8.931*** [2.254]
<i>Capitalisation_{t-1}</i>	-0.269 [0.335]	1.021 [2.149]	-0.264 [0.337]	-0.271 [0.335]	0.977 [2.182]	-0.270 [0.335]
<i>Profitability_{t-1}</i>	0.644*** [0.141]	-0.0209 [0.274]	0.663*** [0.139]	0.643*** [0.142]	-0.0109 [0.279]	0.645*** [0.142]
<i>Deposit Funding_{t-1}</i>	0.0191 [0.132]	0.178 [0.357]	0.0110 [0.131]	0.0178 [0.134]	0.185 [0.358]	0.0184 [0.133]
<i>Bank concentration</i>	-0.138** [0.0539]	-0.868*** [0.245]	-0.139*** [0.0533]	-0.160*** [0.0617]	-0.871*** [0.265]	-0.159*** [0.0612]
<i>Overall capital stringency</i>	-0.160 [0.280]	-2.208* [1.143]	-0.185 [0.277]	-0.142 [0.291]	-2.258* [1.179]	-0.156 [0.294]
<i>Financial statement transparency</i>	1.327* [0.724]	6.525 [4.149]	1.389* [0.734]	1.448** [0.734]	6.456 [4.307]	1.464** [0.740]
<i>GDP growth rate</i>	1.402*** [0.171]	-0.990 [0.896]	1.423*** [0.167]	1.423*** [0.168]	-1.038 [0.915]	1.437*** [0.166]
<i>Inflation</i>	-0.597*** [0.163]	-5.058*** [1.088]	-0.588*** [0.164]	-0.591*** [0.162]	-5.030*** [1.091]	-0.594*** [0.163]
Constant	81.11*** [24.53]	414.2*** [58.10]	81.29*** [24.42]	82.41*** [24.86]	412.0*** [61.20]	83.09*** [25.06]
Observations	4,857	4,857	4,857	4,857	4,857	4,857
Number of id	797	797	797	797	797	797
Year dummies	Yes	No	Yes	Yes	No	Yes
AB test for AR[1] p-value	0.000	0.000	0.000	0.000	0.000	0.000
AB test for AR[2] p-value	0.156	0.995	0.123	0.156	0.973	0.156
Hansen test p-value	0.139	0.183	0.101	0.132	0.196	0.133
No. of instruments	54	33	55	54	33	55

Note: The dependent variable is the annual total loans growth rate. All specifications estimated using two-step system GMM. Robust (Windmeijer, 2005) finite-sample corrected standard errors are in brackets. × indicates an interaction term. ***, **, and * indicate the 1%, 5%, and 10% level of significance, respectively.

our instruments, the p-values for the Arellano-Bond AR[2] and Hansen test show that there is no second-order serial correlation and our instruments are valid.

Table 5.9 shows the results of the relationship between legal system indicators and domestic bank lending. The estimation results in columns 1-3 demonstrate that as in the foreign banks or full sample cases, the loan supply of foreign banks is not significantly influenced by changes in creditor rights protection throughout the sample period. However, when multiplied with the *Crisis* dummy in column 3, the coefficient for Creditor rights becomes statistically significant. This positive and significant result indicates that the domestic banks lending rates in countries with strong creditor rights exceeded their counterparts who were in an environment with weak creditor rights during the recent global financial crisis. Our findings indicate that the lending behaviour of domestic banks are responsive to the information sharing facilities and strength of creditor rights protection, particularly during the crisis period. Thus, regulators in countries with poor information sharing facilities and weak creditor rights protection should consider achieving effective information sharing facilities and efficient legal institutions in order to minimize the negative impact of credit market volatility, especially during the crisis period. With better legal enforcement, give bank incentive to extend more debt and impose more favourable term in loan contract. Furthermore, obtained results also reveal that the relationship between banking sector concentration and bank lending rates is negative and statistically significant. In their model, Boyd and De Nicolo (2005) predict that less competition in banking sector leads to higher interest rate being charged on business loans, consequently raising the credit risk of borrowers because of moral hazard issues. Thus, the policy implication of our results is that policymakers should carefully consider mergers and acquisitions in banking sector to avoid any significant increase of banking sector concentration.

On the other hand, the results for *Court enforcement* in columns 4-6 show that different from the foreign banks, domestic bank lending behaviour was not sensitive to the changes in court enforcement during neither the normal times nor the crisis periods.

The results for the *Crisis* dummy [column 2 and 5] show that domestic banks reduced their lending rates during the 2008-2009 crisis period compared to the full sample period. All other bank-specific and macro-control variables retain their signs and significance, as in Table 5.5.

5.4 Conclusions

In this chapter, we analysed the impact of credit information sharing and legal rights on bank lending behaviour during normal and crisis periods. First, our results confirm the positive role of credit information sharing, creditor rights protection and court efficiency on bank lending (Fosu, 2014; Jappelli & Pagano, 2002). We also find that these variables positively contributed to the bank loan supply during the recent global financial crisis period. Importantly, our results show that foreign-owned and domestic-private banks have a different sensitivity to information sharing and legal rights during the normal and crisis periods.

The results show that the *Depth of credit information* and *Private credit bureau* have a positive and significant impact on bank lending rates in the full sample as well as emerging economies. However, the result for the *Depth of credit information* reveals that the effect of information sharing among banks is economically more substantial for emerging countries, whereas the magnitude of coefficients for the *Private credit bureau* is marginally similar in full and emerging countries cases. On the other hand, different from the two above proxies of information sharing, *Public credit registry* did not have a significant influence on bank lending in neither the full sample nor in the emerging countries.

The results for the crisis period also show that information sharing measured as a depth of credit information and private credit bureau positively and significantly contributed to bank lending during the 2008-2009 crisis period. This indicates that countries with a higher index of depth of credit information sharing and private credit bureau coverage benefited from higher rates of bank lending during the crisis period. As in normal times, public credit registry coverage does not have a significant impact on bank lending during the crisis period.

As the credit information sharing reduces the adverse selection problems in credit market, increases the borrower effort to pay back loans on time, and decreases the credit rationing in multiple bank lending. Thus, considering the above mentioned, our findings indicate that regulator and supervisors should implement policies to improve information sharing facilities that helps to establish stable credit market performance.

Moreover, we investigated the impact of *Creditor rights* protection and *Court enforcement* on bank lending rates. We use the strength of legal rights and enforcing contracts indices to measure creditor rights protection and court enforcement. The results reveal that throughout the sample period, creditor rights do not have a significant impact on bank lending,

in neither the full sample nor in the emerging economies. However, for the crisis period, the results show that banks lend relatively more in countries with stronger creditor rights protection compared to those banks located in countries with weak creditor rights protection. These findings suggest that although *Creditor rights* do not significantly impact bank loan supply during normal times, they positively contributed to bank lending behaviour during the crisis period.

On the other hand, the results for the efficiency of the judicial system indicate that *Court enforcement* has a significant impact on bank lending policy in the full sample and emerging countries during both normal and crisis periods. Furthermore, we also test the impact of court system efficiency on bank lending by using alternative measures for court enforcement- court time [calendar days], cost [as a percentage of claim value], and procedures [procedural steps to file, serve, and enforce the judgment]. All alternative measures except court time for the full sample show that contract enforcement plays a crucial role in shaping bank lending policy. In other words, shorter court time periods, lower costs, and less procedural steps stimulate bank lending.

Improved legal rights and strengthened creditor protection in credit market performance, our finding is important policy implication. Jappelli et al. (2005) state that judicial inefficiency has high economic costs in credit markets, and accordingly, improving the efficiency of courts increases the volume of loans supplied by banks by reducing the credit constraints. Following this point, our results indicate that supervisors and regulators in countries should consider the importance of the efficiency of judicial system and take steps to improve legal rights of creditors.

As the next step of our investigation, we examine how foreign-owned and domestic banks respond to information sharing and legal rights indicators during normal and crisis periods. For this purpose, we run regressions for foreign and domestic banks. For the foreign banks, we found that the *Depth of credit information* has a significant impact on lending rates throughout the sample period, whereas information sharing through public or private credit registries does not contribute to the foreign bank lending. Although the *Depth of information* is important for foreign bank lending during normal times, the results show that foreign bank loan supply was not sensitive to the information sharing indicators during the crisis period. The only exception is *Private credit information*, which is significant at the 10% level. Compared to information

sharing, the results show that foreign banks were more responsive to *Creditor rights* and *Court enforcement*. This finding indicates that countries with stronger creditor rights protection and efficient judicial systems benefited from more robust foreign bank lending rates during the crisis period. Considering the role of foreign banks in alleviating financial dependence of local firms (Bruno & Hauswald, 2014) government should encourage foreign bank participation in local financial market through improving information sharing facilities and strengthening the legal rights. In addition, banks provide relatively more SME and mortgages loans if they are operating in an improved legal system (Haselmann & Wachtel, 2010), hence improved legal systems with efficient contract enforcement encourage SME and mortgage lending by foreign banks suggest.

On the other hand, domestic banks are more sensitive to information sharing indicator during a normal period. For instance, *Depth of credit information* and *Private credit bureau* have positively and highly significantly correlated with domestic bank lending during the normal times, although it is the *Depth of credit information* that is the only significant determinant for the crisis period. Regarding legal rights, we found no significant results for normal times. However, the multiplication of Creditor rights with the Crisis dummy indicates that domestic bank lending was higher in countries with stronger creditor rights indicators.

Finally, obtained results indicate that the transparency of financial statements positively contributes to bank lending behaviour through strengthening their deposit base. Hence, government policies that encouraging commercial banks to publish their statement periodically stimulate intermediation of additional financial resources from savers to borrowers. In addition, our results show that banking sector concentration negatively correlated with loan growth rates. Thus, regulators and banking sector supervisors should carefully consider the mergers and acquisitions to limit the negative impact of increased banking sector concentration.

CHAPTER 6: BANK OWNERSHIP AND THE LENDING CHANNEL OF THE MONETARY TRANSMISSION MECHANISM

6.1 Introduction

This chapter empirically investigates the role of bank ownership in the monetary policy transmission process. Considering recent developments in financial sector integration and increased foreign bank participation³⁴, efficient implementation of monetary policy has become of primary importance. The occurrence of the 2008-2009 global financial crisis highlighted the importance of monetary policy efficiency since it plays a crucial role in providing financial stability in the banking sector. During the post-crisis period, short-term interest rates reached the ZLB and as a result, central banks in many countries struggled to implement effective and efficient monetary policy to prevent any adverse liquidity shocks to the financial sector (Salachas et al., 2017). In this chapter, we investigate the foreign-owned and domestic banks responses to the monetary policy stance with a particular interest in the post-crisis period.

The first formal theoretical model that investigates the existence of a bank lending channel of the monetary transmission mechanism is developed by (Bernanke & Blinder, 1988, 1992). They modify the traditional IS-LM model by including bank loans [in addition to money and bonds]. Kashyap and Stein (1995) further extend their model by analysing the effect of monetary policy shocks to the banks' balance sheets and lending behaviour. Kishan and Opiela (2000) developed a model which analyses the response of banks with different asset sizes and capitalisation to the changes in monetary policies. The main contribution of these models is that when central banks apply contractionary monetary policies by decreasing the money supply, financial intermediaries, particularly banks face difficulties in substituting their deposit base with other sources of funding. In other words, tightening monetary policy by shrinking the deposit base of banks directly influences their lending behaviour. Therefore, theories relating to bank lending channels predict that banks with different balance sheet characteristics [total assets, capitalisation, and liquidity] respond differently to changes in monetary policy. There is

³⁴ Claessens and Horen (2014) analyse how foreign banks have become much more important in domestic financial intermediation and recent trends in foreign ownership in the banking sector.

a considerable amount of empirical studies that investigate the role of balance sheet characteristics in the bank lending channel process (Altunbaş et al., 2002; Ehrmann & Worms, 2004; Gambacorta, 2005; Matousek & Sarantis, 2009).

Although the relevant literature mainly focuses on the role of bank balance sheet characteristics in implementing monetary policies, increased foreign bank participation and banking sector integration are reducing the effectiveness of bank lending channels in host countries. After the 2008 global financial crisis, many countries introduced expansionary monetary policies to prevent liquidity shortages in financial markets. However, the different responses of banks to the changes in monetary interest rates across ownership types made it difficult to implement effective monetary policies. Therefore, by controlling for bank balance sheet characteristics such as size, capitalisation, and profitability, we investigate how banks with different ownership types play a role in the bank lending channel. We empirically investigate how foreign and domestic banks react to the changes in the monetary policy interest rate during normal and crisis periods. First, we investigate the banking sector's [including all banks] response to monetary policy changes. Next, we compare the role of foreign and domestic banks in the transmission process of monetary policy. We also investigate bank lending reactions to the unconventional monetary policy during normal and crisis periods.

6.2 Empirical methodology

To investigate the role of bank ownership in the transmission mechanism of the monetary policy, we will use the following model:

$$\Delta L_{i,j,t} = a + \beta_1 \Delta L_{i,j,t-1} + \beta_2 \Delta MPrate_t + \beta_3 X_{i,j,t-1} + \beta_4 Y_{j,t} + u_{i,t} \quad (6.1)$$

where, $\Delta L_{i,j,t}$ is the growth rate of total loans for a bank i in country j at time t . $\Delta MPrate_t$ is the change in the monetary policy interest rate. As in previous studies we use the change [first-order difference] in interest rate as an indicator of monetary policy stance (Altunbaş et al., 2002; Cantero-Saiz, Sanfilippo-Azofra, Torre-Olmo, & López-Gutiérrez, 2014; Matousek & Sarantis, 2009; Wu et al., 2011). A positive change in interest rate indicates tightened monetary policy, whereas a negative change suggests expansionary monetary policy. If the change in the first difference is negative, this means that the current interest rate value is lower than the previous interest rate value. In other words, in this situation, Central Banks implementing expansionary

monetary policy, according to the bank lending channel of monetary policy theory should lead to increased bank lending rates. Furthermore, following the relevant literature we use $\mathbf{X}_{i,j,t-1}$ which contains bank-specific control variables such as *Size*, *Capitalisation*, and *Profitability*. To control for potential endogeneity between lending growth rates and bank characteristics, we use a one-year lag of bank-specific variables. $\mathbf{Y}_{j,t}$ contains macro-control variables such as *GDP growth rate*, *Inflation*, *Credit to private sector*, and *Concentration*. *Credit to private sector* is domestic credit to the private sector by banks, whereas *Concentration* is the concentration of the banking sector. In line with the previous studies, we consider bank-specific variables as endogenous, whereas macro-control variables as exogenous (Cantero-Saiz et al., 2014; Jimborean, 2009).

We use Eq. 6.1 to investigate how banks respond to the changes in monetary policy for the full period as well as pre- and post-crisis periods. The pre-crisis period includes the 2004-2007 period, whereas the post-crisis period covers the 2008-2013 period. Performing separate estimations for pre- and post-crisis periods allow us to detect any difference in the bank lending response to changes in the monetary policy interest rate during normal and crisis periods.

Continuing our investigation further, we test how bank ownership played a role in the monetary transmission mechanism throughout the full sample period as well as during pre- and post-crisis sub-periods. For that purpose, we split our sample into foreign-owned and domestic private banks. We use a dummy to differentiate foreign-ownership from domestic banks. Therefore, if a bank is foreign-owned, it takes the value of 1 respectively and the value of zero otherwise. To test the impact of bank-ownership on the bank lending channel of the monetary transmission mechanism, we extend the Eq. 6.1 by introducing foreign ownership dummy variables. Thus, the extended model takes the following form:

$$\begin{aligned} \Delta L_{i,j,t} = & a + \beta_1 \Delta L_{i,j,t-1} + \beta_2 MPrate_t + \beta_3 Foreign_{i,j} + \\ & + \beta_4 MPrate_t * Foreign_{i,j} + \beta_5 \mathbf{X}_{i,j,t-1} + \beta_6 \mathbf{Y}_{j,t} + u_{i,t} \end{aligned} \quad (6.2)$$

where *Foreign* stands for the foreign-owned bank. The inclusion of the interaction of *MPrate* with *Foreign* [*MPrate*Foreign*] allows us to detect a potential difference between the response of foreign-owned and domestic banks to changes in monetary policy interest rate. Specifically, if the coefficient for *MPrate*Foreign* interaction term obtains a positive sign, then it can be interpreted that foreign banks have a smaller sensitivity to the changes in monetary policy stance compared to domestic banks. In other words, a statistically significant positive result of an

interaction term for *MPrate* and *Foreign* indicates that foreign banks' reduced sensitivity to the changes in monetary interest rate decreases the efficiency of monetary policy transmission mechanism through bank lending channels.

As in the case above, we estimate Eq. 6.2 for the full sample period as well as pre- and post-crisis period. Therefore, based on these estimation results we can compare foreign banks' response to changes in monetary policy interest rate against the domestic banks' response not only during the full period but also pre- and post-crisis periods. Furthermore, to check how our results are robust, we include interaction terms of bank-specific variables with *MPrate* using the Eq. 6.2. The inclusion of these interaction terms will allow us to test further whether bank ownership is still important in the monetary transmission process once we multiply other bank-specific variables with the monetary interest rate.

Many countries expanded implementation of unconventional monetary policy during the crisis period to directly impact on the credit market (Borio & Disyatat, 2010; Del Negro, Eggertsson, Ferrero, & Kiyotaki, 2017). To test how the unconventional monetary policy contributed to the bank lending policy, particularly during the crisis period, we estimated a separate regression. We also check how a bank with different ownership types [foreign vs domestic] responded to unconventional monetary policies across developing and developed countries during normal and crisis periods.

As mentioned in the methodology part, the relevant literature uses two different approaches to investigate the existence of a bank lending channel of monetary transmission mechanism during normal and crisis periods. Some researchers divided the full sample period into pre- and post-crisis periods (Heryán & Tzeremes, 2017; Khan, Ahmad, & Gee, 2016; Salachas et al., 2017) whereas others used the dummy variable approach for crisis period (Jeon & Wu, 2014; Leroy, 2014; Sanfilippo-Azofra, Torre-Olmo, Cantero-Saiz, & López-Gutiérrez, 2018). Following the methods set in the literature, we use both approaches in our investigations.

We use the central bank total asset to GDP ratio to measure the unconventional monetary policy for each country (Gambacorta & Marques-Ibanez, 2011; Salachas et al., 2017). To investigate the impact of unconventional monetary policy on bank lending behaviour and the role of bank ownership in this process, we use the following equation:

$$\begin{aligned}
\Delta L_{i,j,t} = & a + \beta_1 \Delta L_{i,j,t-1} + \beta_2 CBA_to_GDP_t + \beta_3 CBA_to_GDP_t * Crisis_t + \\
& + \beta_4 Foreign_{i,j} + \beta_5 CBA_to_GDP_t * Crisis_t * Foreign_{i,j} + \\
& + \beta_6 X_{i,j,t-1} + \beta_7 Y_{j,t} + u_{i,t}
\end{aligned} \tag{6.3}$$

where the variable *CBA_to_GDP* is the central bank asset to GDP ratio, whereas *Crisis* is a dummy variable that takes the value of 1 for the 2008-2013 period and of 0 otherwise. The multiplication of the *CBA_to_GDP* with *Crisis* dummy will allow us to investigate how unconventional monetary policy contributed to the bank lending policy during the recent global financial crisis period. We also include the triple interaction of *CBA_to_GDP* and *Crisis* with a *Foreign* dummy variable to find out how foreign banks responded to the changes in unconventional monetary policy during the crisis period.

Following the literature in bank lending channel, we estimate the above equations using the pooled OLS [POLS] and two-step system GMM estimators (Gambacorta & Marques-Ibanez, 2011; Matousek & Sarantis, 2009; Salachas et al., 2017; Wu et al., 2011). Both estimators include country-level macro-control variables and year dummies. Pooled OLS equations are estimated with robust standard errors, whereas system GMM regressions estimated with Windmeijer (2005) corrected standard errors. To test the impact of unconventional monetary policy on bank lending behaviour, we use a dummy variable approach and use a two-step system GMM method.

Since we are using bank-level data, endogeneity problems are a possibility that could lead to biased estimates. For example, the bank capitalisation ratio differs according to the variability in the total assets and thus plays an essential role in bank lending behaviour. Furthermore, bank loans are an integral part of total assets which are used to measure bank size in our estimations. Similarly, the current level of bank loan supply might be related to the previous levels of bank profitability. As a result, these bank-specific characteristics [such as *Size*, *Capitalisation*, and *Profitability*] may be endogenous and may be affected by the current and previous values of our dependent variable or predetermined. Therefore, we take these bank-specific characteristics, including the ownership variables and their interaction terms as predetermined, and we treat all other variables as exogenous.

6.3 Empirical Results

6.3.1 Bank loan growth response to the changes in monetary policy

Firstly, we estimate how individual banks respond to the changes in the monetary policy interest rate for the full sample, emerging, and developed countries using the Eq. 6.1. The regression analyses are performed by using pooled OLS and two-step system GMM and presented in Table 6.1.

Columns 1-4 show the results for the full sample. The estimated coefficients for *MPrate* are negative and statistically significant. These significant results indicate the existence of a bank lending channel in the full sample for the 2004-2013 period. In other words, tightened monetary policy [an increase in interest rate] leads to a decline in banks' credit supply. These results are in line with bank lending channel theory and previous empirical findings which suggest that as the monetary interest rate increases [decreases] the bank lending rate decreases [increases] (Altunbaş et al., 2002; Bernanke & Blinder, 1992; Kashyap & Stein, 1995; Kishan & Opiela, 2000; Matousek & Sarantis, 2009; Wu et al., 2011).

Due to uncertainty in capital markets and poor economic expectations during the financial distress periods, banks may become reluctant to increase their lending or extend their existing loan contracts whatever the monetary policy decisions are (Fungáčová et al., 2014; Gambacorta & Marques-Ibanez, 2011). Therefore, by separating the full sample period into pre-crisis [2004-2007] and post-crisis [2008-2013], we test and compare banks' response to the monetary policy changes during these sub-sample periods.

The results for the pre- and post-crisis period for the full sample are presented in columns [3] and [4]. The significant negative coefficients for the *MPrate* show the existence of a bank lending channel before and post-crisis period. However, the coefficient for the post-crisis period is considerably smaller compared to the coefficient obtained for the pre-crisis period. This indicates that the bank lending channel of monetary policy was weakened during the post-crisis period. This findings are consistent with Salachas *et al.* (2017) who found effective operation of the bank lending channel in response to changes in monetary policy during the pre-crisis period, whereas for the post-crisis period they found distorted results for monetary transmission mechanism.

Table 6.1 Banks' lending response to the changes in the monetary policy interest rate

Variables	Full sample				Emerging countries				Developed countries			
	Sys GMM	POLS	POLS	POLS	Sys GMM	POLS	POLS	POLS	Sys GMM	POLS	POLS	POLS
	Full period	Full period	Pre-crisis	Post-crisis	Full period	Full period	Pre-crisis	Post-crisis	Full period	Full period	Pre-crisis	Post-crisis
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
<i>Total loans growth rate_{t-1}</i>	0.124*** [0.028]	0.176*** [0.014]	0.222*** [0.033]	0.156*** [0.016]	0.188*** [0.036]	0.175*** [0.018]	0.246*** [0.040]	0.140*** [0.021]	0.016 [0.062]	0.174*** [0.023]	0.165*** [0.059]	0.176*** [0.025]
<i>MPrate_t</i>	-1.134*** [0.275]	-0.571*** [0.159]	-1.195*** [0.424]	-0.358** [0.171]	-0.730** [0.285]	-0.712*** [0.171]	-2.241*** [0.499]	-0.385** [0.177]	0.555 [0.641]	-0.012 [0.436]	2.105 [1.300]	-0.629 [0.541]
<i>Size_{t-1}</i>	-13.167*** [3.621]	-0.818*** [0.106]	-0.935*** [0.279]	-0.756*** [0.114]	-7.047* [3.717]	-0.887*** [0.149]	-1.321*** [0.396]	-0.659*** [0.160]	-23.772*** [8.693]	-0.796*** [0.147]	-0.127 [0.380]	-0.943*** [0.160]
<i>Capitalisation_{t-1}</i>	1.416** [0.700]	-0.002 [0.031]	-0.001 [0.072]	-0.004 [0.035]	1.988* [1.085]	0.017 [0.039]	-0.001 [0.088]	0.023 [0.044]	-0.562 [0.383]	-0.052 [0.054]	-0.062 [0.122]	-0.048 [0.060]
<i>Profitability_{t-1}</i>	0.095 [0.229]	0.278*** [0.082]	0.421 [0.271]	0.251*** [0.087]	0.539 [0.791]	0.268 [0.212]	0.351 [0.424]	0.196 [0.248]	0.285 [0.183]	0.311*** [0.072]	0.476 [0.316]	0.301*** [0.072]
<i>GDP growth rate</i>	3.022*** [0.570]	1.516*** [0.080]	1.517*** [0.245]	1.478*** [0.083]	3.398*** [0.662]	1.695*** [0.094]	1.377*** [0.301]	1.630*** [0.098]	2.811* [1.532]	0.869*** [0.156]	1.207* [0.648]	0.794*** [0.170]
<i>Inflation</i>	1.506** [0.612]	0.078 [0.053]	0.452*** [0.172]	0.022 [0.055]	-0.190 [0.601]	0.027 [0.059]	0.590*** [0.212]	-0.025 [0.060]	-0.036 [0.446]	0.337** [0.131]	-0.329 [0.470]	0.625*** [0.140]
<i>Credit to private sector</i>	0.012*** [0.002]	0.002* [0.001]	-0.000 [0.003]	0.003** [0.001]	0.009*** [0.003]	-0.001 [0.001]	-0.004 [0.004]	0.002 [0.002]	0.007 [0.008]	0.002 [0.002]	0.002 [0.005]	0.002 [0.002]
<i>Concentration</i>	-0.009 [0.096]	-0.014 [0.012]	-0.048* [0.029]	-0.003 [0.013]	-0.098 [0.112]	0.001 [0.015]	-0.062 [0.040]	0.010 [0.016]	-0.460** [0.215]	-0.040 [0.026]	-0.188*** [0.066]	-0.007 [0.031]
Constant	80.938*** [30.925]	20.682*** [1.638]	21.977*** [3.952]	2.016 [1.865]	34.348 [33.170]	19.633*** [2.120]	25.512*** [5.540]	1.357 [2.444]	227.130*** [81.461]	25.317*** [3.049]	31.852*** [6.660]	2.031 [3.447]
Observations	10,836	10,836	2,198	8,638	6,429	6,429	1,282	5,147	4,407	4,407	916	3,491
R-squared		0.217	0.186	0.095		0.254	0.300	0.103		0.166	0.045	0.091
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR[1] p-value	0.000				0.000				0.000			
AR[2] p-value	0.813				0.504				0.462			
Hansen p-value	0.091				0.400				0.101			
No. of instruments	37				37				41			

Notes: The dependent variable is the annual total loans growth rate. Sys GMM is a two-step system GMM with (Windmeijer, 2005) finite-sample corrected standard errors, whereas POLS is Pooled OLS. Robust standard errors are in brackets. × indicates an interaction term. ***, **, and * indicate the 1%, 5%, and 10% level of significance, respectively.

Turning our attention to the results of the emerging countries, we can see that both system GMM and pooled OLS show the existence of a bank lending channel in emerging countries for our sample period. The results of both estimation methods for the full period in columns [5] and [6] are negative and significant indicating that an increase in interest rate by monetary authorities decreases bank lending rates in emerging countries. Similarly, the significant and negative coefficients for *MPrate* for pre- and post-crisis in columns [7] and [8] respectively also show the existence of bank lending channels during these sub-periods. However, as in the full sample case, the coefficient for the pre-crisis sub-period is considerably larger in absolute terms compared to the coefficient obtained for the post-crisis sub-period. This indicates that bank loan supply was more sensitive to the changes in monetary policy interest rates during the pre-crisis sub-period than the post-crisis sub-period. In other words, the bank lending channel operated effectively in response to the changes in monetary policy interest rate, whereas it was weakened during the post-crisis period. Similar results were found by (Salachas et al., 2017) for a list of developed countries and by (Fungáčová et al., 2014) for 12 euro area countries.

Although the system GMM and pooled OLS estimation results confirm the existence of a bank lending channel in the full sample and emerging countries, the obtained coefficients for *MPrate* are not statistically significant for the developed countries samples. This indicates that the bank lending response to the changes in monetary policy interest rates was not significantly sensitive in these countries.

To summarise, both of our estimation methods confirm the existence of bank lending channel in emerging countries and full sample cases for the whole period. However, our results reveal that the role of bank lending appears to have declined after the 2008 crisis. In contrast to emerging countries, the results for developed countries show that banks in this sample of countries are not responsive to the changes in monetary policy. These findings indicate that policymakers in developed countries should carefully consider the banks' unresponsiveness when they are implementing monetary policy to impact macroeconomic indicators.

With respect to the bank-specific variables, we notice that *Size* is negatively and significantly related to bank lending rates for all sample groups and sub-sample periods. The only exception here is an equation for developed countries in column [11] where bank size is not significantly related to bank lending during the pre-crisis period. The bank lending literature provides an explanation for the negative effect of *Size*, which is that smaller banks tend to supply

relatively more lending to their clients than larger banks. Our results confirm the existence of a strong lending relationship between small banks and firms in many countries, a finding also confirmed by Ehrmann and Worms [2004], Gambacorta [2005], and Matousek and Sarantis [2009]. Regarding the bank capitalisation variable, the system GMM specifications in the model [1] for the full sample and model [4] for emerging countries show the positive and significant impact on lending growth rates. Thus, these findings indicate that banks with higher levels of equity ratio in the full sample and emerging countries were able to increase their lending rates throughout the sample period compared to those banks with lower levels of equity ratio. However, the pooled OLS results are not statistically significant for neither these sub-samples nor in the developed countries' case.

Furthermore, the other bank-specific control variable bank profitability has a significant positive impact on bank lending only in developed countries compared to the emerging countries during the full period and post-crisis sub-period. The bank profitability in the full sample case is also positive and significant throughout the sample period and post-crisis sub-period. As a result, the positive impact of bank profitability on bank lending rates in full sample cases is possibly based solely on results for banks located in developed countries. Nevertheless, the findings indicate that more profitable banks in developed countries were able to increase their lending rates at a higher rate compared to those banks with less earnings during the post-crisis period.

As mentioned above, to investigate the lending channel of the monetary transmission channel, we also control for macroeconomic variables in our estimations. *GDP growth rate* and inflation rate are included in the models to control for the demand for the bank loans. According to both estimation methods, the coefficients for the *GDP growth rate* in all equations are positive and highly significant. This finding indicates that GDP growth rate has a positive relationship with loan growth rates, a finding that is consistent with the finance-growth nexus literature, which suggests that well-functioning or growing economies provide better financial services as well (King and Levine, 1993; Pagano, 1993). The other macro-control variable *Inflation* has obtained a positive and significant coefficient in 5 equations out of 12. This finding contradicts the earlier findings in the empirical literature, which found that a more inflationary environment discourages banks' lending through the adverse impact on credit market frictions (Boyd et al., 2001). The only possible explanation might be that since we are controlling for

monetary policy changes and credit to the private sector, the relationship between bank lending rates and the inflation rate is becoming positive. Similar results were found in (Khan et al., 2016; Leroy, 2014). Continuing the interpretation with our macro-control variables, we can see that the *Credit to private sector* in columns [1], [2], and [4] for the full sample and column [5] for emerging countries is positively and significantly related to bank lending rates.

Finally, the results for the one-period-lagged total loans growth rates in system GMM and pooled OLS are positive and significant almost in almost all equations [except in column [9]] indicating the validity of our specifications. Furthermore, the Hansen (1982) and the Arellano and Bond [1991] AR[2] tests of the system GMM specifications provide reassuring diagnostics and confirm that the proposed specifications are adequate for valid inference.

6.3.2 Foreign and domestic bank loan growth response to the changes in monetary policy: normal vs crisis periods.

Table 6.2 reports the regression results of the impact of monetary policy on loan growth rates of banks with different ownership types estimated using the Eq. 6.2. We use the same approach by dividing the full sample into emerging and developed countries and dividing the full sample period into pre- and post-crisis periods. These sub-samplings allow us to compare the response of foreign and domestic bank lending to the changes in monetary policy in emerging countries versus developed countries and during pre-crisis against post-crisis periods.

From the regression results in columns [1]-[4] for the full sample, we can see that all the coefficients for *MPrate* retained their sign and significance when we include *Foreign* and *MPrate*Foreign*. Specifically, both estimation methods for the full sample period produce an almost similar negative coefficient for *MPrate* in column [1] and [2]. Consequently, we can interpret this finding as an increase [decrease] in bank loan growth rates when monetary authorities decrease [increase] interest rate. In other words, expansionary monetary policy [decrease in monetary policy interest rate] stimulates bank lending. This indicates the existence of a bank lending channel in our sample countries for the full period.

Table 6.2 Foreign and domestic bank loan growth response to the changes in monetary policy: normal vs crisis periods

Variables	Full sample				Emerging countries				Developed countries			
	Full period	Full period	Pre-crisis	Post-crisis	Full period	Full period	Pre-crisis	Post-crisis	Full period	Full period	Pre-crisis	Post-crisis
	Sys GMM	POLS	POLS	POLS	Sys GMM	POLS	POLS	POLS	Sys GMM	POLS	POLS	POLS
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
<i>Total loans growth rate_{t-1}</i>	0.285*** [0.091]	0.152*** [0.016]	0.193*** [0.038]	0.134*** [0.018]	0.164* [0.085]	0.162*** [0.019]	0.235*** [0.043]	0.126*** [0.022]	0.225* [0.133]	0.128*** [0.031]	0.037 [0.073]	0.146*** [0.033]
<i>MPrate</i>	-1.069*** [0.336]	-1.123*** [0.204]	-1.524** [0.605]	-0.936*** [0.213]	-0.912*** [0.345]	-1.140*** [0.216]	-2.340*** [0.709]	-0.825*** [0.216]	-2.244*** [0.726]	-1.475*** [0.544]	0.122 [1.489]	-2.866*** [0.664]
<i>Foreign</i>	-0.188 [3.303]	-0.347 [0.502]	3.271*** [1.265]	-1.265** [0.548]	1.184 [3.544]	0.581 [0.609]	5.663*** [1.575]	-0.725 [0.659]	-3.466 [3.389]	-1.649* [0.950]	0.815 [2.102]	-1.758* [1.064]
<i>MPrate*Foreign</i>	1.529*** [0.495]	1.194*** [0.320]	1.193 [0.915]	1.122*** [0.340]	1.212*** [0.449]	1.096*** [0.336]	0.787 [1.070]	1.041*** [0.348]	2.995 [1.871]	1.855* [0.998]	1.720 [1.449]	1.658 [1.208]
<i>Size_{t-1}</i>	-4.328** [1.835]	-0.848*** [0.120]	-1.535*** [0.305]	-0.682*** [0.131]	-3.682** [1.577]	-0.961*** [0.157]	-1.564*** [0.419]	-0.766*** [0.169]	-0.572 [3.311]	-0.738*** [0.186]	-1.062** [0.422]	-0.655*** [0.207]
<i>Capitalisation_{t-1}</i>	-0.462 [0.443]	0.013 [0.037]	-0.056 [0.081]	0.030 [0.042]	-0.774** [0.374]	0.009 [0.042]	-0.020 [0.091]	0.020 [0.047]	0.519 [0.644]	0.014 [0.081]	-0.305** [0.154]	0.057 [0.092]
<i>Profitability_{t-1}</i>	1.499 [1.072]	0.357*** [0.088]	0.674 [0.443]	0.313*** [0.081]	2.887** [1.445]	0.409* [0.226]	0.343 [0.475]	0.420 [0.261]	0.650 [0.610]	0.355*** [0.070]	3.144*** [0.925]	0.308*** [0.060]
<i>GDP growth rate</i>	0.871** [0.439]	1.565*** [0.083]	1.356*** [0.270]	1.578*** [0.086]	1.112** [0.473]	1.775*** [0.096]	1.154*** [0.331]	1.782*** [0.099]	1.001* [0.586]	0.733*** [0.167]	0.839 [0.640]	0.451** [0.184]
<i>Inflation</i>	-0.519** [0.246]	-0.016 [0.054]	0.137 [0.198]	-0.041 [0.055]	-0.501* [0.256]	-0.057 [0.059]	0.378 [0.240]	-0.099* [0.059]	0.533 [0.447]	0.296** [0.148]	-0.885* [0.500]	0.622*** [0.154]
<i>Credit to private sector</i>	-0.001 [0.002]	-0.001 [0.001]	-0.001 [0.004]	-0.000 [0.001]	-0.002 [0.004]	-0.002 [0.002]	-0.002 [0.005]	-0.002 [0.002]	0.004 [0.004]	-0.002 [0.002]	-0.006 [0.006]	-0.001 [0.002]
<i>Concentration</i>	-0.081* [0.043]	-0.017 [0.014]	-0.077** [0.034]	-0.001 [0.015]	-0.056 [0.043]	-0.010 [0.017]	-0.120*** [0.043]	0.013 [0.018]	0.026 [0.079]	-0.060* [0.032]	-0.191** [0.080]	-0.073* [0.037]
Constant	47.254** [18.406]	22.970*** [1.977]	30.587*** [4.806]	3.493 [2.211]	42.897*** [12.751]	22.924*** [2.434]	31.839*** [6.145]	3.146 [2.726]	-3.399 [38.740]	27.304*** [3.825]	44.373*** [8.518]	7.355* [4.400]
Observations	7,837	7,837	1,562	6,275	4,965	4,965	983	3,982	2,872	2,872	579	2,293
R-squared		0.243	0.171	0.109		0.277	0.245	0.123		0.183	0.062	0.104
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR[1] p-value	0.000				0.000				0.000			
AR[2] p-value	0.111				0.847				0.083			
Hansen p-value	0.269				0.789				0.087			
No. of instruments	79				79				77			

Note: The dependent variable is the annual total loans growth rate. Sys GMM is a two-step system GMM with (Windmeijer, 2005) finite-sample corrected standard errors, whereas POLS is Pooled OLS. Robust standard errors are in brackets. × indicates an interaction term. ***, **, and * indicate the 1%, 5%, and 10% level of significance, respectively.

The results for pre- and post-crisis periods also retained their sign and significance as in Table 6.1 with slightly larger coefficients. Similarly, the coefficient of *MPrate* for a pre-crisis period in column [3] is considerably larger than the coefficient obtained for the post-crisis period. This indicates that during the pre-crisis period, bank lending responses to the changes in monetary policy interest rates were more sensitive compared to the post-crisis period. In other words, the bank lending channel weakened once the 2018 global financial crisis happened and continued to weaken afterwards. These results are consistent with the earlier findings in the related literature which found the similar reaction of bank response to the monetary policy stance during the pre- and post-crisis periods (Fungáčová *et al.*, 2014; Salachas *et al.*, 2017). Specifically, Salachas *et al.* (2017) emphasise that the traditional monetary policy was ineffective during the financial crisis period because the bank lending channel was significantly distorted. On the other hand, Fungáčová *et al.* (2014) conclude that monetary policy during the crisis period was not as effective as before in Eurozone countries.

As in the full sample size, the results of *MPrate* for the emerging countries in columns [5]-[8] retained their sign and significance. This finding confirms the existence of a bank lending channel in emerging countries once we include the *Foreign* variable and its interaction with *MPrate*, to control the role of bank ownership in the monetary transmission mechanism. However, although the existence of bank lending channels was confirmed in emerging countries, the results in column [7] and [8] reveals some information on how banks responded to the changes in the monetary policy interest rate during the pre- and post-crisis period. In other words, the coefficient of *MPrate* for the pre-crisis period is considerably larger in absolute terms compared to the post-crisis period. Therefore, it can be concluded that the bank lending response to the monetary policy stance was more sensitive before the start of the crisis.

Interestingly, the results in Table 6.1 for developed countries were not statistically significant, whereas, in Table 6.2, they became mostly significant once we control for bank ownership in equations. Although the system GMM and pooled OLS results in columns [9] and [10] for the full sample period are in line with the related literature, the result for post-crisis period contradicts the previous findings. For example, Salachas *et al.* (2017) found that bank lending channels operated effectively during the pre-crisis period in 6 advanced countries, whereas during the post-crisis period, the efficiency distorted. There are some possible explanations for these contradicting findings. One possibility is that Salachas *et al.* (2017)

investigated the group of 6 advanced countries, whereas our developed countries sub-sample includes 22 industrial economies throughout the world. Secondly, different from Salachas *et al.* (2017), we control for bank ownership in our investigations.

Continuing with the results for the *Foreign* in Table 6.2, we can see that foreign bank lending behaviour was different according to the sub-sample groups and sub-period groups. For example, the result in column [3] indicates that foreign bank lending rates exceeded domestic bank lending rates during the pre-crisis period. However, the result for the post-crisis period in column [4] shows that foreign bank lending rates fell more compared to the domestic banks. Moving to the emerging countries, we can see that the result for *Foreign* is only significant for the pre-crisis period. This positive significant coefficient indicates that in this sample of countries, foreign banks were active lenders in credit markets compared to the domestic banks before the start of the 2008 global financial crisis.

On the contrary, for the developed countries' sample group, we found that foreign banks decrease their lending rates faster than domestic banks during the post-crisis period. The result in column [10] on the other hand, indicates that foreign bank lending rates in developed countries fell below domestic bank lending during the full sample period as well. However, this result might be based solely on what happened during the post-crisis period. There was a similar result we encountered in Chapter 5 where we investigate bank ownership and lending behaviour during the normal and crisis period. Considering that we used a slightly different approach previously; current findings also confirm the robustness of our findings in Chapter 5. Furthermore, relevant literature also found similar results which confirms that foreign bank lending rates exceeded domestic bank lending rates during the normal times, but they curtailed their lending once the global financial crisis happened (Choi et al., 2016; Cull & Peria, 2013; De Haas, Korniyenko, Pivovarsky, & Loukoianova, 2012).

Next, to test any possible differences in lending response of domestic and foreign banks to monetary policy, we interacted foreign bank ownership dummy with *MPrate*. From the results for the full sample in Table 6.2, we can see that the coefficients for the interaction term of *Foreign* and *MPrate* were positive and highly significant during the full sample period and post-crisis sub-periods. The coefficients of *MPrate*Foreign* for the full sample period, estimated by system GMM and pooled OLS in columns [1] and [2], are comparably similar, confirming the consistency of our approaches. These positive and significant results indicate

that the response of foreign banks to the changes in monetary policy is less sensitive compared to the domestic banks. In other words, foreign-owned banks adjust their lending to the changes in the monetary policy interest rate by a smaller extent than those of domestic banks. Furthermore, although the coefficient for the pre-crisis period obtained a positive sign, the foreign bank lending response to the monetary policy stance was not significantly different from the domestic bank response.

In contrast, the results of $MPrate*Foreign$ for the post-crisis period reveal that particularly during the crisis period, the foreign bank lending response was significantly different from the domestic banks lending response. In other words, when monetary authorities in many countries implement expansionary monetary policy during the crisis period to support the local financial markets, foreign banks weaken the efficiency of bank lending channels by showing smaller sensitivity to the monetary policy stance. These findings are in line with the previous findings in the relevant literature (Jeon & Wu, 2014; Wu et al., 2011). Specifically, by investigating bank-level data for the 1996-2003 period, Wu *et al.* (2011) found a smaller lending response from the foreign banks to monetary policy compared to domestic banks, and they emphasised the existence of internal capital markets as an explanation to this less sensitivity. Furthermore, Jeon and Wu (2014) claim that foreign banks lessened the potency of monetary policy during the 2008-2009 crisis period, however they only used data for banks located in Asian countries.

Considering the importance of central bank monetary policy in stabilising the financial sector, our findings have key policy implications. Specifically, central banks should take into account the less sensitivity of foreign banks when they are implementing monetary policy to impact future macroeconomic indicators. The policy implication particularly important for emerging countries where the share of foreign banks is high in banking sector³⁵. Furthermore, many countries across the world implemented expansionary monetary policy during the recent global financial crisis period to support the real sector of economy with liquidity. Thus, our findings indicate that governments should carefully consider increased foreign bank participation in local market when they are reforming banking sector. On the other hand, the obtained results for developed countries show that the responses of foreign banks to monetary

³⁵ Table 3.3 shows that in emerging economies the average share of foreign banks is about 45%, whereas in the developed countries it is about 29%.

policy changes in these economies were not significantly different from domestic banks neither pre-crisis nor post-crisis period.

Turning our attention to the results for emerging and developed countries cases, we notice that the coefficient for $MPrate*Foreign$ is mostly significant in the emerging countries subsample. Specifically, the regression results show that although the interaction term between *Foreign* and *MPrate* obtained a positive sign for the pre-crisis, it is not statistically significant whereas the lending response of foreign banks significantly differed from domestic banks during the post-crisis period. In comparison, the results for developed countries in columns [9]-[12] shows that the sign for the interaction term for $MPrate*Foreign$ is positive, however it is only significant for the entire sample period in pooled OLS specification. The system GMM specification in column [9] for the entire sample period is also close to the 10% significance level. Thus, these results indicate that although it was indifferent during the pre-crisis and post-crisis period, the response of foreign bank lending to the monetary policy during the full sample period in developed countries was significantly different from domestic banks. In sum, our results reveal that foreign banks' lending rates were less sensitive to the changes in monetary policy in all sample groups.

Regarding the results for a bank-specific variable, as in Table 6.1, *Size* had an adverse impact on bank lending. Coefficients for *Size* obtained by both estimation methods are negative and highly significant in almost all equations except model 9 for developed countries. As discussed above, this negative association between bank size and lending behaviour indicates that smaller bank's loan growth rates were higher compared to larger banks. The results are consistent across sample groups and sub-periods. In contrast to the bank size, bank capitalisation seems to not be a significant determinant of bank lending. Although it was not statistically significant in most of the equations, the system GMM equation in column [5] for emerging countries and the pooled OLS equation in column [11] for developed countries show that higher capitalisation impedes bank lending. However, the results are not consistent across sample groups and estimation methods. This finding contradicts the general theory, which predicts that well-capitalised banks provide a more robust loan supply. One possible explanation can be that according to Gambacorta and Mistrulli (2004) the capital-to-asset ratio may poorly approximate relevant bank capitalisation, which is generally used in the bank lending empirical literature.

Also, bank profitability has an expected positive sign in all equations, and bank profitability is significant in 7 out of 12 equations.

For the macro-control variables, both estimation methods confirm that GDP growth rate is significantly associated with bank lending. The results for inflation are not consistent for the full sample and emerging countries, whereas, for developed countries, it has mixed results. Specifically, as previous pooled OLS results show inflation has a positive association with bank lending during post-crisis and full sample periods, whereas it was negative for the pre-crisis period. It became negative and significant for the pre-crisis period once we include *Foreign* and *MPrate*Foreign* in the model. The other macro-control variable *Concentration* obtained a negative sign in most of the equations, although it is significant in 6 out of 12. These results imply that banking market concentration impedes bank lending. This finding is in line with previous empirical literature (Black & Strahan, 2002; Fosu, 2014).

Finally, the one-period lagged value of the dependent variable is positive and highly significant, indicating the validity of both estimation methods. Furthermore, the Hansen (1982) and the Arellano and Bond [1991] AR[2] tests of the system GMM specifications justify the validity of the over-identification restrictions and the absence of second-order serial correlation confirming that the proposed specifications are adequate for valid inference.

6.3.3 Robustness test for an alternative possible transmission channel of monetary policy

As discussed in the literature review chapter, theories that were developed to investigate the bank lending channel of monetary policy transmission mechanism predict that bank balance sheet items such as size, capitalisation, liquidity and profitability play a crucial role in monetary policy transmission through the bank lending channel (Bernanke & Blinder, 1992; Kashyap & Stein, 1995; Kishan & Opiela, 2000). To test how our findings are robust to the alternative channels of monetary policy transmission, we estimate Eq. 6.2 by including the interaction term of bank-specific variables with the monetary policy interest rate. In other words, we check whether our main variable [*MPrate*Foreign*] remains significant even after the inclusion of these alternative possible transmission channels of monetary policy. The results are presented in

Table 6.3 Foreign and domestic bank loan growth response to the changes in monetary policy with additional control variables

Variables	Full sample				Emerging countries				Developed countries			
	Full period	Full Period	Pre-crisis	Post-crisis	Full period	Full period	Pre-crisis	Post-crisis	Full period	Full period	Pre-crisis	Post-crisis
	Sys GMM	POLS	POLS	POLS	Sys GMM	POLS	POLS	POLS	Sys GMM	POLS	POLS	POLS
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
<i>Total loans growth rate_{t-1}</i>	0.324*** [0.085]	0.152*** [0.016]	0.193*** [0.038]	0.134*** [0.018]	0.147* [0.082]	0.162*** [0.019]	0.234*** [0.043]	0.127*** [0.022]	0.232* [0.137]	0.128*** [0.031]	0.029 [0.074]	0.147*** [0.033]
<i>MPrate</i>	-5.847 [4.458]	-0.220 [0.796]	-0.442 [2.285]	-0.168 [0.844]	-6.189 [4.409]	-0.287 [0.847]	-1.239 [2.646]	-0.039 [0.881]	-18.342 [12.587]	-1.353 [2.334]	-1.784 [4.727]	-4.421* [2.482]
<i>Foreign</i>	-2.315 [3.180]	-0.347 [0.501]	3.279** [1.272]	-1.265** [0.546]	0.255 [3.269]	0.585 [0.607]	5.699*** [1.591]	-0.719 [0.656]	-4.659 [3.556]	-1.651* [0.948]	1.090 [2.091]	-1.772* [1.064]
<i>MPrate</i> × <i>Foreign</i>	1.595*** [0.589]	1.229*** [0.327]	1.306 [0.987]	1.154*** [0.346]	1.152** [0.516]	1.136*** [0.346]	0.784 [1.170]	1.087*** [0.358]	1.915 [2.877]	1.809* [1.024]	0.903 [1.533]	1.753 [1.243]
<i>Size_{t-1}</i>	-4.423** [1.804]	-0.860*** [0.121]	-1.508*** [0.307]	-0.698*** [0.132]	-3.235** [1.293]	-0.967*** [0.157]	-1.546*** [0.418]	-0.778*** [0.170]	-0.117 [3.360]	-0.742*** [0.191]	-1.012** [0.430]	-0.618*** [0.217]
<i>MPrate</i> × <i>Size_{t-1}</i>	0.576 [0.482]	-0.087 [0.076]	-0.101 [0.239]	-0.075 [0.079]	0.614 [0.499]	-0.078 [0.081]	-0.121 [0.282]	-0.073 [0.082]	1.414 [1.303]	-0.024 [0.212]	0.051 [0.430]	0.176 [0.218]
<i>Capitalisation_{t-1}</i>	-0.201 [0.426]	0.013 [0.037]	-0.044 [0.084]	0.029 [0.042]	-0.584 [0.431]	0.010 [0.043]	-0.014 [0.095]	0.019 [0.048]	0.846 [0.688]	0.015 [0.085]	-0.286* [0.150]	0.065 [0.098]
<i>MPrate</i> × <i>Capitalisation_{t-1}</i>	0.020 [0.105]	-0.018 [0.020]	-0.033 [0.045]	-0.014 [0.022]	0.048 [0.136]	-0.019 [0.021]	-0.016 [0.048]	-0.018 [0.023]	0.518 [0.452]	0.004 [0.087]	-0.059 [0.163]	0.041 [0.098]
<i>Profitability_{t-1}</i>	1.572 [0.957]	0.354*** [0.088]	0.672 [0.448]	0.311*** [0.081]	2.955** [1.297]	0.400* [0.226]	0.337 [0.486]	0.411 [0.259]	0.300 [0.615]	0.356*** [0.070]	3.051*** [0.931]	0.293*** [0.061]
<i>MPrate</i> × <i>Profitability_{t-1}</i>	0.075 [0.320]	-0.005 [0.090]	0.049 [0.175]	-0.007 [0.105]	0.078 [0.301]	0.000 [0.096]	-0.001 [0.188]	0.005 [0.112]	-0.159 [1.533]	0.025 [0.235]	1.605* [0.887]	-0.249 [0.213]
<i>GDP growth rate</i>	0.971** [0.426]	1.567*** [0.083]	1.348*** [0.271]	1.581*** [0.086]	0.919* [0.503]	1.777*** [0.096]	1.153*** [0.333]	1.785*** [0.099]	1.171** [0.527]	0.731*** [0.167]	0.825 [0.650]	0.461** [0.184]
<i>Inflation</i>	-0.576** [0.242]	-0.018 [0.054]	0.142 [0.198]	-0.042 [0.055]	-0.479** [0.243]	-0.058 [0.059]	0.375 [0.241]	-0.100* [0.059]	0.372 [0.412]	0.297** [0.148]	-0.836 [0.527]	0.617*** [0.154]
<i>Credit to private sector</i>	-0.000 [0.002]	-0.001 [0.001]	-0.001 [0.004]	-0.000 [0.001]	-0.002 [0.003]	-0.002 [0.002]	-0.002 [0.005]	-0.002 [0.002]	0.005 [0.004]	-0.002 [0.002]	-0.006 [0.006]	-0.001 [0.002]
<i>Concentration</i>	-0.060 [0.045]	-0.018 [0.014]	-0.078** [0.034]	-0.001 [0.015]	-0.054 [0.044]	-0.011 [0.017]	-0.121*** [0.043]	0.013 [0.018]	0.025 [0.074]	-0.060* [0.032]	-0.183** [0.081]	-0.072* [0.037]
Constant	43.799** [18.691]	23.070*** [1.982]	30.376*** [4.793]	3.632 [2.222]	37.312*** [11.595]	22.978*** [2.440]	31.688*** [6.117]	3.244 [2.734]	-10.499 [38.964]	27.345*** [3.869]	43.522*** [8.677]	7.012 [4.476]
Observations	7,837	7,837	1,562	6,275	4,965	4,965	983	3,982	2,872	2,872	579	2,293
R-squared		0.243	0.171	0.109		0.277	0.245	0.123		0.183	0.068	0.105
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR[1] p-value	0.000				0.000				0.000			
AR[2] p-value	0.052				0.775				0.121			
Hansen p-value	0.245				0.772				0.060			
No. of instruments	85				85				86			

Notes: The dependent variable is the total annual loans growth rate. Sys GMM is a two-step system GMM with (Windmeijer, 2005) finite-sample corrected standard errors, whereas POLS is Pooled OLS. Robust standard errors are in brackets. × indicates an interaction term. ***, **, and * indicate the 1%, 5%, and 10% level of significance, respectively.

The regression results show that estimated coefficients for $MPrate*Foreign$ retained their sign and significance across all sample groups. This indicates that even after controlling for alternative transmission channels of monetary policy, foreign bank response to the changes in monetary policy interest rate is still significantly different from the domestic banks and the magnitude of the effect did not change much in the difference responses. This finding further confirms that by showing less sensitivity than domestic banks, foreign banks lessen the efficiency of the monetary policy transmission process in local economies.

Next, bank-specific variables also retained their previous signs and significance. However, the results for alternative transmission channels of a monetary policy-the interaction term for bank-specific variables and $MPrate$ -are not statistically significant. The only exception is the pre-crisis period case for developed countries in column [11], where the interaction term of $MPrate$ and $Profitability$ obtained positive signs that were significant at the 10% level. This indicates that during the pre-crisis period, banks with higher profitability provided more loans compared to the banks with less profit in developed countries.

Furthermore, as a continuation of our robustness test, we exclude the government banks from the domestic bank and re-estimate the Eq. 6.2 by keeping all bank-specific, macro-control, and alternative transmission channels of monetary policy variables. Since the share of government-owned banks in developed countries is very limited, we only do regression analyses for the full sample and emerging countries. The results are presented in Table 6.4.

As can be seen from the results, once we exclude government-owned banks from our sample, the coefficient for $MPrate*Foreign$ retained its sign and significance in most of the specifications. The only difference is in the model [5] with system GMM specification for emerging countries where the coefficient for $MPrate*Foreign$ is close to the 10% significance level. It was significant at a 5% significance level when estimated without the exclusion of government-owned banks.

Among the bank-specific variables, *Size* is negatively and significantly related to bank lending rates as usual. Interestingly, when government-banks were excluded from the sample, the results for Capitalisation became positive and significant in 5 out of 8 specifications. Specifically, both estimation methods in column [1] and [2] for the full sample confirm that bank capitalisation played a significant positive role in shaping bank lending policy during the

Table 6.4 Foreign and domestic bank loan growth response to the changes in monetary policy with additional control variables-excluded government-owned banks

Variables	Full sample				Emerging countries			
	Full period	Full period	Pre-crisis	Post-crisis	Full-period	Full-period	Pre-crisis	Pre-crisis
	Sys GMM	POLS	POLS	POLS	Sys GMM	POLS	POLS	POLS
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
<i>Total loans growth rate_{t-1}</i>	0.273*** [0.090]	0.151*** [0.017]	0.179*** [0.039]	0.134*** [0.019]	0.155* [0.086]	0.163*** [0.021]	0.222*** [0.045]	0.129*** [0.024]
<i>MP-rate</i>	-9.099* [5.228]	0.053 [0.944]	0.836 [2.737]	-0.047 [1.004]	-7.751* [4.539]	0.082 [1.022]	0.050 [3.198]	0.218 [1.069]
<i>Foreign</i>	0.403 [3.528]	-0.445 [0.521]	2.958** [1.329]	-1.328** [0.571]	-0.389 [3.687]	0.467 [0.637]	5.487*** [1.683]	-0.856 [0.692]
<i>MP-rate × Foreign</i>	1.429** [0.686]	1.366*** [0.353]	1.710 [1.085]	1.218*** [0.371]	1.075 [0.662]	1.282*** [0.374]	1.075 [1.279]	1.177*** [0.385]
<i>Size_{t-1}</i>	-3.658* [1.934]	-0.810*** [0.127]	-1.282*** [0.321]	-0.674*** [0.139]	-3.659** [1.539]	-0.874*** [0.168]	-1.259*** [0.445]	-0.704*** [0.181]
<i>MP-rate × Size_{t-1}</i>	-0.319 [0.390]	0.028 [0.043]	-0.006 [0.099]	0.037 [0.048]	-0.472 [0.414]	0.034 [0.052]	0.057 [0.118]	0.035 [0.057]
<i>Capitalisation_{t-1}</i>	1.999* [1.043]	0.357*** [0.088]	0.778 [0.508]	0.305*** [0.079]	2.630** [1.184]	0.435* [0.247]	0.407 [0.557]	0.416 [0.280]
<i>MP-rate × Capitalisation_{t-1}</i>	0.925 [0.565]	-0.109 [0.087]	-0.264 [0.273]	-0.073 [0.091]	0.583 [0.537]	-0.109 [0.094]	-0.254 [0.323]	-0.084 [0.096]
<i>Profitability_{t-1}</i>	0.087 [0.106]	-0.037 [0.028]	-0.067 [0.061]	-0.031 [0.031]	0.163 [0.137]	-0.042 [0.030]	-0.057 [0.065]	-0.040 [0.033]
<i>MP-rate × Profitability_{t-1}</i>	-0.026 [0.329]	0.010 [0.094]	0.069 [0.188]	0.011 [0.109]	0.025 [0.336]	0.015 [0.100]	0.004 [0.201]	0.023 [0.116]
<i>GDP growth rate</i>	0.610 [0.454]	1.519*** [0.092]	1.413*** [0.308]	1.515*** [0.095]	0.829 [0.530]	1.729*** [0.109]	1.305*** [0.379]	1.720*** [0.112]
<i>Inflation</i>	-0.501** [0.237]	-0.025 [0.056]	0.206 [0.216]	-0.060 [0.057]	-0.380 [0.270]	-0.074 [0.061]	0.395 [0.256]	-0.123** [0.062]
<i>Credit to private sector</i>	-0.001 [0.002]	-0.000 [0.001]	-0.000 [0.004]	0.000 [0.001]	-0.000 [0.003]	-0.002 [0.002]	-0.001 [0.005]	-0.001 [0.002]
<i>Concentration</i>	-0.062 [0.042]	-0.026* [0.015]	-0.082** [0.037]	-0.010 [0.016]	-0.024 [0.042]	-0.019 [0.018]	-0.128*** [0.046]	0.006 [0.019]
Constant	38.448** [19.006]	23.408*** [2.097]	27.953*** [5.007]	4.271* [2.325]	36.807*** [13.782]	22.744*** [2.630]	27.904*** [6.429]	3.392 [2.914]
Observations	7,179	7,179	1,423	5,756	4,427	4,427	870	3,557
R-squared		0.234	0.173	0.099		0.268	0.254	0.111
Year dummies	Yes				Yes			
AR[1] p-value	0.000				0.000			
AR[1] p-value	0.132				0.835			
Hansen p-value	0.258				0.540			
No. of instruments	85				85			

Notes: The dependent variable is the total annual loans growth rate. Sys GMM is a two-step system GMM with (Windmeijer, 2005) finite-sample corrected standard errors, whereas POLS is pooled OLS. In brackets, robust standard errors. × indicates an interaction term. ***, **, and * indicate the 1%, 5%, and 10% level of significance, respectively.

entire sample period, whereas the pooled OLS specification in column [4] indicates that during the post-crisis period well-capitalised banks provided a more robust loan supply compared to their counterparts. Furthermore, regarding the emerging countries case similar results were obtained by both methods for the full sample period in column [5] and [6], however with slightly larger coefficients.

In conclusion, after performing some robustness tests, we can confirm that foreign banks might decrease the efficiency of the bank lending channel of the monetary policy transmission

mechanism in local economies. The inclusion of the alternative transmission channel of monetary policy and exclusion of the government-owned banks in our estimations did not change the results significantly from the ones that we initially obtained for the interaction term of *MPrate* and *Foreign*.

6.3.4 Unconventional monetary policy: normal vs crisis periods

Many countries implemented an unconventional monetary policy to increase capital market liquidity and prevent an economic downturn following the 2008 global financial crisis (Borio & Disyatat, 2010; Del Negro *et al.*, 2017; Gambacorta & Marques-Ibanez, 2011). Continuing our investigation, we test how unconventional monetary policy contributed to bank lending behaviour during the normal and crisis period. Furthermore, we also check how foreign-owned and domestic banks responded to these monetary policies across the countries during normal and crisis periods. For that purpose, following the related literature we use central bank asset purchase to GDP ratio [CBA-to-GDP] to measure the changes in unconventional monetary policy (Gambacorta & Marques-Ibanez, 2011; Salachas *et al.*, 2017). For our investigation, we use Eq. 6.3 by including the crisis dummy and its interaction with unconventional monetary policy measures and bank-ownership dummy. The results are presented in Table 6.5.

The results for CBA-to-GDP in column [1] for the full sample and column [8] for developed countries show that unconventional monetary policy has positively contributed to the bank lending behaviour during the entire sample period, whereas the coefficient for the emerging countries, although obtaining the expected positive sign, is not statistically significant. According to Salachas *et al.* (2017), under an asset purchase program, central banks purchase long-term securities and Mortgage-Backed securities, which in turn injects liquidity into the credit market. In turn, an increase in asset purchases should stimulate bank lending. Our results confirm this prediction that an increase in central bank asset to GDP ratio positively contributes to the growth rate of bank total lending. This result is in line with earlier empirical findings in bank lending literature who found a similar positive correlation between a central bank asset purchase and lending growth (Gambacorta & Marques-Ibanez, 2011).

Our results for unconventional monetary have important policy implications. Specifically, results in Table 6.1 showed effectiveness of monetary policy in emerging countries, whereas the implementation of this traditional monetary policy in developed countries was not as

effective. However, results for CBA-to-GDP show that unconventional monetary policy was effective in developed countries while it was not in emerging countries. This difference can be explained by unsuccessful implementation of traditional monetary policy in developed countries when the short-term interest rates declined to the ZLB particularly during the recent global financial crisis period.

Continuing our investigation, we interact *CBA-to-GDP* with the crisis dummy for the 2008-2013 period to find out whether the unconventional monetary policy implemented during the crisis period was effective. The regression results for *CBA-to-GDP*×*Crisis* interaction terms show that it obtained a positive and significant coefficient in 4 out of 6 specification columns [3], [6], [8], and [9]. This indicates that unconventional monetary policy implemented during the crisis period contributed significantly to bank lending across all sample groups.

Table 6.5 Bank lending response to the unconventional monetary policy: normal vs crisis periods

Variables	Full sample			Emerging countries			Developed countries		
	Sys GMM	Sys GMM	Sys GMM	Sys GMM	Sys GMM	Sys GMM	Sys GMM	Sys GMM	Sys GMM
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
<i>Total loans growth rate_{t-1}</i>	0.478** [0.222]	0.481** [0.222]	0.242** [0.102]	0.230 [0.226]	0.236 [0.226]	0.092 [0.096]	0.219 [0.324]	0.196 [0.323]	0.097 [0.103]
<i>CBA-to-GDP</i>	0.863** [0.423]	0.841* [0.477]	0.026 [0.225]	0.137 [0.317]	0.080 [0.434]	-0.085 [0.206]	2.363* [1.254]	1.867 [1.206]	-0.430 [0.651]
<i>CBA-to-GDP</i> × <i>Crisis</i>		0.031 [0.165]	0.602** [0.256]		0.076 [0.199]	0.552* [0.332]		0.875* [0.448]	1.128* [0.639]
<i>Foreign</i>			13.739 [8.386]			20.271** [9.474]			-4.116 [4.178]
<i>CBA-to-GDP</i> × <i>Crisis</i> × <i>Foreign</i>			-1.504* [0.784]			-1.165* [0.674]			-1.195 [0.834]
<i>Size_{t-1}</i>	-5.803 [4.559]	-5.804 [4.571]	-3.283 [2.158]	-6.678* [3.919]	-6.692* [3.920]	-1.109 [2.041]	-2.684 [2.798]	-3.089 [2.857]	-2.061 [1.702]
<i>Capitalisation_{t-1}</i>	2.978** [1.390]	2.992** [1.391]	0.626 [0.543]	-0.740 [1.634]	-0.720 [1.639]	0.096 [0.579]	0.289 [0.565]	0.278 [0.567]	1.057*** [0.318]
<i>Profitability_{t-1}</i>	0.606 [1.913]	0.609 [1.917]	0.604 [0.805]	3.963* [2.242]	3.965* [2.248]	3.289*** [1.235]	-0.041 [0.670]	-0.030 [0.669]	0.768 [0.474]
<i>GDP growth rate</i>	3.033*** [0.724]	3.032*** [0.729]	1.213** [0.515]	3.481*** [0.807]	3.481*** [0.823]	1.026** [0.487]	4.497 [2.804]	4.774* [2.825]	1.001* [0.563]
<i>Inflation</i>	-1.373 [1.192]	-1.379 [1.192]	-0.448** [0.222]	-2.603*** [0.875]	-2.623*** [0.872]	-0.578** [0.232]	-3.737 [2.435]	-4.008 [2.469]	0.393 [0.367]
<i>Credit to private sector</i>	0.012 [0.009]	0.012 [0.009]	0.004 [0.004]	-0.012 [0.008]	-0.012 [0.008]	-0.002 [0.004]	0.004 [0.003]	0.003 [0.003]	0.003 [0.004]
<i>Concentration</i>	0.033 [0.138]	0.033 [0.140]	-0.007 [0.072]	-0.156 [0.101]	-0.158 [0.102]	-0.083 [0.056]	-0.126 [0.093]	-0.147 [0.097]	0.012 [0.072]
Constant	-0.668 [46.938]	-0.890 [47.222]	15.685 [19.646]	80.740 [55.155]	80.579 [55.243]	8.357 [22.241]	26.443 [27.816]	30.771 [28.540]	10.243 [17.012]
Observations	10,302	10,302	7,331	5,995	5,995	4,566	4,307	4,307	2,765
Number of id	1,825	1,825	1,226	1,060	1,060	768	765	765	458
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR[1] p-value	0.001	0.001	0.000	0.001	0.001	0.000	0.021	0.022	0.000
AR[2] p-value	0.155	0.150	0.165	0.764	0.776	0.653	0.399	0.456	0.133
Hansen p-value	0.264	0.265	0.104	0.586	0.585	0.429	0.366	0.402	0.093
No. of instruments	25	26	76	25	26	76	29	30	89

Notes: The dependent variable is the annual total loans growth rate. Sys GMM is a two-step system GMM with (Windmeijer, 2005) finite-sample corrected standard errors. In brackets, robust standard errors. × indicates an interaction term. ***, **, and * indicate the 1%, 5%, and 10% level of significance, respectively.

Furthermore, to test whether the unconventional monetary policy contributes to the foreign and domestic bank lending behaviour differently during the crisis period, we include the triple interaction of *CBA-to-GDP*Crisis*Foreign* in our estimations. In other words, the inclusion of this triple interaction term allows us to test whether foreign banks responded differently to the unconventional monetary policy during the crisis period. From the regression results in Table 6.5, we can see that the coefficient of *CBA-to-GDP*Crisis*Foreign*, which is our most interesting variable, obtained a negative sign for all sample groups. However, the coefficient is significant only in emerging and full sample cases. This finding indicates that foreign banks were less sensitive to the unconventional monetary policy changes in adjusting their loan growth rates during the crisis period. Whereas the response of foreign bank to unconventional monetary policy in developed countries was not significantly different from domestic banks. To put it differently, when monetary authorities across countries implemented an unconventional monetary policy to support the liquidity of the credit market, the foreign banks' lending responses to these changes were less sensitive, consequently dampening the effects of unconventional monetary policy during the crisis period. This finding is important policy implication for emerging countries. Monetary authorities across emerging economies carefully consider this dampening impact of foreign banks in the transmission process of unconventional monetary policy.

Turning our attention to the bank-specific control variables, we notice that *Size* is negatively and significantly correlated with bank lending rates in the emerging countries cases. Interestingly, in all previous analyses with the traditional monetary policy, the results for banks size was significant in the main and alternative robustness tests. The results for capitalisation are positively related to bank lending in the full sample [column 1 and 2] and developed countries sample [column 9]. In contrast to the *Capitalisation*, *Profitability* was positively contributed to the bank lending rates only in emerging countries [columns 4, 5, and 6].

From the macro-control variables, as before *GDP growth rate* has a positive and significant relationship with bank lending rates across all sample groups, whereas the *Inflation* has expected sign and significance mostly in emerging countries' case. The results in columns [1]-[3] show that bank total lending rates are significantly and positively related with its own lags in the full sample, whereas although the sign was positive the significance disappeared

when the sample divided into emerging and developed countries. Finally, the Hansen (1982) and the Arellano and Bond [1991] AR[2] tests of the system GMM specifications provide reassuring diagnostics and confirm that the proposed specifications are adequate for valid inference.

6.4 Conclusions

In this chapter, we investigated the role of banks in the transmission mechanism of monetary policy during the normal and crisis period. Specifically, first, we test the influence of changes in the monetary policy interest rate on bank lending behaviour during the pre-crisis and post-crisis period. Next, by classifying banks into foreign-owned and domestic banks, we investigated whether banks with different ownership types respond differently to the monetary policy stance during normal and crisis periods. Finally, we also examined how unconventional monetary policy implemented by central banks influences the bank lending behaviour and show the role of bank ownership affects this process.

Firstly, we found a negative and significant relationship between bank lending rates and changes in the monetary policy interest rate. Although the results are mostly significant in emerging economies and full sample cases, our findings confirm the existence of a bank lending channel during the 2004-2013 period. These results are in line with bank lending channel theory (Bernanke & Blinder, 1992; Kashyap & Stein, 1995; Kishan & Opiela, 2000) and previous empirical findings (Altunbaş et al., 2002; Leroy, 2014; Matousek & Sarantis, 2009; Wu et al., 2011) which predicts that as the monetary interest rate increases [decreases], bank lending rates decrease [increase].

In the next step of our investigation, we found that banks with different ownership types responded differently to changes in monetary policy. The difference in response varies according to the sampling group and sub-periods. Specifically, we found positive and significant results mostly for the emerging countries and the post-crisis period.

In line with the related empirical literature (Choi et al., 2016; Cull & Peria, 2013; De Haas et al., 2012), in Chapter 5 of this research, we found that foreign bank lending rates fell below domestic-private and government-owned banks lending rates during the crisis period. Furthermore, as described in the summary statistics, the average monetary policy rate across countries in the sample significantly dropped in 2008 and remained low rates afterwards.

Considering the above-mentioned facts, our findings of foreign banks' less sensitivity to the host country expansionary monetary policy indicate that these banks dampened the efficiency of monetary policy. Thus, monetary authorities should carefully consider this dampening role of foreign bank when they are implementing monetary policy to influence macroeconomic indicators particularly during the crisis period.

Furthermore, to test how robust our findings are, we introduced alternative possible transmission channels of monetary policy in the model. In addition, we also tested the robustness of our findings by excluding government-owned banks from the sample. Both robustness test results did not significantly change our main finding; that foreign banks were less responsive to monetary policy compared to domestic banks.

Finally, different from traditional monetary policy, we also investigated how unconventional monetary policy measures had an impact on bank lending behaviour during the normal and crisis periods. Our findings confirm that unconventional monetary policy is mostly significant in the full sample and developed countries throughout the whole sample period, whereas it was effective in emerging countries during the crisis period only. Although the unconventional monetary policies implemented by sample countries during the crisis period were effective, the foreign banks' lending response to the policy was again less responsive compared to the domestic banks. These results have important policy implications for emerging countries and developed countries separately. In other words, when the short-term interest rate of monetary policy close to zero bound, implementing unconventional monetary policy in the form of various asset purchase programs can be an effective monetary policy tool, particularly in developed world. In addition, as a result of liquidity support through internal capital markets from their parent company, less responsiveness of foreign banks to unconventional monetary policy should be carefully observed by policy regulators in emerging countries.

In short, our results suggest the existence of a bank lending channel throughout the full sample period as well as during pre-crisis and post-crisis periods. However, comparing the two sub-periods, we notice that the bank lending channel was considerably weakened during the post-crisis period compared to the pre-crisis period. Regarding the role of bank ownership in the monetary transmission process, we found that foreign banks were less responsive to changes in monetary policy compared to domestic banks, particularly during the post-crisis period. Finally, the extended unconventional monetary policy seems to have stimulated bank lending.

Foreign banks continued to show a lower sensitivity to the changes in unconventional monetary policy, much like pattern observed in conventional monetary policy.

CHAPTER 7: CONCLUSIONS

7.1 Introduction

This chapter provides a summary of the main findings and contributions made by this research study, which analyses the association between bank ownership and bank lending behaviour during ‘normal’ and ‘crisis’ business periods. Specifically, this chapter discusses the main findings of this research in the following main research areas and makes relevant conclusions. First, it makes the relevant conclusions on the fluctuations of bank lending behaviour during ‘normal’ and ‘crisis’ business periods, depending on their corporate ownership type. Second, it makes the relevant conclusions on the role of information sharing and creditor rights protection in reshaping the lending behaviour of banks with different ownership structures. Finally, this chapter makes the relevant conclusions on the role of ownership in the bank lending channel of monetary policy transmission process with particular interest to the pre- and post-crisis periods.

7.2 Summary of chapters

Chapter 1 discusses the background and motivation of the research study, identifies its main research questions and summarizes the main research findings. It discusses the background literature on the banking sector liberalisation and participation of the foreign-owned banks, domestic-private banks and government-owned banks in this liberalisation. It briefly discusses how increased foreign bank entry and domestic-private bank participation further enhance the competition in the banking sector and thus contribute to economic growth. The chapter also briefly discusses the background literature related with the three main areas of this research:

- (i) First, how banks with different ownership types contribute to the credit market performance, with a particular interest in the period around the recent global financial crisis.
- (ii) Second, continuing further in investigations, the study compares the lending behaviour of banks with different ownership types in countries with various information sharing facilities and creditor rights protection environments.
- (iii) Thirdly, as a final step of our investigation, how banks with different ownership types play a role in the monetary transmission process.

Chapter 2 focuses on identifying the gaps in the relevant literature on bank lending behaviour. It discusses in detail the existing literature related with our main research questions and related with the necessary steps of the empirical analysis. Previous research studies also show that the lending policy of banks fluctuate during normal and crisis periods, depending on their ownership structures. Relevant theoretical views suggest that the lending behaviour of foreign banks might be influenced by economic conditions in the host country [“pull factor”], the economic situation in the home country [“push factor”], and parent bank health [back-up facility] (De Haas & Van Lelyveld, 2006; Stein, 1997). Additionally, a recently developed theory by Brei and Schclarek (2015) compares the lending behaviour of private banks and government-owned banks. Empirical results also show that in the event of a financial crisis, private banks increase their liquidity holdings to prevent an unexpected liquidity shortage. This partial liquidation leads to reduced lending in private banks. Compared to private banks, potential financial support from the state may prevent government banks from suffering because of deposit withdrawals and liquidity shortages. Hence, public-banks tend to provide more loans to the real sector.

First, our literature review shows that previous research papers which have analysed the association between bank ownership and lending behaviour, use data for particular regions and countries, such as Eastern Europe, Latin America or the Asian-Pacific countries. The other group of studies only use data for the countries according to their income group or just use the data for a single country. Furthermore, most of the empirical investigations related to the recent global financial crisis are based on the sample period that covers only pre-crisis and crisis periods. To fill this gap in the literature, our study analyses the association between bank ownership and lending behaviour, using data which includes both pre-crisis and post-crisis period bank ownership and other required variables. Our sample banks also include countries not only from particular economic regions but also from 64 countries around the world. Finally, from a methodological point of view considering the endogeneity problem in bank lending practice we employ the powerful system GMM methodology. This will allow us to control for possible endogeneity between bank-specific variables.

Secondly, previous studies suggest that the quality of information sharing and creditor rights protection impact on bank lending behaviour. The existing theoretical views suggest that

adverse selection and moral hazard problems in credit markets may lead to credit rationing and suboptimal allocation of capital (Stiglitz & Weiss, 1981). In other words, lenders are not always able to obtain reliable information about the characteristics of borrowers and their creditworthiness, and hence, this shortage of information may lead to decreased lending (Bennardo *et al.*, 2015; Pagano & Jappelli, 1993). Therefore, legal rights and well-developed creditor protection are fundamental to credit market development. When lenders can enforce their rights to repayment and seize the collateral, they are more willing to provide loans to the real sector. In other words, banks in poor legal systems charge a higher interest rate, demand more collateral and shorten credit maturity, eventually reducing the overall investment to the real business sector in the economy (Bae & Goyal, 2009; Djankov *et al.*, 2007). Overall, the existing empirical evidences confirm the positive impact of better information sharing facilities and creditor rights protection on bank lending behaviour. However, there is a limited number of attempts to investigate the lending response of banks with different ownership types to changes in information sharing and creditor rights protection, particularly during the recent global financial crisis. Thus, motivated by these theoretical views and identifying the gap in the literature, our study aims to explore the foreign and domestic bank lending behaviour in countries with varying levels of information sharing and creditor rights protection, with a particular interest for the period around the recent financial crisis.

Thirdly, our literature review suggests that the association between bank ownership and monetary policy transmission requires effective monetary policy and efficient bank lending channels. Relevant theoretical views on the bank lending channel predict that monetary policy implemented by central banks plays a crucial role in controlling the aggregate loan supply and hence, financial stability in an economy. For example, by investigating the theories on bank lending channels, Bernanke and Blinder (1988, 1992) studies modify the traditional IS-LM model by including bank loans (in addition to money and bonds). Kashyap and Stein (1995) further extend Bernanke and Blinder's (1988) model by analysing the effect of monetary policy shocks to the bank's balance sheet and lending behaviour. Kishan and Opiela's (2000) model analyses the response of banks with different asset sizes and capitalisation to monetary policy change. Although some empirical papers confirm the existence of a constructive bank lending channel, the literature suffers from empirical studies that only partially examine the role of bank ownership in the monetary policy transmission process. To our knowledge, there are only a few

papers that have studied the lending response of foreign-owned and domestic banks to the changes in monetary policy interest. For example, Wu *et al.* (2011) examined the difference in the lending response of foreign banks in Asia, Latin America, and Central and Eastern Europe using the data for the 1996-2003 period, while Gopalan and Rajan (2017) investigated interest rate pass-through in 57 emerging markets and developing economies for period 1995-2009. Furthermore, previous studies on the monetary policy transmission mechanism mainly focus on bank balance sheet characteristics. However, considering the evolving banking sector structure and financial integration, bank ownership indicators become an essential determinant of monetary policy efficiency. Particularly, after the 2008 global financial crisis, many countries introduced an expansionary monetary policy to prevent a liquidity shortage in financial markets. This, in turn, increased the interest in literature to re-examine the monetary policy efficiency during and post-crisis period. To contribute to the literature in this area, we investigate the role of bank ownership in the monetary policy transmission process. Specifically, by controlling bank balance sheet characteristics such as size, capitalisation, and profitability, we investigate how banks with different ownership types play a role in bank lending channels.

Chapter 3 provides a detailed description of data collection, sampling, variable measurement, preliminary analyses and methodology. It explains bank-level and macroeconomic country-level data, followed by a brief illustration of sampling methods and data sources. Next, the chapter also presents the measurement of variables and some descriptive analyses. For instance, in the primary analysis of the variables in this chapter, we change in bank-specific, information sharing and creditor rights protection, monetary policy, and macro-control variables throughout the sample period. Furthermore, in the final part of the chapter, we discuss the issues related to endogeneity problems in bank lending literature. In the next step, we demonstrate the GMM procedure developed by Arellano and Bond (1991) and finalised the methodological review by focusing on the system GMM estimator proposed by (Blundell & Bond, 1998).

Chapter 4 provides the empirical results on the association between bank ownership and bank lending behaviour. It compares how banks with different ownership types behaved differently during the ‘normal’ times and ‘crisis’ periods. It also tests for any potential differences in bank behaviour between emerging countries and developed countries. The empirical results suggest that foreign-owned, domestic-private, and government-owned bank’s

lending behaviour differ during normal and crisis periods. It also suggests that by changing their lending behaviour, these banks with different ownership types contribute differently to the local credit market performance. Furthermore, by continuing the investigation on the relationship between bank ownership and lending behaviour, the chapter further identifies that foreign-owned and domestic banks' loan supply differ according to the information sharing facilities and creditor rights protection environment. Finally, by comparing the lending behaviour of these banks with different ownership types, the chapter discovers that the lending sensitivity of banks to the changes in monetary policy differs according to the bank ownership type, particularly during financial crisis periods.

Chapter 5 provides the empirical results for the impact of information sharing and creditor rights protection on bank lending behaviour. Next, it tests the lending response of foreign banks to a difference in information sharing facilities and efficiency of legal institutions. Finally, this chapter also empirically examines the role of these variables on bank lending behaviour during the crisis period. The results of this chapter explain whether the lending behaviour of the foreign-owned and domestic banks in countries with better information sharing and creditor rights protection differ from the behaviour of those banks located with poor information sharing and creditor rights environment, particularly during the crisis period.

Chapter 6 analyses the role of bank ownership in the bank lending channel of monetary policy transmission, and in turn their impact on local credit market performance during normal and crisis periods. It tests how banks with different ownership type responded to changes in monetary policy. It shows that bank ownership plays a role in the monetary transmission process. It also checks the efficiency of unconventional monetary policy with a particular interest in the recent global financial crisis period.

7.3 Main results, contributions, and policy recommendations

This thesis contributes to the academic literature in the following three main areas related with the lending behaviour of banks during 'normal' times and 'crisis' periods.

(i) What is the impact of bank ownership on bank lending behaviour?

In line with the findings of the previous studies, we find robust evidence that overall banking sector lending growth rates across all types of loans and sample groups declined during

the 2008-2009 crisis period with significant differences detected between loan series and sample groups. Comparing the bank ownership types, this study shows that foreign banks' lending rates curtailed their lending more sharply compared to the domestic-private banks in 2009, whereas government-owned bank lending rates exceeded the domestic-private bank lending rate for the period. These findings are consistent with previous empirical research that found similar results (Bertay *et al.*, 2012; Brei & Schclarek, 2013; Cull & Peria, 2013). Although the results are consistent with earlier studies, it should be noted that these authors only focused on data for the CEE and Latin American countries or used pre-crisis and crisis period in their empirical analysis. A further contribution this study makes to related literature is that it uses data for banks located in all continents and covers not only the pre-crisis period but also the post-crisis period as well.

Another contribution of this study is that it uses extended bank- and macro-level data from 64 countries from six continents for the period of 2004-2013. To compare the lending behaviour of banks in countries with different income levels, we split our sample into two sub-samples; one for emerging economies and one for the developed. Then we test the lending behaviour of banks with different ownership types across sectors of the economy by employing different loan series in our estimations. Next, different from previous research, to detect any difference in bank lending behaviour during normal and crisis period, this research study uses three different crisis dates in empirical analyses. Specifically, following the literature, we consider 2008-2009 as a global financial crisis period and use two types of dummies to capture bank lending volatilities during this period. In the first case, we use separate dummies for 2008 and 2009, and in the second case, a single dummy was applied for the 2008-2009 period. Next, to also test bank lending behaviour during normal and crisis periods, we use Laeven and Valencia (2018) banking crisis episodes.

These findings have significant policy implications since bank lending is important for credit market stability, particularly during the crisis period. Given that the difference in bank lending rates is statistically significant across sampling groups and loan series, supervisors and authorities should carefully consider these differences when they are formulating policy regulations to maintain credit market stability. Furthermore, since foreign banks' lending significantly differs from domestic-private banks, particularly in emerging countries, bank sector structure and its health have additional values in attempting to prevent or mitigate adverse

impacts stemming from future financial crises. While the related literature highlights poor performance of state banks compared to domestic-private and foreign banks, our findings suggest that governments banks can play a useful role in stabilising the loan market volatility in corporate and commercial sectors, particularly during periods of financial instability. In light of this, policymakers should take into account the stabilising role of government banks particularly during economic downturn periods, when they might be restructuring the banking sector. Finally, bank-level variables such as banks size and profitability were important determinants of bank lending policy formation. Thus, financial sector regulators and policymakers need careful consideration of the balance sheet health of the banking sector to maintain financial sector stability.

(ii) What are the roles of creditor rights and information sharing in determining bank lending behaviour?

Our study also contributes to the literature by investigating the impact of information sharing and creditor rights protection on bank lending behaviour with a particular interest to the recent global financial crisis. Different from the previous research, in this empirical analysis we examine how banks with different ownerships responded to the strength of creditor rights protection and improved information sharing facilities, particularly during the crisis period.

By using advanced panel data-based research methods it provides unique empirical results on the influence of information sharing, creditor rights protection, and court enforcement on the lending behaviour of banks with different ownership types. For example, by employing two-step system GMM, the research found a positive impact of better information sharing, strong creditor rights protection and efficient court enforcement on bank lending behaviour. As the results reveal, improved information sharing facilities and court enforcement stimulate bank lending in not only during normal times but also crisis periods, while creditor rights protection seems to mostly contribute to lending rates during the crisis. These findings are consistent with previous empirical research, which found a similar result (Fosu, 2014; Jappelli & Pagano, 2002).

Among information sharing indicators, Depth of credit information and Private credit bureau showed they had positive and significant impacts on bank lending rates, while the results

for Public credit registry were not as expected. These findings indicate that countries with a higher index of depth of credit information sharing and private credit bureau coverage benefited from higher rates of bank lending, particularly during the crisis period. Moreover, the research also found that the efficiency of court enforcement stimulated bank lending during both normal and crisis periods, whereas the strength of creditor rights was significant only during the crisis period.

Continuing the investigation, we compared the lending response of foreign-owned and domestic banks to these indicators. For this purpose, the study split the sample into foreign-owned and domestic banks sub-samples. Using the same methodology, we found that foreign banks' lending rates are sensitive to the information sharing facilities measured by Depth of credit information index, while Public credit registry and Private credit registry indicators do not have a significant impact on foreign bank lending. The results for the crisis period are mostly insignificant, except for the Private credit bureau, which is only weakly significant. These findings indicate that although foreign bank lending rates were higher in countries with better information sharing throughout the sample period, their lending behaviour was indifferent during the crisis period regardless of the quality of information sharing facilities across countries.

Furthermore, in contrast to the information sharing facilities, foreign bank lending rates were significantly sensitive to the legal rights creditor rights protection and court enforcement indicators. In addition, the result for court enforcement was significant for the normal times as well. Thus, this research discovered that countries with better creditor rights protections and efficient court enforcement facilities benefited from robust foreign bank lending in not only normal times but also during crisis periods.

On the other hand, the results show that intense information sharing facilities stimulates domestic bank lending rates during normal times. Regarding the recent global crisis period, information sharing when measured using Depth of credit information positively influenced domestic bank lending rates, while the results for Public credit registry and Private credit bureau were not significant. Different from foreign banks, domestic bank lending rates seemed to be not significantly sensitive to the legal indicators for the full sample period, while the significant result for interaction term for Creditor rights protection with the Crisis dummy indicates that domestic bank lending was higher in countries with stronger creditor rights indicators.

Consequently, the research found that although domestic bank lending was more sensitive to the information sharing facilities compared to the legal rights indicators during the normal times, countries with higher information sharing and strong creditor rights protection enjoyed higher domestic bank lending rates during the crisis period.

Considering the positive role of the banking sector on economic performance and the significant drops in loan supply during the recent global financial crisis, our findings have important policy implications. Firstly, our results indicate that improving the information sharing facilities is important for countries to sustain stable banking sector loan supply in not only during normal times but also during periods of financial instabilities. In other words, policy regulations should be implemented to stimulate information sharing among lenders and to improve coverage of borrower credit history to minimize the negative impact of reductions in bank lending rates particularly during the crisis period. Improvements in information sharing facilities by reducing adverse selection in the credit market, increasing borrower efforts to repay the loans, and decreasing credit rationing in multiple bank lending boost credit market performance across countries.

Well-developed legal institutions with improved creditor rights protection and effective contract enforcement play vital roles in credit market performance and efficiency. Our findings indicate that supervisors and authorities in this area should implement policy regulations that strengthen creditor rights protection and efficiency of the judicial system. In turn, these steps help to prevent credit rationing by banks in the credit market. This happens because with improved efficiency of the judicial system, the credit market opens to those low-grade borrowers that were previously considered not creditworthy. In addition, an improved legal environment and efficient courts decrease the costs associated with procedures to enforce the law by creditors. Furthermore, as a result of credit market freezes during the recent global financial crisis, many firms and companies across countries suffered significantly from the shortage of external funding. Hence, regulatory authorities should attempt to create creditor friendly legal environments which are important in preventing significant drops in bank loans supply during periods of economic downturns.

In addition, as stated by Haselmann and Wachtel (2010), banks located in better legal environments tend to provide relatively more loans to SMEs and mortgage loans. Considering the importance of SME financing and development in economic growth, our findings reinforce

important policy recommendations in creating increased information sharing facilities and strengthened legal systems. This in turn contributes to higher volumes of SME lending. Next, our findings also indicate that bank financial statement transparency has a positive impact on stable loan growth rates. The related literature states that financial statement transparency of banks allows them to attract additional funds with reliable terms. Considering the primary role of banks' and their deposit base as a main source of funding, government policies that encourage commercial banks to publish their statement periodically should stimulate intermediation of additional financial resources from savers to borrowers. Finally, obtained results show that the relationship between banking sector concentration and bank loan lending rates is negative and significant. Boyd and De Nicolo (2005) predict that less competition in the banking sector leads to higher interest rates being charged on business loans, consequently raising the credit risk of borrowers because of moral hazard issues. As a result, the policy implication of our results is that policymakers should carefully consider mergers and acquisitions in the banking sector to avoid any significant increase of banking sector concentration.

(iii) What are the roles of bank ownership in monetary transmission mechanism?

This study also contributes to the literature by analysing the response of domestic-private and foreign banks to monetary policy with a particular interest in the recent global financial crisis. In this analysis, firstly we empirically examine how banks with different ownership types respond to the traditional monetary policy. Secondly, considering the various types of asset purchase programmes during the recent global financial crisis period, we also tested the role of domestic and foreign banks in the transmission process of unconventional monetary policy.

Using pooled OLS and system GMM methods, this research provides robust empirical results on the lending response of foreign-owned and domestic banks to the changes in monetary policy with an interest in the recent global financial crisis. We found a negative and significant relationship between bank lending rates and changes in the monetary policy interest rate. Although the results are most significant in the full sample and emerging countries, our findings do confirm the existence of a bank lending channel during the 2004-2013 period. These results are in line with bank lending channel theory (Bernanke & Blinder, 1988; Kashyap & Stein, 1995; Kishan & Opiela, 2000) and previous empirical findings (Altunbaş et al., 2002; Leroy, 2014; Matousek & Sarantis, 2009; Wu et al., 2011) which predicts that as the monetary interest

rate increases (decreases) bank lending rates decrease (increase). The policy implications of the study are particularly important since increased foreign-owned and domestic private bank participation has significantly changed the banking sector structure in many countries during the past few decades. Since monetary policy is an essential policy instrument for central banks and governments to support credit market liquidity, particularly during crisis periods, our result offers an important policy implication for banking regulators and policymakers. In contrast to emerging countries, the results for developed countries show that banks in this sample of countries are not responsive to changes in short-term interest rate of monetary policy. These findings indicate that policymakers in developed countries should carefully consider the banks' unresponsiveness when they are implementing monetary policy with the intention of impacting macroeconomic indicators.

Regarding bank ownership, the research found that foreign-owned and domestic banks respond differently to monetary policy stances and the difference varies according to the sampling group and sub-periods. Specifically, the results were positive and significant mostly for emerging countries and the post-crisis period which indicates that during the post-crisis period, foreign banks were less sensitive to the changes in monetary policy, particularly in emerging countries. In other words, these findings indicate that foreign banks dampened the efficiency of bank lending channels of monetary policy at the very least in emerging countries. As this research has discovered less sensitivity of foreign banks to changes in monetary policy compared to domestic counterparts, monetary authorities must carefully consider the buffering effects of foreign banks in implementing effective monetary policy. On the other hand, the obtained results for developed countries show that the responses of foreign banks to monetary policy changes in these economies were not significantly different from domestic banks in neither the pre-crisis nor post-crisis period.

To test the robustness of our findings, we introduced alternative possible transmission channels of monetary policy in the model. Furthermore, we also performed additional robustness tests by excluding government-owned banks from the sample. Both robustness test results did not significantly change our main findings of foreign banks' being less responsive to monetary policy compared to the domestic banks.

As a final step of our investigation, different from traditional monetary policy, we also test how unconventional monetary policy measures impact bank lending behaviour during

normal and crisis periods. Our findings confirm that unconventional monetary policy is mostly significant in the full sample and developed countries throughout the sample period, whereas it was effective in emerging countries only for the crisis period. Although the unconventional monetary policies implemented during the crisis period were effective, foreign bank lending response to the policy was again less responsive compared to domestic banks. Therefore, our research findings indicate that unconventional monetary policy in the form of various asset purchase programmes might be an effective monetary policy tool in developed countries while emerging countries can successfully use the short-term interest rates of conventional monetary policy to stabilise the credit market.

7.4 Limitations and recommendations for future research

Having outlined the main findings and contribution of the study, there are some limitations in our analysis. Firstly, in our empirical analyses, we separated banks according to three ownership types: domestic-private banks, foreign-owned banks, and government banks. However, separation of foreign banks according to their entry modes, via mergers and acquisitions of domestic banks (M&A penetration) or through the de novo establishment, will allow further investigation on how these foreign banks behaved in the credit market compared to the other types of bank ownership. Particularly, relevant literature suggests that de novo foreign banks have limited information about borrowers in the credit market, whereas M&A penetrated banks have information advantages from an acquired local bank (Mody & Peria, 2004). By assuming the information advantage of M&A penetrated banks over de novo foreign banks, it would be particularly interesting to look at how these foreign banks with different entry modes behaved in countries with various information sharing and creditor rights protection facilities.

In addition, due to data unavailability and limited access to bank balance sheet statistics, this study fails to measure variables related to banking sector competition and risk-taking behaviour. It is generally believed that as in other industries, the competition in the banking sector has a positive impact on efficiency and stability. However, according to the ‘competition-fragility’ view, increased competition in the banking sector leads to fragility and therefore limiting the excessive competition contributes to financial stability (Allen & Gale, 2004; Carletti & Hartmann, 2003; Keeley, 1990). After the financial crisis of the 1930s, many industrial countries introduced activity and branching restrictions to control excessive

competition in the banking sector. The idea behind this was to preserve stability in the financial system (Beck, 2008). On the other hand, according to the ‘competition-stability’ view, an uncompetitive banking sector creates unwanted market concentration in deposit and loan markets. In turn, banks with a larger market share and market power may charge higher interest rates to loans, which can increase the moral hazard incentives of customers. Additionally, as a result of adverse selection problems, higher rates for loans may also increase the share of riskier projects in bank asset portfolios (Boyd & De Nicolo, 2005). As a result, assuming that foreign bank entry increases the competition in the banking sector, the investigation of bank risk-taking behaviour according to ownership type and their impact on credit market performance can be a good avenue for future research.

Next, we used in our empirical analyses panel data methods such as pooled OLS and two-step system GMM. By extending the sample size by including banks from additional countries and employing the Quantile regression method, this data may then allow the assessment of the research questions from a different angle. For example, by employing the Quantile regression method, one can investigate the relationship between bank ownership and lending behaviour banks by comparing these banks according to their asset sizes.

Finally, this study does not include discussions of non-traditional banking activities although these activities are becoming important during the recent decade. We believe that non-traditional banking activities also play an important role in shaping bank lending behaviour. Thus, it becomes interesting to investigate how banks with different ownership types use non-traditional banking activities to generate income compared to traditional lending activity.

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Appendix 1. List of countries

Developed economies

Australia	France	Japan	Spain
Austria	Germany	Netherlands	Sweden
Belgium	Hong-Kong	New Zealand	Switzerland
Canada	Ireland	Norway	United Kingdom
Denmark	Israel	Singapore	
Finland	Italy	South Korea	

Developing and emerging economies

Albania	Greece	Moldova	Slovenia
Argentina	Hungary	Montenegro	South Africa
Bosnia and Herzegovina	India	Nigeria	Sri Lanka
Brazil	Indonesia	Pakistan	Taiwan
Bulgaria	Jordan	Peru	Thailand
Chile	Kenya	Philippines	Turkey
Croatia	Latvia	Poland	Uruguay
Czech Republic	Lithuania	Portugal	Venezuela
Ecuador	Macedonia	Romania	Zimbabwe
Egypt	Malaysia	Serbia	
Estonia	Mexico	Slovakia	

Notes: The 64 countries are grouped based on the World Bank's country income group classification system.

Appendix 2. Banking crisis episodes from Laeven and Valencia (2018)

	Start	End		Start	End
Albania			Lithuania		
Argentina			Malaysia		
Australia			Mexico		
Austria	2008	2012	Montenegro		
Belgium	2008	2012	Netherlands	2008	2009
Bosnia and Herzegovina			New Zealand		
Brazil			Nigeria	2009	2012
Bulgaria			Norway		
Canada			Pakistan		
Chile			Peru		
Colombia			Philippine		
Croatia			Poland		
Czech Republic			Portugal	2008	2012
Denmark	2008	2009	Romania		
Ecuador			Serbia		
Egypt			Singapore		
Finland			Slovakia		
France	2008	2009	South Korea		
Germany	2008	2009	South Africa		
Greece	2008	2012	Spain	2008	2012
Hong-Kong			Sri Lanka		
Hungary	2008	2012	Sweden	2008	2009
India			Switzerland	2008	2009
Indonesia			Taiwan		
Ireland	2008	2012	Thailand		
Israel			Turkey		
Italy	2008	2009	United Kingdom	2007	2011
Japan			Uruguay	2004	2005
Jordan			Venezuela		
Kenya			Zimbabwe		
Latvia	2008	2012			