The Moderating Role of Bank-Specific Factors on Commercial Bank Lending - Shadow Banking Nexus

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ABSTRACT

This thesis examines the moderating role of commercial bank-specific factors on commercial bank lending - shadow banking nexus. To this aim, firstly, this thesis constitutes an initial attempt to examine bank risks and profitability effects on commercial bank lending-shadow banking nexus in emerging market economies (EMEs). One-step and two-step system GMM results suggest that commercial banks' credit risk, capital risk and profitability have a key role in the bank lending-shadow banking nexus. Findings also reveal that shadow banking can act as both substitutes and complements to traditional banking. Moreover, high institutional demand and lower restrictions on bank activities are found to be among the main drivers of shadow banking expansion.

Secondly, this thesis investigates whether bank-specific factors within the CAMELS framework moderates the linkage between commercial bank lending (CBL) and non-bank financial intermediation (NBFI). Both static (fixed effects and random effects) and dynamic (one-step and two-step system GMM) panel techniques are employed for the sample of 29 countries spanning 2002-2020. Empirical findings provide strong evidence for the complementarity hypothesis between commercial banking and NBFI sectors. Moreover, marginal effects of CBL on NBFI reveal that complementarity between two sectors depends on several commercial bank-specific characteristics. That is, a strong capital position, poor asset quality, high liquidity position, and high exposure to market risk seem to weaken the link (complementarity) between the two sectors.

Keywords: shadow banking, non-bank financial intermediation, CAMELS, bank – specific factors, emerging market economies, commercial bank lending, dynamic panel data

ÖZ

Bu tez, ticari bankaya özgü faktörlerin ticari banka kredileri - gölge bankacılık bağlantısı üzerindeki düzenleyici rolünü incelemektedir. Bu amaçla, ilk olarak, yükselen piyasa ekonomilerinde (GOÜ) banka risklerinin ve karlılığının, ticari banka kredisi-gölge bankacılık bağlantısı üzerindeki etkilerini incelemeye yönelik çalışma oluşturuldu. Tek adımlı ve iki adımlı sistem GMM sonuçları, ticari bankaların kredi riski, sermaye riski ve karlılığının banka kredisi-gölge bankacılık bağında anahtar bir role sahip olduğunu göstermektedir. Bulgular ayrıca gölge bankacılığın geleneksel bankacılığın hem ikamesi hem de tamamlayıcısı olarak hareket edebileceğini ortaya koymaktadır. Ayrıca, yüksek kurumsal talep ve banka faaliyetlerine yönelik kısıtlamaların, gölge bankacılık genişlemesinin ana itici güçleri arasında yer almaktadır.

Daha sonra, CAMELS çerçevesindeki bankaya özgü faktörlerin, ticari banka kredisi (CBL) ve banka dışı finansal aracılık (NBFI) arasındaki bağlantıyı etkileyip etkilemediğini araştırmaktadır. 2002-2020 yıllarını kapsayan 29 ülke örneğinde hem statik (sabit ve rastsal etki) hem de dinamik (tek adımlı ve iki adımlı sistem GMM) panel very analiz teknikleri kullanılmıştır. Ampirik bulgular, ticari bankacılık ve NBFI sektörleri arasındaki tamamlayıcılık hipotezi için güçlü kanıtlar sağlamaktadır. Ayrıca, CBL'nin NBFI üzerindeki marjinal etkileri, iki sektör arasındaki tamamlayıcılığın ticari bankalara özgü faktörlere bağlı olduğunu ortaya koymaktadır. Güçlü sermaye pozisyonu, düşük aktif kalitesi, yüksek likidite pozisyonu ve yüksek piyasa riskine maruz kalma, iki sektör arasındaki bağlantıyı (tamamlayıcılığı) zayıflattığı görünmektedir.

Anahtar Kelimeler: gölge bankacılık, banka dışı finansal aracılık, CAMELS, bankaya özgü faktörler, yükselen piyasa ekonomileri, ticari banka kredileri, dinamik panel veri analizi

DEDICATION

TO MY LOVELY FAMILY

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I would like to thank my supervisor Prof. Dr. Eralp Bektas for his continuous guidance and support in the preparation of this thesis. Without his invaluable supervision, it would be impossible to accomplish my target on time.

I would like to dedicate this thesis to my family members for their invaluable support throughout my life. In addition, I owe quite a lot to my wife Sevinj Isayeva for her support and efforts helping during the most challenging time of my Ph.D. I am grateful for everything you have done for me! You are treasury in my life.

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LIST OF ABBREVIATIONS

ABS	Asset Backed Securities
AEs	Advanced Economies
CBL	Commercial Bank Lending
EMEs	Emerging Market Economies
FSB	Financial Stability Board
IMF	International Monetary Fund
GFC	Global Financial Crisis
GMM	Generalized Method of Moments
NBFI	Non-bank Financial Intermediation
OBF	Orbis Bank Focus
OBSE	Off-Balance-Sheet Entities
OLS	Ordinary Least Squares
SB	Shadow Banking
SBB	Shadow Banking Broad Measure
SBN	Shadow Banking Narrow Measure
SPVs	Special Purpose Vehicles

Chapter 1

INTRODUCTION

1.1 Research Background

The way of borrowing or investing money for businesses and individuals has been evolved through financial innovations and development in banking. Traditionally, commercial banks have been the dominant supplier of credit to households and firms throughout the history. Nevertheless, due to regulation, innovation, and competition in the financial markets, traditional banking has been reshaping fundamentally. Stringent regulations and innovations in the financial markets have been eroding the competitive advantage of banks, and causing the emergence of newer financial institutions including shadow banks. In his 2007 speech at the Federal Reserve Conference, Paul McCulley was the first to coin the phrase '*shadow banking*'[1] to describe '*the whole alphabet soup of levered up non-bank investment conduits, vehicles and structures'* (McCulley, 2007). According to Financial Stability Board (FSB, 2011), shadow banking is broadly defined as "*credit intermediation involving entities and activities (fully or partially) outside the regular banking system*". This segment of financial system involves in credit, liquidity, and maturity transformation like conventional banks, yet they don't have access to strong safety net, such as publicly guaranteed deposit insurance and lender of last resort facilities from central banks. Moreover, in

[1] In the 2018 Report, in order to emphasize the forward-looking aspect of the FSB's work, the term "shadow banking" is replaced with "non-bank financial intermediation" by the Financial Stability Board (FSB). Neither the substance nor the coverage of the monitoring exercise is not affected by the change in terminology. Hence throughout the thesis we use the phrases "non-bank financial intermediation" and "shadow banking" interchangeably.

contrast to traditional banks, shadow banks typically operate under unregulated or lesser regulated oversight of the supervisory institutions (FSB, 2012). As a result, shadow banks may pose systemic risk to the financial system both directly and through its interconnectedness with other financial institutions (FSB, 2020). Besides potential exposures to financial stability, shadow banks can help fueling economic growth by making financial products cheaper, and improving credit availability. They usually offer cheaper loans and other financial services, as well as, provide services that banks cannot or will not serve (Elliott et al., 2015). Shadow banking may yield greater risk sharing capacity and efficiencies by helping to complete markets - satisfying unmet needs and preferences of borrowers and lenders (Adrian and Jones, 2018). When bank lending is unavailable, shadow banking might be an effective source of credit. Additionally, in some areas, shadow banks have advantage over traditional banks due to specialization and superior market knowledge (Luttrell et al., 2012). To sum up, shadow banks can positively affect economic growth, but at the expense of financial stability which forces policymakers to balance the trade-off between pros and cons of shadow banking system.

However, despite its vital role, a limited number of studies have empirically investigated the potential determinants of shadow banking (Nath and Chowdhury, 2021). Existing studies underscored regulatory arbitrage, economic growth, traditional banking growth, institutional demand, search for yield, and financial development as major determinants of shadow banking (Duca, 2014; IMF, 2014; Barbu et al., 2016; Malatesta et. al, 2016; Kim, 2017; Apostoaie and Bilan, 2020; Hodula et al., 2020). Among the above-cited empirical studies, few considered the link (complementary and/or substitution effects) between mainstream and shadow banking. Acharya et al.

(2013), Apostoaie and Bilan (2020), and Kim (2017) noted complementarity between NBFI and conventional banking. Acharya et al. (2013) underscored that insufficient branches of commercial banks in some areas of India were the reason behind NBFI credit expansion, which confirms the hypothesis of complementarity. Consistently, Kim (2017) evidenced that NBFI growth is accompanied by the growth of mainstream banking in G20 countries. Apostoaie and Bilan (2020) provided similar results for Central and Eastern European economies. In contrast, IMF (2014) and Hodula et al. (2020) concluded that NBFI can act as both complements and substitutes to commercial banking. Concerning mortgage financing, Hodula et al. (2020) showed that in case the commercial banking sector is unable to provide mortgages on the full property due to regulatory constraints, NBFI may step in and finance the remainder of the amount thereby leading to the complementarity between the two sectors. Alternatively, they can substitute commercial banks by offering safe alternatives to banking products, particularly in times of high market stress.

The tremendous growth of shadow banking during the last decade has attracted interest of both regulators and researchers. Globally, shadow banking experienced asset growth of 7.9%, reaching $226.6 trillion which accounts 48.3% of total global financial assets in 2020 (FSB, 2021). As of 2020, broad measure[2] represent by far the largest component of shadow banking, representing 30.3% of total global financial assets. Moreover, the asset growth of broad measure in EMEs was markedly higher (13.1%) than AEs (9.0%) in 2020. On the other hand, narrow measure[3] of shadow

[2] Broad measure of shadow banking is the size of all financial institutions except banks, central banks, insurance corporations, pension funds, public financial institutions or financial auxiliaries which are included in other financial intermediaries (OFIs).

[3] Narrow measure of shadow banking includes non-bank financial entity types that authorities have assessed as being involved in credit intermediation activities that may pose bank-like financial stability

banking which focuses on the subset of non-bank credit intermediation that potentially poses systemic risks to the financial system, grew by 7.4 %, to $63.2 trillion in 2020, and represented 27.9% of total shadow banking assets, and 13.7% of total global financial assets (FSB, 2021). Moreover, since 2011, strong growth in narrow measure outpaced GDP growth in most of the countries. Particularly, shadow banking in emerging market economies has been growing rapidly, and outstripping traditional banking system (IMF, 2014). FSB Chairman and the Governor of Bank of England, Mark Carney described "*shadow banking excesses in emerging markets as posing the biggest threat to the global economy*" (*The Daily Telegraph*, 2013). According to IMF (2014), to some extent, domestic financial deepening is a natural reason behind shadow banking growth in these economies. Emerging countries, with their fast-growing economies and expanding customer base for financial services, experience an increased credit demand. Nevertheless, traditional banks may be incapable to meet this demand due to several reasons including lower lending capacity, more expensive products, and stringent regulations. This creates an opportunity for shadow banks to fulfill this financing gap and increase their assets. In addition, traditional banks engagement in shadow banking activities by securitization, sponsoring shadow banking entities throughout liquidity and credit lines induce shadow banking growth, as well.

Abovementioned facts together with interconnectedness between shadow and conventional banks create a major source of systemic risk for the financial stability. Therefore, shadow banking has become an important research area to be focused in financial economics literature. The aforementioned studies mostly concentrated on the

risks. From broad measure it filters out entities that are not part of a credit intermediation chain and those that are prudentially consolidated into a banking group.

macroeconomic and institutional determinants with very few considering the link (complementarity or substitution) between traditional and shadow banking. Moreover, the moderating role of bank-specific factors on this relationship has not been explored yet. That is, existing studies undermined the impact of bank-specific variables on commercial bank lending - shadow banking nexus. Therefore, our study is motivated to fill this gap, and aims to empirically assess the moderating role of bank-specific factors on commercial bank lending - shadow banking nexus.

1.2 Theoretical Setting

Theoretically, supply and demand-side factors shape shadow banking growth. From the supply side, regulatory arbitrage is considered to be a key driver behind shadow banking (Adrian and Ashcraft, 2012; Plantin, 2015; Buchak et al., 2018). According to this view, commercial banks, due to stringent regulations face fierce competition from non-bank financial intermediaries. Lax regulatory constraints allow those non-bank financial institutions to offer higher rates of return to investors through innovative products. As history shows, activity will always flow to the less regulated sector. As a result, the traditional loan issuance and funding approach (originate-to-hold) gives rise to an originate-to-distribute model. The originator might easily sell and transfer loans off balance sheet rather than keeping them on the balance sheet. Loans were transferred to off-balance-sheet entities (OBSE) or special purpose vehicles (SPVs). Asset-backed securities were created by pooling, underwriting, and selling issued loans. The originate-and-distribute model enabled for loan risk to be sliced, diced, and distributed (credit risk transfer). Commercial banks were able to free up cash, which they then used to make more private-sector loans. This improved risk management, and gave regulatory benefits to traditional banks. In their conceptual frameworks, Adrian and Ashcraft (2016), and Buchak et al. (2018) also assert regulatory arbitrage as one of the

main drivers behind shadow banking. According to Adrian and Ashcraft (2012), regulatory arbitrage occurs when financial institutions avoid disclosing additional information to investors, avoid paying tax to official sector and do not hold enough capital against financial exposures. Buchak et al. (2018) suggest that, increased regulatory requirements change cost of funding for traditional banks and force them, especially in case of stringent capital constraints, to withdraw from markets with high regulatory costs. As such, shadow banks emerge and stepped into to fill this gap. Supportively, Elliott et al (2015) argue that major purpose of shadow bank lending is to serve loan demand that banks are unable to meet because of several regulations over them.

From the demand side, high institutional demand, and unmet needs and preferences by commercial banks tend to foster shadow banking expansion (Poschmann, 2012; Fein, 2013). Through investments in securities and other market debt instruments, such as asset backed securities (ABS), asset backed commercial papers (ABCP), and others, managed funds and other institutional investors face significant risks. In order to keep huge amounts of liquid resources, these institutional investors are also interested in safe alternatives to bank deposits (such as securities with AAA ratings provided by credit rating agencies). Despite deposit insurance works well in most cases, it is restricted to a small scale. As a result, institutional investors such as managed funds, cash-rich non-financial firms, and states are unable to access safe, short-term, and interest-earning investments. In turn, this increases the demand for shadow banking products. Unmet financial needs by traditional banks that are among the main determinants of shadow banking (Fein, 2013), can also be added to demand side factors. In addition to private sector demand, public sector can also demand for shadow

banking services. A more recent study by Lindgren (2018) states that, besides private sector loan demand, strong and unmet demand for credit from growth-seeking public entities made government to move into shadow banking in order to establish a funding channel for the projects. In 2009, a massive government stimulus program adopted in China led to an overextension of credit to local governments. However, bank managers decided to grant loans only to the most reliable state-owned enterprises which encouraged government turn to shadow banking entities to finance the projects. Moreover, Lindgren (2018) argues that lowered restrictions on bank lending rate will act as incentive for banks to supply credit to SMEs. So, this can solve the 'lack of access to affordable credit' problem and consequently the volume of shadow banking activity will be reduced.

Considering the abovementioned theoretical arguments, this thesis suggests that commercial bank-specific factors should have moderating role on commercial bank lending – shadow banking nexus. Since shadow banking assets increase when there is unmet needs and preferences (i.e credit demand) caused by commercial banks, demand side of shadow banking will get affected. Moreover, the commercial banks' incapability of satisfying credit demand, to some extent, may be because of stringent regulations on them. This notion relates with supply side factors that causes shadow banking assets to increase. As such, this thesis hypothesize that, bank-specific factors which affects lending capability will have moderating role on the link between commercial bank lending and shadow banking assets.

Because of their different characteristics, this thesis use both the broad and narrow measure as a proxy for shadow banking assets following (IMF, 2014; Kim, 2016; Apostoaie and Bilan, 2020). According to FSB (2020), while broad measure "covers

financial assets of all non-bank financial entities, and comprises all financial institutions that are not central banks, commercial banks or public financial institutions", narrow measure "comprises a subset of entities of the shadow banking sector that authorities have assessed as being involved in credit intermediation activities that may pose bank-like financial stability risks (i.e., credit intermediation that involves maturity/liquidity transformation, leverage or imperfect credit risk transfer) and/or regulatory arbitrage". As such, narrow measure filters out shadow banking entities that have no direct relation to credit intermediation (e.g., equity investment funds) and already prudentially consolidated into banking groups which is not the case for the broad measure. Then, the following functional relationship is proposed in this thesis:

Shadow Banking = f (commercial bank lending, commercial bank lending x commercial bank-specific factors; macroeconomic and institutional control variables) (1.1)

Taking into account prior theoretical and empirical studies which provided evidence for the significant impact of bank-specific factors on commercial bank lending, this thesis hypothesizes that CBL-SB relationship may depend on bank-specific factors. In other words, this thesis argue that the marginal impact of CBL on SB may be determined by the commercial bank-specific characteristics. The postulated mechanism contains the following intuition: weak financial condition (e.g. lower liquidity position) of traditional banks may cause their failure to satisfy the existing credit demand in the economy. For instance, the theory behind the transmission of liquidity provisions postulates that when banks hold more liquid liabilities than liquid assets, they are vulnerable to sudden liquidity dry-ups. Therefore, banks may not be able to promptly replace their funding sources which further results in costly fire sales

and consequently reduced volume of lending (Carpinelli and Crosignani, 2017). As such, liquidity shortage has a contractionary impact on loan supply. Following reduced lending by commercial banks, there will be an unmet credit demand creating an opportunity for the SB sector to increase their loan supply and fulfill the gap hence strengthening complementarity. This is in line with the notion that SB entities address several financial needs (i.e. credit demand) unmet by traditional banks. On the other hand, commercial banks with higher lending volume are more likely to engage in securitization. As noted by Acharya et al. (2021), banks with higher loan to deposit ratios may seek to transfer loans off their balance sheet through securitization to encounter regulatory disapproval. Moreover, as the volume of loans surges, so does the potential collateral (loans that may potentially be used to involve in securitization). As such, higher lending volume of commercial banks causes SB assets to expand.

1.3 Research's Contribution

To the best of our knowledge, this study is the first to investigate the moderating role of bank-specific factors on commercial bank lending - shadow banking nexus which is graphically represented in Figure 1.1.

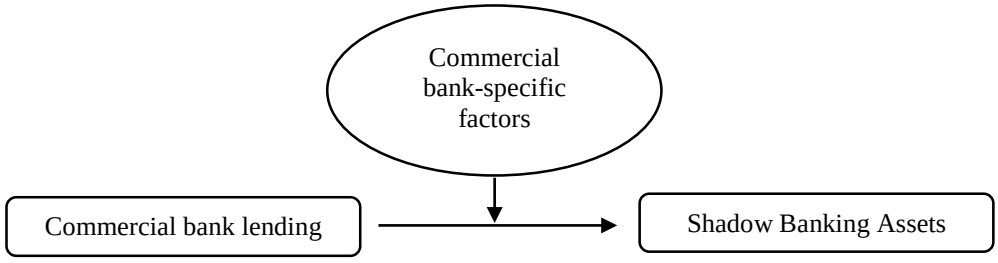


Figure 1.1: Impact of Bank-Specific Factors on CBL - SB Nexus

This thesis contributes to the extant literature in several ways. To start with chapter 2, first, while existing studies undermined bank-specific variables and mostly concentrated on the macroeconomic and institutional factors, this thesis investigate the

impact of bank-specific factors. That is, due to interconnectedness between commercial and shadow banking sectors (Abad et al., 2022), this thesis premise bank-specific variables such as risks and profitability play a moderating role in bank lending (BL) and shadow banking (SB) nexus. In other words, this thesis hypothesize that this nexus can be determined by the change in commercial banks' capital risk, credit risk, liquidity risk, and profitability. For instance, the failure of banks to meet credit demand (e.g., due to lower liquidity, lower capital) may create an opportunity for shadow banks to step in, fill this gap, and thereby increase their assets. Second, instead of advanced economies (AE), this thesis choose EMEs where the fast-growing shadow banking (broad measure grew by 267.04%, narrow measure grew by 279% during the study period)[4] creates a systemic risk exposure and is deprived of shadow banking studies. And finally, on the methodological side, this study is one of very few that employs dynamic system Generalized Method of Moments (GMM) econometric methodology that encounters endogeneity problem. Particularly, in our case, due to interconnectedness between the two banking sectors endogeneity problem is more likely to arise.

Furthermore, in Chapter 3, this thesis analyse whether bank-specific factors within the CAMELS framework moderates the linkage between commercial bank lending (CBL) and non-bank financial intermediation (NBFI) to offer a comprehensive picture. Several contributions to the existing literature have been made. First, to the best of the author's knowledge, the latest study is IMF (2014) that explored the linkage between commercial banking and NBFI by considering all countries provided by the FSB database. This thesis will extend the aforementioned relationship by employing

[4] Author calculations based on FSB (2020) database

updated data (2002-2020). The second and most distinctive contribution is, this thesis makes an initial attempt to test the moderating role of bank-specific variables within the CAMELS framework on the CBL-NBFI relationship. That is, how the marginal impact of CBL on NBFI is influenced by commercial banks' capital adequacy, asset quality, management quality, earnings, liquidity, and sensitivity to market risk. Hence, the findings of this paper extend understanding of the link between mainstream banking and NBFI sectors. Third, the current thesis is one of very few that employs a system GMM panel estimator for NBFI that considers dynamic aspects of the data and endogeneity problem. Due to the interconnectedness between commercial banking and NBFI sectors (Abad et al., 2022), a potential endogeneity problem is more likely to arise. Moreover, to achieve a more reliable system GMM estimation, an updated Stata command introduced by Kripfganz (2019) is utilized to avoid inaccurate aspects and some bugs of older Stata commands for GMM estimations (Kripfganz, 2019; Kiviet, 2020[5]). As such, our paper has the capacity to open a new discussion and trigger future research in NBFI literature.

[5] Kiviet (2020) discussed all the inaccurate aspects of "xtabond2" in detail and cited "xtdpdgmm" as a "*promising improved alternative*".

Chapter 2

THE NEXUS BETWEEN COMMERCIAL BANK LENDING AND SHADOW BANKING ASSETS: DO BANK RISKS AND PROFITABILITY MODERATE? EVIDENCE FROM EMERGING MARKETS

2.1 Introduction

Besides potential exposures to financial stability, shadow banks can help fueling economic growth by acting as a complement or substitute to mainstream banks. They complement commercial banks by being an effective source of credit where bank lending is unavailable and by supporting market liquidity, maturity transformation, and risk sharing (IMF, 2014). Alternatively, they act as a substitute by offering cheaper loans and safe alternatives to banking products, particularly in times of high market stress (Hodula et al., 2020). Nonetheless, liquidity and maturity mismatches, credit enhancement, substantial leverage, high interconnectedness, and unavailability of public backstops make shadow banking less resilient than traditional banking (Pozsar et al., 2013). As such, shadow banks may pose a systemic risk to the financial system directly and indirectly through interconnectedness with other financial institutions.

During the last decade shadow banking sector has experienced a remarkable growth, especially in emerging market economies (EMEs). As the Figure 2.1 demonstrates, between 2013 and 2018, the share of financial assets held by shadow banking sector

increased at a faster pace in EMEs compared to advanced economies (AEs) (FSB, 2020). While broad measure of shadow banking grew by 267.04% from 2013 to 2018, there was 279% growth in narrow measure of shadow banking during the same time period in EMEs[6].

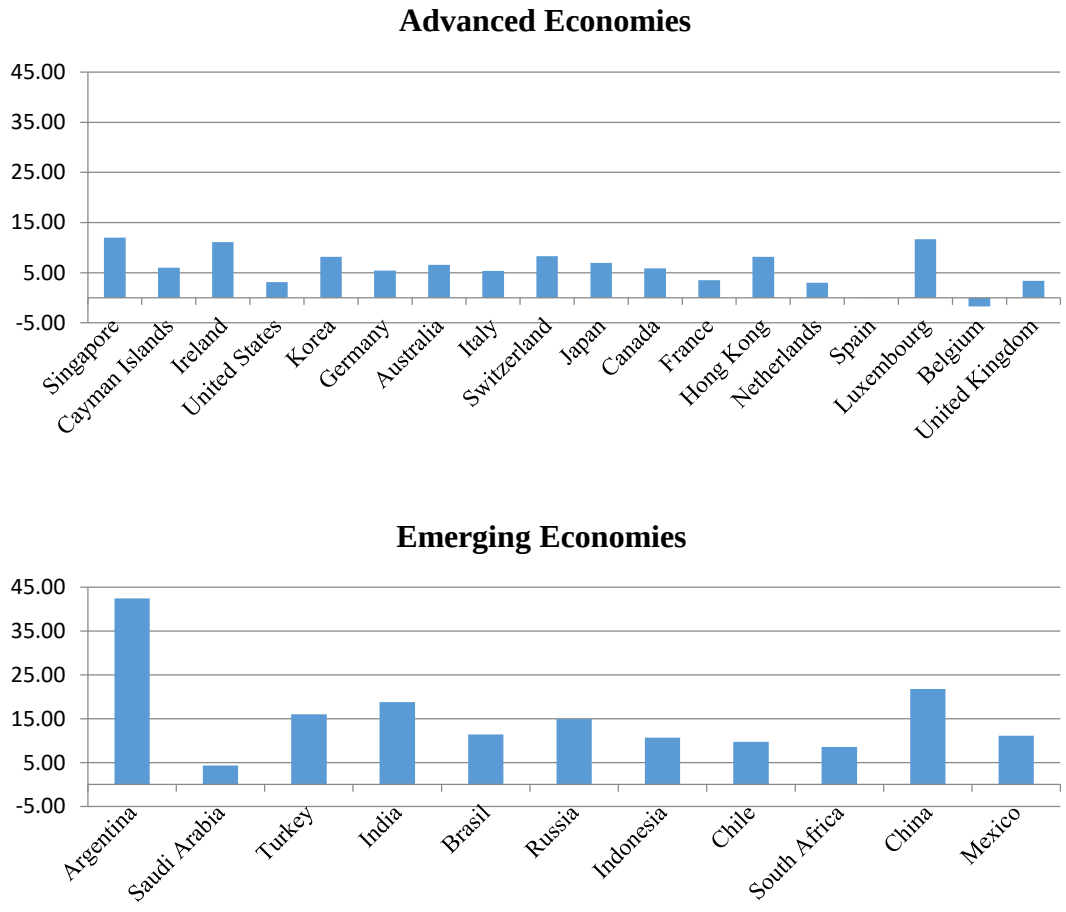


Figure 2.1: Share of financial assets held by shadow banking sector 2013-2018 (compound annual growth rate)
Source: FSB Global Monitoring Report on Non-Bank Financial Intermediation 2020

Theoretical studies suggest that shadow banking growth is driven by supply and demand side factors. Concerning the supply side, regulatory arbitrage is considered a major determinant of shadow banking (Poschmann, 2012; Adrian and Ashcraft, 2012). From the demand side, high institutional demand for safe alternatives to bank deposits,

[6] Author calculations based on FSB (2020) database

such as securities with AAA ratings provided by credit rating agencies, is the primary motivation behind this unregulated or less-regulated sector of the financial system (Poschmann, 2012). However, empirically speaking, few studies have been done to investigate potential determinants of shadow banking expansion. Most of these studies employed institutional and macroeconomic variables in their analyses. Considering institutional and macroeconomic frameworks, previous studies suggest that tighter banking regulations, high institutional demand, economic growth, and financial development are the main drivers of non-banking activities (Duca 2014; IMF 2014; Hodula et al., 2020). Concerning the substitution and complementary role, Acharya et al. (2013) and IMF (2014) finds that shadow banking serves as a complement to conventional banking, while Hodula et al. (2020) concludes shadow banking system can act as both complements and substitutes to mainstream banking.

As the overview of the literature highlights, existing studies undermined bank-specific variables and mostly concentrated on the macroeconomic and institutional factors. Nonetheless, this thesis premise bank-specific variables such as risks and profitability play a role in bank lending and shadow banking nexus as there is an interconnectedness between these sectors. Accordingly, our study is motivated to fill this gap and contributes literature by empirically assessing the moderating role of *commercial bank risks and profitability* on bank lending (BL)-shadow banking (SB) nexus in Emerging Market Economies (EMEs). Including interaction terms in analyses will improve our understanding regarding the marginal effect of BL on SB, conditional on bank risks and profitability. In addition, this thesis include proxies for the "regulatory arbitrage", "procyclicality", and "the institutional cash pool" as control variables since they are indispensable in shadow banking literature.

This paper contributes to the shadow banking literature in three significant ways. First, to the best of our knowledge, this is the first study that examines the *moderating role* of bank risks and profitability on the relationship between bank lending and shadow banking. As Figure 2.2 demonstrates, this thesis hypothesize that commercial banks' capital risk, credit risk, liquidity risk, and profitability have a moderating effect on BL-SB nexus. In other words, this thesis argue that this nexus can be determined by the change in bank risks and profitability. For instance, the failure of banks to meet credit demand due to lower liquidity, shadow banks may step in to fill this gap. Second, instead of advanced economies (AE), this thesis choose EMEs where the fast-growing shadow banking creates a systemic risk exposure and is deprived of shadow banking studies. And finally, on the methodological side, this study is one of very few that employs dynamic system Generalized Method of Moments (GMM) econometric methodology that encounters endogeneity problem. Particularly, in our case, due to interconnectedness between the two banking sectors endogeneity problem is more likely to arise.

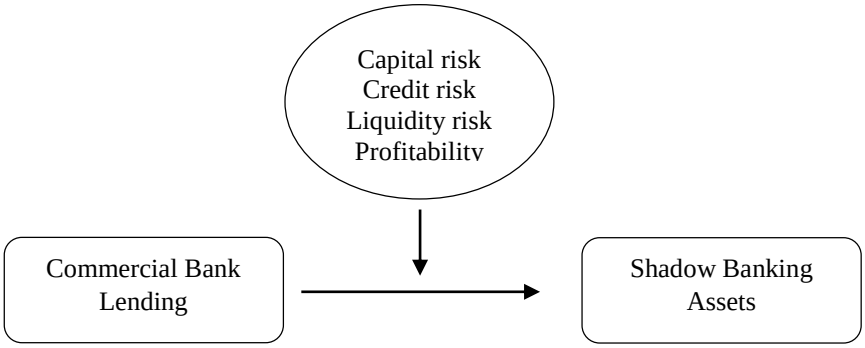


Figure 2.2: Impact of bank-specific factors on BL-SB nexus

The remainder of the study: Section II presents data and methodology, Section III presents and discusses results, and Section IV concludes.

2.2 Literature Review

Existing literature has identified several common drivers of shadow banking such as stringent banking regulation, regulatory capital arbitrage, and high demand from institutional investors, financial development, and economic growth. Institutional framework, especially tighter bank regulations, is found to be among main motivators of shadow banking growth in empirical studies (Duca, 2014; IMF, 2014). These studies confirms regulatory arbitrage hypothesis discussed by conceptual studies in previous paragraph. The fact that shadow banking entities are unregulated or less regulated than traditional banks inevitably implies that, demand for shadow banking is driven by regulatory arbitrage (i.e. the exploitation of differences in regulation). Duca (2014) investigated short-run and long-run determinants of shadow banking share of business credit in US by applying cointegration techniques. His findings suggest that, in the long run, tighter banking capital and reserve requirements are main motivations behind shadow bank funded share of business credit. A comprehensive study done by IMF (2014) aimed to seek potential drivers of shadow banking growth in advanced economies. Their results suggest that, banking sector size, heightened capital regulations and institutional investors' growth have a significant and positive impact. However, in addition to these institutional and regulatory variables, this thesis also consider the impact of bank activity restrictions index on shadow banking since stricter regulations on banks' activities hinders their efficiency and performance (Barth et al., 2013a, Barth et al., 2013b), thereby create an opportunity for shadow banks to step in. The fact that shadow banking entities are unregulated or less regulated than traditional banks inevitably means that to some extent demand for shadow banking is driven by regulatory arbitrage. Financial products and services of highly regulated banks are not as cheap as lightly-regulated shadow banks. Therefore, this thesis include

activity restrictions index to test 'regulatory arbitrage' hypothesis. Macroeconomic environment is likely to affect shadow banking assets in the economy as well. Barbu et al. (2016) conclude that, economic growth, money supply and short-term interest rates have a negative influence on European Union countries' shadow banking total assets' variation. A more recent study by Apostoaie and Bilan (2020), demonstrate similar results in terms of interest rate but contradictory results in terms of economic growth. Stressing the sensitivity of shadow banking to macroeconomic conditions, they provide that shadow banking activities are positively affected by economic growth and negatively by interest rates in 11 European Union (E.U.) countries for the period of 2004-2017. Supportively, IMF (2014) concludes that short term interest rate has a negative influence on shadow banking development in advanced economies. However, Deutsche Bundesbank (2014) argues GDP growth and inflation are not among significant factors that affect growth rate of the real or nominal deposits of non-bank financial institutions, namely, shadow banking.

2.3 Data and Methodology

This study utilized annual data for 569 commercial banks from 11 EMEs[7]. To proxy shadow banking, broad and narrow measures are taken from the FSB database. Due to data availability of Orbis Bank Focus (OBF) and Financial Stability Board (FSB) database our sample period is from 2013 to 2018. Table 2.1 provides variables and descriptive statistics. To avoid undue influence of outliers, this thesis eliminate any observation either is less than 1st percentile or greater than 99th percentile.

[7] FSB provides data only for: Argentina, Brazil, Chile, China, India, Indonesia, Mexico, Russia, Saudi Arabia, South Africa and Turkey

Table 2.1: Descriptive Statistics

Variable	Obs.	Mean	SD	Min	Max	Source
Dependent						
SB broad measure (SBB)	3,288	6.00	1.57	2.03	9.32	FSB 2020
SB narrow measure (SBN)	3,384	4.83	2.10	1.84	9.01	FSB 2020
Independent						
CB lending (BL)	2,348	5.01	2.29	0.40	9.92	OBF
Capital risk	2,977	0.27	0.20	0.09	1.46	OBF
Credit risk	3,097	0.09	0.11	0.00	0.63	OBF
Liquidity risk	3,122	0.60	0.86	0.01	11.96	OBF
Profitability	3,380	0.07	0.06	-0.02	0.46	OBF
Economic growth	3,372	7.59	0.88	5.86	9.54	World Bank
Monetary policy	3,302	0.08	0.05	0.03	0.31	Thomson Reuters
Institutional demand	3,414	4.91	1.35	2.44	7.83	FSB 2020
Activity restrictions index	2,348	7.15	2.21	5.00	10.00	Barth et al. (2013)

Notes: SBB and SBN are the natural logarithm of shadow banking assets. Commercial bank specific variables: LOAN = natural logarithm of gross loans; CAP = (tier1+tier2) / risk-weighted assets; CR = loan loss reserves / gross loans; LIQ = liquid assets / deposit & short-term funding; PROF = net interest margin. Macroeconomic controls: GDP = natural logarithm of GDP (current US$); PR = policy rate; INSTD = natural logarithm of total financial assets of insurance corporations and pension funds. Institutional control: ARI = overall restrictions on banking activities (securities activities, insurance activities, real estate activities)

Due to the interconnectedness between the two sectors, the endogeneity problem is more likely to arise in our analyses. OLS, Fixed and Random effects are unable to mitigate endogeneity problem. Therefore, our empirical analysis is based on the one and two-step dynamic system GMM methodology to avoid endogeneity and reverse causalities. The specific form of the equation is specified as follows:

$$\ln SBB\ (SBN)_{it} = \beta_0 + \beta_1 \ln SBB\ (SBN)_{it-1} + \beta_2 BL_{ijt} + \beta_3 BANK_{ijt} + \beta_4 BL_{ijt} \times BANK_{ijt} + \beta_5 X_{it} + \varepsilon_{ijt} \quad (2.1)$$

where *i*, *j*, *t* denote country *i*, bank *j*, and year *t*. *SBB* and *SBN* represent broad and narrow measure of shadow banking, respectively. BL_{ijt} denotes commercial bank

lending, $BANK_{ijt}$ characterizes the vector of bank risks and profitability variables, $\beta_4 BL_{ijt} \times BANK_{ijt}$ is interaction term between commercial bank lending and bank-specific variables, X_{it} stands for macroeconomic and institutional control variables. ε_{ijt} contains the error term.

Comparing one-step and two-step GMM estimators, Bond (2002) argues that, in the case of very small standard errors, one-step GMM outperforms its two-step counterpart. Supportively, Bond and Windmeijer (2002) state two-step estimator may lead to unreliable asymptotic statistical inference due to its dependence on estimated residuals from the one-step estimator. However, small-sample correction to the two-step covariance matrix developed by Windmeijer (2005) makes two-step GMM estimates more efficient than one-step GMM (Roodman, 2009b). Thus, while the two-step estimator provides asymptotically more efficient coefficient estimates, the asymptotic inference from the one-step standard errors might be more reliable. This thesis, therefore, report both one-step and two-step system GMM results for the robustness of our findings.

2.4 Empirical Results

Results are summarized in Table 2.2. Similar results of one and two-step system GMM indicate robustness in coefficient signs and their statistical significance. Hansen test confirm the validity of instruments and the p-values satisfy the range of 0.10-0.25 suggested by Roodman (2009). AR(1) and AR(2) tests approve the absence of first and second-order autocorrelation. Highly significant lagged dependent variables confirm the dynamic character of our models.

Table 2.2: GMM Results

	SBB				SBN			
	1-step		2-step		1-step		2-step	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
SBB t-1	0.38**	(0.18)	0.42***	(0.14)				
SBN t-1					0.24***	(0.09)	0.19***	(0.07)
BL	0.15**	(0.06)	0.11**	(0.05)	-0.09*	(0.46)	-0.10**	(0.39)
Capital risk	-0.23	(0.80)	1.49	(0.36)	1.78	(1.34)	1.83**	(0.90)
Credit risk	-10.45***	(3.51)	-8.81*	(4.81)	-5.91**	(2.77)	-4.00*	(2.31)
Liquidity risk	0.51	(0.38)	-0.30	(0.68)	-0.46	(0.77)	-0.45	(0.52)
Profitability	6.21***	(2.24)	4.44	(4.19)	5.21**	(2.24)	3.36*	(1.94)
BL x Capital risk	0.02	(0.19)	-0.36	(0.36)	-0.45	(0.29)	-0.47***	(0.18)
BL x Credit risk	3.27**	(0.90)	2.70**	(1.23)	0.91	(0.74)	0.53	(0.65)
BL x Liquidity risk	-0.09	(0.09)	0.07	(0.15)	0.13	(0.16)	0.13	(0.11)
BL x Profitability	-1.53***	(0.53)	-1.30	(0.89)	-1.47***	(0.56)	-1.17**	(0.50)
Economic growth	0.28**	(0.13)	0.04	(0.20)	0.24	(0.16)	0.29**	(0.13)
Monetary policy	-0.42	(1.00)	-2.54**	(1.17)	0.59	(1.87)	1.41	(1.15)
Institutional demand	0.64***	(0.25)	0.65***	(0.13)	0.82***	(0.19)	0.89***	(0.18)
Activity restrictions index	-0.04	(0.05)	-0.06**	(0.03)	-0.17***	(0.03)	-0.15***	(0.04)
AR(1)	(0.389)		(0.623)		(0.523)		(0.334)	
AR(2)	(0.250)		(0.146)		(0.183)		(0.336)	
Hansen stat.	(0.149)		(0.155)		(0.178)		(0.178)	
F-statistics (p-Value)	310.25 (0.000)		151.49 (0.000)		278.79 (0.000)		310.35 (0.000)	

***, **, * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively

It is worth reminding that, in multiplicative interaction models, scholars must not interpret the constitutive elements of interaction terms as unconditional or average effects (Brambor et al., 2006). Therefore, the only inference this thesis can draw from the traditional results table is whether BL has a significant effect on SB for the unique case where bank risks and profitability equals zero. However, this is not the case in real-world situations. Hence for interpretation, this thesis use a graphical illustration to explain the marginal effect of BL on SB across the range of bank risks and profitability.

Results provide a positive relationship between bank lending (BL) and broad measure (SBB) and a negative association between bank lending and narrow measure (SBN). The positive coefficient of BL on SBB suggests that shadow banking entities consolidated into banking groups act as complements rather than competitors. On the other hand, negative sign of BL on SBN shows a substitution effect because narrow measure focuses on shadow banking entities that involve directly in credit intermediation and not consolidated into banking groups. As such, shadow banks compete with commercial banks. Regarding marginal effects, Figure 2.3 indicates that for lower credit risk values, BL has a negative marginal impact on SBB (substitution effect). However, for higher credit risk values negative effect weakens and turns out to be a positive (complementary effect). This implies that when commercial banks have lower credit risk, they can lend more, which makes their loans more compatible than SB loans and creates a substitution effect. However, as credit risk increases, banks tend to engage in securitization activities[8] to reduce the burden in their balance sheets (Affinito and Tagliaferri, 2010). In other words, securitization decreases a bank's

[8] One of the major shadow banking activities

credit risk exposure by increasing the bank's portfolio quality. As a result, commercial banks contribute to SBB development through securitization and enact complementarity between the two sectors. On the other hand, for capital risk, liquidity risk, and profitability[9], the marginal effect of BL on SBB is insignificant, implying they don't have any moderating role in the BL-SB nexus[10].

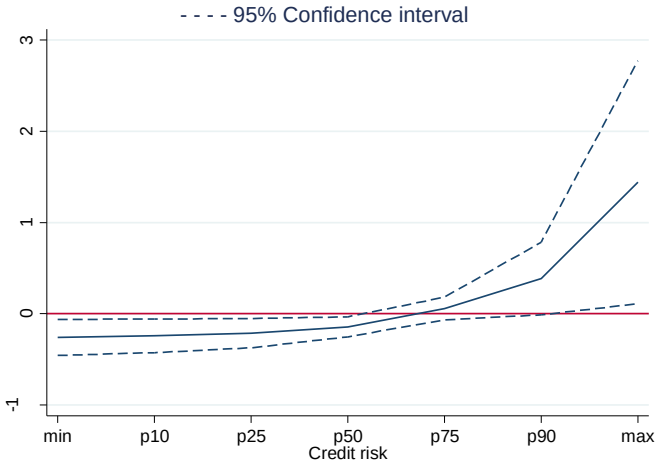


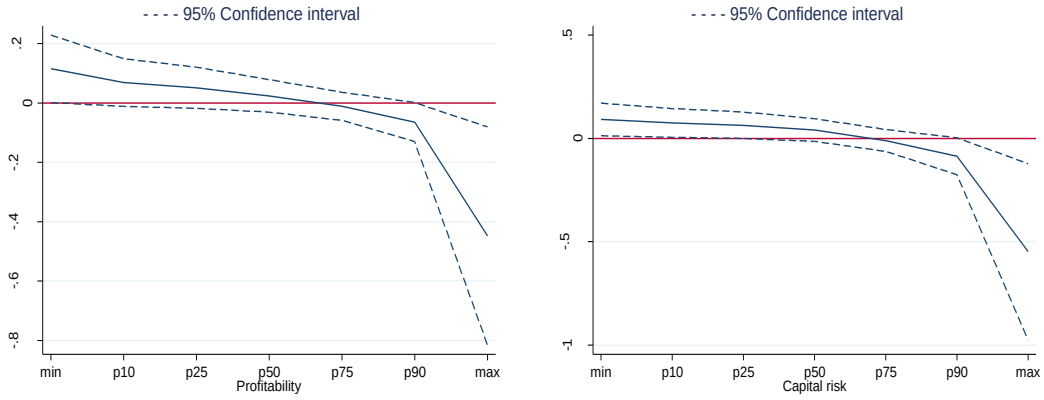
Figure 2.3: Average marginal effect of BL on SBB, conditional on credit risk based on model (1)

Figure 2.4 depicts the marginal effect of BL on SBN conditional on bank profitability and capital risk. For less profitable banks, BL has a positive marginal impact on SBN (complementary effect), while for more profitable banks negative marginal effect is observed (substitution effect). This implies that banks with high profitability satisfy the current credit demand with higher lending capacity leading to a decline in SBN (substitution effect). On the other hand, low-profitable banks tend to engage in securitization activities more (Affinito and Tagliaferri, 2010), leading to SBN

[9] Due to robustness, we didn't accept that profitability significantly affects BL-SB nexus since different results are provided by one and two-step system GMM.

[10] Results are available upon request

expansion in the economy, which implies complementarity. Regarding capital risk, the marginal impact of BL on SBN is positive for less capitalized banks (complementarity) and changes to negative as capital increases, leading to the substitution effect. Since less capitalized banks are more likely to perform securitization (Affinito and Tagliaferri, 2010), they contribute to SBN growth and cause complementary effect. In contrast, banks with strong capital tend to have more lending volume and are able to satisfy the existing credit demand, decelerating SBN expansion and leading to the substitution effect. For liquidity and credit risk, the marginal effect of BL on SBN is insignificant[11].



Panel (a) Panel (b)

Figure 2.4: Average marginal effect of BL on SBN, conditional on profitability and capital risk based on model (1)

Positive and significant sign of institutional demand in all specifications confirm "the institutional cash pool" hypothesis in EMEs. This is in line with IMF (2014) and Hodula et al. (2020). Inconsistent with our expectations, negative coefficient of activity restrictions index supports reverse "regulatory arbitrage" hypothesis, and suggest that increased restrictions on banks reduce their SB activities, hence decrease

[11] Results are available upon request

SB assets. Negative association between ARI and shadow banking is surprising since its implication is inconsistent with the notion that, tighter bank regulations drive shadow banking growth by creating regulatory arbitrage. The intuition is the following. Implementation of Basel III reform closed many loopholes (e.g. loan underwriting standards have been strengthened; information disclosure requirements have increased with regard to securitization activities and off-balance sheet vehicles) in bank regulations in order to prevent regulatory arbitrage. This discourages banks from engaging in shadow banking activities which prevents their contribution to shadow banking assets in EMEs.

2.5 Conclusion

Our empirical results confirm that shadow banks act as substitutes and complements to traditional banks in EMEs. Credit risk, capital risk and profitability have a significant moderating role in the BL-SB nexus. In other words, banks with lower profitability, higher credit risk, and lower capitalization may create opportunities for shadow banking entities to increase their market share. In turn, due to lack of regulations on them and interconnectedness with financial sector, shadow banks may incite widespread panic and contagion in financial markets, causing significant negative spillover to the rest of the economy. Hence risks incurred by this segment of financial sector should be carefully monitored, managed, and mitigated in EMEs. Moreover, findings imply that high institutional demand and lower restrictions on bank activities cause shadow banking expansion. Inferences of this results will facilitate policymakers and regulators to consider/be aware of the type of shadow banking measures when adopting any regulatory policy as they may provide different outcomes.

Chapter 3

THE MODERATING ROLE OF CAMELS FRAMEWORK ON THE RELATIONSHIP BETWEEN COMMERCIAL BANK LENDING (CBL) AND NON-BANK FINANCIAL INTERMEDIATION (NBFI)

3.1 Introduction

In the aftermath of the global financial crisis (GFC), non-bank financial intermediation (hereafter NBFI) - broadly defined as credit intermediation outside the traditional banking system - has been an essential and largely disputed issue in the financial economics literature. According to the Financial Stability Board (FSB) (2020), this segment of the financial system may foster competition in the supply of financing and support economic activities. In this regard, NBFI can substitute or complement banking activities thereby enhancing an economy's ability to produce goods and services. From a complementarity perspective, NBFI can be viewed as a parallel system to mainstream banking in financing the economy, as they expand access to credit, enable better risk sharing, and sustain market liquidity (Acharya et al., 2013; IMF, 2014). Alternatively, substitution effect may take part between two sectors, since NBFI can offer cheaper credit, and safe alternatives to banking products, particularly in times of high market stress (Hodula et al., 2020). However, lack of regulatory oversight together with liquidity and maturity mismatches, credit enhancement, a substantial amount of leverage, high interconnectedness, and unavailability of public

backstops make the NBFI sector less resilient compared to the conventional banking system (Pozsar et al., 2013). To sum up, the NBFI system may pose a systemic risk to the financial system, both directly and through its interconnectedness with the banking sector, if it involves activities (e.g. maturity/liquidity transformation) that are typically performed by banks (FSB, 2020).

Theoretically, supply and demand-side factors shape NBFI growth. From the supply side, regulatory arbitrage is considered to be a key driver behind NBFI (Adrian and Ashcraft, 2012; Plantin, 2015; Buchak et al., 2018). From the demand side, high institutional demand, and unmet needs and preferences by commercial tend to foster NBFI expansion (Poschmann, 2012; Fein, 2013). However, despite its vital role, a limited number of studies have empirically investigated the potential determinants of NBFI (Nath and Chowdhury, 2021). Existing studies underscored regulatory arbitrage, economic growth, traditional banking growth, institutional demand, search for yield, and financial development as major determinants of NBFI (Duca, 2014; IMF, 2014; Barbu et al., 2016; Malatesta et. al, 2016; Kim, 2017; Apostoaie and Bilan, 2020; Hodula et al., 2020). Among the above-cited empirical studies, few considered complementary and substitution effects between mainstream banking and NBFI. Apostoaie and Bilan (2020) mentioned that NBFI is found to be complementary to the rest of the financial system, in particular, commercial banking. Acharya et al. (2013) and Kim (2017) provided similar findings. However, IMF (2014) and Hodula et al. (2020) showed that NBFI can act as both complements and substitutes to traditional banking.

The aforementioned studies mostly concentrated on the macroeconomic and institutional determinants with very few considering the link (complementarity or

substitution) between traditional banking and NBFI. Moreover, they undermined the influence of bank-specific variables on this nexus. In this light, the current paper aims to fill the gap and provide new evidence by answering explicitly the following questions. First, is there any complementary or substitution effect between commercial banking and NBFI sectors? Second, if yes, do bank-specific factors within the CAMELS framework moderate this relationship?

Due to the significant impact of CAMELS[12] parameters on traditional bank lending (among others Jeitschko and Jeung, 2005; Berger and Bouwman, 2009; Altunbas et al., 2010; Cornett et al., 2011; Ryoo, 2013; Gennaioli et al., 2014; Carpinelli and Crosignani, 2017; Naceur et al., 2018; Adesina, 2019; Dahir et al., 2019; Beutler et al., 2020; Gomez et al., 2021), this study premise bank-specific variables within CAMELS approach to play a moderating role in commercial bank lending (CBL) and non-bank financial intermediation (NBFI) nexus as shown in Figure 3.1. In other words, this research hypothesizes that the complementary or substitution effect between two sectors may differ depending upon commercial banks' capital adequacy, asset quality, management quality, earnings, liquidity, and sensitivity to market risk. For instance, the failure of commercial banks to meet credit demand due to their weak financial condition (e.g. lower capital position, poor management quality) may create an opportunity for the NBFI sector to increase their assets by expanding access to credit. This is in line with the notion that NBFI entities satisfy several financial needs (i.e. credit demand) unmet by mainstream banks (Claessens et al., 2012; Fein, 2013). In this sense, Lindgren (2018) stated that strong and unmet demand for credit from

[12] CAMELS is an acronym for six parameters, capital adequacy (C), asset quality (A), management quality (M), earnings (E), liquidity (L), and sensitivity to the market risk (S), to measure the banking and finance performance (Wanke et al., 2016).

both the private and public sectors was one of the main reasons behind NBFI sector growth. In addition, commercial banks with lower lending volume are less likely to engage in securitization activities[13], which in turn may cause NBFI assets to decelerate. Affinito and Tagliaferri (2010) noted that, banks with a larger share of loans are more likely to originate securitization. They argued that higher bank lending increases the need to disinvest part of the loan portfolio and securitize it for funding reasons. In a related paper, Agostino and Mazzuca (2011) noted that as the volume of loans surges, so does the potential collateral (loans that may potentially are used to involve in securitization). Moreover, banks with a higher credit growth may seek to transfer loans off their balance sheet through securitization to encounter regulatory disapproval (Acharya et al., 2021).

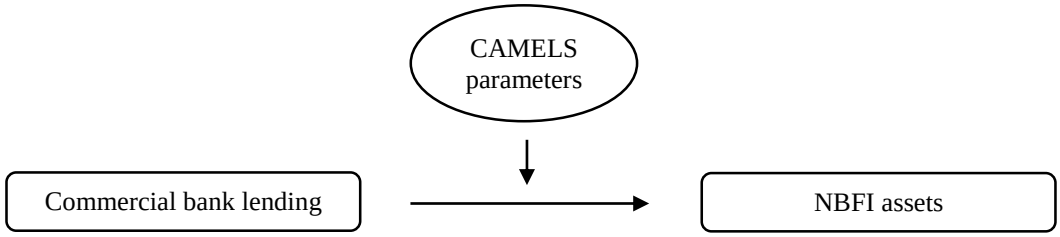


Figure 3.1: Impact of bank-specific factors within CAMELS framework on CBL-NBFI nexus

Several contributions to the existing literature have been made. First, to the best of the author's knowledge, the latest study is IMF (2014) that explored the linkage between commercial banking and NBFI by considering all countries provided by the FSB database. This paper will extend the aforementioned relationship by employing updated data (2002-2020). The second and most distinctive contribution is, this study makes an initial attempt to test the moderating role of bank-specific variables within

[13] One of the major NBFI activities (see Stein, 2010).

the CAMELS framework on the CBL-NBFI relationship. That is, how the marginal impact of CBL on NBFI is influenced by commercial banks' capital adequacy, asset quality, management quality, earnings, liquidity, and sensitivity to market risk. Hence, the findings of this paper extend understanding of the link between mainstream banking and NBFI sectors. Third, the current paper is one of very few that employs a system GMM panel estimator for NBFI that considers dynamic aspects of the data and endogeneity problem. Due to the interconnectedness between commercial banking and NBFI sectors (Abad et al., 2022), a potential endogeneity problem is more likely to arise. Moreover, to achieve a more reliable system GMM estimation, un updated the Stata command introduced by Kripfganz (2019) is utilized to avoid inaccurate aspects and some bugs of older Stata commands for GMM estimations (Kripfganz, 2019; Kiviet, 2020). As such, our paper has the capacity to open a new discussion and trigger future research in NBFI literature.

The main findings of this paper can be listed as follows. Both static and dynamic panel estimates confirmed that there is a complementarity effect between commercial banking and NBFI sectors. Moreover, regarding CAMELS parameters, marginal effects of CBL on NBFI reveal that capital adequacy, asset quality, liquidity, and sensitivity to market risk significantly moderate CBL-NBFI nexus. In other words, a strong capital position, poor asset quality, higher liquidity position, and high exposure to market risk seem to mitigate the complementarity between traditional banking and NBFI sectors during the study period.

The remainder of this study proceeds as follows. Section 2 provides a review of the relevant literature. Section 3 outlines data and methodology. Section 4 discusses empirical results and Section 5 presents the concluding remarks.

3.2 Literature Review

This study completes the existing strand of literature regarding the determinants of NBFI. A comprehensive cross-country study by IMF (2014) concluded that tighter banking regulation, complementarities with the rest of the financial system, and ample liquidity conditions are the main determinants of NBFI growth. Moreover, their study noted that, although NBFI differs vastly across and within countries, key drivers behind its expansion are similar. Barbu et al. (2016) found that long-term interest rates and stock market indices affect NBFI size positively while short-term interest rates, investment fund growth, economic growth, and money supply are negatively associated with NBFI size in 15 European economies. Similarly, Malatesta et al. (2016) underscored that macroeconomic factors are by far the key drivers behind NBFI in euro-area countries. Applying cointegration techniques, Duca (2016) addressed the impact of capital regulation and other factors on the role of NBFI in funding short-term business debt. His findings suggested that NBFI share was affected by tighter banking capital and reserve requirements in the long run, while the economic outlook, deposit rate ceilings, and risk premia are found to be short-run determinants. Kim (2017) reported that the size of banks' assets and institutional demand has a positive impact on NBFI growth. A more recent study by Apostoaie and Bilan (2020) provided consistent results with the above-mentioned studies and noted that growth of the traditional banking sector, higher institutional demand, money market interest rate, overall liquidity, and economic conditions influence the NBFI sector positively. Another recent study conducted by Hodula et al. (2020) revealed the positive impact of financial development, strict regulations on banks, and institutional demand on NBFI growth.

3.2.1 Relationship Between Commercial Banking and NBFI

Among very few studies that focused on the complementary and substitution effects, Acharya et al. (2013), Apostoaie and Bilan (2020), and Kim (2017) noted complementarity between NBFI and conventional banking. Acharya et al. (2013) underscored that insufficient branches of commercial banks in some areas of India were the reason behind NBFI credit expansion, which confirms the hypothesis of complementarity. Consistently, Kim (2017) evidenced that NBFI growth is accompanied by the growth of mainstream banking in G20 countries. Apostoaie and Bilan (2020) provided similar results for Central and Eastern European economies. In contrast, IMF (2014) and Hodula et al. (2020) concluded that NBFI can act as both complements and substitutes to commercial banking. Concerning mortgage financing, Hodula et al. (2020) showed that in case the commercial banking sector is unable to provide mortgages on the full property due to regulatory constraints, NBFI may step in and finance the remainder of the amount thereby leading to the complementarity between the two sectors. Alternatively, they can substitute commercial banks by offering safe alternatives to banking products, particularly in times of high market stress.

3.2.2 Moderating Role of CAMELS Framework on CBL-NBFI Nexus

While the findings of the above-cited papers evidenced the effect of macroeconomic and institutional drivers on NBFI, very few studies accounted for the relationship (complementary or substitution) between commercial banking and NBFI sectors. Moreover, the moderating role of bank-specific factors on this relationship has not been explored yet. Considering prior theoretical and empirical studies which provided evidence for the significant impact of CAMELS parameters on traditional bank lending, among others, - for capital adequacy Berger and Bouwman (2009), Dahir et

al. (2019); for asset quality Altunbas et al. (2010), Adesina (2019); for management quality Jeitschko and Jeung (2005), Naceur et al. (2018); for earnings Ryoo (2013), Adesina (2019); for liquidity Cornett et al. (2011), Gennaioli et al. (2014), Carpinelli and Crosignani (2017); for sensitivity to market risk Beutler et al. (2020), Gomez et al. (2021) - current study hypothesizes that CBL-NBFI relationship may depend on bank-specific factors within the CAMELS approach. In other words, this paper argues that the marginal impact of CBL on NBFI may be determined by the commercial bank-specific characteristics. The proposed mechanism contains the following intuition: weak financial condition (e.g. weaker liquidity position) of traditional banks may cause their failure to satisfy the existing credit demand in the economy. The theory behind the transmission of liquidity provisions, for example, states that banks are vulnerable to abrupt liquidity shortages when they have more liquid liabilities than liquid assets. As a result, banks may be unable to quickly replace their funding sources, resulting in costly fire sales and a resulting reduction in lending volume (Carpinelli and Crosignani, 2017). In the same vein, Naceur et al. (2018) showed that a liquidity shortage reduces loan supply. There will be an unmet credit demand as a result of commercial banks' lower lending, providing an opportunity for the NBFI sector to grow their loan supply and fill the gap. This is in accordance with the idea that NBFIs fill a variety of financial needs (such as credit demand) that traditional banks don't (Claessens et al., 2012; Fein, 2013). Furthermore, commercial banks with higher lending volumes are more likely to securitize their loans, causing NBFI assets to grow. According to Acharya et al. (2021), banks with greater loan-to-deposit ratios may seek to securitize loans off their balance sheet to avoid regulatory oversight. According to Affinito and Tagliaferri (2010), banks with a higher loan share are more likely to undertake securitization activities. They claimed that as bank lending grows, the

demand to disinvest and securitize a portion of the loan portfolio grows. Furthermore, Agostino and Mazzuca (2011) pointed out that as the number of loans increases, so does the amount of possible collateral (loans that may potentially be used to involve in securitization).

3.3 Data and Methodology

3.3.1 Data and Variable Description

This study utilizes annual data for 29 countries[14] spanning 2002 to 2020. Data is obtained from several sources, that is, the FSB database, World Bank Group including World Bank survey on Bank Regulation and Supervision and Global Financial Development databases. The panel is unbalanced and the total number of observations is 551. The size of the panel is conditioned by the availability of data. Table 1 provides additional information on the explored variables and their respective sources.

Following IMF (2014) and Kim (2017), dynamics of the NBFI sector is captured by the broad measure of NBFI assets provided by FSB monitoring dataset. To investigate whether complementary or substitution effects exist between mainstream banking and NBFI sectors, commercial bank lending (CBL) is proxied by domestic credit to private sector by banks. Further, to examine whether bank-specific factors moderate this relationship, interaction terms between each CAMELS[15] parameter and commercial bank lending are included: regulatory capital to risk-weighted assets for capital adequacy (Doumpos and Zopounidis, 2010), nonperforming loans to gross loans for

[14] FSB provides NBFI annual data for the following 29 countries: Belgium, Argentina, Hong Kong, Saudi Arabia, France, Australia, India, Singapore, Germany, Brazil, Indonesia, South Africa, Turkey, Ireland, Korea, Canada, Japan, Chile, Switzerland, Italy, Russia, Cayman Islands, Mexico, United Kingdom, China, Netherlands, Luxembourg, Spain and United States.

[15] Since the values of the CAMELS ratings are confidential and not publicly available (Jin et al., 2011), this paper uses proxy variables to capture the key features of the CAMELS framework based both on prior studies and data availability.

asset quality (Otchere and Chan, 2003; Čihák and Schaeck, 2010), cost to income ratio for management quality (Wanke et al., 2016), net interest margin for earnings (Otchere and Chan, 2003; Wang et al., 2013), liquid assets to deposits and short term funding for liquidity (Maghyereh and Awartani, 2014), and credit to deposits for sensitivity to market risk (Zheng and Cronje, 2019). Control variables are used to isolate the effects of other factors that have a predictable influence on the NBFI assets. Economic growth is included to control for the "procyclicality" hypothesis of NBFI. That is, NBFI assets boom in good years and fall steeply in a recession (Adrian and Shin, 2009; Hodula et al., 2020). The capital regulatory index should help to control for the regulatory and institutional environment and verify whether the "regulatory arbitrage" hypothesis holds (IMF, 2014; Hodula et al., 2020). Moreover, I add crisis dummy as a safeguard against possible nonlinearities caused by the GFC which takes a value of 1 for the years 2007–2009 and 0 otherwise, as in Saif-Alyousfi et al. (2019).

3.3.2 Model Specification and Methodology

This study aims to examine the impact of commercial bank lending (CBL) on non-bank financial intermediation (NBFI). Further, it explores how the commercial bank-specific factors within the CAMELS framework can moderate this relationship. The model can be formulated as follows:

$$NBFI_{it} = \alpha + \beta_1 NBFI_{it-1} + \beta_2 CBL_{it} + \beta_3 (CBL_{it}\, x\, CAMELS_{it}) + \beta_4 GDP_{it} + \beta_5 CRI_{it} + Crisis_t + \varepsilon_{it} \quad (3.1)$$

where subscripts *i*, *t* denote country *i* and year *t*. $NBFI_{it}$ represents non-bank financial intermediation assets. CBL_{it} characterizes commercial bank lending, $CBL_{it} \times CAMELS_{it}$ is interaction term between commercial bank lending and bank-specific variables, GDP_{it} and CRI_{it} stand for economic growth and capital regulatory index, respectively. $Crisis_t$ represents GFC and finally, α, β_1-β_5 denote the parameters to be

estimated and ε_{it} stands for the error term. In essence, the interaction term allows us to compute the marginal effect of CBL on NBFI at different levels of CAMELS parameters through the partial derivative[16] of Equation 1 with respect to CBL as follows:

$$\frac{\partial NBFI_{it}}{\partial CBL_{it}} = \beta_2 + \beta_3 CAMELS_{it}$$

To provide consistent and unbiased results, the current paper implements both static and dynamic models. For equation (1), pooled OLS does not consider heterogeneity between the cross-sections in the model, while the fixed-effect and the random-effect approach account for heterogeneity between cross-sections. However, in the presence of lagged dependent variable or potential endogeneity problem, the above-cited techniques provide bias and inconsistent parameter estimates (Harris and Mátyás, 2004; Nickell, 1981). Hence this paper prefers the dynamic system GMM approach to deal with potential endogeneity issues and unobserved heterogeneity in panel data (Arellano and Bover, 1995; Blundell and Bond, 1998). For unbalanced panel data, which is the case for the current study, System GMM is preferred since Difference GMM has a weakness of magnifying gaps (Roodman, 2009). Moreover, system-GMM is more efficient than difference GMM since it uses a system of equations (both levels and first differences) which allows the former to use more instruments. Comparing one-step and two-step GMM estimators, Bond (2002) argues that, in the case of very small standard errors, one-step GMM outperforms its two-step counterpart. However, small-sample correction to the two-step covariance matrix developed by Windmeijer (2005) makes two-step GMM estimates more efficient compared to one-step GMM

[16] The essence of taking the partial derivatives of the interaction term model (with respect to CBL) is to enable us to calculate the marginal effect of CBL on NBFI across the range of bank-specific factors within CAMELS framework. The marginal effect is important because it shows whether a simultaneous increase (decrease) in both CBL and bank-specific variables can increase (decrease) NBFI assets.

(Roodman, 2009). Hence, while the asymptotic inference from the one-step standard errors is more reliable, the two-step estimator might provide asymptotically more efficient coefficient estimates. This paper, therefore, report both one-step and two-step system GMM results for robustness[17]. The consistency of the GMM estimator depends on the validity of the instruments matrix and the assumption of no residual autocorrelation. Hansen test of over-identifying restrictions is applied to check the validity of the instruments (Arellano and Bond, 1991). The null hypothesis of Hansen test should not be rejected in order to have all instruments jointly exogenous and not correlated with residuals (Arellano and Bover, 1995; Blundell and Bond, 1998). Secondly, for the autocorrelation test, the null hypothesis which states that there is no second-order serial correlation [AR (2)] in the disturbances should not be rejected (Arellano and Bond, 1991). Finally, in order to achieve a more reliable system GMM estimation, an updated Stata command introduced by Kripfganz (2019) is utilized .

[17] Moreover, to assess the robustness of our main findings, this study also re-estimates the models by excluding the Cayman Islands due to the high proportion of missing observations. Results confirm the conclusions derived from the baseline analysis and are available upon request.

Table 3.1: Variables' description

Variable	Definition	Obs.	Mean	SD	Min	Max	Source
NBFI	Natural logarithm of NBFI assets	535	6.887	2.194	0.009	11.259	FSB 2021 Dataset
CBL	Domestic credit to private sector by banks (% of GDP)	510	0.862	0.462	0.095	2.584	World Bank Group
Capital adequacy	Bank regulatory capital to risk-weighted assets (%)	496	0.155	0.034	0.025	0.309	Global Financial Development
Asset quality	Bank nonperforming loans to gross loans (%)	495	0.034	0.038	0.001	0.260	Global Financial Development
Management quality	Bank cost to income ratio (%)	517	0.580	0.177	0.194	2.371	Global Financial Development
Earnings	Bank net interest margin (%)	512	0.027	0.019	0.001	0.154	Global Financial Development
Liquidity	Liquid assets to deposits and short term funding (%)	492	0.359	0.222	0.067	1.453	Global Financial Development
Sensitivity to market risk	Bank credit to bank deposits (%)	491	1.011	0.475	0.165	3.223	Global Financial Development
Economic growth (GDP)	Natural logarithm of GDP (current US$)	540	6.448	1.661	1.242	9.973	World Bank Group
Capital regulatory index (CRI)	This index reveals the stringency of capital regarding the minimum level of capital and the strictness of regulations on components of this capital to understand the nature and sources of capital. This index can take values between 0 and 10, with tighter capital requirements indicated by higher values.	389	6.964	1.412	3	9	Barth et al. (2013) and author calculation

Table 3.2: Correlation matrix

	NBFI	CBL	Capital adequacy	Asset quality	Management quality	Earnings	Liquidity	Sensitivity to market risk	Economic growth	Capital regulatory index
NBFI	1.00									
CBL	0.51	1.00								
Capital adequacy	-0.17	-0.24	1.00							
Asset quality	-0.13	-0.20	0.11	1.00						
Management quality	0.25	0.04	0.01	0.05	1.00					
Earnings	-0.60	-0.60	0.16	0.06	-0.17	1.00				
Liquidity	0.08	-0.05	0.16	-0.04	0.28	-0.06	1.00			
Sensitivity to market risk	0.06	0.36	-0.39	0.07	-0.15	-0.10	-0.19	1.00		
Economic growth	0.50	0.26	-0.30	-0.06	0.09	-0.19	-0.14	0.34	1.00	
Capital regulatory index	-0.21	-0.24	0.28	0.02	-0.28	0.27	-0.01	-0.03	-0.08	1.00

3.4 Empirical Results

For the empirical analysis shown in Tables 3 and 4, the first objective of the paper is to examine the effect of commercial bank lending (CBL) on non-bank financial intermediation (NBFI). To get more reliable and consistent results, estimations are undertaken using fixed/random effects (static models) and one-step/two-step generalized method of moments (GMM) (dynamic models). Low correlation among variables indicates that findings are free from multicollinearity problems, as shown in Table 2. The estimations of random and fixed effects models are statistically significant at the 1% level as reported by the Wald test (χ^2) and F-statistic, respectively (see Table 3). Regarding dynamic models, Table 4 indicates that the reported Hansen test for over-identifying restrictions confirms the validity of instruments for both one and two-step system GMM. Moreover, the Arellano-Bond (AB) test results show the absence of second-order autocorrelation. In all specifications, lagged dependent variable is highly significant, confirming the dynamic character of our model specification. Overall, diagnostic tests reveal that the empirical model is correctly specified and consistently estimated.

The empirical analysis starts from the baseline regression model (column 1) and proceeds further with including interaction terms between CBL and each CAMELS parameter (column 2-7). To a large extent, static and dynamic estimates provide somewhat consistent results. As discussed above, estimation using a static model may have biased estimates due to potential endogeneity problems. As such, this paper relies more on dynamic panel results. Nevertheless, static panel results will give a preliminary understanding of the relationship between NBFI and other key variables. Regarding one and two-step system GMM estimations, mostly similar results are

evidenced which indicate robustness in terms of coefficient signs and their statistical significance.

As empirical results in tables 3.3 and 3.4 indicate, both static and dynamic panel estimates provide a positive relationship between CBL and NBFI assets indicating the NBFI sector can be viewed as a parallel system to mainstream banking in financing the economy (complementarity effect). This is in line with the findings of Acharya et al. (2013), Apostoaie and Bilan (2020), and Kim (2017). NBFI can complement commercial banking by enhancing credit access or by supporting maturity transformation, market liquidity, and risk-sharing. For instance, Ghosh et al. (2012) noted that in emerging markets and developing economies, microcredit lenders and finance companies often grant loans and investments. In advanced economies, various types of NBFI entities have been stepping in to provide long-term credit to the private sector (FSB, 2014). The complementarity mechanism may also work through the commercial banks' NBFI activities. That is, commercial banks with higher lending volume are more likely to engage in securitization, which in turn causes NBFI assets to expand. This is consistent with Affinito and Tagliaferri (2010) and Acharya et al. (2021) who found that banks with a larger share of loans are more likely to involve in securitization activities. Another potential complementarity mechanism is that, commercial banks may sponsor NBFI entities[18] through credit and liquidity lines (Adrian and Ashcraft, 2016). Therefore, higher traditional banking sector growth tends to experience higher growth of the NBFI sector.

[18] Such as conduits, asset-backed securities (ABS) issuers, or special investment vehicles (SIVs).

Regarding control variables, the crisis dummy has a negative and significant sign which means that NBFI activities have remained sluggish after GFC. The positive coefficient of economic growth confirms the "procycicality" hypothesis consistent with previous studies (Duca, 2016; Hodula et al., 2020). Moreover, the negative coefficient of the capital regulatory index supports the reverse "regulatory arbitrage" hypothesis. This result is surprising since its implication is inconsistent with the notion that, tighter bank capital regulations drive NBFI growth by creating regulatory arbitrage. Nevertheless, the intuition might be the following. Implementation of Basel III reform closed many loopholes (e.g. loan underwriting standards have been strengthened; information disclosure requirements have increased concerning securitization activities and off-balance-sheet vehicles) in capital requirements to prevent regulatory capital arbitrage. This discourages commercial banks from engaging in NBFI activities which prevents their contribution to NBFI assets. This finding is in line with Bannier and Hansen (2008) who found 'reverse' regulatory capital arbitrage for the European banks. However, it is worth mentioning that, results for control variables are not significant in all specifications.

Table 3.3: Static panel results (fixed effects)

	Baseline model	Capital adequacy	Asset quality	Management quality	Earnings	Liquidity	Sensitivity to market
CBL	0.43*** (0.08)	0.05 (0.24)	0.61*** (0.10)	0.57*** (0.17)	0.24*** (0.09)	0.44*** (0.14)	0.67*** (0.14)
Capital adequacy		2.29* (1.36)					
CBL x Capital adequacy		2.71** (1.26)					
Asset quality			7.97*** (1.40)				
CBL x Asset quality			-6.53*** (1.32)				
Management quality				0.54* (0.32)			
CBL x Management quality				-0.19 (0.29)			
Earnings					-1.38*** (0.76)		
CBL x Earnings					1.74*** (0.57)		
Liquidity						-0.31 (0.26)	
CBL x Liquidity						0.29 (0.26)	
Sensitivity to market risk							-0.92*** (0.18)
CBL x Sensitivity to market risk							0.19 (0.12)
Economic growth	1.44*** (0.05)	1.30*** (0.12)	1.45*** (0.05)	1.45*** (0.05)	1.59*** (0.05)	1.48*** (0.05)	1.37*** (0.04)
Capital regulatory index	0.02 (0.02)	0.01 (0.02)	-0.01 (0.02)	0.002 (0.02)	0.03* (0.02)	0.03 (0.02)	0.01 (0.02)
Global crisis	-0.05 (0.05)	0.04 (0.05)	-0.05 (0.05)	-0.04 (0.05)	0.001 (0.05)	-0.04 (0.05)	-0.03 (0.05)
Constant	-2.90*** (0.29)	-2.25*** (0.34)	-3.09*** (0.30)	-3.20*** (0.36)	-3.62*** (0.30)	-3.24*** (0.36)	-1.88*** (0.32)
Diagnostic Checking							
R-squared	0.42	0.45	0.45	0.44	0.48	0.42	0.46
F-statistics	340.2***	265.1***	224.1***	230.1***	261.9***	196.1***	252.9***
Number of countries	29	29	29	29	29	29	29
Number of observations	350	323	318	339	339	318	331

***, **, * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Table 3.4: Static panel results (random effects)

	Baseline model	Capital adequacy	Asset quality	Management quality	Earnings	Liquidity	Sensitivity to market
CBL	0.46***	0.10	0.64***	0.58***	0.30***	0.51***	0.70***
	(0.08)	(0.24)	(0.10)	(0.17)	(0.09)	(0.14)	(0.14)
Capital adequacy		2.55*					
		(1.37)					
CBL x Capital adequacy		2.59**					
		(1.27)					
Asset quality			7.85***				
			(1.42)				
CBL x Asset quality			-6.57***				
			(1.34)				
Management quality				0.51			
				(0.32)			
CBL x Management quality				-0.16			
				(0.30)			
Earnings					-1.14***		
					(0.83)		
CBL x Earnings					1.21***		
					(0.69)		
Liquidity						0.28	
						(0.27)	
CBL x Liquidity						0.28	
						(0.26)	
Sensitivity to market risk							-0.98***
							(0.18)
CBL x Sensitivity to market risk							0.19
							(0.12)
Economic growth	1.41***	1.27***	1.42***	1.41***	1.52***	1.43***	1.34***
	(0.04)	(0.44)	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)
Capital regulatory index	0.02	0.01	-0.001	0.004	0.03*	0.03	0.02
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Global crisis	-0.05	0.04	-0.05	-0.05	-0.01	-0.06	-0.04
	(0.05)	(0.05)	(0.05)	(0.05)	(0.02)	(0.05)	(0.05)
Constant	-2.95***	-2.38***	-3.09***	-3.19***	-3.46***	-3.12***	-1.88***
	(0.39)	(0.43)	(0.40)	(0.45)	(0.38)	(0.44)	(0.42)
Diagnostic Checking							
R-squared	0.43	0.45	0.45	0.45	0.48	0.43	0.47
F-statistics	133.3***	158.7***	131.1***	135.8***	145.5***	114.9***	151.6***
Number of countries	29	29	29	29	29	29	29
Number of observations	350	323	318	339	339	318	331

***, **, * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Table 3.5: Dynamic panel results (one-step system GMM)

	Baseline model	Capital adequacy	Asset quality	Management quality	Earnings	Liquidity	Sensitivity to market
NBFI t-1	0.91***	0.91***	0.89***	0.91***	0.84***	0.92***	0.81***
	(0.05)	(0.06)	(0.08)	(0.07)	(0.08)	(0.06)	(0.05)
CBL	0.07**	0.51**	0.15*	0.24	0.09	0.21	0.21***
	(0.34)	(0.23)	(0.08)	(0.24)	(0.17)	(0.21)	(0.04)
Capital adequacy		1.71					
		(1.52)					
CBL x Capital adequacy		-1.83					
		(1.57)					
Asset quality			2.85**				
			(1.36)				
CBL x Asset quality			-3.26***				
			(1.23)				
Management quality				0.21			
				(0.60)			
CBL x Management quality				-0.28			
				(0.53)			
Earnings					-2.98		
					(5.13)		
CBL x Earnings					1.87		
					(8.18)		
Liquidity						0.08	
						(0.30)	
CBL x Liquidity						-0.20	
						(0.32)	
Sensitivity to market risk							-0.01
							(0.08)
CBL x Sensitivity to market risk							-0.08*
							(0.04)
Economic growth	0.05	0.03	0.06	0.06	0.16	0.01	0.20**
	(0.12)	(0.12)	(0.19)	(0.16)	(0.17)	(0.13)	(0.10)
Capital regulatory index	-0.02	0.02	-0.08***	-0.02*	-0.02	-0.03**	-0.01
	(0.01)	(0.02)	(0.03)	(0.01)	(0.04)	(0.01)	(0.02)
Global crisis	-0.05*	-0.02	-0.14**	-0.07***	-0.07*	-0.07**	-0.03
	(0.02)	(0.03)	(0.06)	(0.03)	(0.04)	(0.03)	(0.04)
Constant	0.91***	0.91***	0.89***	0.91***	0.84***	0.92***	0.81***
	(0.05)	(0.06)	(0.08)	(0.07)	(0.08)	(0.06)	(0.05)
Diagnostic Checking							
Number of countries	29	29	29	29	29	29	29
Number of observations	340	313	308	329	329	308	322
AR(2) p-value	0.849	0.664	0.690	0.677	0.798	0.841	0.977
Hansen stat. p-value	0.142	0.694	0.492	0.140	0.295	0.153	0.300

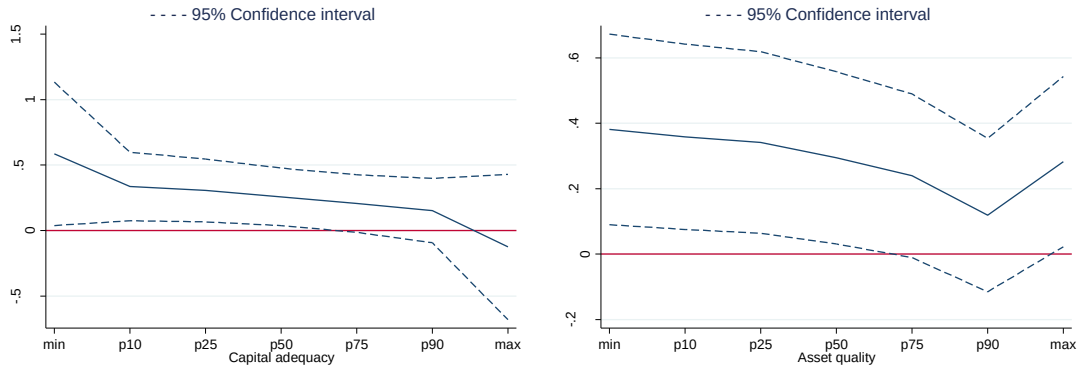
Figures in parenthesis are robust standard errors obtained by the Windmeijer WC-robust estimator. ***, **, * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Table 3.6: Dynamic panel results (two-step system GMM)

	Baseline model	Capital adequacy	Asset quality	Management quality	Earnings	Liquidity	Sensitivity to market risk
NBFI t-1	0.83***	0.87***	0.86***	0.91***	0.83***	0.93***	0.79***
	(0.41)	(0.05)	(0.07)	(0.09)	(0.05)	(0.08)	(0.03)
CBL	0.07**	0.65**	0.38***	0.35	0.002	0.55***	0.22***
	(0.31)	(0.32)	(0.15)	(0.36)	(0.14)	(0.19)	(0.04)
Capital adequacy		2.15					
		(1.93)					
CBL x Capital adequacy		-2.50					
		(1.82)					
Asset quality			2.76**				
			(1.15)				
CBL x Asset quality			-3.95***				
			(1.22)				
Management quality				0.42			
				(0.75)			
CBL x Management quality				-0.51			
				(0.74)			
Earnings					-2.21		
					(5.92)		
CBL x Earnings					-1.15		
					(9.07)		
Liquidity						0.59*	
						(0.32)	
CBL x Liquidity						-0.82**	
						(0.37)	
Sensitivity to market risk							-0.02
							(0.09)
CBL x Sensitivity to market risk							-0.07*
							(0.04)
Economic growth	0.22***	0.14	0.11	0.06	0.25***	0.01	0.24***
	(0.08)	(0.09)	(0.17)	(0.16)	(0.09)	(0.16)	(0.07)
Capital regulatory index	-0.02	0.02	-0.05	-0.02*	-0.02	-0.03	-0.01
	(0.01)	(0.02)	(0.03)	(0.01)	(0.02)	(0.03)	(0.01)
Global crisis	-0.05*	-0.01	-0.14***	-0.07***	-0.06***	0.01	-0.03
	(0.03)	(0.03)	(0.05)	(0.03)	(0.02)	(0.05)	(0.03)
Constant	0.83***	0.87***	0.86***	0.91***	0.83***	0.93***	0.79***
	(0.41)	(0.05)	(0.07)	(0.09)	(0.05)	(0.08)	(0.03)
Diagnostic Checking							
Number of countries	29	29	29	29	29	29	29
Number of observations	340	313	308	329	329	308	322
AR(2) p-value	0.982	0.609	0.990	0.735	0.849	0.638	0.997
Hansen stat. p-value	0.275	0.493	0.553	0.224	0.647	0.517	0.391

Figures in parenthesis are robust standard errors obtained by the Windmeijer WC-robust estimator. ***, **, * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

The second aim of this study is to investigate whether CBL-NBFI relation is influenced by bank-specific factors within the CAMELS framework. It is worth reminding that, in multiplicative interaction models, scholars must not interpret the constitutive elements of interaction terms as unconditional or average effects (Brambor et al., 2006). Moreover, their study noted that a researcher cannot infer correctly whether a variable (X) has a meaningful conditional effect on the dependent variable (Y) from the sign and statistical significance of the coefficient of the interaction term (Brambor et al., 2006). In other words, the only inference that can be drawn from the traditional results table is whether CBL has a significant effect on NBFI for the unique case where each CAMELS parameter equals zero. However, this is not the case in real-world situations. Hence for interpretation, as suggested by Brambor et al. (2006), this paper uses a graphical illustration to explain the marginal effect of CBL on NBFI across the range of bank-specific factors within the CAMELS approach. Several important patterns emerged. Regarding capital adequacy, the positive marginal impact of CBL on NBFI declines as commercial banks' capital adequacy level increases, as shown in Figure 3.1 (a). This indicates that a strong capital position is associated with less lending ("financial fragility - crowding out" hypothesis) which in turn weakens complementarity between two sectors. However, the impact is not significant above the 75 percentile. A similar pattern is documented for asset quality, as demonstrated in Figure 3.1 (b). Findings reveal that the complementary effect between commercial banking and the NBFI sector is mitigated when commercial banks' asset quality deteriorates. The possible reason for this relationship is that a higher level of credit risk is expected to reduce commercial banks' lending volume (Naceur et al., 2018; Adesina, 2019), which in turn negatively affects the CBL-NBFI nexus.

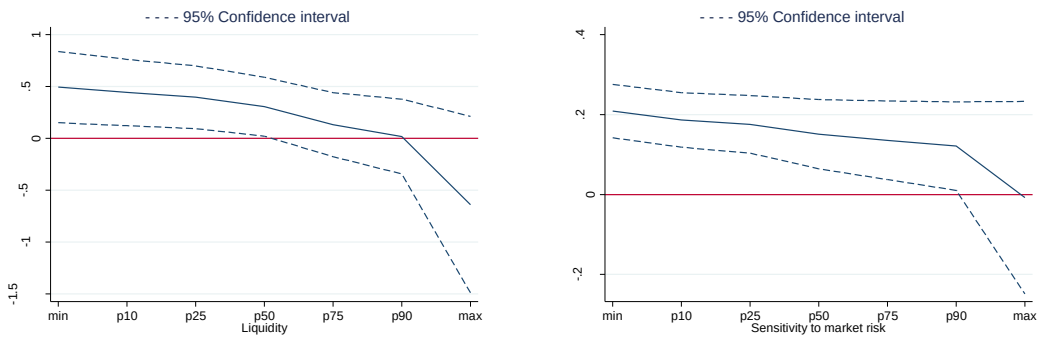


(a) (b)

Figure 3.2: The average marginal effect of CBL on NBFI, conditional on capital adequacy (a) and asset quality (b) based on models (2) and (3), respectively. Note: The solid line is the marginal effect and the dotted lines show the 95% confidence interval.

Further, the results show that another significant bank-specific factor behind the CBL-NBFI nexus is liquidity which also has a negative impact (Figure 3.2 (a)). This confirms the findings by Cornett et al. (2011) who suggested that banks use their increased liquidity positions to protect them from liquidity risk in times of high stress rather than investing in new lending opportunities. Following less lending volume, complementarity between mainstream banking and NBFI sectors weakens. Nevertheless, above 50 percentile this negative impact is not significant. Finally, sensitivity to market risk is another significant factor behind the CBL-NBFI relationship (Figure 3.2 (b)). Looking at the conditional relationship graphically, the marginal effect of the CBL on NBFI is negative and statistically significant, suggesting that complementarity between CBL and NBFI is mitigated with the increase in commercial banks' market risk exposure. On the other hand, for management quality and earnings, the marginal effect of CBL on NBFI is insignificant, implying they don't have any moderating role in the CBL-NBFI nexus[19].

[19] Graphs for marginal effect are available upon request.



(a) (b)

Figure 3.3: The average marginal effect of CBL on NBFI, conditional on liquidity (panel A) and sensitivity to market risk (panel B) based on models (6) and (7), respectively. Note: The solid line is the marginal effect and the dotted lines show the 95% confidence interval.

3.5 Conclusion

Using annual data spanning 2002–2020, the current study aims to empirically assess the CBL-NBFI nexus and constitutes an initial attempt to examine whether bank-specific factors within the CAMELS approach moderate this nexus for the sample of 29 countries. Economic growth, capital regulatory index, and crisis dummy are included to control for the "procyclicality" hypothesis, "regulatory arbitrage" hypothesis, and GFC, respectively. Both static (fixed effects and random effects) and dynamic panel (one-step and two-step system GMM) estimation models are employed. Moreover, to achieve a more reliable system GMM estimation, the Stata command "xtdpdgmm" introduced by Kripfganz (2019) is utilized instead of "xtabond2".

Both static and dynamic panel estimations confirmed complementarity between traditional banking and NBFI sectors. As regards CAMELS parameters, the empirical analysis calls for the need to keep an eye on bank capital adequacy, asset quality, liquidity, and sensitivity to market risk since they significantly affect the CBL-NBFI nexus. Findings revealed that strong capital position, poor asset quality, higher

liquidity position, and high exposure to market risk seem to mitigate the complementarity between traditional banking and NBFI sectors during the study period. Moreover, empirical results for control variables indicated "procyclicality" and reverse "regulatory arbitrage" hypotheses for the NBFI sector. However, results for control variables are not significant for all specifications.

These findings have several implications for the bank managers, policymakers, and regulatory bodies. The above results are of practical relevance as commercial banks' capital adequacy, asset quality, liquidity, and sensitivity to market risk play a crucial role in the link between mainstream banking and NBFI sectors. Commercial bank managers should consider their decisions on these variables since they can affect the relationship between banks and NBFI entities. For example, if the target is to increase capital adequacy, this may associate with lower lending volume, weaker complementarity between two sectors, and lower securitization activities. For the regulators and policymakers, findings suggest that to eliminate the potential risks that the NBFI sector may pose to financial stability, authorities should carefully design the capital and liquidity requirements for commercial banks, since traditional banking growth is associated with increased NBFI assets. In turn, due to the lack of regulations on them and interconnectedness with other financial institutions, the over-heated NBFI sector may incite widespread panic and contagion in financial markets, causing significant negative spillover to the rest of the economy. Alternatively, with proper regulation and market discipline, NBFI can help to address the funding constraints which may boost financial and economic development.

Several issues merit further research. First, further studies can explore the nexus between CBL and NBFI, as well as, the moderation impact of CAMELS parameters

on this nexus using disaggregated data. Particularly, this study primarily considers a broad NBFI measure, thus leaving a scope of research to consider and include individual entities of NBFI, such as money market funds, structured investment vehicles (SIV), and investment funds. Moreover, using the quantile regression approach to examine whether the abovementioned relationship holds over the different quantiles of NBFI remains an area of future research.

Chapter 4

CONCLUSION

Considering the importance of the shadow banking for the stability of financial system and overall economy, the primary aim of this thesis is to examine the moderating role of bank-specific factors on commercial bank lending-shadow banking nexus. Therefore, investigating this nexus will aid policymakers and commercial bank executives in better understand the determining factors that influence the shadow banking assets.

The significance of bank risks and profitability implications on the commercial bank lending-shadow banking nexus in emerging economies (EMEs) was discussed in Chapter 2. In EMEs, our empirical findings show that shadow banks serve as both alternatives and complements to traditional banks. In the BL-SB nexus, credit risk, capital risk, and profitability all have a key moderating influence. In other words, banks with lesser profitability, more credit risk, and smaller capitalization may allow shadow banking firms to gain market share. Shadow banks, in turn, may trigger widespread panic and contagion in financial markets, generating significant negative spillover to the rest of the economy due to their lack of regulation and interconnectivity with the financial sector. Hence risks incurred by this segment of financial sector should be carefully monitored, managed, and mitigated in EMEs. Moreover, findings imply that high institutional demand and lower restrictions on bank activities cause shadow banking expansion. Inferences of this results will facilitate policymakers and

regulators to consider/be aware of the type of shadow banking measures when adopting any regulatory policy as they may provide different outcomes.

Chapter 3 Using annual data spanning 2002–2020, the current study aims to empirically assess the CBL-NBFI nexus and constitutes an initial attempt to examine whether bank-specific factors within the CAMELS approach moderate this nexus for the sample of 29 countries. Economic growth, capital regulatory index, and crisis dummy are included to control for the “procyclicality” hypothesis, “regulatory arbitrage” hypothesis, and GFC, respectively. Both static (fixed effects and random effects) and dynamic panel (one-step and two-step system GMM) estimation models are employed. Moreover, to achieve a more reliable system GMM estimation, an updated Stata command introduced by Kripfganz (2019) is utilized.

Traditional banking and NBFI sectors are complementary, according to both static and dynamic panel estimations. In terms of CAMELS parameters, the empirical research suggests that bank capital adequacy, asset quality, liquidity, and market risk sensitivity should all be monitored because they have a major impact on the CBL-NBFI nexus. During the study period, strong capital position, low asset quality, stronger liquidity position, and significant market risk exposure found to mitigate complementarity between traditional banking and NBFI sectors. Furthermore, the NBFI sector's "procyclicality" and reverse "regulatory arbitrage" hypotheses were supported by empirical results for control variables. For all specifications, however, the results for control variables are not significant.

These findings have a number of implications for bank executives, legislators, and regulators. The following findings are important in practice since commercial banks'

capital adequacy, asset quality, liquidity, and market risk sensitivity all play a role in the relationship between mainstream banking and NBFIs. Commercial bank executives should think about these factors when making decisions since they can alter the relationship between banks and NBFIs. If the goal is to strengthen capital adequacy, for example, this may be associated with reduced lending volume, less sector complementarity, and fewer securitization operations. The findings show that, in order to reduce the potential risks that the NBFI sector poses to financial stability, regulators and policymakers should carefully set capital and liquidity criteria for the industry. In turn, due to the lack of regulations on them and interconnectedness with other financial institutions, the over-heated NBFI sector may incite widespread panic and contagion in financial markets, causing significant negative spillover to the rest of the economy. Alternatively, with proper regulation and market discipline, NBFI can help to address the funding constraints which may boost financial and economic development.

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