Bank Credit and Shadow Banking: The Roles of International Capital Flows and The Development Level of Domestic Financial Institutions

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A mi familia

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Abbreviations

ABCP	Asset-backed Commercial Paper
ABS	Asset-Backed Securities
BIS	Bank of International Settlements
BOP	Balance of Payment
CAB	Current Account Balance
CDOs	Collateralized Debt Obligations
CGFS	Committee on the Global Financial System
EMEs	Emerging Market Economies
EU	European Union
FCIC	Federal Crop Insurance Corporation
FDI	Foreign Direct Investment
FE	Fixed Effect
FSB	Financial Stability Board
GDP	Gross Domestic Product
GFC	Global Financial Crisis
GMM	General Method of Moments
IDR	Indonesian Rupiah
IFS	International Financial Statistics
IMF	International Monetary Fund
LPFCs	Limited-purpose Finance Companies
MMFs	Money Market Funds
MTNs	Medium-term Notes
NBFIs	Non-bank Financial Institutions
NC1	Non-core 1
NC2	Non-core 2
NPLs	Non-performing Loans
OFIs	Other Financial Intermediaries

repos	Repurchase agreements
SIVs	Structured Investment Vehicles
SPV	Special Purpose Vehicle
SVAR	Structural Vector Autoregression
UK	United Kingdom
U.S.	United States
USD	United States Dollar
VIX	Volatility Index
WDI	World Development Indicators

ABSTRACT

This doctoral thesis comprises four independent empirical studies investigating how international capital flows and the development level of domestic financial institutions influence bank credit and shadow banking. The effects of both international factors and domestic institutional factors are analyzed in various countries.

While previous studies of bank credit and shadow banking focus only on particular factors, that is either external or internal, this study provides a novel contribution by investigating the effects of both external and internal factors. This study seeks to enrich the literature in several ways. First, it explores the internal and external factors that influence the level of domestic bank credit in developing countries. Second, this research analyzes the determinant factors, both external and internal, of the level of shadow banking assets in developed and developing countries.

The main objective of this study is to provide macro-level analysis of factors influencing banking credit and shadow banking in various countries. This doctoral thesis is organized into seven chapters. Chapter 1 provides a general introduction to the subject and sets out the aims of the research. Chapter 2 presents a conceptual review on bank credit and shadow banking. Chapters 3 to 6 present the four distinct empirical studies, each of which addresses an aspect of the research topic (see below). The study scope becomes narrower after each stage. Finally, Chapter 7 presents conclusions and future research.

Chapter 3 examines the effects of international capital flows (a key external supply factor) and domestic financial institution development on the level of domestic credit in 74 developing countries between 2005 and 2017. Through dynamic panel data estimation, the study in this chapter yields three main findings. First, domestic credit in developing countries is closely associated with international capital inflows to the banking sector but harmed by rising foreign capital inflows to other financial institutions. Second, domestic financial institution development is essential for increasing domestic credit in developing countries. Third, an increase in international capital inflows to the banking sector will stimulate the level of domestic credit under less-developed domestic financial institutions.

Chapter 4 examines the separate and combined effects of cross-border capital inflows and domestic financial institution development on the level of shadow banking assets. Using a panel dataset of 23 countries over the period 2005–2017, three indicators of domestic financial institution development (depth, access, and efficiency) are tested while controlling for their interaction with two types of cross-border debt inflows (to banks and to other sectors). The study in this chapter yields three main findings. First, cross-border debt inflows to banks harm the level of shadow banking assets. Second, the development of domestic financial institutions forms the foundation of the shadow banking system. Third, the development level of domestic financial institutions largely determines whether cross-border debt inflows will impact the level of shadow banking assets.

Chapter 5 explores how US bank claims and European bank claims on emerging market economies (EMEs) relate to the level of shadow banking assets in 11 major EMEs over the 18-year period spanning 2002–2019. Using a fixed-effects panel model, the study in this chapter finds that cross-border bank flows from US banks and European banks have different effects on the level of shadow banking assets in EMEs. Specifically, the impact is significantly positive for US bank claims but significantly negative for European bank claims.

Chapter 6 analyzes the impact of exchange rate shock on non-core bank liabilities in Indonesia. This study employs the impulse response function in a vector autoregressive model, which is applied to quarterly data for the period 1990Q1–2020Q4. The study in this chapter yields two important findings. In the short run, there is a significant positive relationship between exchange rate shock and the ratio of non-core liabilities to core liabilities in Indonesia. In the long run, however, this relationship becomes significantly negative. These results indicate that non-core bank liabilities serve as an indicator of financial procyclicality. In open EMEs (including Indonesia), a major portion of non-core bank liabilities are foreign exchange-denominated, often short-term. Consequently, domestic currency depreciation impacts on capital outflows through the contraction of banking sector debt, resulting in a sharp reduction in non-core bank liabilities.

CHAPTER 1: GENERAL INTRODUCTION

The financial system is an essential component of a country's economy, providing financial intermediation services. It consists of institutional units and markets that interact with one another (IMF, 2004). Moreover, a financial system includes all financial relations between different actors engaged in the formation, distribution, and use of financial resources (Simion, Stanciu, and Armăşelu, 2015). The system primarily serves to mobilize savings and allocate credit across space and time. It provides not only payment services but also other services enabling households and firms to minimize the risk of economic uncertainties by hedging, pooling, sharing, and pricing risks.

Development of the financial system is the biggest challenge for most developing countries. Previous studies show that the development levels of a country and its financial system are closely related. Countries with well-developed financial systems tend to enjoy a sustained period of social and economic growth. On the one hand, a well-developed financial system enables better access to financial services for a country’s firms and households by providing risk management, reducing their vulnerability to shocks, and raising investment and productivity that generates higher income. On the other hand, poverty and inequality are reduced by providing access to various financial services for the poor and marginalized groups. At this point, financial system development is both a result and a driver of economic growth (Levine, Loayza, and Beck, 2000).

In recent decades, the global financial system has experienced extraordinarily rapid development, resulting in the emergence of various financial instruments and

increasingly connected systems. Rising interconnectedness in the global financial system has also given rise to the phenomenon of financial globalization, characterized by increasing integration of capital markets and international financial transactions. This trend can be seen in the rapid accumulation of external assets and liabilities by countries across the world since the early 1990s (IMF, 2004). Hence, to achieve sustainable development of its financial system, a country must strengthen all aspects of each system component.

The consequences of financial globalization also include new challenges and risks associated with exposure to financial market uncertainties. As demonstrated by the global financial crisis of 2007/2008 and Eurozone sovereign debt crisis of 2010, many countries have become more vulnerable to external shocks, which exert a significant impact on the domestic economy and volatility of capital flows. In light of this challenge, a country must consider not only domestic factors but also external factors when designing policies to achieve sustainable development of the financial system.

Previous studies highlight that the banking sector plays a key role in the early stages of financial system development. It facilitates the flow of funds in the economy and ensures the efficient allocation of financial resources toward promoting economic development and growth. By providing credit to firms and households, the banking sector plays an essential role in promoting investment and consumption (Samargandi and Kutan, 2016). Furthermore, bank credit was a significant early warning indicator for the global financial crisis of 2007/2008 (Gourinchas and Obstfeld, 2012; Jordá, Schularick, and Taylor, 2011, 2016; Lane and McQuade, 2014). When there is a sharp reduction in the

level of domestic credit, this causes economic activity to slow, in turn distorting financial stability, especially in developing economies (Gozgor, 2018).

Besides the banking sector, one of the most important issues in the contemporary financial economics literature is the rise of shadow banks. Recent studies have shown that the shadow banking system was the main cause of the global financial crisis of 2007/2008 (Aftab and Varotto, 2019; Bengtsson, 2013; Huang, 2018; Yang et al., 2019). Shadow banking is a universal phenomenon, although it takes different forms. The composition of shadow banking activities varies across jurisdictions. In developed countries, shadow banking activities are relatively complex and involve various financial institutions with complicated mechanisms. Moreover, much like traditional banks, shadow banking also provides maturity and liquidity transformation (Pozsar, Adrian, Ashcraft, and Boesky, 2012). In developing economies, by contrast, shadow banking activities are relatively simple. Shadow banks provide important sources of alternative funding that cannot be covered by traditional banks, as well as supporting the real economy. However, in both structures (developing and developed countries), shadow banking operates outside the regular banking system and undertakes financial intermediation activities with less transparency and regulation compared to conventional banking (Gandhi, 2014). Shadow banks also lack both direct and indirect public sources of liquidity and safety nets to cover their activities. Consequently, they are inherently vulnerable to economic shocks.

This doctoral thesis focuses on bank credit and shadow banking. To disentangle the issues, this doctoral thesis reports four independent empirical studies using several applied econometric methods to investigate the roles of international capital flows and

the development level of domestic financial institutions. In particular, the empirical studies in this doctoral thesis aim to analyze the determinant factors of bank credit and shadow banking in various countries, focusing especially on developing economies and the Indonesian banking sector. While previous studies focus only on particular factors, that is either external or internal, this doctoral thesis provides a novel analysis of the level of bank credit and shadow banking by combining both external and internal factors.

This doctoral thesis provides three contributions to the literature. First, no prior study has examined the effects of internal macroeconomic indicators, domestic financial institutions, and external financial supply factors on domestic credit expansion in developing countries. Second, this is the first study to analyze both internal and external determinants of the level of shadow banking. Moreover, the study in this doctoral thesis also considers various types of cross-border capital inflows to gain deeper insights into shadow banking activities in both developed and EMEs. Third, this study provides novel empirical evidence of the process through which a domestic financial shock is transmitted to the banking sector through non-core liabilities, drawing on the experience of Indonesia, a large emerging economy in Asia.

This doctoral thesis reports four independent empirical studies in Chapters 3 to 6, respectively. Each chapter presents separate analyses, but all focus on the main research topic. The research scope becomes narrower after each study. The contents of each chapter are introduced below.

Chapter 3 presents an empirical analysis of the effects of international capital flows (a key external supply factor) and domestic financial institution development on the level of domestic credit in 74 developing countries between 2005 and 2017. Using a novel dataset of international debt inflows by borrower type, this study measures the associations with domestic credit. Through dynamic panel data estimation, this study yields three main findings. First, domestic credit in developing countries is closely associated with international capital inflows to the banking sector but harmed by rising foreign capital inflows to other financial institutions. Second, domestic financial institution development is essential for increasing domestic credit in developing countries. Third, an increase in international capital inflows to the banking sector will stimulate the level of domestic credit under less-developed domestic financial institutions.

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Chapter 6 analyzes the impact of exchange rate shock on non-core bank liabilities in Indonesia. This study adopts a structural vector autoregressive model with sign restrictions to illustrate the immediate responses of specific variables to structural shock and applies this model to quarterly data for the period 1990Q1–2020Q4. The results provide robust evidence that exchange rate shock has a negative impact on the ratio of non-core liabilities to core liabilities in Indonesian banks. Moreover, the results confirm that currency depreciation has contractionary effects on Indonesia's output.

Overall, this doctoral thesis contributes to the literature of financial economics, financial institution development, international finance, bank credit, and shadow banking. The findings are expected to have important implications for policymakers in both developed and developing countries, highlighting the important roles of domestic financial institutions and cross-border capital inflows for banking credit and shadow banking. Moreover, policymakers in developed and developing countries should pay attention to the trends in shadow banking growth and be aware of the determinant factors, both external and internal, to ensure that this sector operates safely and sustainably. Considering the nature of shadow banking, which involves long chains and multiple

counterparties with unclear financial obligations, policymakers should improve the quality of their regulation of this sector.

CHAPTER 2: A CONCEPTUAL REVIEW ON BANK CREDIT AND SHADOW BANKING

2.1 Bank credit

2.1.1 Bank and the financial intermediary activity

Banks are essential in the economy by mobilizing and allocating savings. In general, a bank is a subset of financial intermediaries. That is, the bank secures funds from surplus spending units and transmits them to deficit spending units. Therefore, banks are important in directing funds where they are most needed efficiently and have direct implications on capital allocation, industrial expansion, and economic growth (Berger et al., 2003; Levine 1997). In particular, the specific assets purchased by banks may differ from those of other intermediaries. Banks are distinguished from other financial intermediaries because the bank can collect one source of funds, demand deposits, without the payment of explicit interest.

Three dominant theories explain the role and function of banks: the financial intermediation theory, the fractional reserve theory, and the credit creation theory of banking. Werner (2014) states that during particular periods of the 20th century, one of three distinct and mutually exclusive theories of banking has been dominant.

The financial intermediation theory (the most dominant theory today) states that banks are merely financial intermediaries and not different from other non-bank financial institutions (NBFIs). In other words, banks collect deposits and lend these out (Figure. 2.1). In their financial intermediary activity, banks create liquidity by borrowing short

and lending long (Dewatripont, Rochet & Tirole,2010). That means that banks borrow from depositors with short-term maturities and lend to borrowers at longer-term maturities (Werner, 2016).

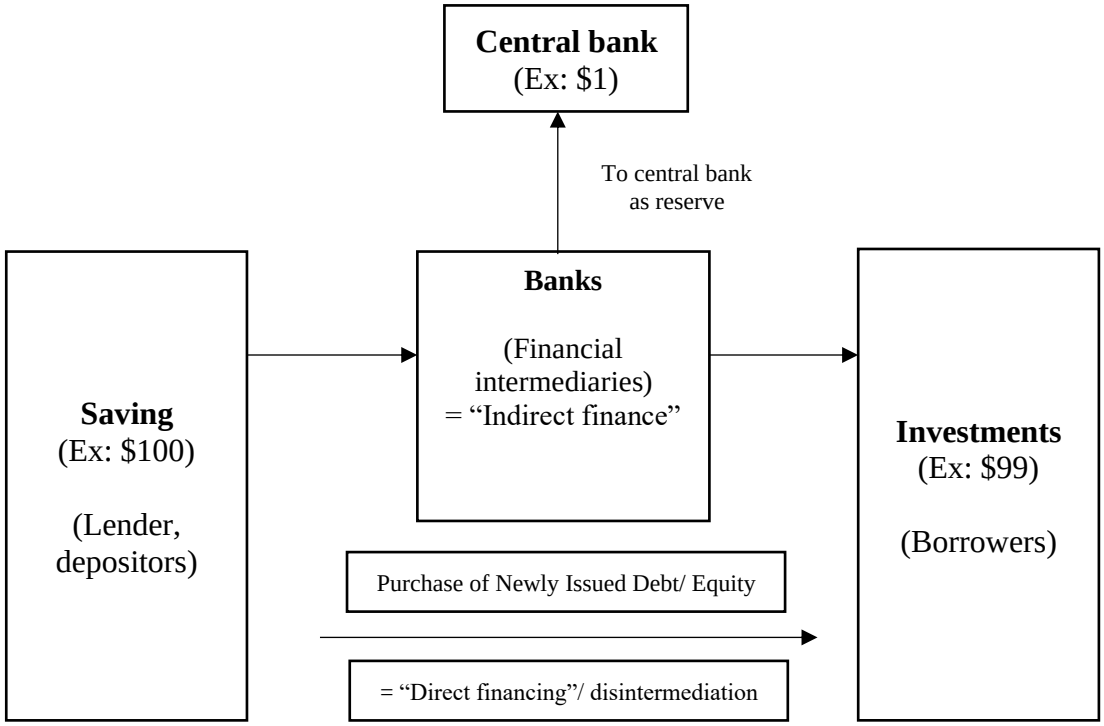

Figure 2.1. The financial intermediation theory of banking.
Source: Werner (2005).

The fractional reserve theory argues that each bank is a financial intermediary. However, it disagrees with the financial intermediation theory concerning the collective, macroeconomic role of banks: this theory argues that, together, the banking system creates money, through the process of 'multiple deposit expansion' (Werner, 2016). The oldest one, the credit creation theory of banking, states that each bank can individually create credit and money 'out of nothing' by performing accounting operations, and does

so when providing a loan. In other words, banks do not require to first gather deposits or reserves to perform a lending activity (Werner, 2016).

In the financial intermediary activity, a financial intermediary institution has to borrow from somebody in order to lend, even though lenders are different. In this case, retail banks mostly borrow from households and firms while investment banks mostly borrow from large enterprises and other financial institutions. This theory of the nature of banks is that currently dominant and can be traced at least to Tobin's pioneering work in the 1960s (Tobin, 1963).

Bossone (2000) illustrates the role of the banking sector in the intermediary activity by using the revisited circuit approach. This approach assumes that the economy consists of four sectors: firms, households, the banking sector (including the central bank and commercial banks), and nonbank financial intermediaries Bossone (2000). Besides, this approach also illustrates that the economic activity is represented as a one-period circuit process with a three-stage of sequence: a beginning phase (circuit-start), an interim interval, and an ending phase (circuit-end). Furthermore, two commodities are produced in the economy for household consumption and capital investment from enterprises. The sequential stages of the circuit process and the associated flow of funds are represented in Figure 2.2.

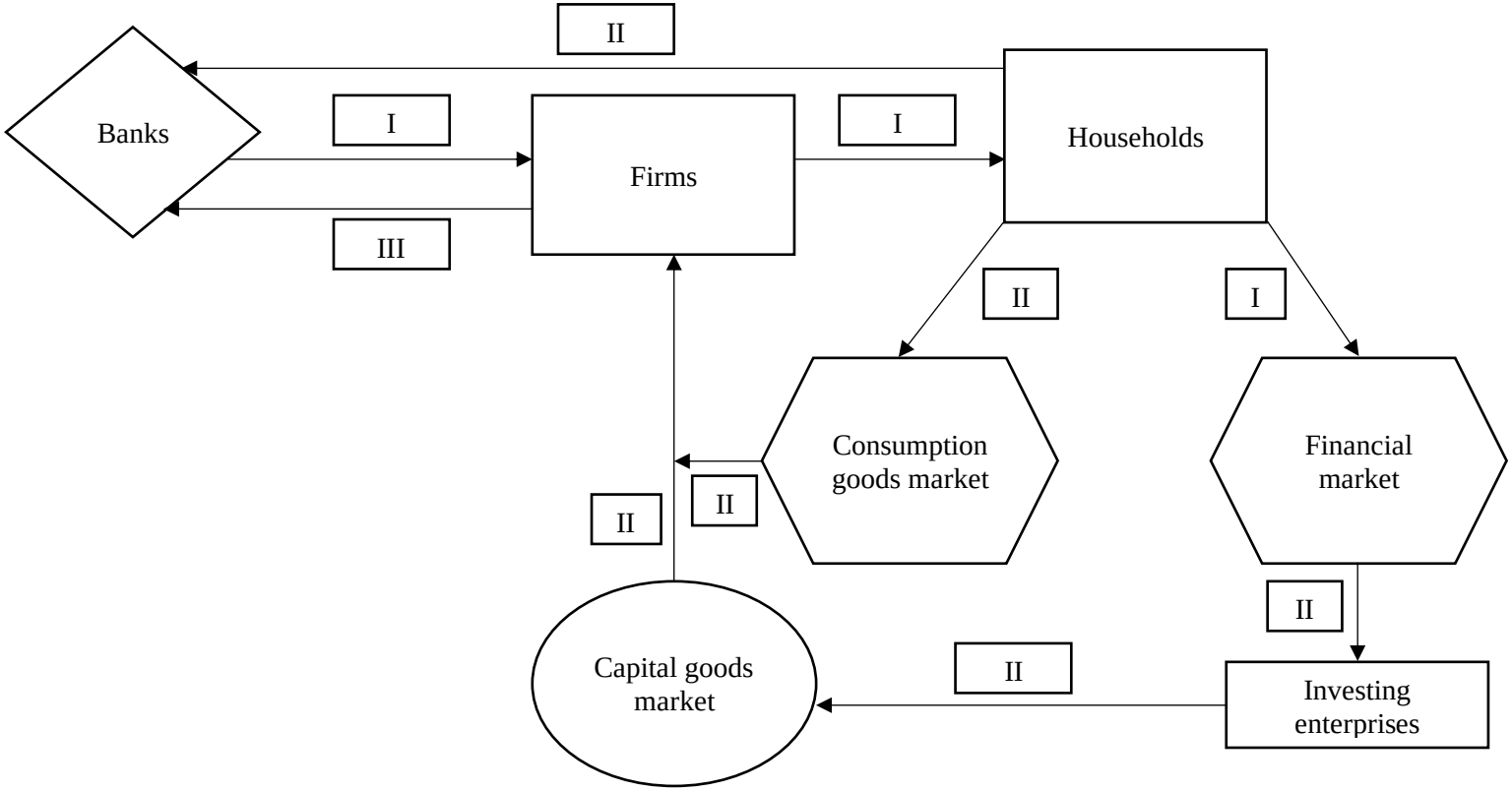

Figure 2.2. The role of banks in the financial intermediation activity.

Sources: Bossone (2000).

In a beginning phase (I), banks select selected firms by screening borrowers firms based on the basis of their risk and efficiency. In this step, banks also negotiate with the selected firns the terms and conditions for one-period loans. The banks lend the negotiated loan amounts and send funds to the firms' deposit accounts. The loans are used by firms to perform goods produced using capital and labor, and use loans to pay wages to workers. Wages in the form of deposits are transferred from the firm's bank accounts to the workers' (wage earners) accounts. In the interim interval (II), household incomes are spent on consumption goods, and/or saved. The saved incomes go into banks through demand deposits and/or go into long-term assets through financial intermediaries in the financial markets. Besides, firms who willing to increase their stock of capital (investing enterprises) can also issue long-term securities in the financial market. Last, ending phase (III), the firms use their revenues from output sales to pay off their bank debt plus interest and the money originally created is destroyed.

The model provided by Bossone (2000) clearly explains the role of the banking sector in the financial intermediary activity. In the process, banks allow the financial intermediary process to start by providing short-term loans to firms to finance production. Banks adopt technology and information to screen and evaluate the risk of borrowers and use incentives to ensure loan repayments. The supply of loans to firms is positive in the loan interest rate and negative in the firms' risk of default anticipated by the banks. The loan interest rate is negotiated between the bank and the firm. Banks increase lending to the point

where the marginal return from lending equals the marginal default risk. The volume of credit to firms determines the number of inputs that firms can purchase in the factors market. Last, banks receive debt payments from the borrowers.

2.1.2 The role of bank credit on the economy

Bank credit refers to the credit extended by banks to borrowers (Phillips, 1931). Bank credit is defined as the aggregate amount of credit/funds provided by commercial banks to individuals (households), firms, and the government. In particular, individuals or households obtain bank credit for both consumption and investment purposes, firms borrow loans to finance investment or working capital, whereas government borrows loans to spend for recurrent as well as capital purposes (Timsina, 2014). On the one hand, bank credit provides funds for production, consumption, and capital formation, which further stimulates economic growth. On the other hand, economic growth may encourage credit expansion through its demand for financial services.

The relationship between bank credit and economic growth has been an extensive subject of empirical research in both developed and developing countries since the development of the innovation theory of Schumpeter in 1911 (Werner, 2016). The idea of creative destruction by innovations and the notion that bank credit is a decisive prerequisite for pioneering entrepreneurs to finance innovational investment activities are key pillars of Schumpeter's Theory of Economic Development (Legrand and Hagemann, 2015). However,

the expansion of domestic bank credit supply can be interpreted as either positive or negative indicators for the domestic economy. On the one hand, a number of works of literature state that bank credit growth can be interpreted as better macroeconomic conditions and long-run economic growth (Arena et al., 2015; Levine, 1997). The growth of the bank credit can also show the strengthening of financial depth and access, especially in the countries with the shallow financial market (Arena et al., 2015; Levine, 1997). On the other hand, the rapid credit expansion or credit booms may be an indicator of increasing credit risks, asset price bubble, and financial and banking crisis (Arena et al., 2015; Kim, 2016).

Bank credit supply expansions are also closely connected with the business cycles. Mian, Sufi, and Verner (2020) outline two potential channels that connect bank credit supply expansions and business cycles. First, bank credit expansion may allow constrained enterprises to borrow and grow and hence, will increase the economy's productive capacity. Second, bank credit expansion may allow households to borrow and consume more. This condition can increase the overall household demand (Mian, Sufi, and Verner, 2020). The distinction between the two channels is important because the macroeconomic implications may be different based on whether credit expansion increases household demand or productive capacity (Mian, Sufi, and Verner, 2020). For example, researchers have emphasized that an increase in household debt is related to an increase in the risk of the financial crisis and a slow-down in growth (Jordà, Schularick, and Taylor, 2014; Mian, Sufi, and Verner, 2020). Furthermore, at the business-cycle frequency, shock in the credit market

supply often results in sharp output contractions. Claus (2007) also explains how disruption in the credit market influences economic activity. Claus (2007) states that there are two main potential channels connecting the credit market shock and economic activity. The first is the bank lending channel. This channel explains that when there is a shock to the economy can influence financial intermediaries' willingness to provide loans. The second channel is the balance sheet channel. This channel focuses on the potential impact of shocks on firms' financial positions and their ability to borrow (Claus, 2007).

The equilibrium level of credit in the economy also reflects the condition of the financial system. On the one hand, when the level of credit is low, high dynamics of credit might reflect an adjustment to the equilibrium. On the other hand, when the level of credit is high, even a one-digit growth rate of credit may be considered excessive. Therefore, deviations of credit from its equilibrium might have an impact on the increase of macroeconomic imbalances, e.g. rising inflation, asset bubbles, inefficient booms, and bursts or instability of the financial system (Rubaszek and Serwa, 2012). In this case, the macroeconomic imbalance caused by excessive credit supply usually hits banks back by deteriorating their assets. This condition, in turn, may even cause a banking crisis.

2.1.3 Bank credit and international capital inflows

As a financial intermediary, banks have an essential role in both developed and developing countries. In their activity, banks must collect funds in order to lend to their borrowers. In

the ordinary case, the retail deposit of the household sector is the main source of funding available to the bank. However, when credit is growing faster than the pool of available retail deposits, the bank will turn to other sources of funding to support its credit growth (Hahm, Shin, and Shin, 2012). In this case, there are two possibilities for domestic banks: first, the growth of bank lending results in greater lending and borrowing between the intermediaries themselves (Figure 2.3); second, the sucking in of foreign debt (Figure 2.4).

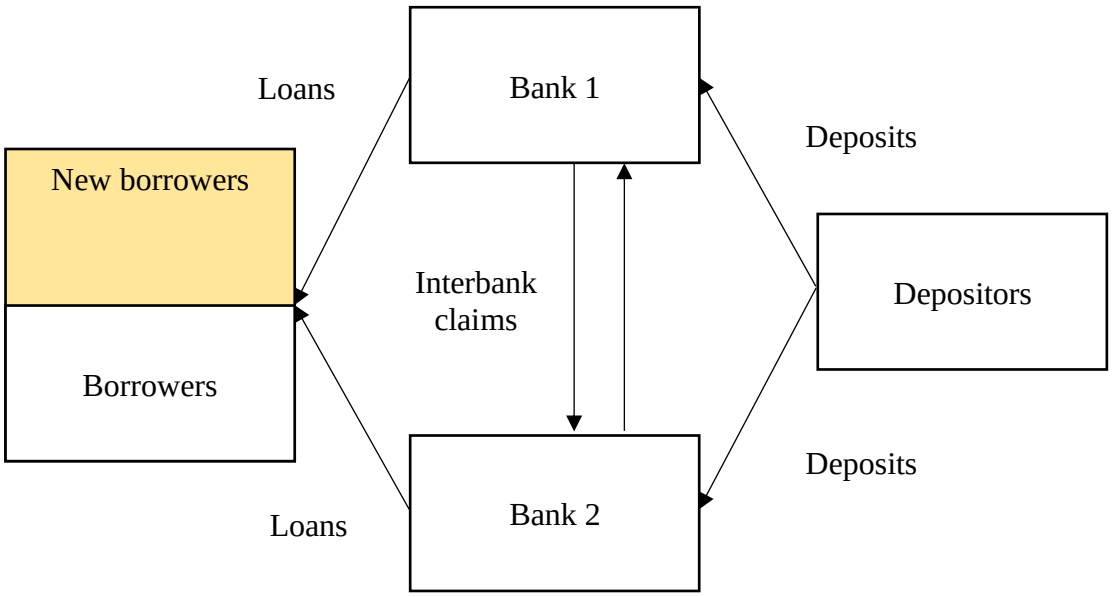

Figure 2.3. A stylized financial system with two banks – Bank 1 and Bank 2 (without foreign creditors).
Source: Shin and Shin (2011).

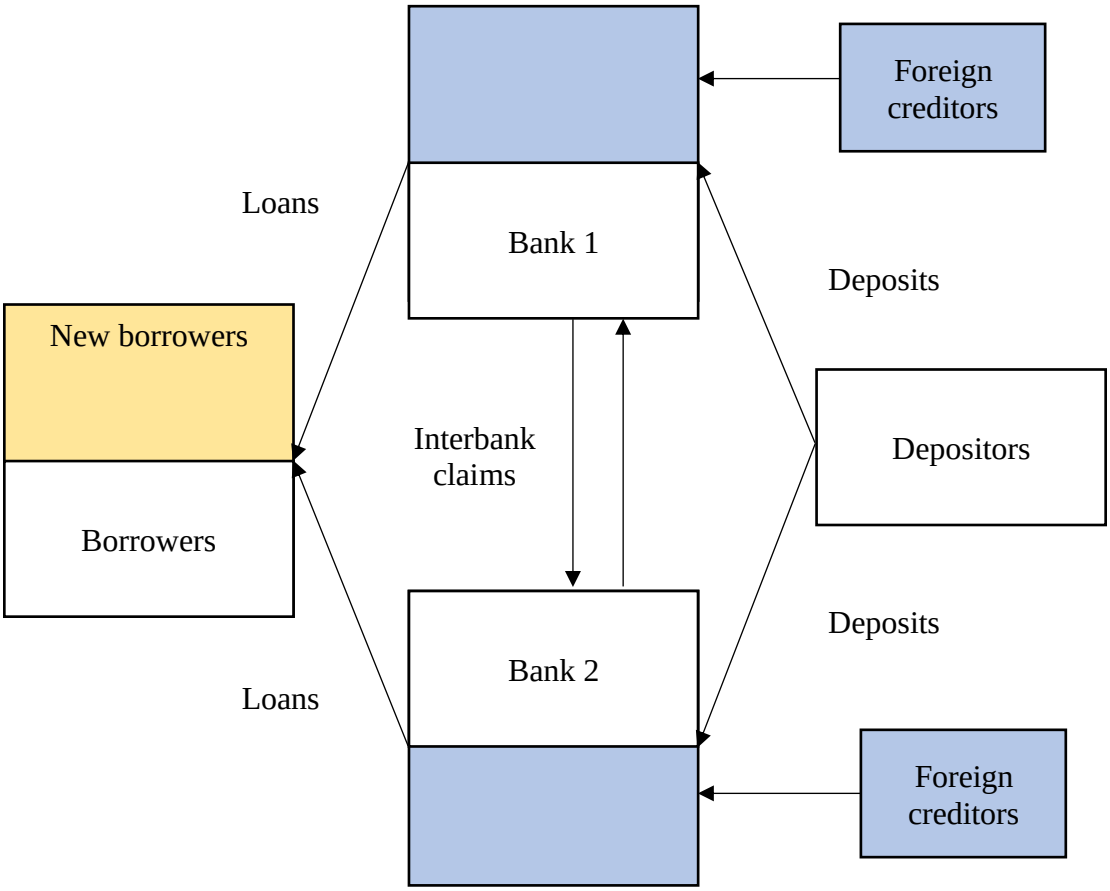

Figure 2.4. The presence of foreign creditors (international capital inflows) in the banking sector balance sheet during the credit boom.

Figure 2.3 depicts a financial system with two domestic banks (Bank 1 and Bank 2) and there is no foreign creditor sector. Both banks collect retail deposits to lend to borrowers. They can also hold claims against each other. In a boom when credit is growing very rapidly and the assets of both banks double in size, but the pool of retail deposits stays fixed. Hence,

the level of banking sector liabilities in the form of retail deposits must decrease. In other words, rapidly expanding bank assets are mirrored by the increased cross-claims across banks (Shin and Shin, 2011). Figure 2.4 depicts the presence of a foreign creditor sector. In this case, the increase in bank lending will result both in increased cross-lending between banks, but also will result in the sucking in of foreign debt (Shin and Shin, 2011).

Previous studies show that international capital inflows are the most important sources for domestic banks to raise external funding. Lane and McQuade (2014) state that under the global financial integration, domestic banks can raise external funding from foreign depositors and international counterparties in the interbank market and money market. Samarina and Bezemer (2016) state that financial openness tends to cause domestic credit booms. It allows domestic banks to finance domestic credit with foreign capital, rather than with domestic retail deposits only. Moreover, wider access to foreign sources of funding might loosen banks' financing constraints. Domestic banks can obtain external funding through several channels such as international bond issues and Interoffice funding. While international bond issues allow domestic banks to get medium-term funding, Interoffice funding allows the domestic bank to get funding through their overseas affiliates and foreign-owned affiliates active in the domestic system linked to their parent banks (Lane and McQuade, 2014).

From a different perspective, the opening up of financial systems and the increase of cross-border financial flows can also influence domestic credit growth. Lane and

McQuade (2014) explain that the opening up of financial systems and the increase of cross-border financial flows can influence domestic credit through two channels. First, at a macroeconomic level, current account imbalances can affect macroeconomic variables such as the rate of output growth, the level of domestic spending, exchange rates, inflation, and asset prices which can all influence equilibrium credit growth in a range of macro-financial models. Second, on the asset side, domestic banks can hold foreign assets as well as domestic assets, with foreign banks a primary set of counterparties for cross-border transactions.

Dell'Ariccia and Marquez (2006) theoretically model the relation between bank liquidity—as a key result of international capital flows—and bank risk-taking incentives. This approach assumes that domestic banks face known and unknown borrowers. Because of these informational asymmetries among domestic banks, adverse selection problems arise that lead domestic banks to screen potential borrowers. Furthermore, the incentives of domestic banks to screen borrowers decrease when the proportion of unknown borrowers is sufficiently high (Dell'Ariccia and Marquez, 2006). In this case, domestic banks ease lending standards and provide credit to all loan applicants, i.e., they choose a pooling equilibrium in contrast to a separating equilibrium. Therefore, in countries with large international capital inflows, domestic banks face a larger proportion of unknown borrowers and they have access to low-cost funding. In turn, this leads domestic banks to prefer the pooling equilibrium, which is characterized by higher aggregate loan volumes and lower credit standards.

Similar theoretical implications of international capital flow to the bank credit are also derived by models that focus on agency problems between bank owners and bank managers developed by Acharya and Naqvi (2012). In this model, Acharya and Naqvi (2012) show that (i) the bank managers' earnings increase in the loan volumes of the banks and that (ii) bank owners have an incentive to conduct an audit of the bank manager if and only if bank liquidity shortfalls exceed a certain threshold. Acharya and Naqvi (2012) derive that if bank liquidity is sufficiently high (special emphasis on international capital inflows), agency problems within banks become more severe, leading to excessive risk-taking.

Other pieces of literature also mention that international capital inflows can decrease bank credit through the substitution effect. In the context of the financial intermediary activity, international capital inflows are transmitted into two sectors i.e., the bank and non-bank sectors. The "bank" sector incorporates deposit-taking corporations (banks) and the non-bank sector Includes non-financial firms, NBFIs, and households. Samarina and Bezemer (2016) state that international capital inflows that transmitted into the non-bank sector may have an unintended side effect on the allocation of domestic credit by crowding out domestic bank loans. Furthermore, Rodrik and Subramanian (2009) also suggest that a substitution effect between domestic bank loans and foreign capital is especially relevant in economies with limited investment opportunities. In this case, domestic and foreign finance are more likely to compete for investment opportunities.

In line with previous literature mentioned above, the argument of this doctoral thesis is that international capital inflows to banks and NBFIs might influence the level of domestic credit. In chapter 3, this doctoral thesis provides an empirical study to analyze the relationship between international capital inflows and the level of domestic credit in developing countries. By using a novel dataset of international capital inflows decomposed by borrower type (i.e., banks versus other types of financial institutions) as a proxy for external factors, the study presents a better understanding of the relationship between international capital and domestic credit, especially in developing countries. Moreover, the empirical study in chapter 3 also considers the development of domestic financial institutions as a proxy for internal factors to investigate the role of the domestic financial institutions in the relationship between domestic credit and international capital inflows.

2.2 Shadow banking

2.2.1 Definition and features of shadow banking

The concept of shadow banking was introduced in 2007 by Paul McCulley in order to picture a large segment of financial intermediation activity that is routed outside the balance sheets of traditional/ commercial banks and other depository institutions (Noeth and Sengupta, 2011). A short definition of shadow banking states that shadow banking replicates the main functions of the traditional banking system (i.e. credit, liquidity, and maturity transformation), as well as exposed to a large extent to the same risks but with far less capital (Meeks, Nelson,

and Alessandri, 2013). In fact, there is no single definition to explain shadow banking and there are many alternative definitions of shadow banking. There are two groups of previous studies that define shadow banking. The first group describes shadow banking by the nature of the entity that carries it out: it is usually less regulated than traditional banks and lacks a formal safety net (for example, Claessens and Ratnovski 2014). The second group describes shadow banking by the nature of the activities e.g., instruments (Mehrling et al. 2013) or markets (Gorton and Metrick 2012). The Financial Stability Board (FSB) defines shadow banking as "credit intermediation involving entities and activities outside the regular banking system", but other scholars and economists give complementary definitions and explanations that emphasize different aspects of shadow banking. Figure 2.5 presents a brief summary of the most recent definitions provided by financial bodies and economists, which account for specific aspects of shadow banking components.

In 2014, IMF introduces a new definition of shadow banking based on nontraditional (non-core) funding (IMF, 2014). The concept of non-core liabilities as a nontraditional source of funding is based on Shin and Shin (2010). Shin and Shin (2010) lay out the conceptual distinction between core and non-core liabilities of the banking sector as different means of funding. Although this concept focuses on non-core liabilities in measuring and analyzing shadow banking, it relates to the stream of literature interpreting shadow banking from the perspective of non-traditional credit intermediation (Harutyunyan et al. 2015). In this concept, any financing of banks and NBFIs through non-core liabilities constitutes shadow banking,

regardless of the entity that carries it out (IMF, 2014). For instance, based on this concept, the securitization process is categorized as shadow banking; whether it is performed directly on a balance sheet by a traditional bank or indirectly through a special purpose vehicle (SPV).

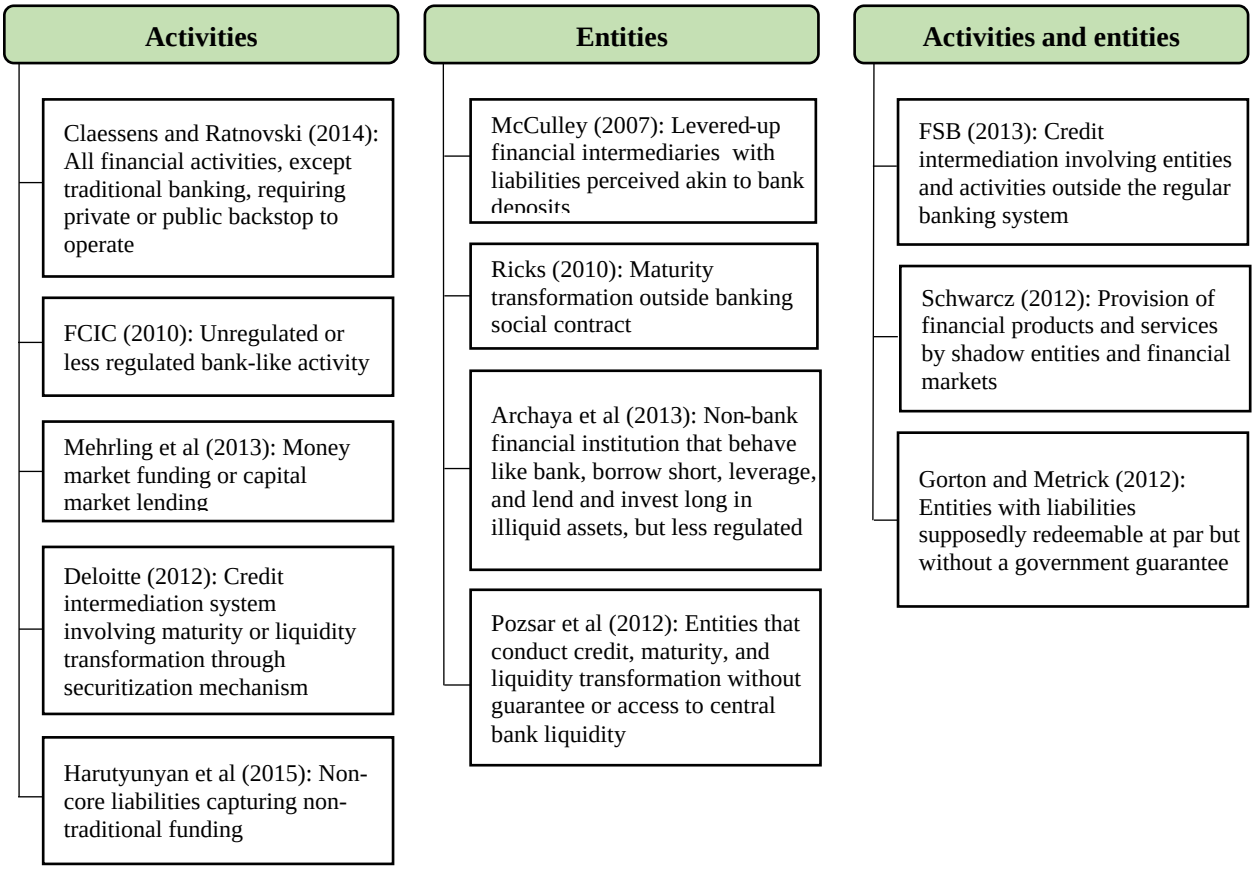

Figure 2.5 Synthesis of shadow banking definitions.
Source: IMF (2014) (modified by the author).

Non-core liabilities are the opposite of core liabilities. Core liabilities define as the main funding that traditional banks and/or other depository corporations traditionally draw on, namely regular deposits of “ultimate creditors". Therefore, while core liabilities represent the traditional financial intermediation function of the banking system, non-core liabilities encompass sources of funding for the financial system that fall outside the core liabilities definition.

In turn, considering large differences in shadow banking activities across countries, it is difficult to describe an ideal definition of shadow banking that would be precise and all-encompassing (see Figure 2.6). For example, in advanced economies, shadow banking mostly involves a complicated network of financial entities and several activities that brake-down the credit intermediation process between lenders and borrowers into a sequence of separated operations. Whereas in emerging markets and developing economies, shadow banking mostly performed without complicated chains and mostly performed in a more straightforward intermediation role between ultimate lenders and ultimate borrowers. In these countries, shadow banking mostly includes several alternative lending channels i.e., a variety of non-bank loan companies such as microfinance companies, entities providing entrusted loans, letters of credit, peer-to-peer lending, and various forms of retail-oriented loan provision.

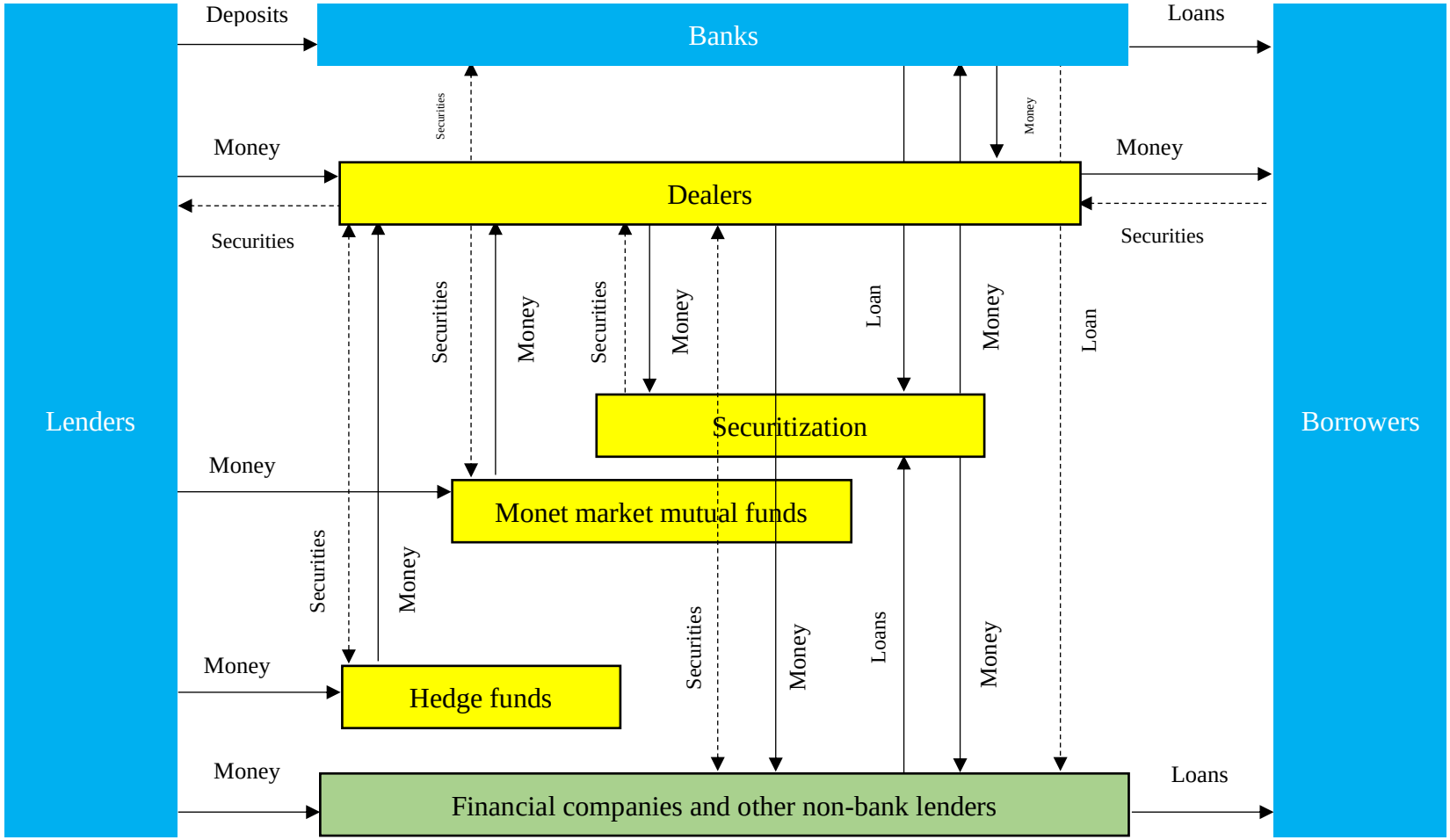

Figure 2.6 Traditional versus shadow banking intermediation.

Sources: IMF (2014) (Modified by author).

Figure 2.6 represents the financial sector with the flow of funds from lenders to borrowers. The blue boxes represent the main parts of the traditional banking system or a bank-based economy, and the other boxes represent the shadow banking sector. The green boxes characterize a simple shadow banking system in most emerging markets and developing economies. The yellow boxes (in the inner quadrant) represent the shadow banking activities that involved a complicated network of financial entities. The shadow banking system in the yellow boxes is usually associated with more advanced economies, with dealers as the hub of most activity. Furthermore, the shadow banking system that represents in the yellow boxes consists of several activities e.g., issuing securities on behalf of borrowers (securitization), providing prime brokerage services to hedge funds, and conducting repurchase agreements and securities lending. Securitization vehicles do not generally involve borrowers directly. Securitized assets generally come from banks and non-bank lenders, and securities from dealers. The lender's category includes institutional investors (such as insurance companies and pension funds) and official sector institutions (such as central banks and sovereign wealth funds) (IMF, 2014).

In the context of credit intermediation by the traditional bank, the failure of credit intermediaries can have an adverse effect on the real economy (Bernanke, 1983; Ashcraft, 2005). Therefore, governments have taken to protect the traditional banking system from the risks inherent in maturity transformation by providing them access to backstop liquidity. In contrast, the shadow banking system, prior to the onset of the financial crisis, was presumed

to be safe, owing to liquidity backstops in the form of contingent lines of credit and tail-risk insurance in the form of wraps and guarantees (Pozsar et al., 2012). However, these forms of liquidity that filled a backstop role for shadow banks were provided by the private, not the public, sector. In this context, commercial banks and insurance companies are the main financial institutions that provided several forms of liquidity and credit insurance that filled a backstop role for shadow banks. Hence, using these instruments allowed shadow banks to conduct several activities such as credit, liquidity, and maturity transformation by issuing highly rated and liquid short-term liabilities (Pozsar et al., 2012). However, these guarantees also acted to transmit systemic risk between the core financial institutions (for example commercial banks and insurance companies) and the shadow banks.

2.2.2 Shadow credit Intermediation process

The shadow banking system transforms high-risk long-term loans (for example subprime mortgages) into seemingly credit-risk-free, short-term through the shadow credit intermediation. In the shadow credit intermediation process, securitization plays an essential role, which includes credit, maturity, and liquidity transformation along its process. In a nutshell, securitization is the process of pooling illiquid traditional loans and selling them into the capital markets. This is pursued by selling large portfolios of loans to SPV(s), and then, issue-rated securities linked to the loan portfolios. Figure 2.7 illustrates the mechanism of the securitization process. Firstly, an originating firm loans funds to borrowers. Secondly,

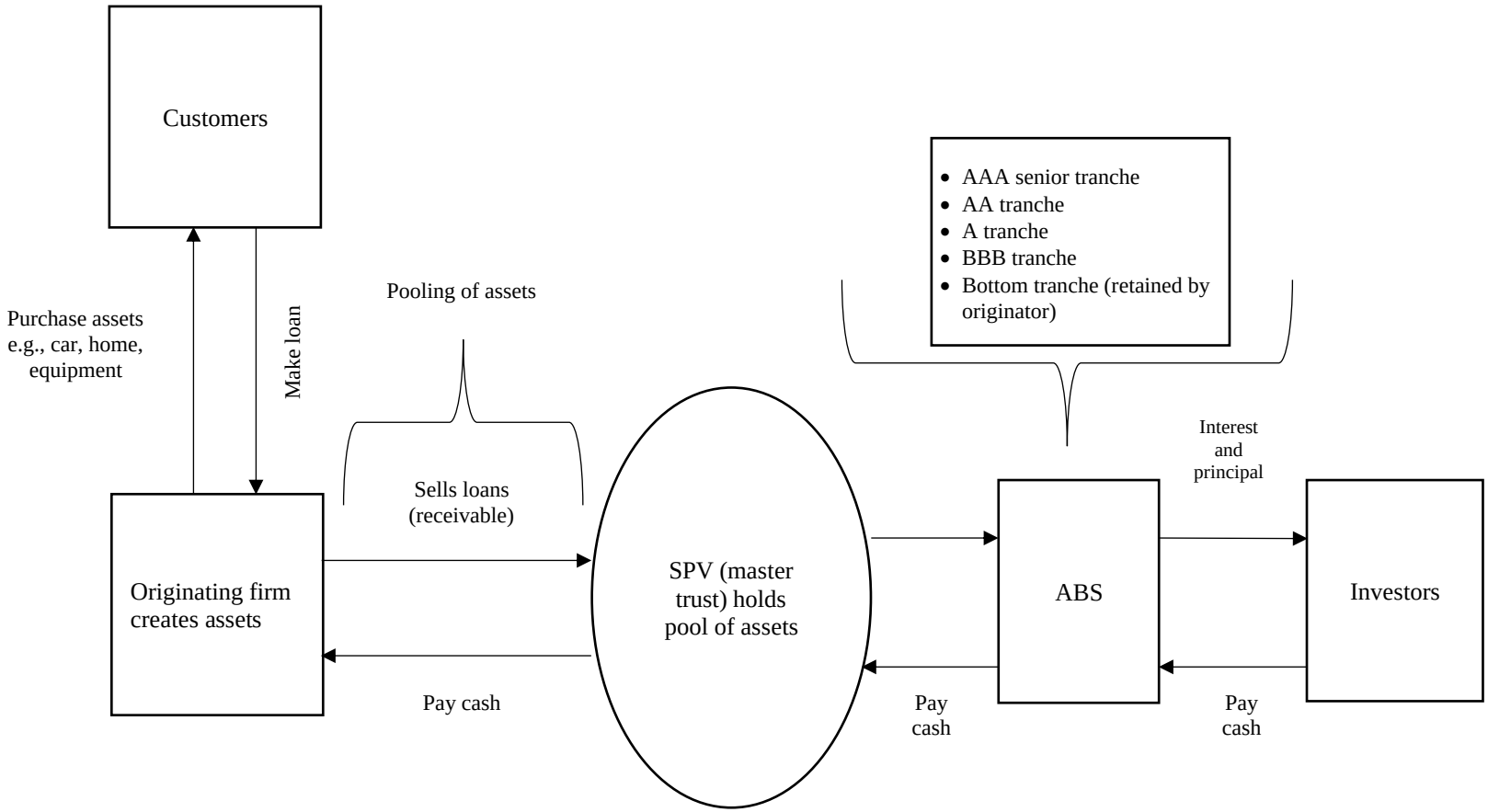

Figure 2.7 The Securitization Process.

originating firm pools a number of these loans and sold to an SPV (a master trust in the figure). Thirdly, The SPV then issues the securities in the form of asset-backed securities (ABS) and sells them to investors. In this step, SPV classifies these securities (ABS) into tranches, which are ranked by seniority and rated accordingly. Last, the SPV finances these purchases by selling securities in the capital markets. In this process, originating firms transform loans that that traditionally would have been held on their balance sheet into securities that can be traded via the off-balance-sheet SPV.

Morganti (2017) states that shadow credit intermediation relies on three pillars: 1) asset securitization, 2) wholesale funding, and 3) securities financing transactions, mostly repurchase agreements (repos). Unlike the traditional banking system, where all the processes occur within a single institution, the shadow banking system performs the credit intermediation in steps along a chain of balance sheets through wholesale-funded, securitization-based lending (Claessens et al 2012). Adrian and Ashcraft (2012) state that shadow credit intermediation is conducted through long chains of nonbank financial intermediaries in a multistep process that can be interpreted as a "vertical slicing" of the traditional bank's credit intermediation process into seven steps (see Figure 2.8). Pozsar et al (2013) describes the seven steps of shadow bank credit intermediation in detail:

1. Loan origination (loans and leases, nonconforming mortgages, etc.) is performed by non-bank finance companies.

2. Loan warehousing is conducted by single- and multi-seller conduits and is funded through asset-backed commercial paper (ABCP).
3. The pooling and structuring of loans into term ABS is conducted by broker-dealers' ABS syndicate desks.
4. ABS warehousing is facilitated through trading books and is funded through repos, total return swaps, or hybrid and repo conduits.
5. The pooling and structuring of ABS into collateralized debt obligations (CDOs) is also conducted by broker-dealers' ABS.
6. ABS intermediation is performed by limited-purpose finance companies (LPFCs), structured investment vehicles (SIVs), securities arbitrage conduits, and credit hedge funds, which are funded in a variety of ways including, for example, repos, ABCP, medium-term notes (MTNs), bonds, and capital notes.

The funding of all the above activities and entities is conducted in wholesale funding markets by money market intermediaries (money market funds, enhanced cash funds) and direct money market investors such as securities lenders.

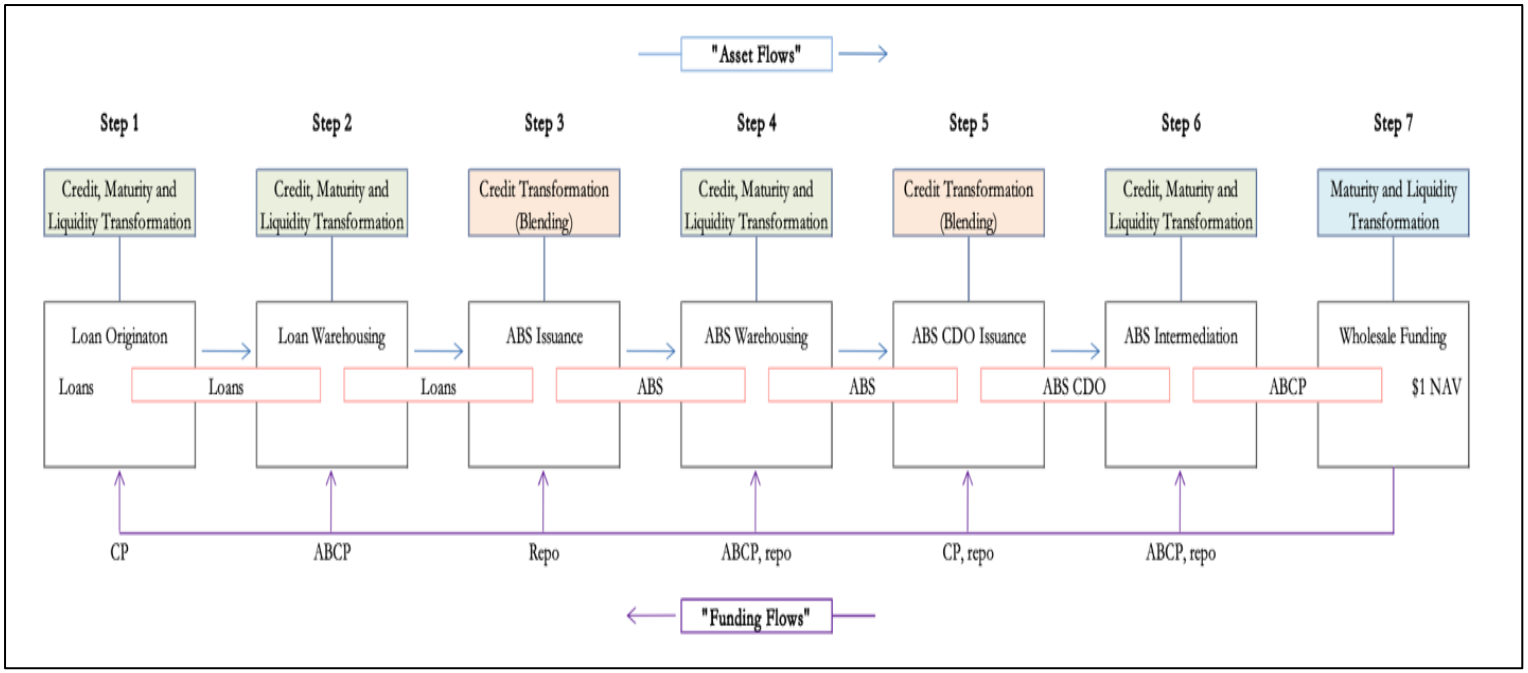

Figure 2.8 The shadow credit intermediation process.

Source: Pozsar et al (2012).

According to Adrian and Ashcraft (2012), not all intermediation processes require all seven steps, and some might require more the seven steps. For instance, an intermediation chain might stop at the second step if a pool of prime auto loans is sold by a captive finance company to a bank-sponsored multi-seller conduit for term warehousing purposes (Adrian and Ashcraft, 2012). The general principle, the intermediation of low-quality long-term loans usually required all seven or more steps. Meanwhile, the intermediation of high-quality short-to medium-term loans (for example credit card and auto loans) required usually three steps (and rarely more) (Adrian and Ashcraft, 2012). The intermediation process always begins with origination and ends with wholesale funding, and each shadow bank appears only once in the process (Adrian and Ashcraft, 2012).

2.2.3 Measuring shadow banking system

Given the difficulty to define or measure shadow banking into one definition or measure, previous studies use several approaches to measure shadow banking activity. However, three main measurements are widely used by scholars or financial bodies to measure shadow banking activity:

1. The global flow of funds measure

   This measure is based on the data from the flow of funds accounts that capture the financial assets of other financial intermediaries (OFIs). There are two main components of OFIs: 1) all nonbank financial corporations and quasi corporations engaged mainly in

financial intermediation. 2) all financial entities providing primarily long-term financing. According to Errico et al. (2013), the flow of funds measure has two dimensions. One dimension is the mapping of the balance sheet of each sector to other sectors in the domestic economy and the rest of the world. The second dimension is the mapping of the external sector to all the jurisdictions globally (Errico et al. 2013).

2. The FSB measure

   The FSB measure is constructed by using a flow of funds and sectoral accounts. There are two categories in the FSB measure. First is a broad measure, the FSB constructs a broad measure of shadow banking activity based on NBFIs which engaged in credit intermediation activities. Second is the narrow measure, the FSB also constructs a narrow measure of shadow banking activity based on NBFIs which engaged in credit intermediation activities but excluding NBFIs that do not provide credit intermediation directly (for example equity investment funds) and NBFIs that are prudentially consolidated into banking groups. Figure 2.9 presents the trend of global shadow banking based on the FSB measure.

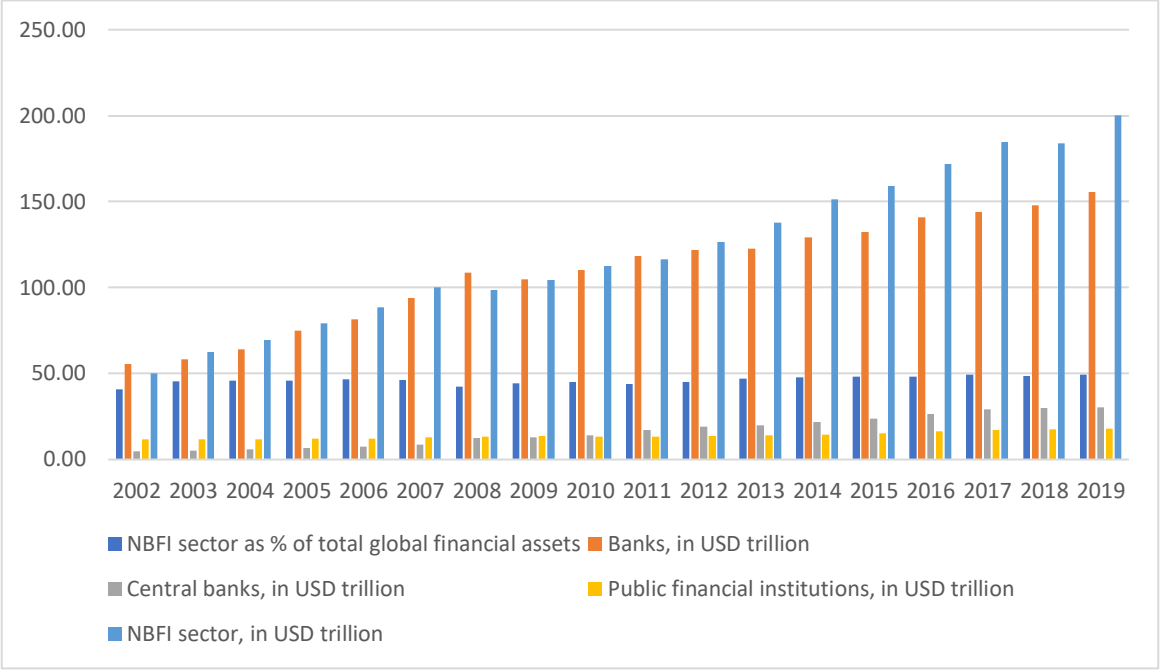

Figure 2.9. The trend of global shadow banking based on the FSB measure.
Data source: FSB (2020) plotted by author.

3. The size of non-core liabilities

The concept of non-core liabilities as a nontraditional source of funding is based on Shin and Shin (2010). Shin and Shin (2010) layout the conceptual distinction between core and noncore liabilities of the banking sector as different means of funding. Non-core liabilities are the opposite of core liabilities. Core liabilities define as the main funding that traditional banks and/or other depository corporations traditionally draw on, namely regular deposits of “ultimate creditors". Therefore, while core liabilities represent the traditional financial intermediation function of the banking system, non-core liabilities

encompass sources of funding for the financial system that fall outside the core liabilities definition. This measure includes non-core liabilities both from banks and from “other financial corporations". In this measure, any financing of banks and NBFIs through non-core liabilities constitutes shadow banking, regardless of the entity that carries it out (IMF, 2014). Figure 2.10 presents the trend of shadow banking based on the size of non-core liabilities in the selected countries and regions.

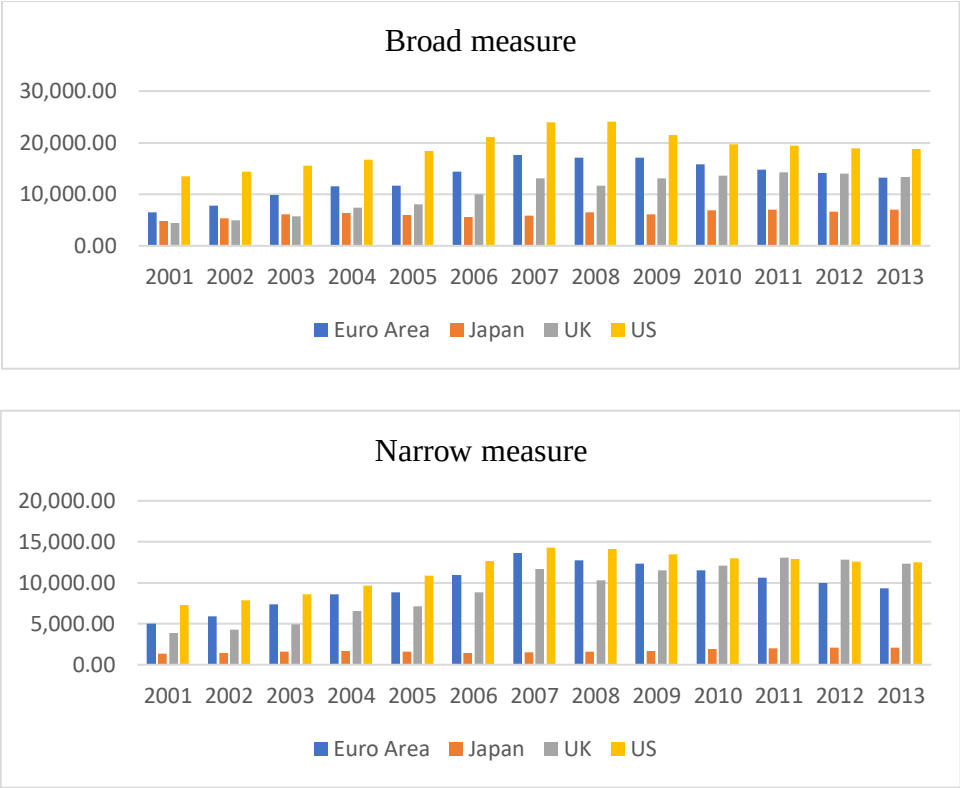

Figure 2.10. The trend of shadow banking based on the size of non-core liabilities in the selected countries and regions. (USD billion). Note: The bottom panel is the narrow measure of non-core liabilities, while the top panel is the broad measure of non-core liabilities.

Data source: Harutyunyan et al (2015) plotted by author.

Table 2.1 Comparation of shadow banking measures

	Flow of funds	**Financial Stability Board**	**Noncore liabilities**
Coverage	Nonbank financial institutions • Engaged in financial intermediation • Providing long-term financing Excludes non-money market funds (MMFs) investment funds	Nonbank financial institutions • Engaged in financial intermediation • Providing long-term financing Includes non-MMFs investment funds	Banks Nonbank financial institutions MMFs Excludes non-MMFs investment funds
	Advanced economies Former emerging market economies	Advanced economies Emerging market economies	Advanced economies Few emerging markets
Sources	Flow of funds statistics Quarterly, long history, starting 1980s	Flow of funds and sector data, FSB Annual, short history, starting 2002	IFS Quarterly, short history, starting 2001
Entities/ activities	Money market mutual funds	Money market mutual funds	Narrow measure includes: • Restricted and nonresident deposits • Securities • Loans • MMF shares/units
	Financial leasing corporations	Financial companies	
	Securitization vehicles	Securitization vehicles	
	Broker/dealers	Broker/dealers	
		Investment funds (bonds, equity, mixed)	
		Hedge funds	
	Country-specific entities • Financial holding corporations • Development capital companies • Other entities	Country-specific entities • Financial holding corporations • Private development banks • Other entities	Broad measure consists of narrow plus the following intra-financial-sector positions: • Securities • MMFs shares/units
	Venture capital corporations		
		Other (not specified)	
Features	Entity based (narrower entity set) Entity breakdown not always available Balance sheet breakdowns available Somewhat more country specific	Entity based (broader entity set) Broad and narrow measures No balance sheet breakdowns More cross-country consistency Not publicly available Data more subject to valuation effects (due to importance of investment funds)	Entity and activity based Broad and narrow measures No balance sheet breakdowns Somewhat country specific Relates to financial fragility literature Captures shadowy banking activities

Source: IMF (2014).

In general, these three measures are conceptually somewhat different and can be expected to yield different size estimates. For example, the flow of funds and the noncore measures exclude non-MMFs funds, the FSB measure includes them. However, all measures have their own merits and can be used to capture specific issues of interest. The details for each measure and their coverage are presented in Table 2.1.

In this doctoral thesis, three empirical studies were conducted by adopting a different measure of shadow banking. In Chapter 4 and Chapter 5, empirical studies adopt the shadow banking measure from the FSB and in Chapter 6, the empirical study adopts the non-core liabilities measure. There are two reasons for choosing those shadow banking measurements: First, by using the FSB measure, it is possible to get the panel data for a wide range of countries. Second, by using non-core liability measure, it is possible to get high-frequency data in Indonesian banks.

There are two arguments of this doctoral thesis; (i) international capital inflows might influence the level of shadow banking assets; (ii) the level of shadow banking in the form of non-core liabilities in Indonesian banks is influenced by the exchange rate movements. Furthermore, three empirical studies were performed in Chapter 4, Chapter 5, and Chapter 6, respectively. In Chapter 4, an empirical study is performed by examining the separate and combined effects of cross-border capital inflows and domestic financial institution development on the level of shadow banking assets. In Chapter 5, an empirical study is conducted by exploring the relationship between the cross-border bank claims of two major

regions (the US and the EU) on EMEs and shadow banking assets in EMEs. Last, in Chapter 6 empirical study is conducted by investigating the effect of the exchange rate shocks on the level of non-core liabilities in Indonesian bank.

CHAPTER 3: HOW INTERNATIONAL CAPITAL INFLOWS AND DOMESTIC FINANCIAL INSTITUTIONAL DEVELOPMENT AFFECT DOMESTIC CREDIT: EVIDENCE FROM DEVELOPING COUNTRIES

3.1 Overview

Domestic credit plays an important role in developing countries. As noted by Obstfeld (2012), domestic credit growth directly affects economic welfare in developing economies. Domestic credit growth has also been a leading driver of economic growth, especially since the early 1990s (Samargandi and Kutan, 2016). Higher levels of domestic credit lead to an increase in household spending, thus increasing the output production and contributing to higher gross domestic product (GDP). Although domestic credit plays an important role in developing countries, these countries' credit markets are still in transition (Nguyen et al., 2018). The level of domestic credit available to the private sector is much lower in developing countries than in developed countries (Chaudhuri et al., 2010; Driver and Muñoz-Bugarin, 2010; Gong et al., 2012).

Understanding the determinants of domestic credit growth in developing countries is essential for several reasons. First, domestic credit fulfills an important role in the economic development of developing countries (Belinga et al., 2016). Domestic credit reflects the financial development of a country and also leads to effective investment allocation in developing countries (Bencivenga and Smith, 1991; Boyd and Prescott, 1986; Bui, 2019). Second, domestic credit can be an early warning indicator of a financial crisis (Lane and McQuade, 2014; Montoro and Rojas-Suarez, 2012; Schularick and Taylor, 2012). A rapid increase in domestic credit availability may be a predictor of a

subsequent financial or economic crisis (Jordà et al., 2011; Mendoza and Terrones, 2012; Obstfeld and Rogoff, 2010). Besides, excessive domestic credit growth has been identified as having been a critical driver of the Global Financial Crisis and of much other financial instability (Borio and Lowe, 2002; Schularick and Taylor, 2012). Another potential signal of an impending financial crisis is when domestic credit grows faster than the pool of available retail deposits and the banking sector starts using other (non-core) funding sources to support its credit growth (Hahm et al., 2012).

As shown in previous studies, domestic credit is closely associated with internal macroeconomic factors, including GDP growth, interest rates, current account balance (CAB), and exchange rates (Andreasen and Valenzuela, 2016; Gozgor, 2018). Moreover, domestic credit is also determined by other domestic social factors. Stable political conditions, including low levels of poverty, unemployment, and corruption and high consumer confidence levels, have been shown to be the main drivers of domestic credit growth (Gozgor, 2018). Domestic credit growth is also determined by the quality of local institutions. Strong and sound local institutions are essential to creating sustainable domestic credit growth (Nguyen et al., 2018). Well-developed local institutions reduce economic problems such as inefficiency, information asymmetry, and domestic credit constraints (Beck et al., 2004; Djankov et al., 2007; Doblas-Madrid and Minetti, 2013; Fauceglia, 2015).

Besides the internal factors, external factors such as international capital flows are also likely to contribute to domestic credit growth (Hahm et al., 2012; Hegerty, 2019; Gozgor, 2014; Lane and McQuade, 2014). International capital flows have been having

a greater influence on domestic credit growth, especially since the global financial crisis of 2008–2009 (Bruno and Shin, 2012; Lane and McQuade, 2014). In particular, international capital flows have both positive and negative effects on the host country. On the one hand, as an element of other (non-core) liquidity, international capital flows play an essential role in helping local banks meet the demand for domestic credit. On the other hand, a large stock of international capital flows erodes the risk premium, thus increasing vulnerability to a financial crisis (Hahm et al., 2012).

Although several previous studies have confirmed that international capital flows and local institutions play essential roles in domestic credit growth, which types of international capital and local institutions are decisive remains unclear. Moreover, the combined effects of the levels of domestic financial institutions and international capital inflows have rarely been studied. To fill this gap, this study aims to further investigate the combined influence of international capital inflows and domestic financial institutional development on domestic credit levels in developing countries. By using international capital inflows segmented by borrower type, i.e., international capital inflows to the banking sector and other financial institutions, and the indicators of the level of development of domestic financial institutions, This study addresses the following research question: Do the two types of international capital inflows (to banks and other financial institutions) and the development of domestic financial institutions influence domestic credit levels in developing countries?

The study in this chapter provides three novel contributions. First, this study considers a novel dataset of international capital inflows. By decomposing debt inflows

by borrower type (i.e., banks versus other types of financial institutions) as a proxy for external factors, it allows to measure the foreign debt inflows most associated with domestic credit specifically. Second, this study adopts the domestic financial institutional development index developed by Svirydzenka (2016) to represent internal factors. This index includes three sub-indices, which measure the depth of, access to, and efficiency of domestic financial institutions, respectively. By using these specific sub-indices, this study generates a more in-depth understanding of the determinants of domestic credit in developing countries. Third, this study presents a further investigation of the combined influence of international capital inflows and the development of domestic financial institutions on the domestic credit level while controlling for other determinants such as GDP per capita, the CAB, and exchange rates.

This study contributes to the literature by combining influence of international capital inflows segmented by borrower type (i.e., banks versus other types of financial institutions) and the development of domestic financial institutions on the domestic credit level across a wide range of developing countries (74 in total) for the period 2005–2017.

The remainder of this chapter is organized as follows. Section 3.2 conducts a literature review; then section 3.3 describes the data. Section 3.4 describes details of the empirical model. Section 3.5 reports and discusses the empirical results. Section 3.6 reports the robustness checks and, finally, section 3.7 concludes.

3.2 Literature review

Previous studies confirm that domestic credit growth is determined by several internal macroeconomic factors: GDP per capita, interest rates, exchange rates, CAB, and monetary policy (Andreasen and Valenzuela, 2016; Gozgor, 2018). Several previous studies specifically highlight that domestic credit growth is determined by internal and external factors. Of the internal factors, domestic institutional quality has been found to be crucial for domestic credit growth. For example, Djankov et al. (2007) confirm that institutional factors are highly correlated with the volume of private credit. Similarly, Nguyen et al. (2018) find that institutional quality is critical to local credit growth and confirmed that domestic institutions are vital for channeling foreign direct investment (FDI) into domestic credit. Fauceglia (2015) suggest that sound domestic institutions in developing countries will improve the capability to obtain external funding and reduce credit constraints. Beck et al. (2004) also show that local firms have more access to domestic credit financing in countries with well-developed institutions. However, these studies only considered domestic institutions in general and did not explicitly distinguish between different kinds of domestic institutions.

Moreover, Gozgor (2018) shows that better socioeconomic and local institutions (i.e., low levels of poverty, unemployment, and corruption and high levels of consumer confidence) affect domestic credit positively. By using the economic uncertainty index as a proxy for internal economic conditions, Gozgor et al. (2019) find that higher uncertainty harms domestic loans. Park (2012) examines the impact of corruption on banking services in various countries between 2002 and 2004 and find that corruption

distorts the allocation of bank funds from normal projects to bad projects, which decreases the quality of banking services, including domestic credit services. Generally, however, these studies did not focus on the driving forces behind cross-institutional differences in credit growth.

Several previous studies have also highlighted the external determinants of domestic credit growth. For example, Shin (2012) finds that gross capital flows between Europe and the U.S. were the main drivers of the U.S. credit boom in the mid-2000s. Nevertheless, Shin's study did not take into account the different relationships between variables in other countries. Lane and McQuade (2014) analyze the relationship between international capital flows and domestic credit growth in the boom period of 2003–2008 and observed that domestic credit growth in European countries is strongly related to foreign debt inflows. However, their study only focused on developed countries and did not consider the different characteristics of international capital flows based on the borrowing institution. Hegerty (2019) also shows that international capital flows are highly related to domestic credit growth in Central and Eastern Europe. Specifically, capital inflows significantly increase consumption through domestic credit in Central and Eastern European countries. However, that study did not explicitly explain the underlying mechanism between international capital flows, domestic consumption, and domestic credit growth.

In other relevant studies, Orhangazi (2014) observes that net private capital inflows are positively correlated with periods of rapid credit expansion in Turkey. Davis et al. (2016) show that CAB and cross-border borrowing are significant drivers of

domestic credit, and Harrison and McMillan (2003) confirm that FDI reduces domestic credit constraints by raising the level of capital in the domestic credit market. Nguyen et al. (2018) find that FDI affects domestic credit in emerging market economies positively through sound domestic institutions. However, they did not differentiate between the different types of institutional borrowers, and they only considered FDI rather than equity or debt flows.

International capital flows have positive and negative impacts on the host country. On the positive side, Bekaert et al. (2005) emphasize that international debt inflows can support domestic investment and economic growth in the host country through domestic credit channels. Similarly, Baskaya et al. (2017) find that external borrowing in the banking sector is vital to supporting domestic credit demand. Moreover, Hahm et al. (2012) state that international capital (as a non-core liability) provides an alternative source for domestic banks to finance domestic credit demand. On the negative side, Hahm et al. (2012) emphasize that a large stock of non-core liabilities (including international capital) indicates an erosion of the risk premium and, hence, can increase financial vulnerability.

Overall, a review of the literature shows that domestic credit growth is determined by internal and external factors. However, which types of international capital and local institutions are decisive remains unclear. Moreover, the combined effects of international capital inflows and the levels of domestic financial institutions have rarely been studied. This creates a need for further research to extend the previous empirical studies to gain a deeper understanding of the determinants of domestic credit levels in developing

countries. In this study, our primary focus is on how the relationships between international capital flows, domestic financial institutional development, and the interaction among these variables affect domestic credit levels in developing countries.

3.3 Data description

The study in this chapter examines empirically how the two types of international capital inflows and domestic financial institutional development affect domestic credit across a broad range of 74 developing countries (see Appendix A). In this study, the sample is classified based on the United Nations Conference on Trade and Development and select countries for which data on international capital inflows and domestic financial institutional development are available (see Appendix B). Annual data are obtained for each variable for the period 2005–2017 from several sources (a more detailed description of the measurements and data sources is given below, and the statistical descriptions of the variables are presented in Tables 3.1 and 3.2). This study focuses on this period for two main reasons. First, for several countries, data on international debt inflows to banks and other financial institutions are only available from 2005. Second, this period covers a full boom–bust cycle, rather than only booms or busts in domestic credit levels, especially in emerging and developing countries (Gozgor, 2014). Hence, using this period assures a large and balanced panel of countries.

Table 3.1 Data summary

Variable	Unit	Min	Max	Mean	Std. Dev
Domestic Credit to Private Sector	Percentage of GDP	1.596	160.12	38.18	29.15
Domestic Credit to Private Sector by Banks	Percentage of GDP	1.344	123.065	34.383	23.468
GDP Per Capita	Logarithm Form	2.513	4.695	3.455	0.455
Current Account Balance	Percentage of GDP	−65.029	45.454	−3.171	9.721
Nominal exchange rate	Local currency unit (LCU) per USD	0.269	13389.413	628.239	1740.146
The VIX Index	Index	11,090	32,693	18,759	6,720
International capital inflows to bank	Percentage of GDP	−12.045	28.698	0.681	2.3142
International capital inflows to other financial institution	Percentage of GDP	−28.073	32.1753	0.943	3.538
Financial institution Index	Index 0 - 1	0.038	0.7399	0.352	0.137
Financial Institution Depth Index	Index 0 - 1	0.002	0.8837	0.189	0.180
Financial Institution Access Index	Index 0 - 1	0.005	0.7408	0.247	0.178
Financial Institution Efficiency Index	Index 0 - 1	0.119	0.8897	0.615	0.137

Table 3.2 Correlations pairs

	logGDPcap	CAB	ERTS	Bank-inflows	Other-inflows	Insti	Depth	Acces	Efficiency
LogGDPcap	1								
CAB	0.333	1							
ERTS	−0.175	−0.133	1						
Bankinflows	0.105	−0.155	−0.022	1					
Otherinflows	−0.101	−0.283	0.022	0.072	1				
Insti	0.72	0.133	−0.193	0.130	−0.065	1			
Depth	0.521	0.137	−0.183	0.062	−0.93	0.843	1		
Acces	0.681	0.016	−0.157	0.105	−0.006	0.784	0.453	1	
Efficiency	0.383	0.185	−0.071	0.149	0.041	0.577	0.358	0.170	1

3.3.1 Domestic credit data

The study in this chapter uses annual data on domestic credit to the private sector (as a percentage of GDP). The domestic credit data was collected from the World Development Indicators (WDI) and the Global Financial Development database of the World Bank. This dataset captures domestic credit extended to the private sector by financial corporations as a percentage of GDP for more than 100 countries. According to the World Bank (2019), domestic credit to the private sector includes the financial resources provided by financial corporations in the form of loans, purchases of nonequity securities, trade credits, and other accounts receivable that establish a claim for repayment. The financial corporations include monetary authorities, deposit money banks, and other corporations that do not accept transferable deposits but do incur liabilities such as time

and savings deposits. Examples of these other financial corporations include finance and leasing companies, money lenders, insurance corporations, pension funds, and foreign exchange companies.

3.3.2 International capital flows data

The study in this chapter provides a novel dataset by decomposing international capital inflows by borrower type. By using this technique, it is possible to distinguishing between banks and other financial institutions as an external factor. Moreover, this study also present dynamic and cross-sectional patterns of capital inflows as a function of global push factors and countries' own business cycles. The main source of these capital flows data is the other investment debt flows in the International Monetary Fund's balance of payments (BOP) dataset. The other investment debt flows dataset captures the vast majority of external bank flows and allows us to segment international capital inflows by borrower type, i.e., banks and other financial institutions, central banks, and governments. Furthermore, this dataset can specifically measure the foreign debt inflows most associated with domestic credit, i.e., inflows to banks and foreign other financial institutions. To enlarge and improve the balance of the panel of countries, this study uses the data-filling technique developed by Kalemli-Ozcan et al. (2017). Specifically, when the BOP data report the total score for the category and the scores for three of the four sectors. Then, subtract the latter from the former to obtain the score for the fourth sector.

3.3.3 Financial institutional development data

The study in this chapter uses annual data on the domestic financial development index as a proxy for the level of development of domestic financial institutions. Developed by

Svirydzenka (2016), this index is the most comprehensive measure of domestic financial development and captures the development level of more than 100 countries since 2005. A higher value on the index reflects a higher level of domestic financial institutions. In addition, this study also includes three indicators of the domestic financial development index, namely, the financial institutions depth index, the financial institutions access index, and the financial institutions efficiency index in the empirical model.

The financial institutions depth index measures the size and liquidity of the banking sector and other financial institutions, the assets of mutual funds and pension funds, and the size of life and non-life insurance premiums (Svirydzenka, 2016). The financial institutions access index measures the number of bank branches and automated teller machines per 100,000 adults, the number of bank accounts per 1,000 adults, the percentage of firms with a line of credit, and usage of mobile phones to send and receive money (Svirydzenka, 2016). The financial institutions efficiency index measures three aspects of bank efficiency: (i) efficiency in intermediating savings to investment, measured by the net interest margin (the accounting value of a bank's net interest revenue as a share of its average interest-bearing assets) and lending-deposit spread; (ii) operational efficiency measures, such as non-interest income to total income and overhead costs to total assets; and (iii) profitability, such as return on assets and return on equity (Svirydzenka, 2016).

3.3.4 Control variables data

The study in this chapter adopts three control variables: GDP per capita, CAB, and the nominal (official) exchange rate. The data for GDP uses the logarithm of GDP per capita

(constant) in US dollars (USD) as the benchmark measure of domestic income or domestic demand. Furthermore, this study includes CAB (as a percentage of GDP) in the econometric model in recognition of the previously identified negative relationship between CAB and domestic credit (Lane and McQuade, 2014). Last, this study also considers the nominal (official) exchange rate measured as units of local currency per USD. A fall in the value of the official exchange rate has previously been found to denote appreciation of the domestic currency, leading in turn to an increase in domestic credit (Borio et al., 2011). The data for GDP per capita, CAB, and nominal (official) exchange rate are sourced from the World Bank's World Development Indicators.

3.4 Empirical model

To estimate the linear relationships among the variables, the study in this chapter uses the dynamic panel generalized method of moments (GMM) estimation developed by Arellano and Bond (1991). Besides, this study also considers the interaction terms between domestic financial institutions development with the two types of international capital inflows (to banks and other financial institutions) to establish whether the two types of international capital inflows react differently to the domestic financial institutions in the context of domestic credit levels. Last, the dynamic panel data regression is estimated as follows:

$$Dcps_{i,t} = \beta_0 + \beta_1 Dcps_{i,t-1} + \beta_2 LogGDPpercapita_{i,t} + \beta_3 CAB_{i,t} + \beta_4 ERTS_{i,t} + \beta_5 Bankinflows_{i,t} + \beta_6 Otherinflows_{i,t} + \beta_7 Insti_{i,t} + \beta_8 X_{i,t} + \beta_9 (Bankinflows_{i,t} \times Insti_{i,t}) + \beta_{10} (Otherinflows_{i,t} \times Insti_{i,t}) + \varepsilon_{i,t} \quad (3.1)$$

where $Dcps_{it}$ is the domestic credit extended to the private sector in country *I* in year *t*; *LogGDPpercapita* is the logarithmized GDP per capita in country *I* in year *t*; *CAB* is the current account balance in country *I* in year *t*; *ERTS* is the nominal (official) exchange rate of country *I* in year *t*; $Bankinflows_{it}$ is foreign debt inflows to the banking sector in country *I* in year *t*; $Otherinflows_{it}$ is foreign debt inflows to other financial institutions in country *I* in year *t*; $Insti_{it}$ is the level of domestic financial institutions development index; X_{it} is the indicators of the domestic financial institutions development index (financial institutions depth sub-index, financial institutions access sub-index, and financial institutions efficiency sub-index) in country *I* in year *t*.

In order to obtain precise results as well as avoid the bias, the model is divided into six sub-models (sub-model I to sub-model VI). Sub-model I estimates the baseline model, excluding the domestic financial institutional development index and its indicators. Sub-models II to V include the domestic financial institutional development index and its indicators. Finally, Sub-model VI estimates the interaction terms between the two types of international capital inflows (international capital inflows to banks versus those to other types of financial institutions) with the domestic financial institutions development index.

Furthermore, all sub-models are tested by using the dynamic panel GMM estimation developed by Arellano and Bond (1991). By using this method, it is possible to eliminate not only the autocorrelation and heteroskedasticity issues but also the

possible presence of different degrees of serial integration in the balanced panel data framework. Moreover, this study considers the Arellano and Bond's (1991) two-stage estimation step with consistent estimators to obtain differentiated dynamic panel data estimates and avoid possible multicollinearity among the explanatory variables.

Last, the marginal effect of the interaction analysis is tested by measuring the coefficient value. To get coefficient values of the international capital inflows variable that are changed by the domestic financial institutions variable, this study 53dopts the partial derivatives (marginal effect) of the regression values and compute it as follows:

$$\frac{\Delta Dcps_{i,t}}{\Delta Bankinflows_{i,t}} = \beta_5 + \beta_9 Insti_{i,t} \quad (3.2)$$

$$\frac{\Delta Dcps_{i,t}}{\Delta Otherinflows_{i,t}} = \beta_6 + \beta_{10} Insti_{i,t} \quad (3.3)$$

A positive sign of coefficient value reflects an increase in domestic credit levels, whereas a negative sign reflects a decrease in domestic credit levels. In other words, as an integral part of this function, the domestic financial institutions development variable determines the signs of these marginal effect estimations.

3.5 Results and discussion

The results of our dynamic panel data estimation are reported in Table 3.3. The results of a Sargan test indicate that there is no over-identification problem in the estimation specifications. Moreover, the results of the Lagrange Multiplier (LM) test for autocorrelation, AR (1) and AR (2), indicate first-order but no second-order

autocorrelation. Thus, the statistical results in Table 3.3 satisfy the necessary conditions for the application of GMM estimation.

Table 3.3 Results of Arellano and Bond's (1991) dynamic panel data estimation

	I	II	III	IV	V	VI
Dcps (−1)	0.750 *** (0.000)	0.7078 *** (0.000)	0.572 *** (0.000)	0.749 *** (0.000)	0.754 *** (0.000)	0.671 *** (0.056)
LogGDPpercapita	13.708 (0.124)	3.156 (0.753)	10.116 (0.241)	12.635 (0.197)	11.136 (0.202)	5.327 (8.842)
CAB	−0.208 *** (0.001)	−0.201 *** (0.001)	−0.159 *** (0.002)	−0.207 *** (0.001)	−0.209 *** (0.001)	−0.201 *** (0.059)
ERTS	−0.001 ** (0.020)	−0.001 *** (0.007)	−0.000 (0.211)	−0.001 ** (0.011)	−0.001 ** (0.016)	−0.001 ** (0.001)
Bankinflows	0.308 *** (0.008)	0.290 ** (0.012)	0.203 * (0.056)	0.319 *** (0.005)	0.292 ** (0.010)	0.778 *** (0.283)
Otherinflows	−0.138 ** (0.049)	−0.130 ** (0.038)	−0.123 ** (0.042)	−0.128 * (0.060)	−0.133 ** (0.049)	−0.279 ** (0.165)
Insti		35.959 *** (0.000)				38.232 *** (8.314)
InstiDepth			96.723 *** (0.000)			
InstiAcces				5.112 (0.417)		
InstiEfficiency					7.519 *** (0.001)	
Bankinflows.Insti						−1.192 ** (0.651)
Otherinflows.Insti						0.414 (0.385)
Observations	814	814	814	814	814	814
Sargan test	0.00	0.00	0.00	0.00	0.0	0.0
AR (1)	0.00	0.00	0.00	0.00	0.00	0.00
AR (2)	0.26	0.27	0.50	0.30	0.30	0.45

Notes: All sub-models were estimated using Arellano and Bond's (1991) dynamic panel data estimation. A Sargan test indicated no over-identification problem in the estimation specifications (null hypothesis: there is over-identification in the estimation specification). AR(1) and AR(2) show the results of the LM statistics for autocorrelation (null hypothesis: no first-order autocorrelation and no second-order autocorrelation, respectively). Standard errors are in parentheses, and the p-values are in brackets. ∗∗∗, ∗∗, and ∗ indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The results in Column I show that GDP per capita does not have a statistically significant effect on the level of domestic credit. Meanwhile, CAB is significantly negatively related to the domestic credit level. This means that the domestic credit level rose in countries running current account deficits during this period. This result is in line with Gozgor (2018) and Lane and McQuade (2014). The nominal exchange rate is also significantly negatively related to domestic credit, indicating that appreciation of the domestic currency is associated with higher domestic credit, which is consistent with Borio et al. (2011).

The results in Column I also demonstrate that international capital inflows to the banking sector are positively related to the domestic credit level. These results are in line with previous empirical findings showing that domestic credit in developing economies is supported by external funding (Arndt et al., 2010; Tang et al., 2008). According to Khan and Khan (1998), capital flows can increase bank lending and are accompanied by a surge in asset prices. This pattern suggests that foreign capital inflows to the banking sector are an important explanatory factor in the interrelation between international capital flows and domestic credit in developing countries. This result also confirms that the banking sector in developing countries still depends on foreign capital to support domestic credit demand (Khan and Khan, 1998). Hahm et al. (2012) observed that traditional deposit funding in developing countries does not keep pace with domestic credit growth, with the result that banking sector expansion is funded by non-core liabilities (in this case, from foreign creditors). The highly significant positive

relationship between foreign debt inflows to the banking sector and domestic credit also indicates that bank-based finance still plays a major role in developing countries.

Column I also include the noteworthy finding that foreign capital inflows to other financial institutions are negatively related to domestic credit levels in developing countries. Other financial institutions are non-bank entities that also provide financial intermediation. According to Apostoaie and Bilan (2019), Arora and Zhang (2019), Gabrieli et al. (2018), and Zhou and Tewari (2019), credit services provided by non-bank financial institutions substitute for the domestic credit provided by the banking sector in developing countries. Besides, as non-bank financial institutions are the primary buyers of corporate bonds, foreign debt inflows to these institutions will result in high corporate bond purchases, thereby providing companies with alternative financing. This result is in line with Astrauskaite and Paškevicius (2014).

The results in Column II demonstrate that the domestic financial institutional development index is significantly positively related to the domestic credit level. This indicates that better domestic financial institutions positively affect domestic credit to the private sector in developing countries. The linear relationship between domestic financial institutional development and the domestic credit level also highlights the importance of domestic financial institutions in developing countries (Morakinyo et al., 2018). Financial institutions play a vital role in financial activities: better quality institutions are associated with higher quality financial services, including domestic credit for the private sector. On the one hand, domestic financial institutions are vital to fostering the process of industrialization via coordination between savers and investors (Basu, 2007). On the other

hand, increasingly fragile domestic financial institutions may impair the financial sector's ability to extend credit to individuals or innovative small enterprises (Rewilak, 2017).

The results in Column III indicate that the depth of domestic financial institutions is positively related to the level of domestic credit. However, the results in Column IV suggest that access to domestic financial institutions is not significantly related to the domestic credit level. The financial institutions depth sub-index concerns the size and liquidity of domestic financial institutions. Deeper financial institutions have greater liquidity to meet domestic credit demand. This result is in line with Gaytan and Rancière (2001), who found that deeper domestic financial institutions are associated with the provision of a higher quality of financial services (including domestic credit) to households and firms. Moreover, countries with deeper financial institutions tend to be more resilient to financial crisis shocks (Gaytan and Rancière, 2001).

Column V shows a positive and statistically significant link between the efficiency of domestic financial institutions and the domestic credit level in developing countries. This indicates that higher efficiency of domestic financial institutions will lead to an increase in the level of domestic credit in developing countries. Efficiency is defined as the ability of financial institutions to produce a result with minimal effort or resources. Thus, a higher level of efficiency of domestic financial institutions will improve the quality of financial services.

Finally, the results in Column VI show that the interaction between international capital inflows to banks and the domestic financial institutions development index has a negative effect on the domestic credit level in developing countries. Meanwhile, the

interaction terms between international capital inflows to other financial institutions and domestic financial institutions development index are not significant. In other words, higher international capital inflows to the banking sector will increase the level of domestic credit in countries with less developed domestic financial institutions and vice versa. The results of the interaction analysis are also in line with Moradia et al. (2016), who stated that developing countries with less developed financial institutions mostly have a characteristic bank-based financial system.

This result confirms that the development level of domestic financial institutions determines the relationship model between international capital inflows to the banking sector. Based on our marginal effect analysis (Table 3.4), if a country has relatively less developed financial institutions (*Insti* < 0.653), then international capital inflows to the banking sector are more likely to stimulate an increase in domestic credit levels in developing countries. The performance of most countries in the sample on the domestic financial institutions index was below these points during the research period (Table 3.1). This means that international capital inflows to the banking sector mostly demonstrated a positive effect on the domestic credit level over the period.

Table 3.4 Coefficient value of interaction term analysis and their signs

$\frac{\Delta\, Dcps}{\Delta\, Bankinflows}$	0.778 − 1.192.Insti
	Insti > 0.653= − Insti < 0.653 = +
$\frac{\Delta\, Dcps}{\Delta\, Otherinflows}$	-
	-

3.6 Robustness check

The robustness checks are conducted by using a different measure of the domestic credit level, namely the domestic credit extended to the private sector by banks (% of GDP) instead of all financial institutions. Besides, this step also controls for the impact of two indicators of global economic and financial conditions: the VIX index and a dummy variable for the global financial crisis of 2008–2009 (2008 and 2009 = 1; other years = 0). Finally, the dynamic panel data GMM estimations are estimated using this alternative measure of domestic credit level and additional control variables; the results are reported in Table 3.5.

The results of the robustness check are similar to the main estimation results reported in Table 3.3. Again, GDP per capita is not statistically significant, whereas the nominal exchange rate and CAB are significantly negatively related to the domestic credit level. Also, foreign debt inflows to the banking sector are again positively related to the domestic credit level. The only minor change is that foreign debt inflows to other financial institutions are not statistically significantly related to the domestic credit level. This change is explained by our dependent variable only covering domestic credit extended by the banking sector. Thus, foreign debt inflows to other financial institutions do not correlate with our dependent variable.

Table 3.5 Results of Robustness check

	I	II	III	IV	V	VI
Bankcredit (−1)	0.773 *** (0.000)	0.778 *** (0.000)	0.734 *** (0.000)	0.623 *** (0.000)	0.781 *** (0.000)	0.775 *** (0.000)
LogGDPpercapita	11.570 (0.165)	11.248 (0.179)	1.123 (0.905)	7.270 (0.373)	9.578 (0.272)	8.860 (0.278)
CAB	−0.187 *** (0.003)	−0.191 *** (0.003)	−0.172 *** (0.003)	−0.139 *** (0.009)	−0.180 *** (0.003)	−0.183 *** (0.003)
ERTS	−0.001 ** (0.013)	−0.001 ** (0.014)	−0.001 *** (0.084)	−0.000 (0.1149)	−0.001 ** (0.012)	−0.001 ** (0.007)
Bankinflows	0.312 *** (0.008)	0.305 *** (0.008)	0.293 ** (0.014)	0.220 * (0.050)	0.322 *** (0.006)	0.295 ** (0.011)
Otherinflows	−0.098 (0.123)	−0.108 (0.100)	−0.090 (0.132)	−0.067 (0.216)	−0.085 (0.164)	−0.096 (0.126)
VIX		−0.072 ** (0.012)				
Dummy		0.699 (0.178)				
Insti			34.222 *** (0.000)			
Depth				79.967 *** (0.000)		
Acces					3.433 (0.522)	
Efficiency						7.818 *** (0.001)
Observations	814	814	814	814	814	814
Sargan test	0.00	0.00	0.00	0.00	0.00	0.0
AR (1)	0.00	0.00	0.00	0.00	0.00	0.00
AR (2)	0.90	0.83	0.83	0.46	0.88	0.94

Notes: All sub-models were estimated using Arellano and Bond's (1991) dynamic panel data estimation. A Sargan test indicated no over-identification problem in the estimation specifications (null hypothesis: there is over-identification in the estimation specification). AR(1) and AR(2) show the results of the LM statistics for autocorrelation (null hypothesis: no first-order autocorrelation and no second-order autocorrelation, respectively). Standard errors are in parentheses, and the p-values are in brackets. ∗∗∗, ∗∗, and ∗ indicate statistical significance at the 1% , 5%, and 10% levels, respectively.

The results in Column II demonstrate that the VIX index is negatively related to the domestic credit level, but the dummy variable for the global financial crisis of 2008–2009 is not statistically significant. As a higher level of the VIX index indicates higher global risk, an increase in the VIX index will reduce capital inflows to developing countries and, in turn, reduce bank credit (Forbes and Warnock, 2012). The results in Column III show that a higher level of domestic financial institutions is positively related to the level of domestic credit in developing countries. Columns IV and VI show that the depth and efficiency of financial institutions are positively and significantly associated with the level of domestic credit in developing countries, whereas access to financial institutions is not statistically significant (Column V).

3.7 Conclusion

The study in this chapter investigates the determinants of the domestic credit level across a wide range of 74 developing countries in the period 2005–2017. This study employs Arellano and Bond's (1991) dynamic panel GMM estimation method to examine the effect of internal financial institutions and an important external supply factor on the domestic credit level. The robustness of the empirical findings was checked by considering the global economic and financial conditions, controlling for the VIX index and the effect of the global financial crisis of 2008–2009.

There are four notable empirical findings. First, this study confirms that domestic credit in developing countries is closely associated with international debt inflows to the banking sector. However, the increase of international capital inflows to other types of

financial institutions harms the domestic credit level in developing countries. These findings confirm a substitution effect between domestic credit provided by the banking sector and other financial institutions. Second, the empirical results indicate that better domestic financial institutions, particularly in terms of depth and efficiency, positively contribute to domestic credit expansion in developing countries. Third, based on interaction analysis, higher international capital inflows to the banking sector will increase the level of domestic credit in countries with less developed domestic financial institutions and vice versa. In this respect, the bank-based system is more dominant for developing and transitional countries without well-developed domestic financial institutions. Fourth, the empirical analyze finds that more uncertain global economic and financial market conditions suppress domestic credit in developing countries.

Our findings have two important policy implications. First, policymakers in developing countries should improve the quality of domestic financial institutions in order to achieve sustainable domestic credit growth. This is because well-developed domestic financial institutions can lead to more rapid and sustainable domestic credit growth. Sound domestic financial institutions are particularly essential in the context of most developing countries, given the relative lack of savings, the higher proportion of the population that is underbanked, and the massive investment needs. Moreover, better domestic financial institutions can serve as shock absorbers and mitigate the negative effects of real external shocks on the domestic economy.

Second, considering the close relationship between international capital flows to the banking sector and domestic credit in developing countries, policymakers should

carefully manage international capital flows to overcome their negative effects as well as the pursuit of sustainable domestic credit growth. According to the emoirical result, international capital is the most important (external supply) factor in domestic credit expansion in developing countries. In fact, the level of domestic credit in developing countries is growing faster than the retail deposits available. Hence, the banking sector will turn to external sources of funding by borrowing short-term debt on international inter-bank and money markets and by issuing bonds to support its credit growth. This study also confirms that the increase in domestic credit has been supported by the large increase in international capital inflows to the banking sector. Moreover, the tight correlation between retail deposits and domestic credit seems to have broken down as domestic banks increasingly turned to wholesale cross-border funding.

In this context, international capital can increase welfare by consumption smoothing and may also increase investments through domestic credit channels. However, it has bitter consequences as well. Previous studies confirm that excessive capital inflows will eventually lead to balance-of-payment crises as well as currency crises (Calvo, Leiderman, and Reinhart, 1996; Chuhan, Claessens, and Mamingi, 1993). For instance, the propagation of the Asian financial crisis can be explained through this mechanism. Before the Asian financial crisis, international capital inflows to developing countries (especially to the banking sector) were sustained at a relatively high level throughout the 1990s. However, domestic banks in developing countries mostly raised external funds by borrowing short-term debt, which is very volatile and associated with consumption

booms or inefficient investment. Thus, this condition weakens countries' fundamentals, possibly resulting in financial crises in those countries (Khan, 2004).

In turn, the potential interplay between international capital flows and domestic credit in developing countries is especially important in the context of the various distortions that can lead to inefficient credit booms and international overborrowing. Therefore, domestic and external factors should be interpreted in an integrated joint framework to achieve more rapid and sustainable domestic credit growth.

CHAPTER 4: SHADOW BANKING AND CROSS-BORDER CAPITAL INFLOWS: DOES THE LEVEL OF DEVELOPMENT OF FINANCIAL INSTITUTIONS MATTER?

4.1 Overview

Recent studies show that the shadow banking system was one of the main causes of the global financial crisis of 2007/2008 (GFC) (Aftab and Varotto 2019; Bengtsson 2013; Huang 2018; Yang et al. 2019). After the GFC, there was an increase in the monitoring and regulation of shadow banking by domestic or international bodies, especially by the FSB. The FSB uses a two-pronged strategy (monitoring and policymaking) to address the financial stability risks of shadow banking and ensure that this sector operates safely and sustainably. However, even after monitoring and regulation, shadow banking activities have continued to increase. FSB (2019) noted that the narrow measure of non-bank financial intermediaries grew by 1.7% to $50.9 trillion in 2018, compared to an average annual growth rate of 8.5% from 2012 to 2017, representing 13.6% of total global financial assets. These figures reflect the importance of shadow banking or non-bank financial intermediaries to the global economy.

Shadow banking activities involve not only non-bank financial institutions (NBFIs) but also traditional banks. Traditional banks engage in several shadow banking activities, such as securitization through SIVs, collateral operations of dealer banks, and repos (Pozsar and Singh 2012). Ehlers et al. (2018) also confirm an interconnection between banks and shadow banks through several activities in particular. This evidence is critical to proving that not only other financial corporations but also traditional banks

engage in shadow banking activities. Moreover, these findings also confirm that traditional banks are engaged in certain off-balance-sheet activities that resemble shadow banking.

Deeper analyses of the determinant factors behind the growth of shadow banking have been carried out by researchers and several international financial bodies. The growth of the shadow banking system is closely associated with GDP growth, low interest rates, bank capital stringency, and domestic financial developments (Adrian and Ashcraft 2012; Adrian and Shin 2009a, 2009b; Apostoaie and Bilan 2019; Hodula et al. 2019; Kim 2016; Malatesta et al. 2016). Furthermore, previous studies have also demonstrated that the growth of shadow banking is determined by external factors, e.g., international capital flows (Acharya and Schnabl 2010; Errico et al. 2014; Iwamoto 2015; Pozsar and Singh 2012). Iwamoto (2015) shows that there are gross capital flows from the shadow banking system in the U.S. to Europe through U.S. MMFs. Errico et al. (2014) also confirm that the gross flows of and the large position occupied by the U.S. banking sector, including other depository corporations, are interconnected with the banking sectors in the euro area and the U.K.

However, the potential determinants behind the growth of shadow banking remain unclear and appear to be complex. The determinant factors behind the growth in shadow banking are complicated because the composition of shadow banking activities varies across jurisdictions. In developed countries, shadow banking activities are relatively complex and involve various financial institutions with complicated mechanisms. By contrast, shadow banking activities are relatively simple in developing economies.

One of the main factors affecting the differences in the composition of the shadow banking services provided in developed and developing countries is the level of development of their respective domestic financial institutions. In developed countries with developed financial institutions, shadow banking activities are a response to the high demand for off-balance-sheet asset securitization and MMFs (Apostoaie and Bilan 2019). In developing countries with less-developed financial institutions, shadow banking activities provide alternative funding to underserved market segments in the economy (Allen and Gu 2020; Sun 2019). However, the research literature on shadow banking usually focuses on a particular perspective, such as macroeconomic variables and bilateral capital flows, and overlooks the various external and internal factors that explain the growth of shadow banking. Besides, previous studies have failed to answer questions about which types of cross-border capital inflows affect the growth of which shadow banking assets and have ignored the influence of the level of development of domestic financial institutions (direct and indirect) on the growth of shadow banking.

To fill this gap, the study in this chapter aims to analyze empirically how different variables related to these external and internal factors influence the dynamics of the growth of shadow banking. By using cross-border capital inflows grouped by borrower type, i.e., cross-border capital inflows to banks and non-bank sectors, and the indicators of the level of development of domestic financial institutions, this chapter addresses the following research questions: Do the two types of cross-border capital inflows (to banks and non-bank sectors) and the development of domestic financial institutions influence the growth of shadow banking assets? Moreover, how does the development of domestic

financial institutions influence cross-border capital inflows to banks and non-bank sectors, and how does it affect the growth of shadow banking assets?

To answer the research questions, first, this study divides cross-border capital inflows by borrower types (banks and non-bank sectors). The study in this chapter uses cross-border bank flow data from the Bank of International Settlements (BIS) as a proxy for cross-border capital inflows to the banking sector. This study also considers cross-border debt inflows to other sectors (including non-bank sectors) from the IMF balance of payments (BOP) data as a proxy for cross-border capital inflows to non-bank sectors. Second, this study uses the narrow measure of the level of development of domestic financial institutions as a proxy for the internal factors presented in the financial development index developed by Svirydzenka (2016). Using this index, it is possible apply three indicators to determine the level of development of financial institutions based on their depth index, access index, and efficiency index. Third, all variables are tested using the fixed effect (FE) panel data model to estimate the direct effect of each independent variable on the level of shadow banking assets. This study also considers an interaction analysis between cross-border capital inflows to banks and non-bank sectors and the level of development of domestic financial institutions. By considering the interaction analysis, it is possible to explore how the level of development of domestic financial institutions influences the cross-border capital inflows to banks and non-bank sectors on the level of shadow banking assets.

The study in this chapter is expected to enhance the existing knowledge of the level of shadow banking assets in two major ways. First, by using cross-border capital inflows grouped by borrower type and the indicators of the level of development of domestic financial institutions, this study offers perspectives on both the external and internal determinants that drive the level of shadow banking assets. Second, it offers a new perspective on the factors behind the growth of shadow banking by considering interaction relationships (simultaneously) between cross-border capital inflows to banks and non-bank sectors and the level of development of domestic financial institutions.

The remainder of this chapter is organized as follows: Section 4.2 presents the literature review. Section 4.3 describes the data. Section 4.4 explains the model specification. Section 4.5 discusses the empirical results and their interpretation. Section 4.6 presents the robustness check. Section 4.7 concludes the paper.

4.2 Literature review

4.2.1 Shadow banking and cross-border capital

Previous studies confirm that cross-border capital flows contribute to the growth of shadow banking (Acharya and Schnabl 2010; Errico et al. 2014; Iwamoto 2015; Pozsar and Singh 2012). Considering that global financial systems are becoming more interconnected, this has implications for domestic financial systems that are becoming more connected with external financial systems. Domestic financial institutions (i.e., banks and other financial corporations) can access the global liquidity market to support their activities, including several activities associated with shadow banking. A previous

study conducted by Errico et al. (2014) highlight the fact that a significant portion of the gross flows of the U.S. banking system, including other depository corporations (shadow banks), are interconnected with the banking sector in the euro area and the U.K. Furthermore, they suggested that European counterparties are large holders of the debt securities of other financial corporations or shadow banks in the U.S. (Errico et al. 2014).

Similar empirical findings were obtained by Iwamoto (2015), who highlights the fact that there are gross capital flows from the U.S. to Europe through U.S. MMFs. These gross capital flows are subsequently considered global liquidity (non-core liabilities) supplied by the U.S. shadow banking system that has two functions: securitization and collateral intermediation (Iwamoto 2015). Moreover, Acharya and Schnabl (2010) note that European banks are the primary international purchasers of U.S. mortgage-related assets. In other words, European banks are a source of funding for the U.S. shadow banking system.

The role of cross-border capital flows in driving the growth of shadow banking can also be explained from the perspective of financial regulations. As quantified by Lanau (2011), tighter domestic financial regulation can also drive direct cross-border borrowing by domestic non-banks seeking to overcome domestic restrictions. Although the interconnectedness of cross-border shadow banking systems is weak during normal periods, the systems are strikingly linked in times of tightening global liquidity conditions (Fong et al. 2018). Because tightening financial regulations have an impact on decreasing the availability of liquidity, the financial sector switches to shadow banking activities in response.

Based on previous studies, shadow banking is driven not only by other financial corporations but also by traditional banks (Ehlers et al. 2018; Pozsar and Singh 2012). In cross-border capital transactions, banks and other financial corporations also become the main channels through which foreign capital enters the domestic economy (Errico et al. 2014; Hahm et al. 2012; Lane and McQuade 2014). Global cross-border bank claims rose by $1.4 trillion between the end of 2018 and the end of March 2019, representing their most significant quarterly increase since 2007 (BIS 2019). Moreover, cross-border claims on NBFIs grew rapidly, expanding at an annual rate of 12% (BIS 2019). Based on these facts, the increase of cross-border capital inflows to banks and other financial institutions may also have spread to the shadow banking sector.

Unfortunately, previous studies that have analyzed the relationship between cross-border capital and the growth of shadow banking have mostly focused on the bilateral relationship between them and only considered general capital flows. There are no previous studies that directly analyze cross-border capital flows according to borrower type and the growth of shadow banking for a wide sample of countries. This study employs specific cross-border capital inflows, i.e., cross-border debt inflows to banks and cross-border debt inflows to other sectors (including other financial institutions). By using cross-border debt inflows to banks and other sectors, this study aims to achieve a more in-depth analysis of the determinant factors affecting the growth of shadow banking from the perspective of external supply factors.

4.2.2 Shadow banking and the development of domestic financial institutions

The development of domestic financial institutions plays a dual role in the growth of shadow banking. First, domestic financial institutions directly affect the growth of shadow banking (Hodula et al. 2019) because well-developed financial systems create a high demand from investors for various financial instruments to secure their assets. Nesvetailova (2017) confirms that shadow banking is the financial industry's institutionalized response to investors' search for yield and investment. Moreover, Palan (2013) shows that the complex web of shadow banking operations, entities, and products provides an institutional infrastructure for financial capitalism that is oriented toward the future and plays a vital role in the economic cycle.

Second, domestic financial development also plays a role in determining the model and pattern of shadow banking activities. Shadow banking has different mechanisms depending on the characteristics of the financial system in which it operates. In developed countries with advanced financial systems, shadow banking activities operate through multiple steps, involve numerous sub-systems, and are connected by complex linkages (Apostoaie and Bilan 2019). In developing countries with less-developed financial systems, shadow banking operates using simple mechanisms and is very easy to identify (Ghosh et al. 2012). Moreover, in the developed countries group, shadow banking has two main functions—financial intermediation and securitization—whereas, in the developing countries group, the shadow banking system has the primary function of providing alternative funding that cannot be obtained through traditional banks.

The unique role of the development of domestic financial institutions also determines the relationship between cross-border capital inflows and the growth of shadow banking. In developed countries with advanced financial systems, cross-border capital enters the shadow banking system through a complex and long intermediation chain. This mechanism also involves various instruments such as securitization and secured funding techniques, asset-backed commercial paper, asset-backed securities, collateralized debt obligations, and repos. In developing countries with less-developed financial systems, cross-border capital enters shadow banking activities through simple mechanisms (Ghosh et al. 2012).

Furthermore, financial institutions have also become distribution channels for cross-border capital to enter the local economy. Through cross-border capital flow transactions, domestic financial institutions have become highly connected with the global financial system. Thus, the ability and capability of domestic financial institutions (i.e., banks and other financial corporations) to operate in this way are a prime determinant in forming the relationship between foreign capital and shadow banking. Based on previous studies, the development of domestic financial institutions not only directly determines the growth of shadow banking but may also contribute to the growth of shadow banking through the role of these institutions as distribution channels for cross-border capital inflows.

4.3 Data description

This empirical study examines the individual and simultaneous effects of cross-border capital flows and the development of domestic financial institutions on the level of

shadow banking assets for a panel of 23 countries (Appendix C). Annual data are obtained for each variable for the period between 2005 and 2017 from several sources (Appendix D). A more detailed description of the measurements and data sources is given below, and the statistical descriptions of the variables are presented in Tables 4.1 and 4.2.

Table 4.1 Descriptive summary statistics

Variable	**Measurement**	**Min**	**Max**	**Mean**	**Std. Deviation**
Shadow bank assets	Logarithm form	9.361	13.489	11.565	0.899
Gross domestic product	Logarithm form	3.402	4.754	4.336	0.354
Current account balance	Percentage of GDP	-25.752	27.143	0.621	6.428
Money growth	Index	5.301	9.978	8.813	0.673
Debt inflows to non-bank sectors	Percentage of GDP	-17.362	20.074	1.196	3.310
Debt inflows to banks	Percentage of GDP	-31.025	78.330	2.279	9.092
Central bank policy rate	Percentage	-0.1	18	3.498	3.559
Money market rates	Percentage	-0.350	19.123	3.078	3.328
Financial institution depth index	Index 0–1	0.098	0.985	0.595	0.287
Financial institution access index	Index 0–1	0.103	1.000	0.648	0.227
Financial institution efficiency index	Index 0–1	0.316	0.904	0.722	0.123
Overall financial development index	Index 0–1	0.190	0.952	0.643	0.199

Table 4.2 Correlation matrix

	logGDP	CAB	Mon-growth	Polrate	MMIR	Bank-flows	Nonbank-flows	Depth	Access	Efficiency	Dev
LogGDP	1										
CAB	0.338	1									
Mongrowth	0.256	0.03	1								
Polrate	-0.6	-0.2	-0.3	1							
MMIR	-0.583	-0.286	-0.197	0.8	1						
Bankflows	0.136	0.276	-0.029	-0.3	-0.047	1					
Nonbankflows	0.079	0.169	-0.152	0.3	-0.041	0.4	1				
Depth	0.765	0.254	0.328	-0.4	-0.355	0.5	0.129	1			
Access	0.403	-0.248	0.209	-0.2	-0.234	-0.12	-0.181	0.146	1		
Efficiency	0.328	0.071	0.235	-0.5	-0.435	0.2	-0.107	0.317	0.004	1	
Dev	0.800	0.221	0.329	-0.4	-0.410	0.4	0.016	0.849	0.504	0.305	1

4.3.1 Shadow banking data

This study considers the OFIs assets that were borrowed from the FSB as a proxy for the level of shadow banking assets. These datasets cover 29 jurisdictions for the 2005–2017 period (FSB 2018). The OFIs assets consist of all financial institutions that carry out financial intermediation activities, excluding central banks, banks, insurance corporations, pension funds, public financial institutions, and financial auxiliaries (FSB 2018). The main sub-sectors of OFIs are investment funds, captive financial institutions, and money lenders, and broker–dealers (FSB 2018). To expand the country sample, this study added shadow banking assets data from several European countries that are not covered by the FSB database, namely, Bulgaria, the Czech Republic, Poland, and Romania. The shadow banking assets data for the additional countries are taken from the OFI assets in the Eurostat database.

4.3.2 Cross-border capital flows data

For the cross-border capital flows data, this study uses two types of cross-border capital inflows, namely cross-border capital inflows to the banking sector and cross-border capital inflows to the non-bank sectors. The cross-border bank flows presented in the consolidated banking statistical data provided by the BIS are used as a proxy for cross-border capital inflows to the banking sector. For the cross-border capital inflows to non-bank sectors, this study considers cross-border debt inflows to other sectors (including the non-bank sectors) presented in the other investment debt flows in the BOP data provided by the IMF. Other investment debt flows are essential because the vast majority of external bank and non-bank flows are captured in this category (Stefan et al. 2017). In

this category, it is possible to divide cross-border capital inflows by borrower type, i.e., banks, other sectors (including non-bank sectors), central banks, and sovereign borrowers. Therefore, it can be possible to consider a narrow measure of the cross-border capital inflows that are most associated with shadow banking activities. Furthermore, this study adopts the data-filling exercise developed by Stefan et al. (2017) to get a larger, more extended, and more balanced panel of countries with debt inflows split by sector.

4.3.3 Financial institutions development data

In this study, the narrow measure of the financial development index was adopted as a proxy for domestic financial institutions development indicators, namely, the depth index, access index, and efficiency index. These indexes are available in the financial developments index data developed by Svirydzenka (2016) and presented by the IMF. The financial development index is one of the most comprehensive measurements of domestic financial development. By covering the financial institutions development index indicators, i.e., the depth index, access index, and efficiency index, it is possible to capture the complex multidimensional nature of financial development (Svirydzenka 2016).

4.3.4 Control variables data

This study has several control variables, namely, GDP per capita, CAB, money growth, central bank policy rates, and money market rates. The data for the GDP per capita and CAB variables were taken from the World Bank. The money growth index data are captured from the Fraser Institute's economic freedom index, which provides several indicators related to economic freedom for more than 100 countries. The central bank

policy rates data are taken from the BIS. Finally, the money market rates data are taken from the International Financial Statistics provided by the IMF.

4.4 Model specification

There are two models in this study. Both models investigate 23 countries from 2005 to 2017. The first model is the basic model, which analyzes the individual relationships among shadow banking assets growth, domestic financial institutions' development indicators (*X*), cross-border debt inflows to banks (*Bankflows*), cross-border debt inflows to non-bank sectors (*Nonbankflows*), and other controlled variables (*Controls*), namely, GDP per capita, CAB, money growth, central bank policy rates, and money market rates. The second model is an extension of the first model to include two interaction terms of domestic financial institutions' development indicators with external factors (cross-border debt inflow into banks and non-bank sectors) to establish whether the two types of external factors react differently to the domestic financial institutions' indicators in the shadow banking context. The models are as follows:

Model 1:

$$LogSB_{i,t} = \beta_0 + \beta_1 Controls_{i,t} + \beta_2 Bankflows_{i,t} + \beta_3 Nonbankflows + \beta_4 X + \varepsilon_{i,t} \quad (4.1)$$

Model 2:

$$LogSB_{i,t} = \beta_0 + \beta_1 Controls_{i,t} + \beta_2 Bankflows_{i,t} + \beta_3 Nonbankflows_{i,t} + \beta_4 X_{i,t} + \beta_5 Bankflows.X_{i,t} + \beta_6 Nonbankflows.X + \varepsilon_{i,t} \quad (4.2)$$

$$\varepsilon_{i,t} = \alpha_i + \lambda_t + \mu_{i,t}, \quad (4.3)$$

where $LogSB_{it}$ is the shadow banking assets in country *i* in year *t*. $Bankflows_{it}$ are cross-border debt inflows into banks in country *i* in year *t*. $Nonbankflows_{it}$ are cross-border debt inflows into non-bank sectors in country *i* in year *t*. X_{it} is the level of domestic financial institutions' development indicators (financial institutions depth index, financial institutions access index, and financial institutions efficiency index) and the overall financial development index in country *i* in year *t*. *Controls* are the control variables, including GDP per capita, CAB, money growth, central bank policy rates, and money market rates. ε_{it} is the composed error term, where *ai* and λ_t denotes any unobservable country- and time-specific effects, respectively, and μ_{it} denotes the remainder of disturbance and variation over countries and time.

To avoid the multicollinearity issue, all domestic financial institutions development indicators (X) are divide into four sub-models: I–IV. Sub-models I–III represent domestic financial institutions development indicators, and sub-model IV represents the overall domestic financial development. Based on the correlation tests, the values of the correlations between the domestic financial institutions development and overall domestic financial development variables are relatively high (Table 4.2). It is

obvious that a country with a high level of development in one area of financial institutions development is likely to have high levels in other areas of domestic financial institutions development. If all the domestic financial institutions' development indicators are tested simultaneously, the risk of multicollinearity can lead to potential bias in the statistical tests.

Last, all sub-models are tested by using the FE estimations model to control for time-invariant unobserved other individual characteristics that can be correlated with the regressor variables. In Model 2, this study also considers the interaction terms between two types of cross-border debt inflows (cross-border debt inflows to banks and cross-border debt inflows to other sectors) with the domestic financial institutions development variable (X_{it}.$Bankflows_{it}$ *and* X_{it}.$Nonbankflows_{it}$, respectively). An interaction term explains a condition in which the simultaneous effect of two variables on a third variable (interaction variable) is not additive. By considering the interaction terms in the model, it is possible to gain a deeper understanding of the relationships among the variables.

Considering the interaction terms, the coefficient values of the cross-border capital inflows variable and the domestic financial institutions' development variable depend on each other. To get coefficient values of the cross-border capital inflows variable that are changed by the domestic financial institutions variable, the partial derivatives (marginal effect) of the regression values are used and compute it as follows:

$$\frac{\Delta Y}{\Delta Bankflows} = \beta_2 + \beta_5 X \tag{4.4}$$

$$\frac{\Delta Y}{\Delta Nonbankflows} = \beta_3 + \beta_6 X \tag{4.5}$$

Equations 4 and 5 compute the percentage change in the level of shadow banking assets when there is a 1% change in the cross-border capital inflow. The signs in this marginal effect reflect the true effect of the two types of cross-border capital inflows on the level of shadow banking assets, taking into consideration the interaction effect with domestic financial institutions development indicators. A positive sign reflects an increase in shadow banking activities, whereas a negative sign reflects a decrease in shadow banking activities. In other words, as an integral part of this function, the domestic financial institutions development variable determines the signs of these marginal effect estimations.

4.5 Result and discussion

Models 4.1 and 4.2 have been tested with the three domestic financial institutions development indicators using the FE model. The estimation results of Model 4.1 are presented in Table 4.3. Model 4.2's results are shown in Table 4.4, and the analysis of its interaction terms is presented in Table 4.5. Whereas Model 4.1 reveals the individual relationship effects between the variables, Model 4.2 provides more insight into the simultaneous relationship between the development level of domestic financial institutions, the cross-border debt inflows to banks, and the debt inflows to non-bank sectors. All sub-models in Models 4.1 and 4.2 have a goodness of fit, measured by adjusted R-squared, at around 0.60, implying that approximately 60%–65% of the total

variation in the level of shadow banking assets is explained by the regression models. This is a good level for panel data with a wide cross-sectional dimension.

Table 4.3 Results of the model 4.1 (basic model)

Sub-model	**1.1**	**1.2**	**1.3**	**1.4**
X	**Depth**	**Access**	**Efficiency**	**Dev**
LogGDP	3.131 ***	2.649 ***	3.544 ***	3.320 ***
	(0.346)	(0.348)	(0.328)	(0.336)
CAB	-0.014 ***	-0.016 ***	-0.015 ***	-0.015 ***
	(0.003)	(0.003)	(0.003)	(0.003)
Mongrowth	0.080 ***	0.056 **	0.090 ***	0.086 ***
	(0.017)	(0.017)	(0.017)	(0.017)
Polrate	-0.054 ***	-0.047 ***	-0.055 ***	-0.054 ***
	(0.009)	(0.009)	(0.009)	(0.009)
MMIR	0.0413 ***	0.033 ***	0.042 ***	0.0412 ***
	(0.009)	(0.009)	(0.009)	(0.009)
Bankflows	-0.002 ***	-0.003 ***	-0.002 **	-0.002 ***
	(0.001)	(0.001)	(0.001)	(0.001)
Nonbankflows	0.001	0.003	0.002	0.002
	(0.003)	(0.003)	(0.004)	(0.004)
X	1.109 ***	0.994 ***	0.287 *	1.104 **
	(0.306)	(0.168)	(0.157)	(0.372)
Number of countries	23	23	23	23
Number of observations	299	299	299	299
Adj. R squared	0.604	0.633	0.590	0.598
*All columns report results for Fixed effect regressions. Standard errors are given in parentheses. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively*				

In Model 4.1 (Table 4.3), the GDP and money growth demonstrate a significant positive effect on the level of shadow banking assets. In contrast, the CAB shows a significant negative effect on the level of shadow banking assets. This pattern holds true across sub-models 1.1–1.4. These statistical results confirm that shadow banking is highly procyclical. These results are in line with the earlier findings of Adrian and Shin (2009b), Hodula et al. (2019), Malatesta et al. (2016), Huang (2018), and Apostoaie and Bilan (2019).

However, the central bank policy rates show a significant adverse effect on the level of shadow banking assets. This result is the opposite of what the "waterbed" effect theory, which states that monetary contractions have tended to increase shadow bank asset growth, would suggest. This result can be explained by the theory of the importance of the "search for yields" in shadow banking growth. The low-interest rates condition caused massive inflows into investment funds (one of the shadow banking entities) as a result of the search for yields induced by persistently low interest rates. The model also shows that the money market rates demonstrate a significant positive effect on the level of shadow banking assets. MMFs are activities associated with shadow banking alongside structured investment vehicles, securitization entities, mortgage companies, and broker–dealers. MMFs are also one of the five areas examined under the FSB's shadow banking work program. Thus, the increase in the money market rates directly affects the increase in the level of shadow banking assets.

The cross-border capital inflows to banks have a significant opposite effect on the level of shadow banking assets in all of the sub-models (sub-models 1.1–1.4). This result

can be stated as follows: the increase in cross-border capital inflows to banks is transmitted through regular banking credit and thus reduces the level of shadow banking assets. Even though traditional banks are also involved in shadow banking activities, this result indicates that cross-border capital inflows to banks are not directly transmitted into shadow banking activities. There are two explanations for this relationship. First, instead of using foreign capital, the banking sector uses reserve funds from regular deposits in shadow banking activities. Second, due to the sample consisting of both developed and developing countries, this analysis shows that the relationship between cross-border capital inflows to banks and shadow banking tends to follow the model of developing countries. The model cannot confirm a direct effect of cross-border capital inflows to non-bank sectors on the level of shadow banking assets. However, in Model 3.2, the results show a more meaningful relationship between cross-border capital inflows to non-bank sectors and the level of shadow banking assets, as will discuss below.

Furthermore, all the domestic financial institutions' development indicators have a significant positive relationship with the level of shadow banking assets (sub-models 1.1, 1.2, and 1.3). These results indicate that the level of shadow banking assets grows faster under advanced or well-developed financial institutions. The financial institutions depth index represents more in-depth financial systems. More in-depth financial systems provide various financial instruments that support shadow banking activities. Furthermore, the financial institutions access index represents the accessibility of financial institutions. A more accessible financial institution allows investors to invest

their funds in various financial instruments, including several instruments related to shadow banking activities.

The findings of Model 4.2 are interesting. The interaction terms between cross-border capital inflows to banks and domestic financial institutions development indicators are significant in all sub-models. Meanwhile, the interaction terms between cross-border capital inflows to non-bank sectors and domestic financial institutions' development indicators are also significant in almost all sub-models (Table 4.4).

These results indicate that cross-border capital inflows to banks and cross-border capital inflows to non-bank sectors have an indirect relationship with the level of shadow banking assets mediated by the development level of domestic financial institutions. The results of Model 4.2 indicate that domestic financial institutions' development plays an important role as a distribution channel for cross-border capital inflows to the banking sector and non-bank sectors. Based on Model 4.2, the model shows that under shallow and inefficient financial institution conditions, cross-border capital inflows to the banking sector will increase the level of shadow banking assets and vice versa. Moreover, these results also demonstrate that under shallow and inefficient financial institution conditions, cross-border capital inflows to non-bank sectors will decrease the level of shadow banking assets. On the contrary, under deeper and more efficient financial institution conditions, cross-border capital inflows to non-bank sectors will increase the level of shadow banking assets.

Table 4.4 Results of the model 4.2 (extension model)

Sub-model	**2.1**	**2.2**	**2.3**	**2.4**
X	**Depth**	**Access**	**Efficiency**	**Dev**
LogGDP	2.818 ***	2.477 ***	3.434 ***	2.932 ***
	(0.342)	(0.351)	(0.332)	(3.371)
CAB	-0.022 ***	-0.022 ***	-0.018 ***	-2.389 ***
	(0.003)	(0.003)	(0.004)	(3.646)
Mongrowth	0.070 ***	0.055 **	0.087 ***	7.826 ***
	(0.017)	(0.017)	(0.017)	(1.646)
Polrate	-0.043 ***	-0.037 ***	-0.048 ***	-4.074 ***
	(0.009)	(0.009)	(0.009)	(9.142)
MMIR	0.036 ***	0.027 ***	0.037 ***	3.375 ***
	(0.009)	(0.009)	(0.009)	(8.775)
Bankflows	-0.001	-0.001	-0.001	-5.404
	(0.001)	(0.003)	(0.001)	(8.473)
Nonbankflows	-0.038 **	-0.012	-0.045 **	-4.587 **
	(0.013)	(0.013)	(0.022)	(1.965)
X	2.080 ***	1.363 ***	0.508 *	2.075 ***
	(0.459)	(0.209)	(0.225)	(4.474)
Bankflows.X	-0.291 **	-0.134 **	-0.095 *	-3.022 ***
	(0.092)	(0.048)	(0.052)	(0.022)
Nonbankflows.X	0.046 **	0.018	0.063 **	6.382 **
	(0.014)	(0.023)	(0.030)	(2.623)
Number of countries	23	23	23	23
Number of observations	299	299	299	299
Adj. R squared	0.633	0.646	0.601	0.630

All columns report results for Fixed effect regressions. Standard errors are given in parentheses. ∗∗∗, ∗∗, and ∗ denote significance at the 1, 5, and 10 percent levels, respectively

The development level of domestic financial institutions determines, to a large extent, the relationship model between cross-border capital inflows to the banking sector and cross-border capital inflows to non-bank sectors in the level of shadow banking assets. Based on the marginal effect analysis (Table 4.5), if a country has relatively less-developed financial institutions, then cross-border capital inflows to the banking sectors can be a trigger for an increase in the level of shadow banking assets. By contrast, if a country has relatively good financial institutions (Depth > 0.826, Efficiency > 0.70, and Dev > 0.714), then cross-border capital inflows to non-bank sectors can be a catalyst for an increase in the level of shadow banking assets.

Table 4.5 Interaction term analysis: Partial derivatives and their signs

Sub-model X	**I**	**II**	**III**	**IV**
$\frac{\Delta Y}{\Delta Bankflows}$	– 0.291.Depth	– 0.134.Access	– 0.095.Efficiency	– 3.022.Dev
	Depth> 0 = – Depth< 0= +	Access> 0 = – Access< 0 = +	Efficiency> 0 = – Efficiency< 0 = +	Dev > 0 = – Dev < 0 = +
$\frac{\Delta Y}{\Delta Nonbankflows}$	-0.038 + 0.046.Depth	-0.012 + 0.018.Access	-0.045 + 0.063.Efficiency	-4.587 + 6.382.Dev
	Depth > 0.826 = + Depth < 0.826 = –	Access > 0.70 = + Access < 0.70 = –	Efficiency > 0.714 = + Efficiency < 0.714 = –	Dev > 0.720 = + Dev < 0.720 = –

Based on the marginal effect coefficient values of the interaction relationship between cross-border capital inflows to banks and the development level of domestic financial institutions, the model tends to follow the shadow banking model in developing countries. In this model, due to lack of access to regulated financial services, including traditional banks, traditional banks tend to invest in finance companies and microfinance institutions to provide credit and investments to underbanked households, subprime borrowers, and low-rated companies (small and medium-sized enterprises). Based on the marginal effect coefficient values, it can be assumed that countries in the sample with less-developed financial institutions, e.g., Indonesia, Mexico, Russia, the Czech Republic, Bulgaria, Poland, and Romania tend to follow this model (average value of domestic financial institutions' development index < 0.4). However, beyond this model, the relationship between traditional banks and shadow banking also occurs in countries with well-developed financial institutions (shadow banking model in developed countries). In this model, traditional banks engage in shadow bank activities through off-balance-sheet investments to either avoid regulatory arbitrage or search for higher yields.

The marginal effect analysis also shows that good domestic financial institutions (domestic financial institutions development index > 0.740) are necessary to distribute the cross-border capital inflows to non-bank sectors through shadow banking activity. This means that only countries with well-developed financial institutions whose shadow banking sectors are influenced by cross-border capital inflows to non-bank sectors. The findings of this study are consistent with those of previous studies, in that most of the relationships between cross-border capital flows and the shadow banking system occur

in developed countries, especially the U.S., Japan, and those in the European Union (EU) (Acharya and Schnabl 2010; Errico et al. 2014; Iwamoto 2015).

Most countries in the sample had domestic financial institution performance indicators below the marginal effect coefficient values during the research period. According to Table 4.1, the average value of the financial institutions development index (depth, access, and efficiency) was smaller than the magnitudes of neutral impact. That means that cross-border capital inflows to non-bank sectors mostly demonstrated a negative influence over the period. Among 23 countries, cross-border capital inflows to non-bank sectors only show a significant effect in Australia, Canada, France, Japan, the Republic of Korea, Spain, and the U.S.

Comparing Model 4.1 and Model 4.2, cross-border capital inflows to non-bank sectors do not directly affect the level of shadow banking assets, but the potential effect can still be delivered through the domestic financial institutions development indicators. This study proves that domestic financial institutions development is a crucial channel delivering the significant effect of both cross-border debt inflows to the banking sector and cross-border debt inflows to non-bank sectors. Moreover, the development level of domestic financial institutions is essential to understanding these relationships.

The empirical findings also highlight the potential interplay between traditional banks and NBFIs in the context of shadow banking assets growth. The NBFIs are the main entities that provide the shadow banks' activities. They provide financial intermediation activities such as liquidity transformation and the creation of leverage, commonly called non-bank financial intermediation. Mostly, NBFIs operate without

appropriate regulations (especially before the GFC). This gap is usually used by traditional banks to enter into shadow banking activities to either avoid regulatory arbitrage or search for higher yields. the interaction analysis shows a negatively significant relationship between cross-border capital inflows to the banking sector and domestic financial institutions' development on the level of shadow banking assets. This result indicates that in the less-developed financial systems, traditional banks tend to invest in shadow bank activities. In this mechanism, traditional banks use NBFIs as intermediary institutions to enter into shadow banking activities. This model tends to follow the interplay between traditional banks and NBFIs in developing countries. In this model, shadow banking provides alternative funding to the market segments that are not served by traditional banks, and this market segment tends to be large (Allen and Gu 2020). Thus, in order to search for higher yields, traditional banks tend to expand their activity through NBFIs to provide credit and other financial services to underbanked households, subprime borrowers, and low-rated companies (small and medium-sized enterprises) (Allen and Gu 2020; Sun 2019).

Without appropriate regulations, non-bank financial intermediation provided by NBFIs can become a source of systemic risk to the financial system. Moreover, this risk can be compounded if the non-bank financial intermediation activities involve the interplay between traditional banks and NBFIs. Thus, the most important step is to regulate the NBFIs to address the potential for systemic risks to financial stability to emerge outside of the traditional banking system. Moreover, appropriate regulations for

NBFIs are also important to transforming shadow banking into safe non-bank financial intermediation activity.

4.6 Robustness check

This section presents some robustness exercises for the effects of cross-border capital flows and domestic financial institutions' development on shadow banking assets growth. First, testing instrumental variables estimation model to analyze the relationships between the variables. Second, running a robustness check by using different measures of cross-border capital inflows to non-bank sectors. Third, considering a dummy variable to analyze the structural change before and after the GFC.

4.6.1 Results of the instrumental variables estimation

As the first robustness exercise, the results of the instrumental variables estimation are reported in Appendix E and Appendix F. By using an instrumental variables estimation, the results are mostly stable and identical to the initial results. The only minor change is the relationship between the overall domestic financial development index and the level of shadow banking assets becomes insignificant (Appendix E, sub-model 1.4). This result means that the overall domestic financial development index does not affect the level of shadow banking assets. However, this minor difference does not affect the main conclusions.

4.6.2 Results of the robustness check by using a different measure of cross-border capital inflows to non-bank sectors

The second robustness check is conducted by using a different measure of cross-border capital inflows to non-bank sectors (Appendix G). This robustness check uses cross-border capital inflows to the NBFIs (except insurance companies and pension funds), financial auxiliaries, cooperative financial institutions, money lenders, and MMFs taken from the institutional sector accounts data provided by Eurostat. In this dataset, it is possible to divide cross-border capital inflows based on counterparty sectors for European countries. By using this dataset, it is possible to use the cross-border capital inflows to the entities which are most associated with shadow banking. Due to this dataset only being available for European countries, this robustness check only consists of the ten European countries that are part of full sample of countries.

The results of this robustness check are interesting. Although some control variables show results different from the initial results (money market rates and central bank policy rates become insignificant), cross-border capital inflows to non-bank financial intermediaries show a significant positive relationship with the level of shadow banking assets. These results indicate that domestic shadow banking assets are directly influenced by cross-border capital inflows or directly connected with external factors. These findings also show that the spillover risk of the shadow banking sector is not limited by national borders. Considering the complex linkages of this mechanism and that various shadow banking entities operate under different regulations, the interconnectedness between domestic shadow banking and cross-border capital inflows

warrants continued monitoring by authorities to avoid spillover risk and transform shadow banking into safe non-bank financial intermediations.

4.6.3 Results of the robustness check by including the structural change

This step considers the structural changes that occurred before and after the GFC in the model by using a dummy variable. A dummy variable for structural change codes this variable as 1 for "after the GFC" and 0 for "before the GFC" (Appendix H). The coefficient on the interaction term between GDP and money growth with the GFC is negative and statistically significant (Columns I and III), telling us that GDP and money growth have a weaker impact on the level of shadow banking assets after the GFC compared to before the GFC, whereas the interaction term between money market rates and central bank policy rates with the GFC is positive and statistically significant (Columns II and IV). These results mean that money market rates and central bank policy rates have a stronger relationship with the level of shadow banking assets after the GFC compared to before it. Based on these results, domestic financial institutions development indicators (depth and efficiency) negatively interact with the GFC (Columns VII–X). These results show that the domestic financial institutions depth and efficiency have a weaker impact on the growth of shadow banking assets after the GFC than before it. Before the GFC, almost all NBFIs were not adequately regulated or monitored, which made these sectors and other sectors involved in shadow banking activities more volatile and susceptible to changes in institutional conditions. However, after the GFC, the NBFIs and other sectors involved in shadow banking activities (including traditional banks)

became more monitored and regulated, making these sectors more resilient to institutional changes.

Furthermore, this robustness check finds that there is no interaction relationship between the two types of cross-border debt inflows (Bankflows and Nonbankflows) and the GFC (Appendix H, Columns V and VI). These results indicate that there is no difference between before and after the GFC in the context of the relationship between cross-border capital inflows to banks and non-bank sectors on the level of shadow banking assets. In terms of quality, the relationship between these variables has become more monitored and regulated in the aftermath of the GFC. However, in terms of quantity, there are no differences between before and after the GFC. These results are in line with the fact that the level of shadow banking assets has continued to increase after the GFC. FSB (2019) noted that the narrow measure of non-bank financial intermediaries grew by 1.7% to $50.9 trillion in 2018, compared to an average annual growth rate of 8.5% from 2012 to 2017, representing 13.6% of total global financial assets. These figures reflect the importance of shadow banking or non-bank financial intermediaries to the global economy. Based on these results, policymakers should improve the quality of their monitoring and regulation of this sector to ensure it works safely and sustainably.

4.7 Conclusion

The study in this chapter shows the individual and simultaneous relationships between domestic financial institutions' development indicators, the two types of cross-border capital inflows, and the level of shadow banking assets. Individually, the level of shadow

banking assets does not depend on the cross-border capital inflows to non-bank sectors. Meanwhile, the cross-border capital inflows to banks harm the level of shadow banking assets. Furthermore, this study also confirms that the development of domestic financial institutions plays a vital role in forming the foundation of the shadow banking system in the country sample.

Simultaneously, the two types of cross-border capital inflows are sensitive to the level of development of the domestic financial institutions in the host countries, which determines whether this type of capital inflow will increase or decrease the shadow banking activities in the host country. The empirical findings confirm that in countries with less-developed financial institutions, cross-border capital inflows to the banking sector can be a trigger for an increase in the level of shadow banking assets. By contrast, in countries with good financial institutions, cross-border capital inflows to non-bank sectors can be a catalyst for an increase in the level of shadow banking assets.

The findings of this study have three important implications for policymakers. First, the shadow banking sector has continued to grow after the GFC and after being regulated by domestic or international bodies (especially FSB). Based on this finding, policymakers need to pay attention to the trends in shadow banking growth and should be aware of the variables related to shadow banking growth (external and internal) to ensure that this sector works safely and sustainably. Moreover, policymakers should devise rules and standards requiring shadow banking markets to hold enough liquidity to be sufficiently sensitive to risk. However, where investors and financial intermediaries fail to identify new risks, it is less likely that the regulators – who have fewer resources –

will succeed. Increasing capital requirements can limit the capacity of financial intermediaries to involve in the high-risk activities.

Second, the level of shadow banking assets is highly related to both external factors (cross-border capital inflows) and internal factors (domestic financial institutions' development). Considering the nature of this sector, which involves long chains and multiple counterparties with unclear financial obligations, policymakers should improve the resiliency of the financial system and lowering the chances of another financial crisis through strong financial regulation. Moreover, improving the resiliency of the financial system is also important not only to mitigate the negative effect of the shadow banking activity, but also it promotes long-term, sustainable economic growth.

Third, the interplay between traditional banks and NBFIs has also continued to increase and to contribute significantly to the level of shadow banking assets. Based on this finding, policymakers should strengthen the monitoring and regulating of the rising exposure of traditional banks to NBFIs or unregulated financial institutions to mitigate systemic risk in these sectors. Tighter banking regulations would both mitigate the ongoing risks posed by the core banking sector and further address the risks posed by the shadow banking sector, as the banking and shadow banking systems are deeply connected. However, improvement in the supervisory quality in this sector needs to be carried out to strike a fine balance between close supervision and allowing space for financial innovation. If regulation is too loose, it may result in excessive risk-taking, but if it is too tight, it may harm the financial sector, which serves as the lifeline of the economy.

One shortcoming of this study concerning the selected explicative variables is that this study fails to obtain a better proxy for cross-border capital inflows that enter shadow banking directly for all countries in the sample. There are several datasets that can be used as proxies for cross-border capital inflows into shadow banking, i.e., the institutional sector accounts provided by Eurostat (only for European countries) and the cross-border bank claims on NBFIs provided by BIS (only available from 2013 Quarter 4). However, these datasets are not available for all of the sample countries or for the research period. As a result, further research that includes such variables is needed to get a deeper understanding of the factors behind the growth of shadow banking.

CHAPTER 5: THE US VS. THE EU: CROSS-BORDER BANK FLOWS' ORIGIN FACTOR AND SHADOW BANKING IN EMERGING MARKET ECONOMIES

5.1 Overview

After the global financial crisis of 2008/2009, the interconnectedness of banks and shadow banking entities is often mentioned as a major financial stability issue. Previous studies show that there are several channels and mechanisms linking banks and shadow banking entities through both domestic and cross-border linkages. In the cross-border context, cross-border bank flows are the main channel linking global banks and shadow banking entities. Abad et al., (2017) find that approximately 60% of EU banks' total exposure to shadow banking entities is toward non-EU-domiciled entities, especially in the U.S. Acharya and Schnabl (2010) also demonstrate that European banks are a source of funding for the US shadow banking system through cross-border bank flows. Through the same mechanism, Errico et al., (2014) highlight the close relationship between the U.S. banking system and shadow banking entities in the euro area and the UK. Finally, the IMF (2014) and Maes (2014) highlight the interaction of EU banks and U.S.-domiciled shadow banking entities during the financial crisis. However, previous studies only focus on advanced economies and neglect the potential relationship between global banks and shadow banking in EMEs.

Considering the rapid increase of the shadow banking sector in EMEs (Apostoaie and Bilan, 2019; Ehlers et al., 2018; FSB, 2020) and the increase of global banks' exposure to EMEs (Cerutti and Osorio-Buitron, 2020; Jo, 2014; Goldberg, 2001;

Herrmann and Mihaljek, 2013), cross-border bank flows from advanced economies may be transmitted to the shadow banking sector in EMEs. The study in this chapter aims to explores the relationship between the cross-border bank claims of two major regions (the U.S. and the EU) on EMEs and shadow banking assets in EMEs. Another goal of this study is to compare the differences in how cross-border bank flows from U.S. banks and European banks influence shadow banking assets in EMEs.

This study makes two main contributions. First, it is one of the few studies to examine the relationship between the global banks and the shadow banking system in EMEs. Second, by dividing cross-border bank flows based on home country, it explores how U.S. banks and EU banks influence the shadow banking system in EMEs.

The remainder of this chapter is organized as follows: Section 5.2 presents the literature review. Section 5.3 describes the data and methodology. Section 5.4 discusses the empirical results and their interpretation. Section 5.5 concludes the paper.

5.2 Literature review

Previous studies confirm that cross-border capital flows contribute to the growth of shadow banking (Acharya and Schnabl 2010; Errico et al., 2014; Iwamoto 2015; Pozsar and Singh 2012). A previous study conducted by Errico et al., (2014) highlight the fact that a significant portion of the gross flows of the U.S. banking system, including other depository corporations (shadow banks), are interconnected with the banking sector in the euro area and the UK Furthermore, they suggested that European counterparties are

large holders of the debt securities of other financial corporations or shadow banks in the U.S. (Errico et al., 2014).

Similar empirical findings were obtained by Iwamoto (2015), who highlights the fact that there are gross capital flows from the U.S. to Europe through U.S. MMFs. These gross capital flows are subsequently considered global liquidity (non-core liabilities) supplied by the U.S. shadow banking system that has two functions: securitization and collateral intermediation (Iwamoto 2015). Moreover, Acharya and Schnabl (2010) note that European banks are the primary international purchasers of U.S. mortgage-related assets. In other words, European banks are a source of funding for the U.S. shadow banking system.

Previous studies also show that cross-border bank flow is one of the most important channels for the transmission of financial shocks or contagion. Cetorelli and Goldberg (2011) argue that global banks played a significant role in the transmission of the U.S. crisis of 2007–8 to EMEs via the channel of internal capital markets between the parent bank and the subsidiary. Peek and Rosengren (1997, 2000) argue that financial shocks in Japan strongly affect lending by Japanese banks in the United States. Jo (2010) also argues that the financial crisis in the mid-1990s in Japan was transmitted to other East Asian economies via international lending by Japanese banks. In addition, De Haas and van Lelyveld (2010) also argue that although multinational banks tend to transmit home-country financial shocks to host countries, the internal capital markets within multinational banking tend to dampen the host-country financial shocks.

Van Rijckeghem and Weder (2001) present evidence in favor of common lender effects in Asian, Mexican, and Russian crises, noting that the banks reduced investments in related markets when they were exposed to a financial crisis in a particular country, thereby causing a credit crunch in the host countries. Using an analysis of claims by seven home countries on ten host countries in Latin America, Martinez Peria et al., (2005) find that international lending is influenced by the home country's business cycle.

Considering the rapid increase of the shadow banking sector in EMEs (Apostoaie and Bilan, 2019; Ehlers et al., 2018; FSB, 2020) and the increase of global banks' exposure to EMEs (Cerutti and Osorio-Buitron, 2020; Jo, 2014; Goldberg, 2001; Herrmann and Mihaljek, 2013), cross-border bank flows from advanced economies may be transmitted to the shadow banking sector in EMEs.

5.3 Data description and model specification

The study in this chapter examines the effects of cross-border bank flows based on origin factor on shadow banking assets for a panel of 11 major EMEs, namely, Argentina, Brazil, Chile, China, India, Indonesia, Mexico, Russia, Saudi Arabia, South Africa, and Turkey. Annual data are obtained for each variable from several sources for the period between 2002 and 2019.

This study uses a broad measure of shadow banking assets, namely, NBFI assets, borrowed from the FSB (2020), as a proxy for the level of shadow banking assets in EMEs. For the robustness check, this study uses the OFIs assets that were borrowed from the FSB as a proxy for the level of shadow banking assets. The OFIs assets consist of all

financial institutions that carry out financial intermediation activities, excluding central banks, banks, insurance corporations, pension funds, public financial institutions, and financial auxiliaries (FSB 2018). In order to make data in smaller scale to reduce non-linearity, the data of NBFI and OFIs variables were transformed into logarithmic form.

For the main exogenous variables, this study uses the BIS consolidated banking statistics divided by the country of origin factor (U.S. and EU) as a proxy for cross-border bank claims on EMEs. The main advantage of this dataset is can identify the cross-border bank flows by home country. Finally, this study also considers several control variables that reflect the host country's macroeconomic conditions, i.e., GDP, collected from the WDI provided by World Bank; CAB, borrowed from the WDI provided by World Bank; the money market rates taken from the IMF; and the financial institutions index taken from Svirydzenka (2016). A more detailed description of the measurements and data sources is presented in Tables 5.1, and the correlation matrix among the variables is presented in Tables 5.2.

Table 5.1 Definition and Source of variables

Variable label	Definition	Sources
LogSB	Non-Bank Financial Intermediation (NBFI) assets (Logarithm form)	FSB
OFIs	Other financial intermediaries' (OFIs) assets (Logarithm form) - for robustness check	FSB
GDP	Gross Domestic Product (Logarithm form)	WDI
CAB	The current account balance (% of GDP)	WDI
MMIR	The money market rates (%)	IMF
Institutions	The financial institutions index (Index= 0-1)	Svirydzenka (2016).
USbankflows	The US bank claims on 11 EMEs (% of GDP)	Consolidated banking statistics, BIS
Eurobankflows	European bank claims on 11 EMEs (% of GDP)	Consolidated banking statistics, BIS

Table 5.2 Correlation matrix

	GDP	CAB	MMIR	Institution	USbank-flows	Eurobank-flows
GDP	1					
CAB	−0.030	1				
MMIR	−0.129	−0.330	1			
Institutions	0.105	−0.421	−0.013	1		
USbankflows	−0.222	−0.301	−0.022	0.141	1	
Eurobankflows	−0.350	−0.244	0.007	0.403	0.108	1

Furthermore, a panel data estimation model is used to investigate the linear relationships among the variables. The panel data regression is estimated as follows:

$$LogSB_{i,t} = \beta_0 + \beta_1 GDP_{i,t} + \beta_2 CAB_{i,t} + \beta_3 MMIR_{i,t} + \beta_4 Institution_{i,t} + \beta_5 USbankflows_{i,t} + \beta_6 Eurobankflows_{i,t} + \varepsilon_{i,t}$$

where LogSB_{it} is the logarithmized shadow banking assets; GDP_{it} is the logarithmized GDP; CAB_{it} is the current account balance; $MMIR_{it}$ is the money market rates; $Insti_{it}$ is the level of domestic financial institutions development index; $USbankflows_{it}$ is cross-border bank flows from US banks; and $Eurobankflows_{it}$ is cross-border bank flows from European banks.

The model estimated by using the Fixed-Effects (FE) estimation model to deal with cross-country regressions. In addition, this study also conducts the Hausman test to confirm the model selection (Table 5.3). The results of the Hausman test show that the null hypotheses are rejected and confirm that the FE method is more efficient than the Random Effect method for estimating the model. Last, to address any heteroskedasticity issues, the Huber–White heteroskedasticity-robust standard errors also reported in the estimation results.

Table 5.3 The Hausman test

Sub-model	I	II	III	IV
X^2	26.6207	27.3712	23.7856	22.709
P value	$<2.37161e \times 10^{-5}$	$<4.82913 \times 10^{-5}$	<0.000238702	<0.0008

Table 5.4 Empirical results

Sub-model	I	II	III	IV
GDP	1.313 ***	1.402 ***	1.285 ***	1.389 ***
	(0.110)	(0.115)	(0.110)	(0.113)
CAB	0.008 *	0.009 **	0.007 *	0.009 **
	(0.004)	(0.004)	(0.004)	(0.004)
MMIR	0.015 ***	0.016 ***	0.014 ***	0.016 ***
	(0.003)	(0.003)	(0.003)	(0.003)
Institutions	4.083 ***	3.841 ***	4.179 ***	3.899 ***
	(0.407)	(0.415)	(0.405)	(0.407)
USbankflows		0.008 **		0.011 ***
		(0.004)		(0.004)
Eurobankflows			−0.003 **	−0.003 ***
			(0.001)	(0.001)
Observations	198	198	198	198
Robust Std. Error	Yes	Yes	Yes	Yes
R-Squared	0.862	0.866	0.866	0.872
*Notes: Robust standard errors between parentheses. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.*				

5.4 Results and discussion

The main results of this study are presented in Table 5.4. The results in Column I show that GDP and CAB are significantly positively related to shadow banking assets. These findings show that shadow banking assets in EMEs increase when the economy is expanding. Column I also shows that money market rates and the financial institutions development index are significantly positively related to shadow banking assets in EMEs. These results indicate that the increase in shadow banking in EMEs is in line with the development of financial markets and institutions.

The relationship between CAB and shadow banking assets in this chapter is different with the result of the previous chapter (see Chapter 4). In this chapter, CAB has

a positive impact on the level of shadow banking assets in sample countries. However, in Chapter 4, CAB is significantly negatively related to the level of shadow banking in sample countries. One plausible explanation for the difference in the relationships between CAB and shadow banking assets in this chapter and Chapter 4 is caused by the different compositions of the sample countries. On the one hand, the sample country in this chapter consists of 11 EMEs. On the other hand, the sample country in Chapter 4 consists of 23 developed and developing countries (mostly developed countries).

The current account deficits in developed countries are not driven primarily by fiscal deficits, but rather by private saving and investment decisions (Blanchard, 2007). Besides, the current account deficits in developed countries are mostly financed through the increased borrowing by the domestic intermediation sector (Errico et al., 2014). Therefore, the increase of the current account deficit in developed countries might leads an increase of the shadow banking activities. In the contrary, the current account deficits in emerging market and developing economies are driven primarily by fiscal deficits and mostly financed through external debt. A current account deficit in emerging market and developing economies may imply the economy is becoming uncompetitive. Therefore, considering the characteristic of the shadow banking in emerging market and developing economies that mostly provided the alternative source of funding to the households and firms, an increase of the current account deficit in those countries might leads a decrease of the shadow banking activities and vice versa.

The results in Columns II and III provide totally new and interesting evidence. The U.S. bank claims on EMEs have a positive impact on shadow banking assets in EMEs

(Column II). Meanwhile, European bank claims on EMEs are significantly negatively related to shadow banking in EMEs (Column III). These results indicate that cross-border bank flows from US banks and European banks have different effects on shadow banking assets in EMEs.

The results in Column II also confirm that U.S. banks' presence in EMEs has become much larger through the shadow banking system. This relationship may be caused by the characteristics of U.S. bank claims on EMEs. U.S. bank claims on EMEs are relatively countercyclical with respect to US macroeconomic conditions. The real sector shocks in the U.S. trigger an increase in cross-border bank lending to EMEs (Cerutti and Osorio-Buitron, 2020; Goldberg, 2001). The negative correlation between U.S. bank claims on emerging countries and U.S. macroeconomic conditions indicates that U.S. banks tend to use the shadow banking system in emerging countries to search for higher yields.

One plausible explanation for the difference in the relationships between U.S. banks and European banks with the shadow banking sector in EMEs may be the different conditions of U.S. banks and European banks. Several economic crises have hit European banks harder than U.S. banks and have greatly affected the health of European banks. The financial shocks to European banks' balance sheets can be captured by the capital-to-assets and nonperforming loans (NPLs) ratios. Compared to U.S. banks, the bank capital-to-assets ratio of European banks is relatively small (under 8%) (Figure 5.1). In other words, as financial instability intensified, European banks experienced a capital squeeze and had to withdraw their assets from EMEs to comply with the capital adequacy ratio.

This may explain why EU banks play a relatively small role in high-risk investments in EMEs (including shadow banking).

The level of NPLs of European banks is also higher compared to U.S. banks (Figure 5.2). Increased NPLs deteriorated the balance sheets of the European banks, causing them to reduce their lending to or investment in EMEs (to comply with liquidity constraints). Therefore, the lower level of the capital to asset ratio and the higher level of the NPLs pushed the European banks to invest in low-risk investments in EMEs, e.g., regular banking credit, thus reducing the shadow banking assets in EMEs.

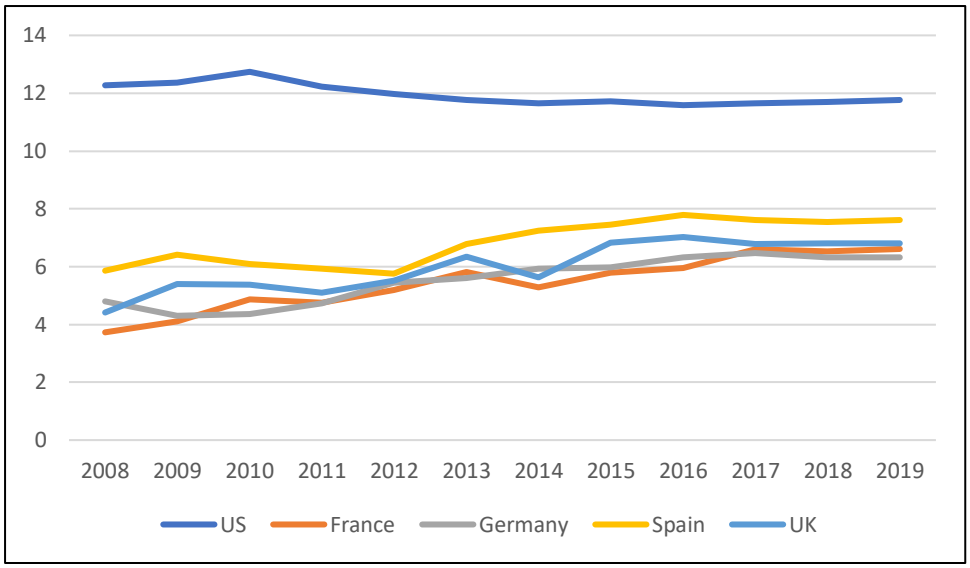

Figure 5.1 The level of bank capital-to-assets ratio of the US banks and European banks (%).

Data source: World Bank plotted by author.

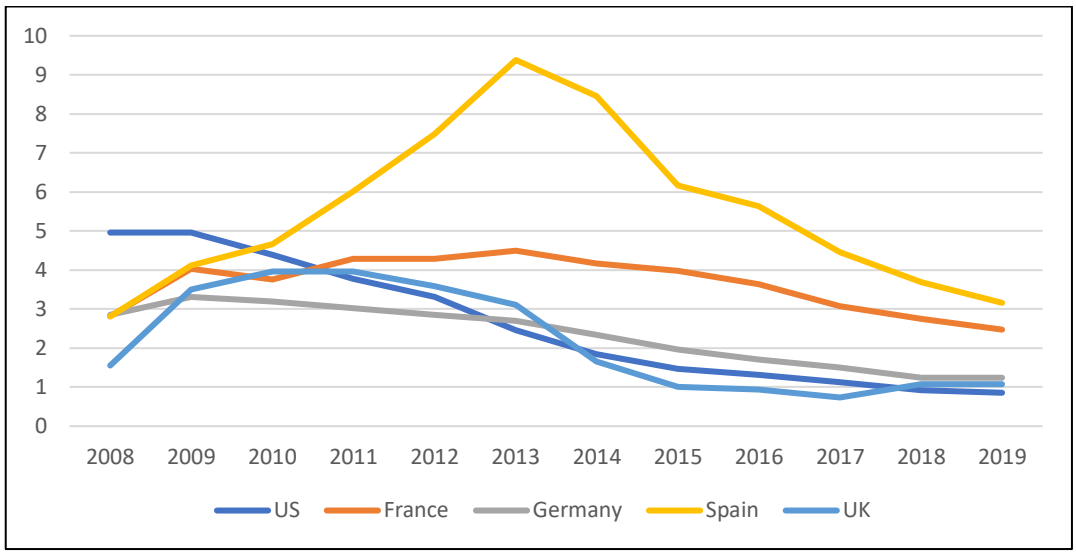

Figure 5.2 The Level of nonperforming loans of the US banks and European banks (%). Data source: World Bank plotted by author.

A robustness check is conducted by using a different measure of the shadow banking assets in EMEs, namely OFIs, taken from FSB (2020). The results of the robustness check are consistent with the main estimation results (Table 5.5). The results of the robustness check confirm that the claims of both U.S. banks and EU banks on EMEs have close—albeit different—relationships with shadow banking assets in EMEs.

Table 5.5 Robustness check

Sub-model	I	II	III	IV
GDP	1.834 *** (0.168)	1.951 *** (0.176)	1.808 *** (0.168)	1.939 *** (0.175)
CAB	0.019 *** (0.006)	0.020 *** (0.006)	0.019 *** (0.006)	0.020 *** (0.006)
MMIR	0.016 *** (0.004)	0.018 *** (0.004)	0.016 *** (0.004)	0.018 *** (0.004)
Institutions	4.408 *** (0.618)	4.087 *** (0.633)	4.496 *** (0.620)	4.144 *** (0.630)
USbankflows		0.011 ** (0.005)		0.013 ** (0.005)
Eurobankflows			−0.002 * (0.002)	-0.003 * (0.001)
Observations	198	198	198	198
Robust Std. Error	Yes	Yes	Yes	Yes
R-Squared	0.801	0.855	0.803	0.810
*Notes: Robust standard errors between parentheses. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.*				

5.5 Conclusion

The empirical analysis in this chapter finds that the claims of both U.S. banks and EU banks on EMEs have close—albeit different—relationships with shadow banking assets in EMEs. U.S. bank claims on EMEs have a positive impact on shadow banking assets in EMEs. Meanwhile, European bank claims on EMEs are significantly negatively related to shadow banking in EMEs.

Foreign claims of U.S. banks are highly correlated with U.S. GDP growth, but not with foreign demand conditions. Based on the previous study, the negative correlation between U.S. bank claims and U.S. GDP growth for emerging country partners suggests that net claims on these areas contract when the U.S. economy is expanding (Goldberg, 2001). Furthermore, previous study also show that foreign claims of U.S. banks are correlated with real U.S. interest rates, but generally uncorrelated with foreign real interest rates. In other words, tighter real lending conditions in the U.S. are associated with higher real claims on emerging country partners. The negative correlation between U.S. bank claims on emerging countries and U.S. macroeconomic conditions indicates that U.S. banks tend to use the shadow banking system in emerging countries to search for higher yields. Previous study also demonstrates that U.S. banks have not been volatile lenders internationally. This condition indicates that the conditions of the U.S. banks are relatively stable. Therefore, U.S. banks potentially invest their funds in the high-risk investment (shadow banking) in EMEs.

Compare to the U.S. banks, the European banks' presence in EMEs is relatively small. Previous study shows that cross-border bank lending to most emerging market

regions (Asia and Latin America) is U.S.'s banks dominated (Cerutti and Osorio-Buitron, 2020). Moreover, several economic crises have hit European banks harder than US banks and have greatly affected the health of European banks. Compared to U.S. banks, the bank capital-to-assets ratio of European banks is relatively small (under 8%). The level of NPLs of European banks is also higher compared to U.S. banks. Therefore, the lower level of the capital to asset ratio and the higher level of the NPLs pushed the European banks to invest in low-risk investments in EMEs, e.g., regular banking credit, thus reducing the shadow banking assets in EMEs.

Last, the results of this chapter also shows that U.S. banks' presence in EMEs has become much larger through the shadow banking system, as well as increase the transmission of sources of financial shock that link the U.S. and EMEs.

CHAPTER 6: EXCHANGE RATE AND NON-CORE LIABILITIES: EVIDENCE FROM INDONESIA BANKS

6.1 Overview

The increase of foreign funding of the banking sector in EMEs has well-explained by Hahm, Shin, and Shin (2013) that classify the other funding sources (outside retail deposit) of the banking sector as non-core liabilities. Previous studies have emphasized that non-core bank liabilities play a role as a predictor of financial vulnerability e.g. currency crisis, stock market crisis, and credit crisis in EMEs (Shin and Shin 2010; Hahm et al. 2010; Hahm, Shin, and Shin 2013). However, the response of non-core bank liabilities to an exchange rate shock remains ambiguous.

As argued by (Sahminan, 2007), the increase of banks liabilities dominated in foreign currency (as a main component of non-core bank liabilities) in EMEs makes the banking sector in EMEs are relatively fragile to the exchange rate risks. The risks are getting bigger due to the banking sector in EMEs mostly rely on short term foreign debt which do not incur the cost of hedging against depreciation (Sharma, 2003). In addition, Lane and Shambaugh (2010) state that the tendency to rely on large amounts of foreign-currency debt in EMEs potentially harm the domestic economy including the banking sector especially during currency depreciations. Therefore, this study takes another point of view by exploring the response of non-core bank liabilities when there is a shock in the exchange rate.

The purpose of this chapter is to investigate the effect of the exchange rate shock on the level of non-core bank liabilities. This study investigates the issue in the context

of the experience of Indonesia, a large emerging economy in Asia. Considering the rapid increase of the non-core bank liabilities and the fluctuating exchange rate movements in Indonesia, addressing this issue is essential to understand the transmission process of exchange rate shock to the banking sector.

The study in this chapter contributes to the literature along two dimensions. First, this study emphasizes how exchange rate shock affect the level of non-core bank liabilities. Second, the study in this chapter also provides a novel empirical evidence of the transmission process of the exchange rate shock to the banking sector through non-core liabilities channel. In particular, this study adopts a structural vector autoregressive (SVAR) model with sign restrictions to illustrate the immediate responses of specific variables to structural shocks. This study finds a robust evidence that the exchange rate shock has an impact in the decline of the non-core liabilities in the Indonesian banks. Moreover, the results also confirm that currency depreciation produces contractionary effects in Indonesia's GDP.

The remainder of this chapter is organized as follows: Section 6.2 presents the data description. Section 6.3 describes the methodology. Section 6.4 discusses the empirical results and their interpretation. Section 6.5 concludes the research.

6.2 Data description

The study in this chapter analyze how exchange rate shock helps explain changes in non-core liabilities in Indonesia banking system over the period 1990 Q1–2020 Q4. Firstly, the macro-level data of non-core liabilities in Indonesian banks are calculated by

following the approach of Hahm, Shin and Shin (2013). This study divides the non-core bank liabilities into two measurements namely non-core 1 (NC1) and non-core 2 (NC2). Thus, two alternative measures of non-core bank liabilities are calculated as follow:

$$NC1 = Liability\ of\ banks\ to\ foreign\ sectors + Liability\ of\ banks\ to\ non\ bank\ financial\ institutions \quad (6.1)$$

$$NC2 = Liability\ of\ banks\ to\ foreign\ sectors + (M3 - M2) \quad (6.2)$$

Both measures of non-core bank liabilities consider bank liabilities to the foreign sectors, which represents an important component of non-deposit funding for banks in Indonesia. In addition to foreign liabilities, we add bank liabilities to non-bank financial institutions (for NC1) and M3 — M2 (for NC2). In main estimations, this study considers various ratios of non-core to core liabilities. As a measure of core bank liabilities, this study follows Hahm, Shin, and Shin (2013) namely M1, M2 and core deposits. Thus, six alternative methods of constructing the ratio of non-core to core liabilities namely NC1/M1, NC1/M2, NC1/CORE, NC2/M1, NC2/M2, and NC2/CORE are used in the estimation. All data to construct the non-core bank liabilities and core bank liabilities are taken from Bank Indonesia.

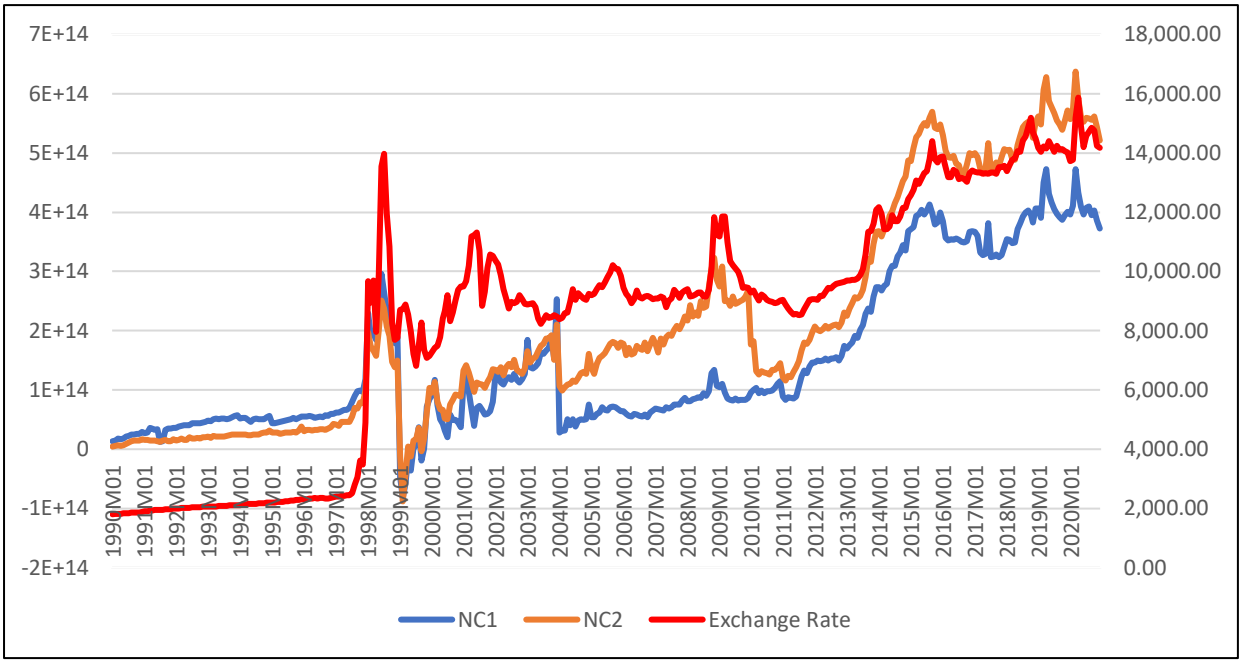

Figure 6.1 the level of non-core liabilities in Indonesian banks (billion IDR) and the exchange rate of the IDR against the USD.
Data source: Bank Indonesia and IMF (calculated and plotted by author)

For the exchange rate data, this study uses nominal exchange rate of Indonesia Rupiah (IDR) to USD data taken from the IMF. This study also considers the global VIX index taken from Federal reserve economic data as a proxy for external shock. Figure 6.1 illustrates the level of non-core liabilities in Indonesian banks and the exchange rate of the IDR against the USD. According to our calculations, there is a rapid increase in non-core liabilities on the Indonesian banking sector. Figure 6.1 also clearly illustrates that the increase of the non-core bank liabilities was followed immediately by the depreciation of the IDR against the USD and vice versa.

6.3 Methodology

To disentangle the issue, this study employs the SVAR model identified by sign restrictions to perform empirical analysis. This study considers a SVAR model in reduced form as presented below:

$$y_t = B(L)y_{t-1} + u_t \quad \text{.....} \quad (6.3)$$

Where y_t is an $n \times 1$ vector of endogenous variables, $B(L)$ is a lag polynomial, and u_t is an $n \times 1$ vector of error terms with variance covariance matrix $\sum$. Having estimated the parameters of this reduced-form SVAR, we are interested in the responses of the variables into various structural shocks. In this study, y_t consists of five endogenous variables: exchange rate, six ratios of non-core liabilities to core liabilities in Indonesian banks i.e. NC1M1, NC1M2, NC1CORE & NC2M1, NC2M2, NC2CORE (for robustness check) and GDP.

The study in this chapter presents an alternative identification approach developed by Uhlig (2005) and by Mountford and Uhlig (2009) by imposing sign restrictions on the impulse response functions of a set of variables. For a given structural impulse vector a, the impulse responses of n variables up to horizon S are calculable as:

$$r_s = [I - B(L)]^{-1}a \quad \text{.....} \quad (6.4)$$

Where r_s is the vector of impulse response function at horizon s. Furthermore, sign restrictions can be imposed on $m \leq n$ variables over the horizon $0, \dots, s$, which

implies that the SVAR is identifiable by potentially imposing restrictions only on a smaller subset of variables.

This study imposes sign restrictions on the impulse response functions (IRFs) to identify the structural shocks. Previous studies show that currency depreciation has an impact on international capital flight and will decrease the level of non-core bank liabilities. Besides, non-core liabilities of the banking system mostly take the form of short-term foreign exchange liabilities which are relatively sensitive to the sudden stop and capital flow reversal. Moreover, in the context of Indonesia, economic activities are dominated by exports of primary products and the manufacturing sector rely heavily on import of raw materials, depreciation will harm domestic firms. This condition stimulates domestic firms to reduce their investment as well as reduce domestic credit demand. In other words, depreciation will affect in the decline of non-core bank liabilities through direct and indirect effect. Thus, the negative sign ("-") is imposed on the responses of all ratios of non-core bank liability to core bank liability and GDP.

6.4 Results and discussion

Figures 6.2 shows the IRFs based on the Bayesian VAR approach with sign restrictions of the all ratios of non-core 1 to core bank liability (NC1M1, NC1M2, NC1CORE) and the GDP to the exchange rate shock along with the corresponding 68% credible sets. The result shows that a depreciation of IDR causes all ratios of non-core 1 to fall on impact and then last for about 30 quarters. In other words, exchange rate shocks have significantly negative influences on all ratios of non-core 1. This finding indicates that,

depreciation of the IDR against the USD has an impact on the decline the ratio of non-core 1 in the Indonesian banks and vice versa.

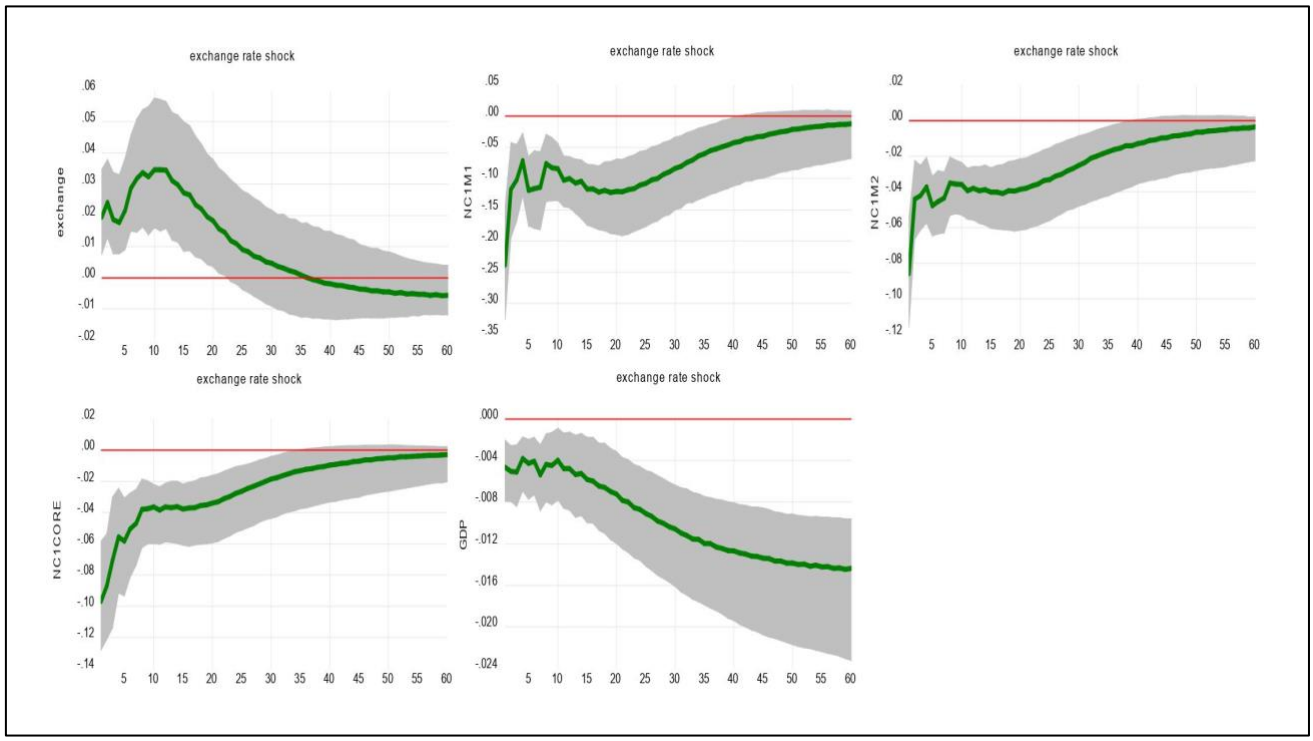

Figure 6.2 Impulse responses of the ratio of non-core bank liabilities and GDP to the exchange rate shocks.

Two plausible explanations are provided behind this relationship. First, a depreciation of the IDR against the USD will decrease ratio of non-core 1 through direct effect. Currency depreciation causes the fear of loss of asset value by foreign investors (Bruno and Shin, 2015a, Bruno and Shin, 2015b). Hence, a depreciation of the domestic currency makes foreign investors tend to demanding higher valued currencies and stimulates to withdraw their funds. Moreover, in emerging economies with open capital markets (including Indonesia), non-core liabilities of the banking system mostly take the

form of short-term foreign exchange liabilities and very sensitive to domestic financial shocks including currency shocks. Second, a depreciation of the IDR against the USD will decrease ratio of non-core 1 through indirect effect. Half of Indonesia's exports are food, agricultural products, minerals, energy and other primary products and often denominated in USD. When the IDR depreciates, the prices of these primary products will increase (in terms of the importing countries' currencies) and will decrease Indonesia's exports. Besides, manufacturing sector in Indonesia also depends on imported many raw materials and intermediate goods. Hence, currency depreciation will increase the cost of production. These two conditions will harm domestic firms and make domestic firms to decrease their investments and will ultimately reduce the demand for bank credit. This condition will reduce the profitability of domestic banks and have an impact on the decrease in non-core bank liabilities.

The empirical results also show that the response of GDP is significantly negative against (adverse) exchange rate shocks, which indicates that an adverse exchange rate shock was transmitted to Indonesian output. This result is the opposite with the "expansionary effects" theory where depreciation of the domestic currency is expected to stimulate on real output (Bahmani-Oskooee et al., 2002; Sencicek & Upadhyaya, 2008). In other words, Indonesia obtains no benefit from depreciation, but hurts from associated exchange rate risk. This result in line with what we have explained above that the characteristics of the Indonesian economy are dominated by exports of primary products (mostly denominated in USD) and are highly dependent on imports of raw materials.

Hence, a depreciation of the IDR will decrease exports and increase imported price. This condition will dampen economic activity and ultimately pushes into recession.

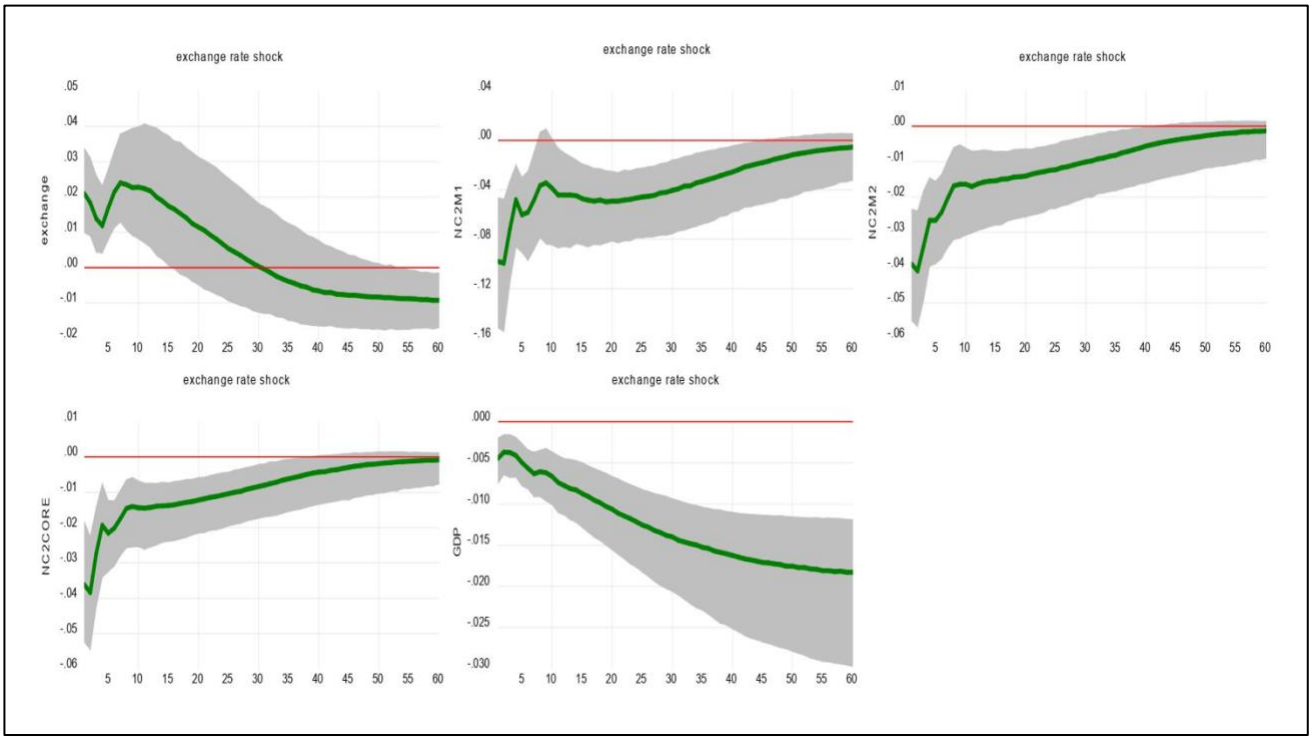

Figure 6.3 Impulse responses of the ratio of non-core bank liabilities and GDP to the exchange rate shocks (robustness check).

A robustness check conducted by using a different measure of the non-core bank liabilities, namely non-core 2. Again, this study considers the ratio of non-core 2 to core liabilities in this estimation (NC2M1, NC2M2, NC2CORE). The results of the robustness check are consistent with the main results (Figure 6.3). The results of the robustness check confirm that exchange rate shocks have significantly negative influences on all ratios of non-core liabilities and GDP.

6.5 Conclusion

The empirical analysis in this chapter clearly demonstrates that the exchange rate shocks have a closely relationship with the level of non-core liabilities in the Indonesian banks. The results show that exchange rate shocks have significantly negative influences on all ratios of non-core 1 and indicates that depreciation of the IDR against the USD has an impact on the decline the ratio of non-core 1 in the Indonesian banks and vice versa.

The non-core liabilities in Indonesian banks mostly consist of short-term foreign exchange liabilities and very sensitive to domestic financial shocks including currency shocks. Therefore, currency depreciation causes the fear of loss of asset value by foreign investors makes foreign investors tend to demanding higher valued currencies and stimulates to withdraw their funds. Moreover, manufacturing sector in Indonesia also depends on imported many raw materials and intermediate goods. Hence, currency depreciation will increase the cost of production. This condition will harm domestic firms and make domestic firms to decrease their investments and will ultimately reduce the demand for bank credit. In turn, this condition will reduce the profitability of domestic banks and have an impact on the decrease in non-core bank liabilities.

The empirical results also show that the response of GDP is significantly negative against (adverse) exchange rate shocks, which indicates that an adverse exchange rate shock was transmitted to Indonesian output. In other words, Indonesia obtains no benefit from depreciation, but hurts from associated exchange rate risk. This result is in line with Chou and Chao (2001), who show that in Indonesia, both the long-run and the short-run,

currency depreciation produces contractionary effects, mainly due to the negative exchange rate risk effect.

Liberalization of financial markets in emerging market countries has given more latitude for banks in those countries to raise funds and expand credits denominated in foreign exchange currency. Thus, holding assets and liabilities denominated in foreign currency is prevalent in the banking sector of many emerging market countries including Indonesia. Regardless of the reasons for holding currency denomination of assets and liabilities, banks in Indonesia are exposed to exchange rate risks when they hold assets and liabilities denominated in foreign currency. Moreover, banks in Indonesia do not adopt the cost of hedging instruments in mitigating risk due to the exchange rate changes. therefore, the implication for the banking regulator and supervisor is that the adverse effects of the exchange rate depreciation on Indonesian banks can be mitigated through monitoring the non-core liabilities exposure of the banks. Moreover, the portfolios of the foreign currency loans of the banks also call for more attention.

CHAPTER 7: GENERAL CONCLUSION AND FUTURE RESEARCH

7.1 General conclusion

Generally, this doctoral thesis highlights the importance of the several types of international capital flows and the domestic financial institutions development on the banking credit and shadow banking activity. Moreover, this study also highlights how domestic financial institutions development determine the impact of the international capital flows on the level of banking credit and shadow banking in various countries. In particular, each chapter of this study provides deeper insights by emphasizing the role of various types of international capital flows and domestic financial institutions indicators on the banking credit and shadow banking. The key findings of each chapter are explained as follows:

In Chapter 3, the empirical results show several noteworthy findings. First, the empirical analysis confirms that international capital inflows to the banking sector are positively related to the domestic credit level. This pattern suggests that foreign capital inflows to the banking sector are an important explanatory factor in the interrelation between international capital flows and domestic credit in developing countries. This finding also indicates that the banking sector in developing countries still depends on foreign capital to support domestic credit demand. Second, the result of chapter 2 also shows that foreign capital inflows to other financial institutions are negatively related to domestic credit levels in developing countries. This finding confirms that credit services

provided by non-bank financial institutions substitute for the domestic credit provided by the banking sector in developing countries.

The finding in Chapter 3 also highlight the importance of the domestic financial institutional development on the level of domestic credit by banking sector. In particular, better domestic financial institutions positively affect domestic credit to the private sector in developing countries. Moreover, result in Chapter 3 also show the important role of the domestic financial institutional development in the context of a relationship between international capital inflows to the banking sector and the level of domestic credit. The result confirms that higher international capital inflows to the banking sector will increase the level of domestic credit in countries with less developed domestic financial institutions and vice versa.

In Chapter 4, the empirical findings demonstrate several notable findings. First, the increase in cross-border capital inflows to banks is transmitted through regular banking credit and thus reduces the level of shadow banking assets. Even though traditional banks are also involved in shadow banking activities, this result indicates that cross-border capital inflows to banks are not directly transmitted into shadow banking activities. Second, all the domestic financial institutions' development indicators (depth, access, and efficiency) have a significant positive relationship with the level of shadow banking assets. In other words, the level of shadow banking assets grows faster under advanced or well-developed financial institutions. The financial institutions depth index represents more in-depth financial systems. More in-depth financial systems provide various financial instruments that support shadow banking activities. Furthermore, the

financial institutions access index represents the accessibility of financial institutions. A more accessible financial institution allows investors to invest their funds in various financial instruments, including several instruments related to shadow banking activities.

Third, domestic financial institutions' development plays an important role as a distribution channel for cross-border capital inflows to the banking sector and non-bank sectors. The empirical result shows that under shallow and inefficient financial institution conditions, cross-border capital inflows to the banking sector will increase the level of shadow banking assets and vice versa. Moreover, these results also demonstrate that under shallow and inefficient financial institution conditions, cross-border capital inflows to non-bank sectors will decrease the level of shadow banking assets. On the contrary, under deeper and more efficient financial institution conditions, cross-border capital inflows to non-bank sectors will increase the level of shadow banking assets.

In Chapter 5, the empirical results provide totally new and interesting evidence. The U.S. bank claims on EMEs have a positive impact on shadow banking assets in EMEs. Meanwhile, European bank claims on EMEs are significantly negatively related to shadow banking in EMEs. The result in Chapter 5 indicates that cross-border bank flows from U.S. banks and European banks have different effects on shadow banking assets in EMEs. In other words, U.S. banks' presence in EMEs has become much larger through the shadow banking system.

This relationship may be caused by the different conditions of U.S. banks and European banks. Compared to U.S. banks, the bank capital-to-assets ratio of European banks is relatively small (under 8%). In other words, as financial instability intensified,

European banks experienced a capital squeeze and had to withdraw their assets from EMEs to comply with the capital adequacy ratio. The level of NPLs of European banks is also higher compared to U.S. banks. Increased NPLs deteriorated the balance sheets of the European banks, causing them to reduce their lending to or investment in EMEs (to comply with liquidity constraints). Therefore, the lower level of the capital to asset ratio and the higher level of the NPLs pushed the European banks to invest in low-risk investments in EMEs, e.g., regular banking credit, thus reducing the shadow banking assets in EMEs.

Last, Chapter 6's empirical results provide several interesting findings. The result in chapter 5 shows that a depreciation of IDR causes all ratios of non-core 1 to fall on impact and then last for about 30 quarters. In other words, exchange rate shocks have significantly negative influences on all ratios of non-core 1. This finding indicates that, depreciation of the IDR against the USD has an impact on the decline the ratio of non-core 1 in the Indonesian banks and vice versa.

The empirical results in Chapter 6 also demonstrate that the response of GDP is significantly negative against (adverse) exchange rate shocks, which indicates that an adverse exchange rate shock was transmitted to Indonesian output. This result is the opposite with the "expansionary effects" theory where depreciation of the domestic currency is expected to stimulate on real output. In other words, Indonesia obtains no benefit from depreciation, but hurts from associated exchange rate risk.

The findings of this study provide several important implications for policymakers. Considering the close relationship between international capital flows to

the banking sector and domestic credit in developing countries, policymakers should carefully manage international capital flows to overcome their negative effects as well as the pursuit of sustainable domestic credit growth. Moreover, policymakers in developing countries should improve the quality of domestic financial institutions in order to achieve sustainable domestic credit growth.

In the context of shadow banking activity, policymakers need to pay attention to the trends in shadow banking growth and should be aware of the variables related to shadow banking growth (external and internal) to ensure that this sector works safely and sustainably. Considering the nature of this sector, which involves long chains and multiple counterparties with unclear financial obligations, policymakers should improve the quality of their regulation of this sector. Monitoring the rising exposure of traditional banks to NBFIs or unregulated financial institutions is also important to mitigate systemic risk in these sectors. Moreover, improvement in the supervisory quality in this sector needs to be carried out to strike a fine balance between close supervision and allowing space for financial innovation. If regulation is too loose, it may result in excessive risk-taking, but if it is too tight, it may harm the financial sector, which serves as the lifeline of the economy.

7.2 Future research

There are a number of issues that the findings of this study do not resolve, for which additional research is warranted. The areas that would benefit from further research include the following:

First, the importance of domestic financial institutions: The results of this study highlight the importance of domestic financial institutional development inflows for the level of domestic credit and shadow banking assets. The findings show that better domestic financial institutions (i.e., those that have a greater level of depth and are more efficient) positively influence the level of domestic credit in developing countries. This is because well-developed domestic financial institutions can lead to more rapid and sustainable domestic credit growth. Sound domestic financial institutions are particularly essential in the context of most developing countries given the relative lack of savings, the higher proportion of the population that is underbanked, and the massive investment needs. Moreover, better domestic financial institutions can serve as shock absorbers and mitigate the negative effects of real external shocks on the domestic economy.

Considering the importance of domestic financial institutions, future research should focus on policies that foster the development of such institutions, especially in developing countries. The development of domestic financial institutions requires special efforts that not only consider economic factors but also political factors. Therefore, it is strongly recommended that future research focus on domestic political factors to yield comprehensive findings in order to enhance the level of domestic financial institutions.

Second, the importance of international capital flows: This study confirms that the increase in domestic credit has been supported by the large increase in international capital inflows to the banking sector. In particular, international capital can increase welfare by consumption smoothing, and may also increase investments through domestic credit channels. However, international capital flow also has negative consequences.

Previous studies confirm that excessive capital inflows eventually lead to balance-of-payment crises as well as currency crises (Calvo, Leiderman, and Reinhart, 1996; Chuhan, Claessens, and Mamingi, 1993). For instance, the propagation of the Asian financial crisis can be explained through this mechanism. Before the Asian financial crisis, international capital inflows to developing countries (especially to the banking sector) were sustained at a relatively high level throughout the 1990s. However, domestic banks in developing countries mostly raised external funds by borrowing short-term debt, which is very volatile and associated with consumption booms or inefficient investment. Thus, this condition weakens countries' economic fundamentals, potentially resulting in financial crises in these countries (Khan, 2004). Furthermore, the potential interplay between international capital flows and domestic credit in developing countries is especially important in the context of the various distortions that can lead to inefficient credit booms and international overborrowing. Therefore, future studies should focus on the characteristics of international capital to manage their negative effects as well as enable the pursuit of sustainable domestic credit growth.

Third, the direct interplay between traditional banks and shadow banks: Shadow banking entities often form part of complex financial intermediation chains that may include traditional banks (Catorelli, 2014; Pozsar et al., 2013). Owing to their heterogeneous activities, shadow banking entities can be direct counterparties to traditional banks in a number of markets, including derivative and funding markets. Previous studies confirm that the direct link between traditional banks and shadow banks is one of the main causes of the GFC. Before the GFC, shadow banks emerged as an

alternative to traditional banks in providing several functions of liquidity, credit, and maturity transformation. Besides, the rise of shadow banking also has been largely driven by tightening of the regulatory requirements of traditional banks and financial innovation. Furthermore, shadow banks do not have direct access to safety nets such as insured deposits or the central bank discount window. Hence, shadow banks tend to be relatively fragile because money market investors quickly withdraw their funds in response to asset price shocks. In turn, the illiquidity condition pushes shadow banks to seek support from traditional (regulated) banks and other financial institutions. However, a miscalculation of the implicit guarantees of traditional banks to shadow banks during the GFC led to the underestimation of risks that shadow banks were taking pre-crisis (Chen, ren and Zha, 2009; Lane, 2016; Tarullo, 2013).

In recent years, the cross-border links between banks and non-bank financial institutions at a global level have continued to grow (Aldasoro et al., 2020). Moreover, the financial market turmoil prompted by the COVID-19 shock resulted in several vulnerabilities associated with cross-border relationships between traditional banks and non-bank financial institutions (Aldasoro et al., 2020). The significant size and growth of shadow banking assets as well as the essential relationships between traditional banks and shadow banking have led to increased monitoring and supervision of this sector. However, because shadow banking entities are subject to varying degrees of supervision, there is a lack of granular data and comprehensive risk monitoring of their linkages and activities. Hence, understanding the nature of these linkages is important from a systemic risk

perspective owing to the different types of non-bank financial institutions and their associated diverse business models.

A further elucidation of the interplay between traditional banks and shadow banks is essential for understanding the mechanisms underlying systemic risks and liquidity channels in financial systems. Moreover, understanding this issue is also essential to prevent systemic financial crises or mitigate their impact in the future. The lack of the macro-level data is the main challenge in disentangling this issue. Moreover, the interplay between traditional banks and shadow banks operates through multiple steps, involving numerous sub-systems and connections via complex linkages. Therefore, it is strongly recommended that future studies use micro-level data to obtain a deeper understanding about the interplay between banks and shadow banking.

Fourth, supervision and regulation of the shadow banking system: Previous studies confirm that the limited regulation of non-depository financial institutions, or shadow banks, was a major cause of the GFC. Therefore, it is important for financial supervision and regulation to move toward a more global and macro-prudential direction to transform the shadow banking system into a safe form of financial intermediation activity.

The FSB has issued several recommendations for enhanced supervision of non-bank financial institutions that highlight several key elements required for effective supervision, namely: (i) strong and unambiguous mandates, (ii) independence to act, (iii) sufficient quality and quantity of resources, and (iv) supervisors having a full suite of powers to execute on their mandate (FSB, 2014). However, according to the International

Monetary Fund-World Bank Financial Sector Assessment Program (FASP) several significant weaknesses remain. The FSB (2013b) stated that only 25% of FSB member countries are fully compliant with the Basel Committee on Banking Supervision principles on regulatory independence and resources. In addition, the FSB (2012) stated that out of the 61 countries, 17 have yet to show satisfactory adherence to the relevant supervisory and regulatory standards. The lack of human resources (in terms of both quantity and quality) in the regulatory authorities is one of the most important constraining factors in this regard. Moreover, policymakers in those countries are not always aware of the transparency, availability, and policy relevance of data enhancements and new data emerging from the implementation of the Data Gap Initiatives from FSB. Furthermore, the global NBFIs operate in a large number of countries, with some financial services that are very mobile and able to cross borders easily. Moreover, the structure of global governance and the roles of the current international institutions have changed slowly over recent times (Moshirian, 2014). Therefore, future supervision and regulation require a more inclusive and integrated global economy and global financial framework. In addition, good supervision requires closer collaboration between national governments on the one hand and regulators and relevant international bodies on the other.

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APPENDICES

Appendix A. List of developing countries

Albania	Cambodia	Ghana	Lesotho	Panama	Tanzania
Algeria	Cameroon	Guatemala	Madagascar	PNG	Tajikistan
Angola	Chile	Guinea	Maldives	Peru	Tunisia
Argentina	Colombia	Guinea Bissau	Malaysia	Philippines	Uruguay
Armenia	Costa Rica	Honduras	Mali	Senegal	
Azerbaijan	Cote de Ivoire	India	Mexico	Sierra Leone	
Bangladesh	Dominica	Indonesia	Moldova	Sri Lanka	
Belarus	Dominican Republic	Jamaica	Morocco	Suriname	
Benin	Ecuador	Jordan	Myanmar	South Africa	
Bolivia	Egypt	Kazakhstan	Namibia	Swaziland	
Bosnia & Herzegovina	El Salvador	Kenya	Niger	Thailand	
Botswana	Fiji	Kuwait	Nigeria	Togo	
Brazil	Georgia	Kyrgyz Republic	North Macedonia	Trinidad and Tobago	
Burkina Faso	Gambia	Lebanon	Pakistan	Turkey	

Appendix B. Variable description and data sources

No.	Code	Description	Measurement	Data sources
1.	Dcps	Domestic credit to the private sectors.	Percentage of GDP	World Bank
2.	Bankcredit	Domestic credit to the private sectors by banks	Percentage of GDP	World Bank
3.	LogGDP percapita	GDP per capita	Logarithm form	World Bank
4.	CAB	Current account balance	Percentage of GDP	World Bank
5.	ERTS	Nominal (official) exchange rate	LCU per USD	World Bank
6.	VIX	The Chicago Board Options Exchange Volatility Index (The VIX Index)	Index	The Chicago Board Options Exchange
7.	Dummy	A dummy variable for the global financial crisis of 2008/2009	2008 and 2009 = 1; other years = 0	-
8.	Bankinflows	International capital (Debt) inflows to the banking sector	Annual debt inflows of other investment into other sectors (percentage of GDP)	IMF BOP data (BPM6)
9.	Otherinflows	International capital (Debt) inflows to other financial institutions	Annual debt inflows in other investment into other sectors (percentage of GDP)	IMF BOP data (BPM6)
10.	Insti	Financial institution index	Index 0–1	IMF Financial Development Index Database
11.	Depth	Financial institution depth index	Index 0–1	IMF Financial Development Index Database
12.	Access	Financial institution access index	Index 0–1	IMF Financial Development Index Database
13.	Efficiency	Financial institution efficiency index	Index 0–1	IMF Financial Development Index Database

Appendix C. List of countries sampled

Australia	Germany	Mexico	United States
Belgium	Hong Kong	Netherlands	Bulgaria
Brazil	Indonesia	Russia	Czech Republic
Canada	Italy	Singapore	Poland
Chile	Japan	South Africa	Romania
France	South Korea	Spain	

Appendix D. Variable description and sources

No.	Code	Description	Measurement	Data sources
1.	LogSB	Assets of other financial intermediaries (OFIs)	Logarithm form of annual total assets of OFIs	The FSB, Eurostat (Financial Balance Sheets data)
2.	LogGDP	GDP percapita (USD)	Logarithm form of gross domestic product per-capita	World Bank
3.	CAB	Current account balance	Percentage	World Bank
4.	Mongrowth	Money growth	Index	Economics Freedom index provided by the Fraser Institute
5.	Nonbankflows	Cross-border capital inflows to Non-bank sectors	Percentage of GDP	IMF BOP data (BPM6)
6.	Bankflows	Cross-border capital inflows to banks	Percentage of GDP	BIS
7.	Polrate	Central bank policy rates	Percentage	BIS
8.	MMIR	Money market rates	Percentage of annual money market rate	International Financial Statistics/IMF
9.	Depth	Financial institution depth index	Index 0–1	IMF Financial Development Index Database
10.	Access	Financial institution access index	Index 0–1	IMF Financial Development Index Database
11.	Efficiency	Financial institution efficiency index	Index 0–1	IMF Financial Development Index Database
12.	Dev	Overall financial development index	Index 0–1	IMF Financial Development Index Database
13.	GFC	The structural change that occurred before and after the global financial crisis of 2007/2008 (GFC)	A dummy variable for structural change codes this variable as 1 for “after the GFC” and 0 for “before the GFC”	
14.	NBFIflows	Cross-border capital inflows to non-bank financial the intermediaries’ entities	Percentage of GDP	Eurostat (Financial Balance Sheets data) (Covered 10 European countries)

Appendix E. Robustness check by using instrumental variable estimation

Sub-model	**1.1**	**1.2**	**1.3**	**1.4**
X	**Depth**	**Access**	**Efficiency**	**Dev**
LogGDP	2.219 ***	2.254 ***	2.387 ***	2.492 ***
	(0.278)	(0.240)	(0.197)	(0.270)
CAB	-0.013 ***	-0.013 ***	-0.014 ***	-0.014 ***
	(0.003)	(0.003)	(0.003)	(0.003)
Mongrowth	0.079 ***	0.049 **	0.087 ***	0.084 ***
	(0.017)	(0.017)	(0.018)	(0.017)
Polrate	-0.050 ***	-0.043 ***	-0.051 ***	-0.052 ***
	(0.009)	(0.009)	(0.010)	(0.009)
MMIR	0.047 ***	0.041 ***	0.048 ***	0.047 ***
	(0.009)	(0.009)	(0.010)	(0.009)
Bankflows	-0.002 ***	-0.003 ***	-0.002 ***	-0.003 ***
	(0.001)	(0.001)	(0.001)	(0.001)
Nonbankflows	0.001	0.0002	0.002	0.001
	(0.003)	(0.003)	(0.003)	(0.003)
X	0.803 ***	0.989 ***	0.191 *	0.351
	(0.271)	(0.167)	(0.162)	(0.372)
Number of countries	23	23	23	23
Number of observations	276	276	276	276
Adj. R squared	0.530	0.570	0.543	0.510
All columns report results for Fixed effect regressions. Standard errors are given in parentheses. ∗∗∗, ∗∗, and ∗ denote significance at the 1, 5, and 10 percent levels, respectively				

Appendix F. Robustness check by using instrumental variable estimation

Sub-model	**2.1**	**2.2**	**2.3**	**2.4**
X	**Depth**	**Access**	**Efficiency**	**Dev**
LogGDP	2.058 ***	2.291 ***	2.532 ***	2.320 ***
	(0.253)	(0.234)	(0.200)	(0.245)
CAB	-0.021 ***	-0.019 ***	-0.018 ***	-0.023 ***
	(0.003)	(0.003)	(0.003)	(0.003)
Mongrowth	0.069 ***	0.051 **	0.082 ***	0.075 ***
	(0.017)	(0.016)	(0.017)	(0.017)
MMIR	0.039 ***	0.035 ***	0.040 ***	0.038 ***
	(0.009)	(0.009)	(0.010)	(0.009)
Polrate	-0.037 ***	-0.030 **	-0.037 ***	-0.034 ***
	(0.009)	(0.009)	(0.010)	(0.009)
Bankflows	0.001	0.002	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Nonbankflows	-0.043 ***	-0.010	-0.049 **	-0.055 ***
	(0.012)	(0.012)	(0.023)	(0.020)
X	1.923 ***	1.347 ***	0.692 ***	1.733 ***
	(0.407)	(0.191)	(0.219)	(0.430)
Bankflows.X	-0.329 ***	-0.163 ***	-0.180 ***	-0.352 ***
	(0.086)	(0.045)	(0.048)	(0.073)
Nonbankflows.X	0.052 ***	0.016	0.066 **	0.074 **
	(0.014)	(0.022)	(0.031)	(0.026)
Number of countries	23	23	23	23
Number of observations	276	276	276	276
Adj. R squared	0.604	0.60	0.60	0.60

All columns report results for Fixed effect regressions. Standard errors are given in parentheses. ∗∗∗, ∗∗, and ∗ denote significance at the 1, 5, and 10 percent levels, respectively

Appendix G. Robustness check by using a different measure of cross-border capital inflows to non-bank sectors

Sub-model	**1.1**	**1.2**	**1.3**	**1.4**
X	**Depth**	**Access**	**Efficiency**	**Dev**
LogGDP	1.036 ***	1.375 ***	1.142 ***	1.115 ***
	(0.367)	(0.357)	(0.376)	(0.388)
CAB	0.011 **	0.015 ***	0.017 ***	0.014 ***
	(0.005)	(0.005)	(0.005)	(0.005)
Mongrowth	0.006	0.025	0.016	0.014
	(0.011)	(0.011)	(0.011)	(0.011)
Polrate	-0.010 **	-0.006	-0.006	-0.009 **
	(0.004)	(0.005)	(0.005)	(0.005)
MMIR	0.026 ***	0.021 ***	0.019 ***	0.021 ***
	(0.007)	(0.007)	(0.007)	(0.007)
Banksflows	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
NBFIflows	0.001 ***	0.001 **	0.001 **	0.001 **
	(0.001)	(0.003)	(0.004)	(0.004)
X	0.929 ***	1.174 ***	0.328 ***	0.806 **
	(0.252)	(0.280)	(0.116)	(0.413)
Number of countries	23	23	23	23
Number of observations	115	115	115	115
Adj. R squared	0.46	0.50	0.420	0.40

All columns report results for Fixed effect regressions. Standard errors are given in parentheses. ∗∗∗, ∗∗, and ∗ denote significance at the 1, 5, and 10 percent levels, respectively

Appendix H. Robustness check by including the structural change

Sub-model	**I**	**II**	**III**	**IV**	**V**	**VI**
LogGDP	2.981 *** (0.331)	3.059 *** (0.330)	3.059 *** (3.207)	3.121 *** (0.313)	2.955 *** (0.302)	3.085 *** (0.327)
CAB	-0.017 *** (0.003)	-0.015 *** (0.003)	-1.667 *** (3.056)	-0.013 *** (0.003)	-0.013 *** (0.003)	-0.017 *** (0.003)
Mongrowth	0.055 ** (0.017)	0.073 *** (0.017)	1.266 *** (2.293)	0.047 ** (0.016)	0.027 * (0.016)	0.064 *** (0.017)
MMIR	0.047 *** (0.009)	0.046 *** (0.008)	4.044 *** (8.914)	0.032 *** (0.009)	0.045 *** (0.005)	0.048 *** (0.009)
Polrate	-0.037 *** (0.009)	-0.038 *** (0.009)	-3.117 *** (9.296)	-0.035 *** (0.009)	-0.055 *** (0.008)	-0.040 *** (0.009)
Bankflows	-0.001 ** (0.001)	-0.001 * (0.001)	-1.093 * (5.094)	-0.002 ** (0.001)	-0.001 *** (0.001)	-0.001 ** (0.001)
Nonbankflows	0.001 (0.002)	0.002 (0.003)	8.803 (3.415)	0.001 (0.003)	0.003 (0.003)	0.002 (0.003)
GFC	0.827 ** (0.290)	0.148 *** (0.029)	1.135 *** (2.719)	0.049 (0.035)	0.002 (0.035)	0.182 *** (0.036)
LogGDP.GFC	-0.153 * (0.043)					
CAB.GFC		0.005 (0.004)				
Mongrowth.GFC			-1.117 *** (3.067)			
MMIR.GFC				0.032 *** (0.006)		
Policy.GFC					0.041 *** (0.006)	
Bankflows.GFC						0.001 (0.001)
Number of countries	23	23	23	23	23	23
Number of observations	299	299	299	299	299	299
Adj. R squared	0.630	0.623	0.64	0.65	0.70	0.63

Appendix H (Continue). Robustness check by including the structural change

Sub-model	**VII**	**VIII**	**IX**	**X**	**XI**
LogGDP	3.136 *** (0.328)	2.634 *** (0.343)	2.480 *** (0.353)	3.100 *** (0.316)	2.633 *** (0.345)
CAB	-0.015 *** (0.003)	-0.016 *** (0.003)	-0.017 *** (0.003)	-0.012 *** (0.003)	-0.015 *** (0.003)
Mongrowth	0.067 *** (0.017)	0.048 ** (0.017)	0.043 ** (0.016)	0.063 *** (0.016)	0.055 ** (0.009)
MMIR	0.048 *** (0.008)	0.047 *** (0.008)	0.040 *** (0.008)	0.047 *** (0.008)	0.049 *** (0.009)
Polrate	-0.040 *** (0.009)	-0.039 *** (0.009)	-0.038 *** (0.009)	-0.035 *** (0.009)	-0.038 *** (0.009)
Bankflows	-0.001 * (0.001)	-0.001 ** (0.001)	-0.002 *** (0.001)	-0.001 ** (0.001)	-0.002 *** (0.001)
Nonbankflows	-0.001 (0.004)	-0.001 (0.003)	0.001 (0.003)	0.003 (0.003)	0.001 (0.003)
GFC	0.151 *** (0.030)	0.275 *** (0.057)	0.060 (0.071)	0.686 *** (0.124)	0.328 *** (0.083)
Depth		0.967 *** (0.298)			
Access			0.829 *** (0.169)		
Efficiency				0.743 *** (0.173)	
Dev					1.174 ** (0.354)
Nonbankflows.GFC	-0.002 (0.006)				
Depth.GFC		-0.218 *** (0.078)			
Access.GFC			0.084 (0.091)		
Efficiency.GFC				-0.731 *** (0.165)	
Dev.GFC					-0.252 * (0.111)
Number of countries	23	23	23	23	23
Number of observations	299	299	299	299	299
Adj. R squared	0.620	0.643	0.660	0.650	0.641
*All columns report results for Fixed effect regressions. Standard errors are given in parentheses. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively*					

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3. Subroto Rapih. (2021). How international capital inflows and domestic financial institutional development affect domestic credit: Evidence from developing countries. Cogent Economics and Finance, 9(1): 1-22. DOI: https://doi.org/10.1080/23322039.2021.2007614