Contribution of Rural Banks to Regional Economic Growth

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Abstract

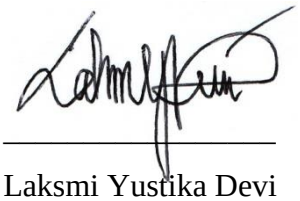
Following the literature on the relationship between financial development, economic growth and the poverty rate, this present study empirically examined the links between rural bank development, economic growth, and the poverty rate at the sub-regional level in Indonesia. The contribution of this research is based on its utilisation of regional variation in rural bank development (over time) to explain the complex relationship between this development and both economic growth and the poverty rate.

The first objective of this study was to address the causal relationship between rural bank development and either economic growth or the poverty rate. The second objective was to analyse whether central bank policies or regional government policies on rural banks have had an impact on the development of the banks in Indonesia, and particularly whether the policies have had an impact on the contribution of rural banks to regional economic growth and regional poverty rate reduction.

Two methodologies were used in this study. The first methodology was cointegration tests and an error correction based causality test. The second methodology was two-stage least squares. The findings of this study were: 1) Cointegration tests indicate that there is a long-run relationship between rural bank assets and regional GDP per capita, and between rural bank assets and the regional poverty rate; 2) DOLS and FMOLS estimations show that rural banks promote economic growth and reduce regional poverty; 3) There is no evidence that rural bank assets Granger-cause regional GDP per capita and the regional poverty rate. The direction of causality is the other way around, from regional GDP per capita to rural bank assets and from the regional poverty rate to rural bank assets; 4) Results of 2SLS estimation show that rural bank assets promote regional economic growth and reduce regional poverty; and 5) The 2SLS estimation also suggests that only one local regulation has a significant effect on the development of rural banks which is local regulation on the development of SMEs. Meanwhile, the national regulations positively and significantly affect rural bank assets, except for developed regions.

Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.



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It was a very challenging endeavour to write this thesis. During the writing process, I changed my way of thinking and grew as a person. I was lucky to receive a lot of support during this time and I would like to express my gratitude to several people without whom I would not have been able to complete this thesis.

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1 Chapter 1 – Introduction

This chapter provides background information, and outlines the purpose and contributions expected from this thesis. Finally, a brief outline of the forthcoming chapters in this thesis is also provided.

1.1 Background

Many economists believe that well-functioning financial institutions are essential for economic growth. As early as 1911, Schumpeter argued that financial intermediaries are needed for economic development (Schumpeter & Elliott, 2012). A well-functioning financial system helps to promote economic growth and stability by encouraging savings and by properly directing these savings into the most productive possible investments. In contrast, a poorly functioning financial system can create serious problems for an economy. This proposition has been explored extensively with empirical evidence pointing towards financial development influencing economic growth (King & Levine, 1993a).

Following on from the studies on the finance-growth nexus, a question on the contribution of financial development on poverty reduction also has been raised. (Levine, 2004) stated that there are two opposite theories on the role of financial institutions to reduce poverty in developing countries. Some believe that only the rich will benefit from more developed financial institutions because the poor do not possess the financial, physical, and human capital resources needed to get loans or benefit from a well-functioning financial system. Moreover, other studies have argued that financial development does not help the poor because a more developed financial sector brings more risks for this group. A developed financial sector offers more opportunity for speculation which may cause bubbles and crises (Kirkpatrick, Sirageldin, & Aftab, 2000; Zhuang et al., 2009). The opposing opposite hypothesis states that better functioning financial intermediaries can offer financial services to larger segments of the population. More credit means more entrepreneurship, firm formation, and economic growth (Aghion & Bolton, 1997). Another way financial development can reduce poverty is by providing financially disadvantaged families with low-cost loans (Tiwari, Shahbaz, & Islam, 2013) or increasing access to various sources of funding

(Boukhatem, 2015). Some studies have attempted to narrow the research scope by identifying the importance of specific types of financial institutions in this process, such as rural banks or community banks (Burgess & Pande, 2005; Collender & Shaffer, 2003; Kendall, 2009; Meslier-Crouzille, Nys, & Sauviat, 2012). The belief is that rural or community banks act differently from large commercial banks as they usually have the advantage of access to local information, better relationships with their customers, and a greater commitment to the development of the local community. Hence, they are better placed to monitor and assess the risk of local enterprises (Meslier-Crouzille et al., 2012). These kinds of banks, mostly found in developing countries, are intentionally designed to provide financing opportunities to small and medium enterprises (SMEs). Rural banks cover an important gap in the market, due to the reluctance of commercial banks to finance SMEs. This is because the loans are usually relatively small in value (less than US$ 1,000) (Todaro & Smith, 2012).

Most studies on the link between financial development and economic growth are cross-country studies. Some economists have argued that investigating the relationship between financial development and growth is better done for individual countries, rather than cross-country studies (Arestis & Caner, 2004; Ram, 1999; Rousseau & Wachtel, 2011). The reason is that the effect of financial development on growth may be country-specific. Because the relationship between the two variables is complex, a systematic study of the financial development of individual countries is needed.

If we want to focus on an individual developing country, we also need to take into account the characteristics and geographical scope of the link on a sub-national level. According to Spiezia and Weiler (2007), this will provide a better understanding of the sources of both the strengths and weaknesses of an economy, assuming a national economy is effectively an aggregation of its regional parts. Samolyk (1994, p. 2) promoted the hypothesis that "the health of the regional financial sector (in terms of the credit quality of local banks and non-bank borrowers) can influence investment activity and regional economic growth by affecting a region's ability to fund local projects". In addition, Carbó-Valverde and Rodriguez-Fernández (2004) argued that a regional definition appears to provide more accurate measures when analysing the relationship between the banking sector and economic growth because the interaction between financial intermediaries and households and firms can be defined more precisely.

The unit of observation for this study is Indonesian regional areas and the banking sector. The preference is based on several reasons. First, Indonesia is a developing country. Previous studies have found that the relationship between financial development and economic growth is more prominent in developing compared to developed countries. Second, Indonesia has extensive and varied regional areas. Previous studies have stated that a regional study provides a better understanding of the sources of both strengths and weaknesses of an economy. Third, Indonesia has a bank-based financial system. Failures in the system caused a major financial crisis in 1997 that shattered the economy. Therefore, an investigation of the banking sector's contribution to the economy should be particularly beneficial for policy makers.

Research on the relationship between financial development and economic growth has been carried out for the case of Indonesia, but generally such research has employed time series national data. When performing causality analysis, some studies have found bi-directional causality between financial development and growth (Hasiholan & Adiningsih, 2003; Hidayati, 2009; Inggrid, 2006; Setiawati, 2008). Other studies have reported that financial development positively and significantly affects Indonesian GDP per capita (Abdurohman, 2003; Agung & Ford, 1998; Zulverdi, Syarifuddin, & Prastowo, 2005), while Mukhopadhyay and Pradhan (2011) showed that financial development in Indonesia has very little impact on economic growth. These inconsistent findings are the further motivation behind carrying out the following analysis in this thesis. Another important study by Nasrudin and Soesilo (2004) also has been an encouragement in doing this study. Nasrudin and Soesilo found that commercial banks had no contribution to regional economic growth over the period 1987-1998. Given the findings from previous studies that small banks act differently from large commercial banks, there is a need to investigate the contribution of rural banks to regional economic growth.

Indonesia is located in the south-east of Asia. The United Nations (2014) classifies Indonesia as a developing country and with a population of 254.5 million, it is the fourth most populated country in the world. Indonesia ranks 10th of the world's largest economies in terms of purchasing power parity (World Bank, 2015).

Indonesia experienced rapid growth before the Asian Financial Crisis in 1997, which had a massive impact on the economy. In 1998, Indonesia registered negative growth of 13.13%, significantly below the 7.8% recorded in 1996. Since then, after efforts to improve banking supervision and regulation as well as the macroeconomic condition, Indonesia registered an average growth of 5% per year over the 2000-2014 period. The poverty rate decreased from 18.47% in 2000 to 12.01% in 2014. The unemployment rate also decreased slightly from 6.08% in 2000 to 5.94%, in 2014 (BPS, 2015).

The Indonesian financial sector comprises three broad categories: banks, non-banks, and capital markets. Non-bank financial institutions include insurance firms, financing companies, pension funds, and microfinance organisations. The financial system in Indonesia is largely bank-based. Indonesia has a well-functioning stock market, but only the largest corporations are listed on the country's stock exchange. Hence, it can be said that funding for the majority of businesses in the country is sourced primarily from banks and not through stock markets.[1] According to Fry (1997), the dominant role of banks in the financial system is a specific characteristic of a developing country.

Indonesian banking institutions can be divided into two categories: commercial banks and rural banks.[2] Commercial banks include both state and private banks. Private banks can be differentiated into regional development banks, conventional private banks, and Islamic private banks. Rural banks were originally rural financial institutions. However, these banks have evolved into community banks and are mostly established in urban areas. Having said that, rural banks are different from commercial banks. The particular objective of rural banks is to provide financial services in particular areas with a financing focus of SMEs and local communities. Because rural banks operate at a local level[3], they are considered to have important roles in local economic development. The number of rural banks in Indonesia in 2014 was 1,643 units, more than 10 times the 119 commercial banks (Bank Indonesia, 2015). However, the assets held by rural banks were less than 2% of the assets held by commercial banks. By the end of 2012, the total

[1] Indonesia's stock market capitalisation (% of GDP) in 2012 was 45.2%. In the same year, the similar percentage capitalization for Singapore, Malaysia, Philippines, and Thailand was 149.8%, 156.9%, 105.6%, and 99.2% respectively (Asian Development Bank, n.d.).

[2] 'Rural bank' is the official translation used by Bank Indonesia. In Indonesian language, the bank is called *Bank Perkreditan Rakyat*. The literal translation in English is People's Credit Bank.

[3] Any rural bank may establish a branch office only in the same province as its head office (Bank Indonesia Regulation Number 8/26/PBI/2006 concerning Rural Banks).

assets of commercial banks amounted to IDR 5,615,150 billion, whereas the assets of rural banks totalled IDR 89,878 billion (Bank Indonesia, 2015). Despite their relatively small size in the Indonesian banking sector, the central bank considers rural banks to be particularly important in supporting the programme of financial inclusion. This role of rural banks was stressed by the Governor of Bank Indonesia in his 2008 annual speech. He stated that "the role of rural banks should be enhanced and directed to provide service to the SMEs and local economy"[4].

In 2005, Hausman, Rodrik and Velasco of the Asian Development Bank (2010) developed a growth diagnostics approach. The approach is intended to identify the most significant constraints and to figure out the priorities for policies needed to propel and sustain growth. Low growth generally stems from a low level of private investment and entrepreneurship. The major cause of a low level of private investment and entrepreneurship is the high cost of finance which is the result of poor local finance and the unavailability of international finance. Low domestic savings and poor intermediation are two primary determinants of poor local finance. Indonesia is still behind its neighbouring countries in terms of financial accessibility (financial inclusion).

The Indonesian government has been aware of the fact that there is still limited access to financial institutions in the country. In 2010, the government declared that a 'financial inclusion programme' was an agenda item of national significance. The government stated that "poverty alleviation is a top priority for Indonesia and financial inclusion is an essential component of our poverty-alleviation strategy because most of those in poverty do not have access to financial services – savings, loans, transfer payments, and insurance – at a reasonable cost" (Bank Indonesia, 2011a). Five main indicators of a lack of financial access and its ramifications in Indonesia were identified by Bank Indonesia in 2012 (Bank Indonesia, 2012a): 1) 13.33% of the Indonesian population were below the poverty line; 2) 64.25% of the Indonesian population were living in villages; 3) 60% of the Indonesian population were not eligible to be granted loans from banks[5]; 4) 99.91% of the total business units in Indonesia were SMEs; and

[4] Governor of Bank Indonesia's speech on Annual Banking Meeting, 2008. http://www.bi.go.id/web/en/Investor+Relations+Unit/Presentation+and+Speeches/Speeches/bankerdinner2008.htm

[5] Due to a lack of collateral, steady employment and verifiable credit history

5) 60-70% of the SMEs did not have access to banks. Rosengard and Prasetyantoko (2011) pointed out that the fundamental constraint of financial inclusion in Indonesia is the preference of Indonesian commercial banks to place their funds in government instruments (Certificate of Bank Indonesia and government bonds) rather than using them to make loans. The banks consider SME loans to have higher transaction costs and greater risks than other comparable financial assets.

Hill (1998) stated that Indonesia is well-suited to study regional development. Indonesia is the largest archipelago country in the world, consisting of five main islands and 17,508 smaller islands. Currently, the large geographic area of Indonesia is divided into 34 provinces. The economy of Indonesia represents the geographical aggregation of different economic conditions across these provinces. The spatial distribution of economic output in Indonesia is very uneven; some areas experience high local growth, whereas others remain stagnant. A study conducted by Asian Development Bank (2010) concluded that the growth and poverty rates in Indonesia vary substantially across the regions. Thus, studying the link between financial development and economic growth in Indonesia is better being done on the sub-national level. This would give policymakers a better understanding of the potential role of financial institutions on regional economic growth.

1.2 Statement of the Problem

This present study intends to empirically examine the links between rural bank development, economic growth, and the poverty rate at the sub-national (regional) level in Indonesia. The contribution of this research is to utilise regional variation in rural bank development (over time) in explaining the complex relationship between that development and both economic growth, and the poverty rate.

The first objective of this study is to address the causal relationship between rural bank development and either economic growth or the poverty rate. The second objective is to analyse whether central bank policies or regional government policies on rural banks have an impact on the development of the banks in Indonesia, and particularly whether the policies have impacts on the contribution of rural banks to regional economic growth and regional poverty rate reduction.

To summarise, this research will estimate the role of rural banks in economic growth and poverty rate reduction in Indonesia at a regional level. In other words, this research attempts to address the following questions:

1. Do rural banks contribute significantly to regional economic growth and poverty reduction in Indonesia?
2. Do central bank policies and regional government policies on rural banks have positive impacts on the development of rural banks?

1.3 Significance of the Study

Thus far, there is no specific research on the rural banks-regional growth nexus or rural banks-regional poverty rate nexus in Indonesia. This study will fill this gap by analysing the specific effect of rural banks on regional performance and effect on rural banks on regional poverty reduction. Considering that the direction of causality is crucial for development policy, this study will try to provide clear evidence on the causal relationship between rural banks, regional economic growth, and regional poverty rates in Indonesia.

In addition, this study will provide a thorough analysis of rural bank-related policies that are enacted both by the central bank and regional government. The analysis will answer the question whether the policies have positive impacts on the development of rural banks and whether the policies have positive impacts on increasing rural bank contribution to regional economic growth and regional poverty reduction. This will provide better understanding of the evolution and development of rural banks in Indonesia and their contributions to the Indonesian economy.

1.4 Organisation of the Study

This study consists of six chapters. Following this introduction, Chapter 2 reviews the literature on financial institutions and economic growth and financial institutions and poverty. The literature is classified into two categories: theoretical literature and empirical literature.

Chapter 3 justifies the preference of the Indonesian regional areas and Indonesian rural banks as the object of this study. It explains the evolution of the banking sector in Indonesia and, particularly, the development of rural banks in the country. This chapter also describes the differences between regions in Indonesia and the importance of doing this study in a regional context.

Chapter 4 analyses the relationship between rural bank development, economic growth, and poverty. It includes the empirical model, description of data, data analysis and findings for both the relationship between rural bank assets and regional economic growth as well as between rural bank assets and the regional poverty rate, sensitivity analyses to check the robustness of the estimations, and discussion of the findings.

Chapter 5 provides an analysis of the impact of local regulations on small and medium enterprises and rural bank development on regional economic growth and the poverty rate. The analysis includes the empirical model that will be estimated, the description of the estimated panel data, the findings, sensitivity tests to check the robustness of findings, and a broader discussion of the importance of these findings.

Finally, Chapter 6 provides a summary of the main findings, implications from the study, and suggestions for future studies in this area.

1.5 Summary

This chapter laid the foundations for this study. It introduced the motivation and the objectives of this study. The hypotheses of this study are that rural banks in Indonesia support regional economic growth and reduce regional poverty rates. We believe that rural banks act differently from commercial banks, particularly because the banks are specifically designed to support small and medium enterprises which have been the backbone for regional economic growth. Therefore, the investigation of the contribution of rural banks would be beneficial for the policy makers. To answer the objective of this study, we use Indonesian regional data on rural banks, GDP, and the poverty rate over the period 2000-2014. The analysis consists of relationship analysis and policy analysis. The following chapter will describe the theoretical and empirical literature as the foundation for this study.

2 Chapter 2 – Literature Review

This chapter provides a review of the relevant literature for this thesis. First, we review the studies investigating the financial development and economic growth nexus. This section includes a review of the theory and empirical evidence. The second section also reviews the theory and empirical evidence on the relationship between financial development and poverty. Finally, a brief summary of the literature is provided.

2.1 Financial Development and Economic Growth

2.1.1 Theoretical Literature

2.1.1.1 The Nexus of Financial Development and Growth

A country's economic growth can be defined as an increase in a country's measured aggregate output of goods and services from one period of time to another. In 1956, Robert Solow stated that output growth is determined by the inputs of capital and labour through a production process (Solow, 1956). In its subsequent development, the theory of economic growth added numerous other factors including technological progress.

Traditional growth models do not explicitly include financial development. Some economists have hypothesised that the financial sector directly contributes to economic growth (e.g., Schumpeter in 1911 and McKinnon and Shaw in 1973). In 1911, Schumpeter stated that services provided by financial intermediaries are essential for technological innovation and economic development (Schumpeter & Elliott, 2012). McKinnon and Shaw argued that alleviating financial repression[6] can positively affect growth (Gemech & Struthers, 2003). However, it was only after King and Levine's study in 1993 that economists began to consider financial development as an important component in understanding economic growth. As stated by Honohan (2004), studies on the relationship between financial development and economic growth flourished extensively after the publication of King and Levine's study. Their study showed that financial development variables are strongly associated with real per capita GDP growth

[6] Artificial ceiling on interest rate, set by the government (Gemech & Struthers, 2003).

the rate of physical capital accumulation, and improvements in the efficiency with which economies employ physical capital (King and Levine, 1993a).

Proponents of the 'finance-supports-growth' theory emphasise the importance of savings and investment in achieving long-run economic growth. Higher savings and investment provide higher resources to augment the capital stock. More capital will increase productivity and eventually the living standards of a country. Through this mechanism, a financial system helps to efficiently channel funds from savers to investment projects. According to Levine (2004), financial systems provide five functions: 1) producing information about investment and allocating capital; 2) monitoring evaluation on disbursed funds; 3) facilitating trading, diversifying, and managing risk; 4) mobilising and pooling savings; 5) easing the exchange of goods and services. These functions may influence savings and investment decisions and hence economic growth. A well-functioning financial system helps to promote economic growth and stability by encouraging savings and by properly directing these savings into the most productive possible investments. In contrast, a poorly functioning financial system can create serious problems for an economy.

Dornbusch and Reynoso (1989) supported the notion that the financial system promotes growth because finance is the key to investment. Investment can be both costly and risky without an efficient financial system. Stiglitz (1993) even stated that the financial system is like "the brain" of the economy. It allocates resources across space and time in an environment of uncertainty and contributes to economic growth by supporting capital accumulation and technological innovation. Green, Kirkpatrick, and Murinde (2006) added that financial development is at least as important as human capital in the growth process. Regardless of the measurement of financial development used (money or credit), it makes a significant contribution to growth.

The theory of regional economic growth also highlights the role of savings (Armstrong & Taylor, 1993). The growth of a capital stock is one of the three main components of regional growth; the two others components are technical progress and the growth of the labour force. The growth of capital stock depends on investment by residents of the region and by the inflow of capital from other regions. Investment by the region's residents depends on the regional savings rate. Through this channel, the output of the

region will grow faster if the regional savings rate increases. The determinants of regional economic growth are illustrated in Figure 2.1. The banking sector plays a role in this channel because it transform savings into investments (Nasrudin & Soesilo, 2004).

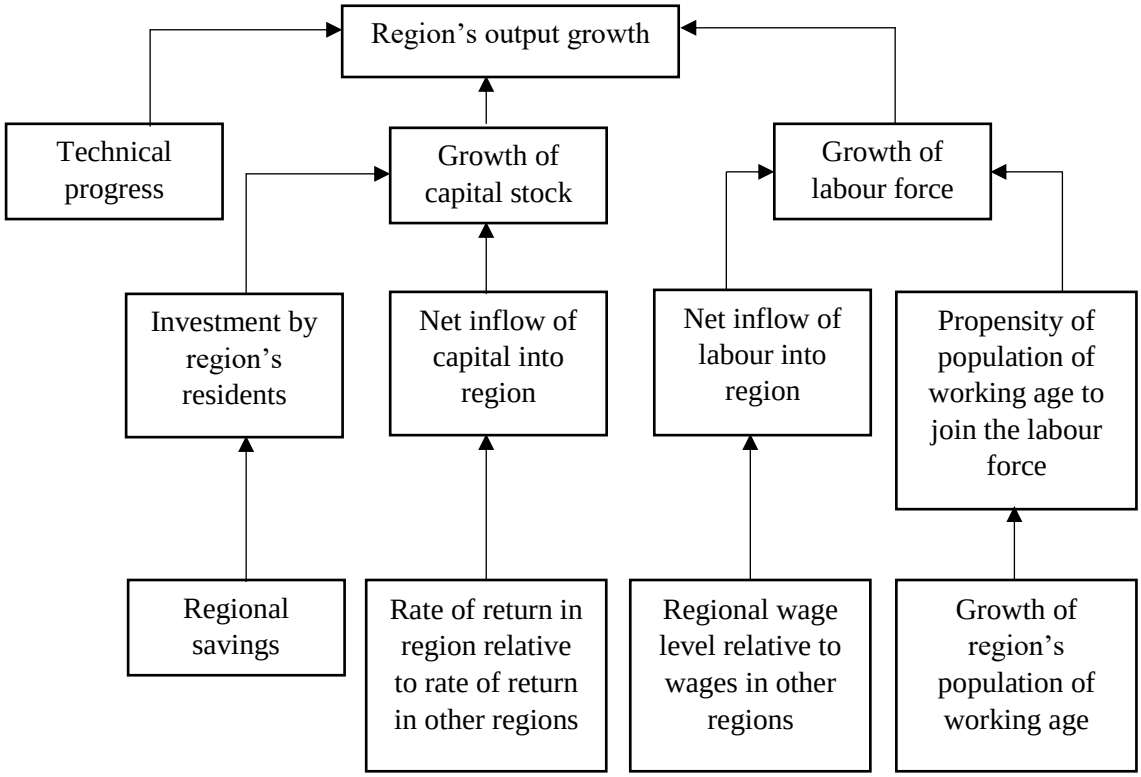

Figure 2.1: Determinants of regional economic growth
Source: Armstrong and Taylor, 1993

Opponents of the theory include Lucas (1988) and Ram (1999). Lucas argued that economic development is a result of physical capital accumulation and technological changes as well as human capital accumulation. He concluded that "the importance of financial matters is very badly over-stressed" (Lucas, 1988, p. 6). Ram supported Lucas' argument by showing that there was no evidence that financial development promoted growth. In particular, Ram challenged the study of King and Levine (1993a) and Odedokun (1998). Both tests employed a panel dataset and concluded that financial development promoted growth. Ram treated 95 countries in his data set individually, not as a panel data. First, Ram carried out an individual correlation test between the ratio of broad money to GDP and the growth of real GDP per capita. The results suggested a weak and negative association between the two variables. After that, he

estimated broad money as a function of growth for selected individual countries in his data set. The results indicated that broad money was negative and statistically insignificant. To further prove his point, Ram employed the regression by using a panel dataset of 85 countries and classified three sub-samples from the dataset: low-growth, mid-growth, and high-growth. The full sample showed a positive and significant coefficient of broad money, but only one sub-sample (high-growth) indicated the same result. Therefore, Ram argued that it was inappropriate to conclude that financial development promoted growth for the full sample.

It is important to note that some studies have highlighted that supporting regulations on financial system (e.g. financial reforms) are essential in order for the system to support growth (Apergis, Filippidis, & Economidou, 2007; Calderón & Liu, 2003; Demetriades & Hussein, 1996). The studies have argued that developing country governments should employ financial reforms to gain sustainable economic growth. The World Bank (1989) explained that financial reforms mean that financial institutions and markets have to be guided primarily by market forces rather than government directives. Strengthening market competition is also important, which can be done by encouraging the entry of new and innovative providers of financial services, by phasing out interest rate controls and high levies on financial transactions, and by stimulating the development of money and capital markets.

According to Arestis and Demetriades (1997), the reforms recommended in previous studies were regulations to liberate financial system, such as commercial bank privatisation, credit ceilings removal, and banks' independence to set their own lending and deposit rates. Mishkin (2000) summarised that the financial reforms needed, among others, were 1) banking supervision, 2) accounting and disclosure requirements, 3) restrictions on connected lending, 4) legal and judicial systems, 5) market-based discipline, 6) entry of foreign banks, 7) capital controls, 8) inappropriate government interventions in financial markets, 9) restrictions on foreign-denominated debt, 10) financial liberalisation, 11) monetary policy, and 11) choice of exchange rate regimes.

However, financial liberalisation might lead to a financial crisis if uncontrolled. Financial liberalisation policy is accompanied by weak financial regulation contributes

directly to economic instability and decline (Green et al., 2006; Rousseau & Wachtel, 2011).

2.1.1.2 The Importance of the Banking Sector

The financial sector consists of many institutions, instruments, and markets (World Bank, 1989). Financial institutions can be in the form of banks, pawnshops, insurance companies, pension funds, or credit unions. Cheques, currency notes/coins, bonds, and corporate bills are examples of financial instruments. Bond and stock markets are examples of specific financial markets. Because banks are considered to be the most important part of a financial sector, they can play a major role in economic growth. Thirlwall (2002) stated that one of the first priorities of development strategy is to develop a national banking system which comprises a central bank, commercial banks, and special development banks. Supporting Thirlwall, Kidwell (2012) suggested that banks are the main player in the financial system. According to Thirlwall, the important functions of banks are to create credit and to allocate savings to the most productive activities. Kidwell (2012) added that banks receive special treatment by regulators because money in the economy today is represented largely by deposits and checking accounts issued by banks. It is important to note that most developing countries have a bank-based financial system (Fry, 1997).

Because of its important role, the health of a banking sector is considered to have a substantial impact on a developing economy. Major economic crises, such as the 1997 Asian Financial Crisis and the 2008 Global Financial Crisis, attest to the fact that the health of banks can affect overall economic conditions. The Asian Financial Crisis revealed the weaknesses of the financial sector in the economies affected. At that time, Indonesia was severely influenced by the crisis. Santoso (2000) stated that the root causes of this crisis were problems associated with non-performing loans and lack of supervision and regulation of the banking system. There were a lot of non-viable loans as a result of lack of credit analysis. Additionally, the banking sector grew rapidly without proper regulation and supervision from the central bank. This condition led to the fragility of the Indonesian banking sector in the period 1988-1997. When the South-east Asian currency plummeted during the crisis, the banking sector in Indonesia was

unable to protect itself. The public in Indonesia lost their confidence in the country's banking system. This led to a major withdrawal of banks' deposits or a bank run.[7]

In 2008, the United States financial crisis led to the closure of 147 banks, including banks that were considered 'too big to fail'. The root cause was complex in that there were debates on identifying one single main reason which triggered the crisis. However, both Mishkin (2011) and Lin and Treichel (2012) agreed that lack of supervision of new financial instruments was the major problem. Mishkin argued that what happened in the United States in the period of the crisis was a series of runs on financial institutions. But, unlike the classic bank runs that happened in Indonesia during the 1997 crisis, it was a run on the shadow banking system.[8] It can be concluded that both major crises were triggered by a fragile banking system.

The total cost required to restore the banking system from both crises was very high and caused slower economic growth. To restore the public confidence in the banking system in Indonesia after the 1997 Asian Financial Crisis, the government recapitalised 36 banks worth IDR 412,306 billion or USD 51.5 billion (1 USD = IDR 8,000) as of July 2000. Moreover, the government also issued bonds worth IDR 164,536 billion or USD 20.56 billion to replace the government debts generated from the central bank's liquidity supports for problem banks during the crisis. Total recapitalisation bonds[9] from the government accounted for 60% of Indonesian GDP in July 2000, which was the highest restructuring cost with respect to GDP in history (Santoso, 2000). The government of the United States had to inject USD 787 billion into troubled financial institutions. Other costs borne as a result of the 2008 Global Financial Crisis were sharp contractions of -5.4% and -6.4% at annual rates on real U.S. GDP in the fourth quarter of 2008 and the

[7] Diamond & Dybvig (2000, p. 401) explained that "a bank run happens when depositors rush to withdraw their deposits because they expect the bank to fail. The sudden withdrawals can force the bank to liquidate many of its assets at a loss and to fail. In a panic with many bank failures, there is a disruption of the monetary system and a reduction in production."

[8] In the shadow banking system, institutions had short-term liabilities in the form of short-term borrowing, which used longer-term assets like mortgage-backed securities as collateral. As the value of mortgage-backed securities fell and uncertainty about their future value increased, the same amount of collateral supported less borrowing, leading to deleveraging in which financial institutions had to sell off assets. The decline in asset values lowered the collateral's value while further raising uncertainty, forcing financial institutions to deleverage and sell more assets, and so on (Mishkin, 2011).

[9] Recapitalisation (recap) bonds were issued by the Government of Indonesia to restructure the banking sector as the impact of the 1997 Asian financial crisis took effect. The government gave the bonds to selected banks to improve their capital. The recap banks held the bonds on their assets and government ownership on their liabilities. The recap banks could sell the bonds in a secondary market to obtain fresh money (Asian Development Bank, n.d.; Santoso, 2000).

first quarter of 2009 and a sharp rise in the unemployment rate which exceeded 10% by October 2009 (Mishkin, 2011).

It should be noted, however, that not everyone agreed with the statement that the banking sector had the most important role within the financial sector. Miller (2012) argued that financial markets should be diversified, not relied heavily on in the banking sector. He considered the banking sector as prone to vulnerability. A diverse financial market would increase the efficiency of the capital allocation process and reduce an economy's vulnerability to credit crunches.

2.1.2 Empirical Literature

2.1.2.1 Cross-Country Panel Data Studies

The study by King and Levine (1993a) was considered as the trigger of subsequent studies on the financial development and economic growth topic (Honohan, 2004). King and Levine (1993a) built the basic econometric model to analyse the relationship between financial development and economic growth which is as follows:

$$G(j) = \alpha + \beta F(i) + \gamma X + \varepsilon$$

where $G(j)$ represents the value of the j^{th} growth indicator (e.g., per capita GDP, per capita capital stock, productivity), $F(i)$ represents the value of the i^{th} indicator of financial development (e.g., liquid liabilities of the financial system/broad money, ratio of bank credit divided by bank credit plus central bank domestic assets, ratio of credit to private enterprises to total domestic credit, and credit to private enterprises divided by GDP), and X represents a matrix of conditioning information to control for other factors associated with economic growth (e.g. education, political stability, indicators of exchange rate, trade, fiscal, and monetary policy). The model has been replicated extensively in the literature of financial institution-growth nexus. Different financial development variables, as well as control variables, were used in the studies following King and Levine, adjusted to different objectives and contexts.

King and Levine (1993a) employed cross-country data from 80 developed and developing countries over the period 1960-1989. Firstly, they carried out a correlation test between the financial indicators and the growth indicators. The results indicated a positive and significant correlation between each financial indicator and each growth indicator. When they categorised the dataset into four categories (very fast, fast, slow, and very slow growth), they found that the rate of growth was positively associated with financial development. Countries with a faster rate of growth were more likely to have a more developed financial sector.

Secondly, King and Levine (1993a) investigated the strength of the partial correlation between financial development indicators and growth indicators. The cross-country regressions result suggested that the four financial development indicators had positive and significant coefficients when the growth indicators were the dependent variable. Lastly, King and Levine attempted to prove that the initial value of the financial development indicators was strongly linked with subsequent growth. They simply used the initial value of financial indicators (the value in 1960, 1970, and 1980) as the independent variables and used the averaged value of growth indicators over the period 1960-1969, 1970-1979, and 1980-1989 as the dependent variables. The results showed that the initial value of financial development indicators was positively and significantly associated with the rate of growth over the next 10 years.

Since King and Levine's (1993a) study, studies on the topic have grown. The studies have classified cross-country data into developed, developing, transition economies[10], and regional economies. Some examples of regional economies classification are Asia Pacific countries (Abdullah, Sanusi, Kamil, & Hasan, 2008), Organisation for Economic Cooperation and Development (OECD) countries (Shan, Morris, & Sun, 2001), island countries (Seetanah, Ramessur, & Rojid, 2009), African countries (Oluitan, 2012), Central and East European countries (P. J. Dawson, 2003), and Latin American countries (De Gregorio & Guidotti, 1995). The method preferred for these cross-country studies has been panel regression (i.e., King & Levine, 1993a; Abdullah et al., 2008) or Generalised Method of Moment/GMM (R. Beck, Georgiadis, & Straub, 2014; Koetter

[10] Countries which are in the process of changing from centrally planned (socialist) economies to market (capitalist) economies (Akimov, Wijeweera, & Dollery, 2009).

& Wedow, 2010; Levine, Loayza, & Beck, 2000; Rousseau & Wachtel, 2011; Seetanah et al., 2009).

The terms 'financial deepening', 'financial depth', and 'financial development' have been used interchangeably in the studies on the financial-growth nexus. Financial deepening is an upsurge in the stock of financial assets (World Bank, 1989). Financial depth measures the relativity of the financial sector to an economy. It is the size of banks, other financial institutions, and financial markets in a country taken together and compared to a measure of economic output (World Bank, 2016). Financial development is an improvement in the services provided by the financial system (Levine, 2004).

Lynch (1996) stated that a complete set of financial sector development indicators should cover credit intermediation, liquidity management, and risk management characteristics of the financial system. In previous studies, proxy variables for the three terms have been similar: money/GDP ratio to measure the degree of monetisation in an economy and private credit/GDP to measure credit intermediation. Money can be measured in the form of narrow or broad money. Narrow money reflects stock of valuable payment, while broad money reflects saving services (Lynch, 1996). Some other measurements of financial development are,

a. commercial bank assets/commercial plus central bank assets to measure the quality and quantity of services provided by financial intermediaries (Levine et al., 2000);
b. stock market capitalisation/GDP (Adamopoulos, 2010; Kappel, 2010) to measure stock market development;
c. the number of banking offices per capita (Meslier-Crouzille et al., 2012) or the ratio of bank assets to GDP (Zulverdi et al., 2005) to measure banking development.

More than 10 years after the study of King and Levine (1993a), evidence supporting the fact that financial development leads to growth was still being found. Abdullah, et al. (2008) used data from 18 Asia-Pacific countries over the period 1970-2003 and found a positive and significant relationship between financial depth and economic growth. Oluitan (2012) found that private sector credit was important to growth in 31 African countries over the period 1970-2005. Seetanah et al. (2009) added that financial

development had a positive contribution on the output level of 20 island economies in the period 1980 – 2002.

However, there were also a certain amount of opposing evidence. De Gregorio and Guidotti (1995) found a robust and significant negative correlation between financial development and growth in Latin America over the period 1950-1985. This effect occurred because extreme experiments on financial liberalisation in Latin America during the 1970s and 1980s subsequently collapsed and led to a negative relationship between the degree of financial intermediation and growth. Ram (1999) pointed out that previous evidence that finance promoted growth was still not encouraging. He compared results from previous cross-country studies (King & Levine, 1993a; Odedokun, 1998) with his individual-country study. He argued that results from the cross-country studies might be spurious. Shan et al. (2001) also found no evidence that finance led to growth in nine OECD countries and China.

More recent studies have also supported the findings of De Gregorio and Guidotti (1995) and Shan et al. (2001). The study by Favara (2003) revealed that in 85 developed and developing countries over the period 1968-1998, the relationship between financial development and growth was weak. In detail, the study found that the exogenous component of financial development did not spur growth, financial development and economic growth did not have linear association, and the estimated effect of financial development on GDP growth was often negative if a dynamic specification and heterogeneity across countries (in terms of different stages of economic and financial development) were taken into account.

P. J. Dawson (2003) tested the hypothesis that financial development promoted economic growth in 13 Central and East European Countries (CEECs) during transition using panel data. The results showed that financial development, as measured by liquid liabilities as a proportion of gross domestic product, had an insignificant effect on economic growth. Economic growth in CEECs was not constrained by underdeveloped financial sectors. Rousseau and Wachtel (2011) added that excessive financial deepening and rapid growth of credit after the 1980s might have led to both inflation and weakened banking systems and eventually to financial crises. Financial deepening had a strong impact on growth as long as a country could avoid a financial crisis. Their

conclusion was based on evidence in their study that the link between financial development and growth in more recent data (1990-2004) was not as strong as it was in the original studies with data for the period from 1960 to 1989.

2.1.2.2 Individual Country (Time Series) Studies

Arestis and Demetriades (1997) warned against the over-simplified nature of results obtained from cross-country regressions in that they might not accurately reflect individual country circumstances such as the institutional structure of the financial system, the policy regime, and the degree of effective governance. Ram (1999) added that the effect of financial development on growth was relative to each country, thus an individual-country study was better than a cross-country study. The view was supported by Rousseau and Wachtel (2011) who argued that the relationship between financial development and growth is complex. To have a better understanding of the relationship, one should do a systematic study of the financial development of individual countries, including investigating the appropriate policy regarding financial sector reform and regulation in the respected countries.

Individual-country studies have not indicated a clear pattern with regard to the relationship between finance and growth. In 1966, Patrick promoted the hypothesis that financial development led to growth in developing countries and growth led to financial development in developed countries. Agung and Ford (1998), Ghali (1999), and Mahran (2012) provided evidence that Indonesia, Tunisia, and Saudi Arabia followed Patrick's hypothesis. While evidence of finance led growth existed in the developing countries, Mazur and Alexander (2001) found no significant effect of banking indicators on output growth in New Zealand. The United Nations (2014) considers New Zealand to be a developed country.

However, results in some studies have not supported Patrick's hypothesis. Thangavelu and Jiunn (2004) reported that the financial market had a causal impact on economic growth in Australia. In China over the period 1952-2001, there existed a unidirectional causality from economic growth to financial development (Liang & Teng, 2006). Australia and China are considered as developed and developing countries respectively (United Nations, 2014).

2.1.2.3 Regional Panel Data Studies

Some studies have considered that using time series data at a national level is not enough to explain the complex relationship between financial development and growth in a country. Particularly in the case of countries that consist of extensive regional areas, there is a question about financial integration among these regions. Regional disparities within one country should also be taken into account. These questions have encouraged studies to examine the role of financial markets and institutions with respect to regional economic growth.

Dreese (1974) raised the question whether individual banks and bankers play a significant role in the economic growth of their areas. He stated that, at that time, the small numbers of studies on the topic was because of the assumption that funds were not restricted to a geographic area. Investors in one area could borrow in other areas and financial institutions could acquire funds in any areas (Dreese, 1974). According to McPherson and Waller (2000), the term to describe this phenomenon is 'financial integration'. The relationship between local banks and the local economy is affected by the degree of financial integration. This means if financial markets are integrated at the national level, lending by a region's banks and regional economic performance (regional income) should be uncorrelated. There are three levels of financial integration: 1) full integration if funds can move freely between areas, 2) partial financial integration if banks acquire funds from one area but allocate the funds to other areas, and 3) no financial integration if funds are acquired and allocated within one area (McPherson & Waller, 2000).

Nasrudin and Soesilo (2004) combined McPherson and Waller's (2000) model of financial integration and regional growth to evaluate the role of financial intermediaries in Indonesia. They used a dataset that consisted of 26 provinces in Indonesia[11] over the period 1987-1998. Financial integration was calculated using the following equation:

$$L_{it} = D_{it} + z_{it} \quad (1)$$

[11] Six new provinces are not included in the study, namely Riau Islands, Banten, Southeast Sulawesi, Gorontalo, West Sulawesi, and West Papua

where L_{it} stood for loans distributed by banks in province *i* and year *t*, and D_{it} represented funds accumulated by banks in the province in that same period, z_{it} indicated any shock to the distribution of the loans. The equation assumed that bank customers in province *i* did not always put their money in banks in the province. Likewise, banks in province *i* did not always distribute their loans in province *i*. Another important assumption was that interest rates for savings and loans were the same for all provinces. Nasrudin and Soesilo applied the Granger causality test to the model to investigate the degree of provincial financial integration as categorised by McPherson and Waller (2004). They found that only three provinces (North Sumatera, DKI Jakarta, and Southeast Sulawesi) were categorised as having no financial integration. One province (Jambi) had partial financial integration. Other provinces had full financial integration.

After testing financial integration, Nasrudin and Soesilo (2004) analysed the provincial data with panel data regression. The dependent variable was the growth of regional gross domestic product per capita. The independent variables were the ratio of commercial bank assets to regional GDP, the ratio of commercial bank loans to regional GDP, and the ratio of commercial bank deposits to regional GDP. The results indicated that the regression results were slightly consistent with the characteristic of financial integration of the provinces. For example, Southeast Sulawesi had no financial integration. According to McPherson and Waller (2000), this meant funds in Southeast Sulawesi were acquired and allocated within one area or, in other words, there was a correlation between the banking sector and economic growth. However, for this province, the regression results showed that all the banking indicators (assets, number of bank offices, deposits, and loans) had negative coefficients. The results also showed that in most provinces with full financial integration, the credit variable had a positive correlation. Integration of financial intermediation was not always associated with economic growth.

Usai and Vannini (2005) argued that the study of economic growth at the regional level should take into account the issue of regional financial integration. They used a different approach than in the study of McPherson and Whaller (2000) and Nasrudin and Soesilo (2004). Using regional data in Italy, Usai and Vannini employed the equation as follows:

$$\log r_i = a + b\log r_j \quad (2)$$

where r_i and r_j were the interest rates in region *i* and *j* respectively. A perfectly integrated market was indicated by the constant term that equalled zero ($a = 0$) and the coefficient *b* that equalled one. Usai and Vannini regressed equation (2) using annual interest data from every possible pair of provinces. The results indicate the existence of significant fixed interregional price gaps in regional areas of Italy due to regional capital market peculiarities, such as different operating costs and/or disparities in risk levels.

Amos and Wingender (1993) stated that the small attention paid to the role of regional financial activity was partly due to the common assumption that financial capital was perfectly mobile among regions and thus played a passive role in regional growth. The key questions posed by their analysis was whether financial activity played a passive or active role in unbalanced regional growth attributed to the polarisation-backwash and trickling down-spread effects. The polarisation-backwash effect means that one region grows at the detriment of other regions, while the trickling down-spread effect means that the growth in one region encourages growth in others. If financial activity plays an active role in economic development and is regionally differentiated, then it could also contribute to unbalanced regional growth. The potential importance of regionally differentiated financial activity to regional growth lies at the heart of regional financial market analysis.

The kind of analysis described by Amos and Wingender (1993) was conducted by Boyreau-Debray (2003). In his attempt to identify the relationship between growth and financial intermediation at the subnational level within China, he found that credit extended by the banking sector at the state level had a negative impact on provincial economic growth. Provinces with a more diversified banking sector performed better in terms of economic growth. Another empirical study on the importance of local financial development was the study of Kendall (2009). Its findings showed that the growth of many districts in India was financially constrained due to a lack of banking sector development.

Anwar and Nguyen (2011) employed data from 61 provinces in Vietnam over the period 1997-2006. They found that financial development had contributed to economic growth in Vietnam. They also found that the ratio of credit to Gross Provincial Product (GPP) was an important determinant of provincial economic growth in Vietnam – an increase in the ratio of credit to GPP in Vietnam was significantly associated with an increase in economic growth. When using alternative measurements of financial development such as gross domestic saving and monetary aggregate M2, they received the same result. Cheng and Degryse (2010) also showed evidence that local economic growth was significantly affected by banking development in 27 Chinese provinces over the period 1995-2003.

2.1.2.4 Small Bank-Specific Studies

Some studies have attempted to narrow the scope of financial development by identifying the importance of specific financial institutions, such as rural banks or community banks (Berger, Hasan, & Klapper, 2004; Burgess & Pande, 2005; Meslier-Crouzille et al., 2012; Usai & Vannini, 2005). The idea is that rural or community banks act differently from large commercial banks. Rural banks usually have the advantage of access to local information, better relationships with their customers, and a greater commitment to develop the local community. Hence, they are better placed to monitor and assess the risk of local enterprises (Meslier-Crouzille et al., 2012). These kinds of banks, mostly found in developing countries, are intentionally designed to provide financing opportunities to SMEs. Rural banks cover an important gap in the market, caused by the reluctance of commercial banks to finance SMEs. This is because the loans are usually small (less than US$1,000 but carry higher administrative costs than large ones) (Todaro & Smith, 2012). They are also riskier since the borrowers cannot offer much collateral (de Aghion Armendariz & Morduch, 2005).

Previous studies have controlled specific bank type to investigate the contribution of financial development to economic growth. Berger et al. (2004) categorised their dataset into three groups: small banks, foreign banks, and state banks. Small banks are private and domestically owned banks with assets less than USD 1 billion for developed countries or less than USD 100 million for developing countries. State and foreign banks are banks with 50% or more owned by state or foreign, respectively. Similarly,

Meslier-Crouzille et al. (2012) controlled for all banks when investigating the contribution of rural banks in the Phillippines. They used bank aggregate data in the regional level for three types of banks: universal and commercial banks, thrift and private development banks, and regional rural and cooperative banks. Furthermore, to investigate the role of specific categories of banks to Italy's regional economic growth, Usai and Vannini (2005) considered four types of financial intermediaries: banks of national interest (private banks), cooperative and rural banks, specialcredit institutions, and public law banks (state-owned banks). Meanwhile, Burgess and Pande (2005) did not control for other types of bank. They specifically investigated the impact of opening rural bank branches on poverty reduction in an area.

Berger et al. (2004) found that in 49 developed and developing nations between 1993 and 2000, greater market shares and efficiency ranks of small, private, domestically owned banks were associated with better economic performance, and that the marginal benefits of higher shares were greater when these banks were more efficient. Burgess and Pande (2005) provided robust evidence that opening branches in rural unbanked locations in India was associated with reduction in rural poverty. Supporting Burgess and Pande, Meslier-Crouzille et al. (2012) showed that rural banks had a positive effect on the development of intermediate and less-developed regions in the Philippines. However, when they employed the data of all banks (commercial banks, thrift banks, and rural banks), there was no strong evidence that the banking sector led to regional economic development. Usai and Vannini (2005) confirmed the results from Meslier-Crouzille et al. In Italy, the overall size of the financial sector did not have a robust impact on regional growth, but some intermediaries were better than others. Cooperative banks and special credit institutions appeared to have a positive role in regional growth. Meanwhile, large private banks and state-owned banks did not affect growth when growth was measured value added per worker and had a negative influence when the measurement of growth was regional GDP per capita.

The competition between community and large banks in financing SMEs has been explored in some studies. de la Torre, Martínez Pería, and Schmukler (2010) argued that SME lending is neither led by small or niche banks, nor is it highly dependent on relationship lending. Rather, all types of banks cater to SMEs and large, multiple-service banks have a comparative advantage in offering a wide range of products and

services on a large scale through the use of new technologies, business models, and risk management systems. Zhu (2012) also argued that larger banks increase the amount of SME lending, creating more opportunities for SMEs; however, the dominance and high concentration of very large banks is harmful for the enterprises. Shen, Chu, and Wang (2012) supported the findings of de la Torre, et al. (2010) and Zhu (2012) and found that large banks made more SME loans than small banks did in both tranquil and crisis times. Foreign-owned banks cut SME loans in crisis times, but not for government owned banks and privately owned banks. Government owned banks even significantly increased SME lending during the crisis period.

In contrast, DeYoung, Hunter, and Udell (2004) believed that efficient community banks can be viable rivals with larger banks in providing financial services to retail consumers and small business owners. Carter, McNulty, and Verbrugge (2004) added that when compared to large banks, small banks make better choices from available small business loans and have an information advantage in evaluating credit.

2.1.2.5 The Issue of Endogeneity and Reverse Causality

It is important to note that some studies have recognised the possibility of reverse causality when analysing the financial-growth relationship using ordinary least squares (OLS) method (Levine et al., 2000). Those studies have carried out a different approach to check the possibility of reverse causality. King and Levine (1993a) used the initial values of financial development indicators to investigate if financial development could be the predictor of subsequent economic growth. They found that the initial value of financial development was positively and significantly associated with subsequent economic growth. Favara (2003) took a similar approach to King and Levine. His results indicated that the initial values of broad money and loans to the private sector were significant predictors of subsequent growth.

Levine et al. (2000) used instrumental variables to test for the exogeneity of financial development. The instruments were dummy variables for the origin of a country's legal system (English, German, or French). The origin of a country's legal system was proved to have significant effect on the structure and development of its financial system (Porta, Lopez-de-Silane, Shleifer, & Vishny, 1996). Levine et al. (2000) used

Generalized Method of Moments (GMM) as the estimation method. The estimation was that legal origin could only affect growth through financial development or through control variables (other determinants of growth). The results suggested that there was a strong connection between the exogenous component of financial development and growth for 71 countries over the period 1960-1995. Favara (2003) replicated the method used by Levine et al (2000). Favara compared the results of OLS (log of GDP as the dependent variable, broad money and private credit as the independent variables) and the results of GMM with instrument variables. OLS results indicated that financial development was positively and significantly associated with growth. However, GMM results indicated that there was a drop in the magnitude of financial development coefficients and that financial development was no longer having a significant effect on growth. Favara concluded that the the OLS estimation might be biased.

The difficulty of investigating the relationship between financial development and growth is that most variables can be regarded as endogenous. The GMM method seems to be the generally accepted method to deal with the issue of endogeneity (Anwar & Nguyen, 2011; Cheng & Degryse, 2010; Favara, 2003; Seetanah et al., 2009). GMM uses lagged dependent and independent variables as instruments. The crucial assumptions are that the lagged differences of financial development are good instruments for explaining subsequent levels and the lagged levels of financial development are good instruments for explaining subsequent first differences (Arellano & Bover, 1995). However, the method has a drawback that should be noted. The drawback of the GMM method is that lagged variables do not always serve as good instruments and the estimated results may be sensitive to the choice of instruments. Therefore, other suitable instrumental variables should be used (Anwar & Nguyen, 2011). Despite the drawback, GMM has been the preferred method, particularly when the problem of data prevents studies from using other possible instrumental variables.

The possibility of reverse causality has encouraged subsequent studies to focus on causality analysis between financial development and growth. Previous studies on causality analysis are explained further in sub-section 2.12.6.

2.1.2.6 Causality Analysis

Differences in the Direction of Causality

With regard to the direction of causality between financial development and economic growth, Patrick (1966) theorised that there are two kinds of links between the two: demand-following and supply-leading. The link is demand-following when financial markets develop as a consequence of real economic growth. This implies that finance is essentially passive and permissive in the growth process. The demand-following phenomenon may be found during more advanced stages of development. Conversely, the link is supply-leading if the financial sector plays a significant role in the growth process through the creation of financial institutions and the supply of financial assets. It is more likely to happen in the early stages of growth. Thus, according to Patrick, the nature of the relationship between financial sector development and economic growth depends on the stage of economic development.

Many studies on financial institution development and economic growth have questioned the direction of causality between the two because there is no firm consensus whether financial development leads to growth or vice versa. Studies on this topic can be classified into three groups of findings: evidence of financial development influences growth, evidence of reverse causality, and evidence of bi-directional causality. The study of causality between financial development and growth conducted by Jung (1986) could be regarded as the earliest study on the topic. Jung used two indicators of financial development: narrow money/M1 (the sum of currency and demand deposit) as a proxy of the complexity of financial structure, and the ratio of broad money/M2 to GDP as a proxy for the real size of the financial sector of a growing economy. Real economic growth was measured by per capita real GNP or GDP, depending on the availability of data. Applying the Granger causality test to 59 countries, in which 19 were developed countries, Jung found that causal direction from financial development to economic growth existed in the least developed countries and reverse causal direction existed in developed countries.

Ahmed and Ansari (1998) used data from India, Pakistan, and Sri Lanka to identify the direction of causality between three measurements of financial development (e.g., the

ratio of broad money to nominal GDP, the ratio of quasi money to nominal GDP, and the ratio of domestic credit to nominal GDP) and two measurements of economic growth (e.g., real GDP and per capita real GDP). Applying the Granger causality test, they found that quasi-money and domestic credit caused economic growth in India, all indicators of financial development caused economic growth in Pakistan, and broad money, as well as quasi-money, caused economic growth in Sri Lanka. The results, according to Ahmed and Ansari, could be the foundation for the governments of the countries to encourage financial development as a way to promote economic growth.

Chang and Caudill (2005) used a similar indicator of financial development as Ahmed and Ansari (1998) (broad money to GDP) and the same methodology (the Granger causality test). They found that financial development caused economic growth in Taiwan over the period 1962-1998. Christopoulos and Tsionas (2004) investigated the long-run relationship between financial depth and economic growth in 10 developing countries over the period 1970-2000. Financial depth was measured by the ratio of total bank deposit liabilities to nominal GDP and economic growth was defined by the quantity of output expressed as an index number (1995=100). They argued that the causality should be differentiated between short and long-run because the impact of financial development was more likely to occur in the short-run and it would slowly disappear in the long-run. In this study, they found no evidence of short-run causality but there was evidence of long-run causality. This implied that the government of the countries should focus on long-run policy in the attempt to boost economic growth.

The evidence that financial development causes economic growth has been challenged by several studies. Adamopoulos (2010) applied the Granger causality test to identify the effect of stock and credit market development on economic growth. He used Ireland's annual national data for the period 1965-2007. The results of the test indicated that in Ireland, there was a bilateral causality between economic growth and stock market development, and causality with direction from economic growth to credit market development.

In another study by Carbó-Valverde and Rodriguez-Fernández (2004), economic growth predicted financial deepening in the 17 regions of Spain between 1993 and 1999. They used five indicators of financial deepening: the outstanding value of customer plus

interbank loans as a measurement of the relationship level between lending and economic growth, the outstanding value of total deposits, the outstanding value of equity and security holdings, an estimation of fee-earning activities (i.e., portfolio management, mutual and pension funds distribution, loan commitments), and the outstanding value of mutual funds distributed by the bank. Economic growth was defined as regional GDP. They also applied the Granger causality test to the dataset.

Abu-Qarn and Abu-Bader (2008) found evidence of bi-directional causality in Egypt. They followed the standard practice of using the Granger causality test between financial development and economic growth. They also used the standard measurement of financial development, namely ratio of broad money/M2 to GDP, the ratio of M2 minus currency to GDP, the ratio of bank credit to the private sector to nominal GDP, and the ratio of credit issued to non-financial private firms to total domestic credit (excluding credit to banks). Using more complex data of 15 OECD and 50 non-OECD countries over the period 1975-2000, Apergis et al. (2007) found bi-directional causality between financial deepening and growth. This finding implied that policies aiming at improving financial markets and their functions would have, in the long-run, a significant effect on economic growth. Additionally, policies that improve economic growth, such as macroeconomic stability or investment in physical and human capital would also have an important effect on financial development in the long-run. Apergis et al. used three different measures of financial development. The first was currency plus demand and interest-bearing liabilities of bank and non-bank financial intermediaries divided by GDP. The second was credit by commercial banks to the private sector divided by GDP, and the last was the value of credits by deposit money banks and other financial institutions to the private sector divided by GDP.

The same kind of multi-country causality analysis was also conducted by Calderón and Liu (2003). Calderon and Liu applied the Granger causality test to 109 developing and industrial countries from 1960 to 1994. Two of their main findings were 1) the Granger causality from financial development to economic growth and the Granger causality from economic growth to financial development coexisted, and 2) financial deepening contributes more to the causal relationships in the developing countries than in the industrial countries. Two standards of financial development measurements were used,

namely, ratio of broad money/M2 to GDP and ratio of credits provided by financial intermediaries to the private sector to GDP.

Critiquing the standard practice of causality analysis on multi-country studies, Demetriades and Hussein (1996) argued that causality patterns vary across countries, thus the countries should not be treated as homogenous entities and the statistical inference from such studies may result in an unreliable conclusion. Their findings underlined their arguments. Using data from 16 countries, Demetriades and Hussein found three findings: causality runs from financial indicators to economic growth in three countries (Honduras, Spain, and Sri Lanka), bi-directional causality in seven countries (Guatemala, Honduras, India, Korea, Mauritius, Thailand, and Venezuela), and reverse causality in six countries (El Salvador, Greece, Pakistan, Portugal, South Africa, Turkey). In their study, they used two measurements of financial development, namely ratio of bank deposit liabilities to nominal GDP and ratio of bank claims on the private sector to nominal GDP. Real GDP per capita is used as the indicator of economic development.

Carby, Craigwell, Wright, and Wood (2012) used a similar financial development measurement as Calderon and Liu. They employed data from Barbados over the period 1945-2011. The result showed that causality runs from economic growth to financial development in the short-run and bi-directional causality in the long-run throughout the entire period. Demirhan, Aydemir, and Inkaya (2011) investigated the causality relationship between financial development and economic growth using Turkish data from 1987:1 to 2006:04. They used total bank credit to the private sector and total market capitalization as proxies for financial development. The result showed that, in Turkey, the stock market and banking development has caused economic growth and that economic growth has propelled the development of the financial sector. In other words, bi-directional causality between financial development and growth exists in Turkey.

Indonesian-Specific Causality Studies

In the context of Indonesia, there have been several studies specifically investigating the direction of causality between financial development and economic growth. They have

generally followed the standard causality test and standard measurement of financial development and economic growth. All of the studies have also used data at the national level.

Hasiholan and Adiningsih (2003) used Indonesian quarterly national data over the period 1983:2-2000:4. They used three measurements of financial development: ratio of broad money/M2 to GDP, ratio of banking credit to GDP, and ratio of narrow money/M1 to demand deposit. Economic growth was measured by real GDP. Hasiholan and Adiningsih employed the Granger causality test. First, they conducted ADF and the Phillip Perron unit root test to identify the stationarity of data and the level of integration. If the variables had the same level of integration, the cointegration test could be carried out. Co-integrated variables meant that there existed (at least) one-directional causality between the variables. Residuals from the cointegration test, subsequently, were used in the model of vector auto regression to identify the existence of causality relationship.

The results showed that there was bi-directional causality in the long-run between the ratio of broad money to GDP and economic growth, bi-directional causality in the short-run between the ratio of banking credit to GDP and economic growth, and no causality between the ratio of narrow money to demand deposit and economic growth. The results indicated that the financial sector in Indonesia had a contribution to economic growth, not passively being the outcome of the growth.

The findings of Hasiholan and Adiningsih's (2003) study were supported by Mukhlis (2012), Inggrid (2006), Hidayati (2009), and Setiawati (2008). Mukhlis (2012) used Indonesian national annual data in the years 1990-2010. He employed similar methods and measurements of financial development as used by Hasiholan and Adininigsih (2003). He found evidence of bi-directional causality between financial development and GDP. Inggrid (2006) also found evidence of bi-directional causality between real output and volume of credit and one-way causality from spread (the difference between loan rate and deposit rate) to output. Using Indonesian data in the period 1992:2-2004:4, she used variables of bank loans to the private sector and spread. Inggrid also employed three estimation stages: unit root tests, Johansen cointegration test, and Granger causality based on the Error Correction Model (ECM).

Hidayati used Indonesian annual data over the period 1999-2008. Volume of banking credit and stock market capitalisation were used as proxies of financial development. Her results showed that there was bi-directional causality between economic growth and banking credit development. Setiawati (2008) used Indonesian annual data between 1990 and 2003. The results indicated that, in the short term, GDP growth caused development in the ratio of banking credit to GDP. In the long term, the causality was bi-directional.

The evidence of bi-directional causality was challenged by the study of Zulverdi et al. (2005). Employing 1980-2004 Indonesian annual data, they found that the ratio of banks' assets to GDP caused the growth of aggregate real GDP and real GDP per capita. Using different financial sector development measures, which were the ratio of total banks' assets and non-bank financial institutions' assets to GDP, their results also showed that financial development causes the growth of real GDP and real GDP per capita.

In contrast, evidence of no such relationship was provided by Mukhopadhyay and Pradhan (2011). Employing 1990-2009 Indonesian data, they showed that financial development in Indonesia had very little impact on economic growth. Moreover, financial development could not be considered as the policy variable to accelerate economic growth in an economy like Indonesia.

2.2 Financial Development and Poverty

2.2.1 Theoretical Literature

2.2.1.1 The Measurement of Poverty

There are two kinds of poverty measures – absolute and relative. Absolute poverty is a measure of poverty which is constant over time in terms of a minimum, absolute standard of living. The World Bank has set a standard to define absolute poverty. The world poverty line was USD 1 a day based on 1993 Purchasing Power Parity (PPP). It was revised to USD 1.25 a day for 2005 and is currently USD 1.90 a day. Based on the World Bank indicator, people are poor if they live on less than USD 1.90 a day. The

USD 1.90 poverty headcount ratio is defined as extreme poverty. Another poverty line set by the World Bank is moderate poverty which is currently USD 3.10 a day. An example of a country's absolute poverty line is one that is applied in the United States. The United States Census Bureau determines poverty status by comparing pre-tax cash income against a threshold that is set at three times the cost of a minimum food diet in 1963. This figure is updated annually for inflation using the Consumer Price Index (CPI), and adjusted for family size, composition, and age of householder (The United States Census Bureau, 2015).

Relative poverty is measured in relation to the overall distribution of income or consumption in a country. This means the definition of poverty could be varied across countries. One example of relative poverty measurement can be found in New Zealand. To measure poverty, the researchers in New Zealand use this measurement: "low-income thresholds set at 50% and 60% of median household income, adjusted for household size and composition (age and relationship between people)" (Perry, 2015, p. 77).

To measure poverty, several studies on financial development-poverty nexus have adopted the World Bank indicator (Akhter & Daly, 2009; Jeanneney & Kpodar, 2011; Perez-Moreno, 2011; Yusuf, Malarvizhi, & Jayashree, 2014). The studies have been cross-country studies, thus needing only one standard measurement to define poverty across countries. Perez-Moreno (2011) used both World Bank indicators, that is, extreme poverty and moderate poverty. By using both indicators, he found the interesting result that financial development leads to the reduction of moderate poverty, rather than extreme poverty. He concluded that financial development does not primarily benefit the poorest, but instead poor people with higher income/expenditure levels.

Odhiambo (2009) investigated the relationship between economic growth, financial development, and poverty in South Africa. Poverty reduction in South Africa was measured by per capita consumption.[12] The per capita consumption measurement was also used by Uddin, Kyophilavong, and Sydee (2012) to investigate the relationship between banking sector development and poverty reduction in Bangladesh. Kar, Agir,

[12] Population cut-off at 50% of national per capita expenditure (Woolard & Leibbrandt, 1999)

and Peker (2011) used per capita final consumption expenditure and per capita household final expenditure collected from the OECD Online database to proxy poverty reduction in Turkey. The studies argued that they used the indicator because time series data of poverty in developing countries were difficult to obtain. Another argument was because data of per capita household consumption expenditure were publicly available on World Bank Development Indicators (Quartey, 2005; Sehrawat & Giri, 2015).

However, in some developing countries, poverty data are easy to obtain. To investigate whether financial deepening affects poverty in India, Inoue and Hamori (2011) used a poverty indicator set by the Government of India. Poverty ratio is the percentage of people below the poverty line. The poverty line is defined as minimum consumption expenditure affixed in a nutritional norm of 2400 calories per person per day in rural areas and 2100 calories per person per day in urban areas. The data were obtained from the Reserve Bank of India, the website of the Planning Commission, and Indiastat.com (Hamori & Inoue, 2012).

The poverty indicator used in India is similar to the Indonesian poverty indicator. The Indonesian poverty line includes both the food poverty line (FPL) and the non-food poverty line (NFPL). FPL is the expenditure value of food minimum requirements or is equivalent to 2100 kilocalories per capita per day. NFPL is minimum needs for housing, clothing, education, health, and other basic individual needs (BPS, 2015). Data of poverty rate in Indonesia are available from the year 1970.

Rather than focus on a poverty indicator, Bittencourt (2010), Deng and Su (2011) and Kappel (2010) used the Gini coefficient to investigate the relationship between financial development and inequality. Kappel (2010) used the Gini coefficient data from the UNU-WIDER[13] World Income Inequality Database for 78 developing and developed countries over the period 1960-2006. Bittencourt (2010) and Deng and Su (2011) calculated the Gini coefficient. Bittencourt (2010) used data on individual earnings from people between 15 and 65 years of age to calculate the Gini coefficient in Brazil. Deng and Su (2011) used provincial urban household income data to calculate the coefficient in China.

[13] United Nations University World Institute for Development Economics Research

2.2.1.2 The Relationship between Financial Development and the Poverty Rate

There are two opposing theories on the role of financial institutions to reduce poverty in developing countries (Levine, 2004). Some believe that only the rich will benefit from more developed financial institutions because the poor do not possess financial, physical, and human capital resources needed to get loans. That condition is described by Stiglitz (1993) as market imperfection. The market behaviour will benefit those who can provide collateral and those with whom the financial institutions have an established relationship. Hence, this will lead to wider income disparity (Jalilian & Kirkpatrick, 2005; Shahbaz & Islam, 2011). The financial institutions described by Stiglitz (1993) are formal ones, for example, banks

Other studies have argued that financial development does not help the poor because a more developed financial sector brings more risks. A developed financial sector offers more opportunity for speculation which may cause bubbles and crises (Kirkpatrick et al., 2000; Zhuang et al., 2009). Akther and Daly (2009) and Jeanneney and Kpodar (2008). Also, financial instability brought on by the development of this sector can be particularly detrimental for the poor.

Financial crises worsen the condition of the poor through four channels (Arestis & Caner, 2004). First, crises typically lead to a fall in wages in both the formal and informal sector. Second, the distribution of income will be affected by changes in relative prices caused by a crisis. A financial crisis may lead to currency depreciation. Currency depreciation may cause declines in the prices of non-tradeable goods relative to tradeable goods. Those working to produce non-tradeable goods will experience a fall in their earnings. If the economy is reliant on imported goods, particularly imported food, the exchange rate change will hurt the households that are net consumers of food. Thirdly, a crisis is traditionally followed by a contractionary fiscal policy which generally means cuts in social programmes. The poor will have limited access to some essential services at the same time as their income is falling. Fourthly, a crisis often causes an interest rate rise so it will be more difficult and expensive for the poor to get a loan. A sound and stable financial sector will have the ability to help the poor. Therefore, Kirkpatrick et al. (2000) concluded that governments should provide robust

prudential regulation of financial institutions as a necessary condition for stable and efficient financial sector development.

The opposite theory states that better functioning financial intermediaries can offer financial services to larger segments of a population. More credit means more entrepreneurship, more firm formation, and economic growth (Aghion & Bolton, 1997). Another way financial development can reduce poverty is by providing financially disadvantaged families with low-cost loans. Families can use the loans to invest in the education and health of their children, an intergenerational investment to get families out of poverty (Tiwari et al., 2013). Financial development is beneficial for the poor because it increases access to various sources of funding. Increases in M3 to GDP or bank credits to GDP ratios may directly translate into improved the living conditions of the poor. Finance facilitates transactions. It also provides the opportunity to accumulate assets and to smooth consumption (Boukhatem, 2015).

Others have argued that growth is the best way to significantly reduce poverty. Economic growth caused by (or accompanied by) financial liberalisation increases incomes and therefore reduces poverty (Aghion & Howitt, 2012; Arestis & Caner, 2004; Dollar & Kraay, 2002). It is preferable if the growth helps the poor by providing a good environment which can increase their production and income, rather than through the "trickle down" process in which the growth makes the rich become richer first and eventually passes down these benefits to the poor (Dollar & Kraay, 2002).

Holden and Prokopenko (2001) concluded that financial development can reduce poverty in indirect or direct ways. The indirect way means that financial development has a positive impact on economic growth and growth reduces poverty. The direct way results from the availability of accessible financial instruments, services, and institutions for the poor. Zhuang, et al. (2009) summarised both ways as shown in Figure 2.2.

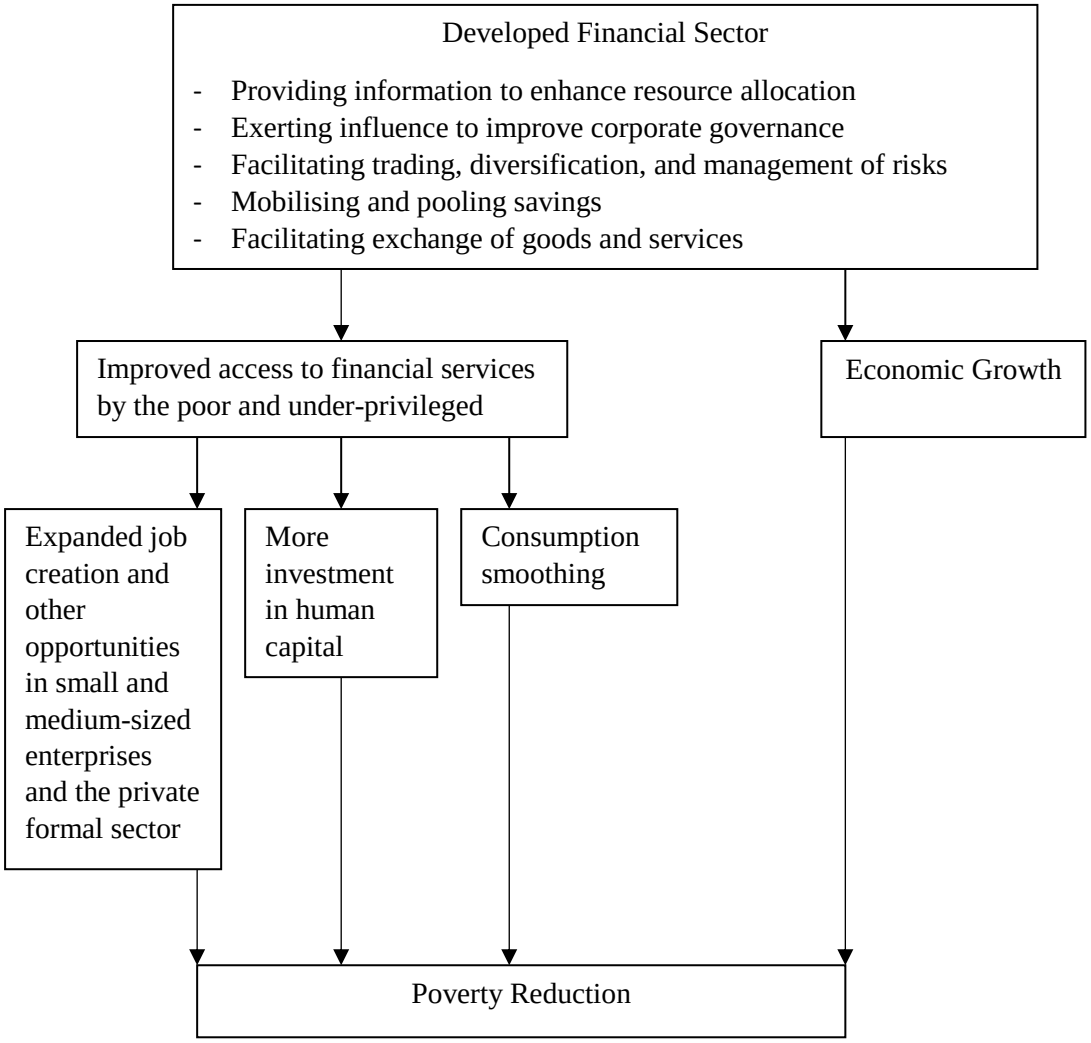

Figure 2.2: Financial development and poverty reduction
Source: Zhuang et al. (2009)

However, some have argued that growth alone is not sufficient to reducing poverty. There are numbers of other factors that determine whether growth improves the living standards of the poor (Ravallion, 2001; Todaro & Smith, 2012). Such factors, according to Todaro and Smith (2012), could be in the form of the achievement process of the growth, the participators of the growth, the priority sectors, or the designated and emphasised institutional arrangements. Kirkpatrick et al. (2000) added that even though economic growth is essential for poverty reduction, it still needs policy intervention in order to increase income and improve the poor's economic security. This policy intervention can be in the form of prudential regulation of financial institutions (Kirkpatrick et al., 2000), investment in the human and physical assets of poor people (Ravallion, 2001), or targeted credit programs for the poor.

There has also been a debate on the most suitable financial institutions to serve the poor. Robinson (1996) proposed that formal microfinance is the most suitable institution for the poor because they generally lack access to large institutional commercial finance. This view is backed up by evidence that microfinance contributes significantly to reducing poverty (Imai, Gaiha, & Thapa, 2012; Inoue & Hamori, 2011; Khandker, 2005; Morduch & Haley, 2002). Gonzalez-Vega (1994) stated that financial institutions in developing countries should focus on financing activities dominated by small-scale manufacturing, farming, and services firms. Therefore, small local banks are more suitable because the size and sophistication of financial institutions and markets in the developed countries may not be appropriate for the poor. Usai and Vannini (2005) also pointed out that smaller and less complex banking institutions are better equipped than large hierarchical banking corporations at funding small enterprises. Other proponents of small local banks in developing countries are Carter et al. (2004); Nakamura (1994); Zhu (2012).

This view is countered by those who believe that the sizes of financial institutions do not matter, as long as they can serve small enterprises (T. Beck, 2013; de la Torre et al., 2010). Zhuang, et al. (2009). These studies also emphasised that local and small banks may not have enough assets and networks to serve the poor. Kappel (2010) even found that developed stock markets have significantly contributed to reducing income inequality and poverty. To conclude, Gonzalez-Vega (1994) stated that the poor may benefit from financial institutions only if the institutions provide the correct services which are to facilitate payments and liquidity management, to intermediate, and to deal with risk. Regardless of the form, the most important thing is institutional viability. A permanent formal financial institution is required to serve the poor, while in the past the lack of institutional viability has been the greatest drawback in subsidised targeted credit programs.

2.2.2 Empirical Evidence

While studies investigating the relationship between financial development and economic growth are numerous, empirical evidence linking financial development and poverty is more limited. Evidence that financial development contributes significantly to reducing poverty can be found in the studies of Burgess and Pande (2005),

Boukhatem (2015), Hamori and Inoue (2012); Inoue and Hamori (2011); Odhiambo (2009); Perez-Moreno (2011); Pradhan (2013); Rehman and Shahbaz (2014) among others. Financial development has also been found to reduce inequality in several studies (Bittencourt, 2012; Deng & Su, 2011; Kappel, 2010).

The basic model to investigate the relationship between financial development and poverty is as follows (Boukhatem, 2015):

$$pov_{it} = \beta_0 + \beta_1 loggdp_{it} + \beta_2 FD_{it} + \beta_3 X_{it} + u_i + \vartheta_t + \varepsilon_{it} \quad (3)$$

where pov_{it} is the poverty indicator, gdp_{it} is the gross domestic product per capita, FD_{it} is financial development indicator, X_{it} is a vector of control variables (inflation rate, trade openness, financial openness), u_i is the country-specific effect, ϑ_t is the time-specific effect, ε_{it} is the error term, i is the individual dimension of the panel (country), t is the temporal dimension. The model had been adjusted by previous studies to suit different objectives and contexts.

Some studies do not control for GDP on the right-hand side as in equation (3). The studies attempt to investigate the direct mechanism from financial development to poverty by employing these models (Odhiambo, 2009):

$$pov_{it} = \beta_0 + \beta_1 FD_{it} + \beta_2 X_{it} + u_i + \vartheta_t + \varepsilon_{it} \quad (4)$$

$$FD_{it} = \beta_0 + \beta_1 pov_{it} + \beta_2 X_{it} + u_i + \vartheta_t + \varepsilon_{it} \quad (5)$$

Perez-Moreno (2011) found that financial development, measured by liquid assets of the financial system as a share of GDP or by money and quasi-money[14] as a percentage of GDP, led to the reduction of moderate poverty in 35 developing countries in the period 1970-1980 , but not in the period 1980-1990. However, similar results were not found when Perez-Moreno used another financial development measurement, that is, the ratio of private credit to GDP. This means financial intermediaries in the 35 developing

[14] Quasi-money or near money is "a highly liquid financial asset that does not function directly or fully as a medium of exchange but can be readily converted into currency or checkable deposit. It could be in the form of savings deposits, small-denominated (less than US$ 100,000) time deposits, or money market mutual funds held by individuals" (McConnell, Brue, & Flynn, 2012, p.713).

countries studied were successful in helping the poor by providing transaction services and saving opportunities, but they were still behind in channelling funds to the poor. Moreover, different results for a different period means that the relationship between financial development and poverty in developing countries was influenced by a particular historical context and the economic, political, and social circumstances existing in each period.

Odhiambo (2009) found similar results to Perez-Moreno – financial development and economic growth Granger-caused poverty reduction in South Africa. Odhiambo used the ratio of broad money stock (M2) to nominal GDP as a proxy of financial depth. Odhiambo replicated his study in Kenya and found that there was a distinct causal flow from financial development to poverty reduction in Kenya. He also found a bi-directional causality between savings and poverty reduction. Therefore, he concluded that financial development in Kenya is pro-poor and pro-savings (Odhiambo, 2010).

Pradhan's (2010) study supported all the positive results, confirming the presence of unidirectional causality from poverty reduction to economic growth, economic growth to financial development, financial development to poverty reduction, and economic growth to poverty reduction in India between 1951 and 2008. Also in India, Burgess and Pande (2005) found that opening bank branches in rural locations reduced rural poverty. Furthermore, Hamori and Inoue (2012) agreed that financial deepening in India significantly decreased poverty. Hamori and Inoue measured financial deepening by commercial bank credit and deposit therefore could conclude that the development of the banking sector had been beneficial for the poor in India.

The long-run relationship between financial deepening, economic growth, and poverty reduction also existed in Pakistan over the period 1972-2011 (Rehman & Shahbaz, 2014). In China, financial development was proven to be beneficial to the increase of income for poor families and the alleviation of inequality of income distribution (Deng & Su, 2011). Furthermore, Boukhatem (2015) provided the evidence that financial development contributed directly to reducing poverty in 67 low and middle-income countries over the period 1986-2012, insensitive to the indicators of poverty and financial development used.

Uddin, Shahbaz, Arouri, and Teulon (2014) also showed that there was a long-run relationship between financial development and poverty in Bangladesh, but the contribution of financial development on poverty reduction was still small in magnitude. They applied the VECM Granger causality test to investigate the nexus of financial development-poverty reduction. They pointed out that VECM Granger was unable to forecast a comprehensive economic policy to reduce poverty in Bangladesh. Therefore, in the attempt to forecast the behaviour of the variables and to show the relative strength of the variables, they applied the innovative accounting approach (IAA), which is a combination of the variance decomposition method (VDM) and impulse response function (IRF). The variance decomposition analysis in their study showed that 2.06% of variance in poverty could be explained by financial development. The contribution of economic growth in poverty variance was 7.82%, and shock (change) in poverty was 90.13% explained by the poverty variable itself. This means that only a small portion of poverty reduction could be explained by financial development.

Focusing specifically on microfinance, Inoue and Hamori (2011) used the term financial permeation to describe how microfinance institutions (MFIs) distribute loans among the poor. Financial permeation is measured by the number of MFIs, the ratio of the number of MFIs to per capita real GDP, and the gross loan portfolio from MFIs. They found that the number of MFIs and their loan portfolio had significant effects in decreasing the poverty rate in 90 developing countries. This finding was supported by Khandker (2005) and Imai, et al. (2012). Khandker (2005) found that in Bangladesh, access to microfinance contributed to poverty reduction, especially for female participants, and to overall poverty reduction at the village level. Furthermore, Imai, et al. (2012) provided evidence that microfinance not only reduced the incidence of poverty but also its depth and severity. Poverty incidence was measured by poverty headcount ratio, poverty depth and severity was measured by poverty gap and squared poverty gap respectively.

The results of both cross-country and panel data regressions suggest that inequality and poverty are reduced not only through enhanced loan markets but also through more developed stock markets (Kappel, 2010). Green et al. (2006) explained that stock markets allow households and firms to diversify their sources of investment capital and spread investment risk. This will lead to the growth of enterprise (and entrepreneurship)

and encourage innovation and productivity which is in line with poverty alleviation strategy (King & Levine, 1993a, 1993b).

According to theory, the two general channels by which financial development affects poverty are the indirect channel through economic growth and the direct channel through credit for the poor. Several empirical studies have attempted to identify those channels. Abosedra, Shahbaz, and Nawaz (2015) used domestic credit to the private sector as a proxy for financial development in Egypt. The variable was indicated as the direct channel. They found that private credit reduced poverty, and thus the contribution of the direct channel in Egypt was confirmed. The indirect channel was indicated in the use of M2 as a proxy for financial development and infant mortality per capita as a proxy for poverty. The empirical results showed that financial sector development also contributed to poverty reduction through economic growth in Egypt.

Akhter and Daly (2009) attempted to differentiate indirect and direct channels by investigating 54 developing countries over the period of 1993-2004. They used two measurements of financial development which represented each channel. The ratio of aggregate money balances to GDP (M3/GDP) represented the indirect effect of financial development on poverty alleviation. The ratio of aggregate credit to GDP (C/GDP) represented the direct channel. The result of the study showed that, on average, financial development was conducive to poverty reduction but financial development was generally accompanied by instability which was detrimental to the poor.

Similar variables (M3/GDP and private credit/GDP) were used by Jeanneney and Kpodar (2011) to differentiate the direct and indirect effect of financial development on poverty. Investigating 65 developing countries over the period 1980-2000, they concluded that financial development is pro-poor, with the direct effect stronger than the indirect effect through economic growth. From the result, it can be assumed that even though financial institutions do not provide credit directly to the poor, they still contribute to the poor by offering profitable financial opportunities for savings.

As well as reducing poverty, there is also evidence that financial development reduces inequality. Bittencourt (2012) showed that financial development in Brazil over the period 1980-1990 contributed to reducing inequality through the channel of short and

long-run investment in productive activities. The effects even occurred in periods of poor macroeconomic conditions. Deng and Su (2011) found that financial development in China was beneficial to the increase in the income of the poor and the alleviation of income inequality. Investigating the effect of financial development in 78 developing and developed countries in the period 1960-2006, Rao and Tamazian (2011) found that an enhanced loan market and a developed stock market reduced inequality and poverty.

Several studies have agreed with the view that more developed financial institutions do not reduce poverty. Tiwari, Shahbaz, and Islam (2013) disputed the positive results, concluding that financial development and economic growth in India over the period 1965-2008 did not help to reduce rural-urban inequality in the long-run. In the short-run, economic growth lowered inequality, while financial development was not statistically significant in affecting inequality. They explained that this may have been due to misalignment between the short-term objective and no long-run strategy of sustainability. Another explanation is that growth alone is not sufficient to reduce poverty. It should be accompanied by policy interventions with an emphasis on improving the living conditions of the poor.

Dandume (2014) also found that financial sector development, measured by increases in the supply of loanable funds, neither caused nor contributed to poverty reduction in Nigeria. This indicates that in the case of Nigeria, financial development alone without equitable income redistribution and good governance may not be enough to reduce poverty.

Acharya (2003) showed evidence that rapid development of the financial sector in Nepal in the 1990s appeared to have no backwards and forward linkage with economic growth and poverty alleviation. According to Acharya, this inefficiency is because the dominant institution in Nepal's financial sector (commercial banks) was affected by the political intervention and the oligopolistic tendencies in the financial sector. Stiglitz (1993) described the condition as a market failure. The fundamental cause of poverty, according to Stiglitz, is a market failure which mainly arises from market imperfections, asymmetric information, and the high cost of small-scale lending.

Most of the variables that have been included in the model of the relationship between financial institution and economic growth have also been used in the financial institution-poverty model. However, the interaction of these variables with growth might differ from those with poverty (Jalilian & Kirkpatrick, 2002). The measurement of financial development has been varied as shown in these studies:

a. M2/GDP (Odhiambo, 2009), M3/GDP (Jeanneney & Kpodar, 2011; Perez-Moreno, 2011);
b. private credits/GDP (Hamori & Inoue, 2012; Jeanneney & Kpodar, 2011; Kappel, 2010; Perez-Moreno, 2011; Uddin et al., 2012);
c. commercial bank assets/commercial plus central bank assets (Jeanneney & Kpodar, 2011);
d. stock market capitalisation/GDP (Kappel, 2010);
e. deposit/GDP (Inoue & Hamori, 2011).

Some studies have selected their financial development variables based on the objective of their studies which is to differentiate the channel used by financial development in affecting poverty. In this case, they have used M2 (Abosedra et al., 2015) or M3 (Akhter & Daly, 2009; Jeanneney & Kpodar, 2011) to represent the indirect channel. M2 or M3 relates to the ability of financial systems to provide transaction services and saving opportunities (Akhter & Daly, 2009). The direct channel is represented by the variable of private credit/GDP, a proxy to measure the role of financial intermediaries in channelling funds to productive agents (Akhter & Daly, 2009).

In studies with the specific objective of determining the contribution of microfinance to poverty reduction, financial development has been specifically described as microfinance development. The proxies of microfinance development are a number of branches, loan accounts, and deposit accounts per 100,000 adults (Imai et al., 2012). Inoue and Hamori (2011) used similar measurements, which were the number of microfinance, the number of microfinance relative to per capita real GDP, and the logarithms of the gross loan portfolio of microfinance.

The proxy of poverty has also been varied. In general, studies have used data of poverty head ratio. A study by Imai et al. (2012) tried to differentiate between poverty, poverty depth, and poverty severity. Poverty, poverty depth, and poverty severity is measured

by poverty head ratio, poverty gap, and squared poverty gap, respectively. The study showed that the three measurements delivered the same results. Some studies have focused on income inequality, rather than poverty. Income inequality is measured by Gini ratio (e.g., Bittencourt, 2010; Deng & Su, 2011).

2.2.3 The Issue of Endogeneity and Reverse Causality

Similar to the investigation on the financial development-growth nexus, there is also a possibility of reverse causality in the analysis of the financial-poverty relationship. Boukhatem (2015), Hamori and Inoue (2012), and Jeanneney and Kpodar (2005) applied GMM to deal with the issue of endogeneity. The standard approach of GMM is estimating equation (15) (the basic model) in first differences, using previous lags of the explanatory variables as instruments. Lagged levels of the dependent variables, the predetermined variables, and the endogenous variables are used to form instruments for GMM (StataCorp, 2011).

Kappel (2010) used 2SLS estimation to overcome the problem of endogeneity. She replicated the instrument variables used in the study of T. Beck, Demirgüç-Kunt, and Levine (2003), which were used the legal origin and the absolute value of the latitude of each country as instruments. (T. Beck et al., 2003) argued that the origin of adopted law in a country can explain cross-country differences in financial development. Likewise, the geographical endowment of a region also can explain the institutional environment of the region. Known as the endowment theory, the geographical endowment of a region determined whether Europeans formed settler or extractive colonies, which in turn defined the institutional environment. In extractive colonies, the colonisers attempted to extract as many resources as possible from the colonised regions, thus they were not willing to support the development of free and competitive financial markets. In contrast, colonisers in settler colonies were more likely to construct institutions that protected private property rights and hence fostered financial development. The geographical endowment in Kappel's study was measured by the latitude of each country in her dataset. She found that latitude was a stronger instrument for financial development than legal origin.

To investigate the relationship between financial development and poverty, several previous studies have focused on performing causality analysis (Odhiambo, 2009, 2010; Perez-Moreno, 2011; Pradhan, 2010; Rehman & Shahbaz, 2014). The procedures of conducting causality tests, in general, are the unit root test, the cointegration test, and the causality test. To investigate the long-run relationship between financial development and poverty, the Johansen cointegration test (Pradhan, 2010) or the Pedroni cointegration test (Odhiambo, 2009, 2010) has been used. The Johansen test is for a time series dataset, while the Pedroni test is for a panel dataset. The necessary condition for the Johansen and Pedroni tests is that the preliminary unit root test shows all variables included are in the same order. If the variables are not in the same order, Autoregressive Distributed Lag (ARDL) methodology is carried out (Ho & Odhiambo, 2011; Rehman & Shahbaz, 2014; Uddin et al., 2014). Within prior studies, the Granger method has been employed for the causality tests (Odhiambo, 2009, 2010; Perez-Moreno, 2011).

2.3 Summary

Previous studies have provided conflicting conclusions on the relationship between financial development and growth and poverty. On one hand, there is ample evidence supporting the notion that financial development contributes significantly to economic growth and reduces the poverty rate. On the other hand, there is also adequate evidence that financial development does not affect growth and poverty.

The results of previous studies may have been dependent on the preference of financial development indicators and the object of the study (cross-country panel data, individual country time series, or within one country regional panel data). Financial development indicators that have been widely used in the studies are money/GDP ratio to measure the degree of monetisation in an economy and private credit/GDP to measure credit intermediation. With regard to the object of the studies, some have argued that the effect of financial development on growth is relative to each country, thus an individual-country study may be better than a cross-country study. It has further been argued that regional studies can better explain the relationship complexity between financial development and growth in a country.

There are key points that can be taken from previous studies. First, some studies have pointed out that different types of bank/financial institutions have different contributions to economic growth. In this case, the studies control various different types of bank/financial institutions. Second, regional studies have recommended considering the financial integration between regions. Third, previous Indonesian studies, in general, have used data relating to financial development at a national level. They have also similarly found that there is bi-directional causality between financial development and growth. One study by Nasrudin and Soesilo (2004) used data at a regional level, but it focused only on the data on commercial banks. The result showed that the banking sector made no significant contribution to regional growth.

Previous studies have emphasised the importance of dealing with simultaneous equation bias. There are two general methodologies to overcome the problem: GMM and 2SLS. GMM has been the preferable method, particularly when the problem of data lacking prevents the studies from using other instrumental variables. However, the GMM method has a drawback which is lagged variables do not always serve as good instruments. Other previous studies have investigated the issue of endogeneity by performing causality analysis. The results of the studies show three kinds of relationship: unidirectional causality from finance to growth, unidirectional causality from growth to finance, and bi-directional causality between the two.

After reviewing the previous literature, there are important points that are applied in this current study:

1. This study will use regional data because regional studies are able to better explain the complex relationship between financial development and growth in a country.
2. This study uses data on the banking sector because banks are the main player in the financial systems in developing countries.
3. The choice to focus on the role of rural banks is based on results of previous studies that show rural banks act differently from commercial banks. It should be noted that previous studies have controlled for the contribution of other types of banks/financial institutions when investigating the contribution of specific types of bank/financial institutions to economic growth.

4. This study uses Indonesian data. Previous Indonesian studies, in general, have used data on financial development at a national level. They have also generated similar results that there is bi-directional causality between financial development and growth. So far, there has only been one study (Nasrudin & Soesilo, 2004) that has used data at a regional level, but with a focus on the data of commercial banks.
5. This study investigates the relationship between financial development and economic growth and poverty by performing cointegration test and the error correction based causality. In addition, this study uses the 2SLS method to deal with the issue of endogeneity.

The following chapter will justify the preference of using regional areas and rural banks in Indonesia as the object of this study. The chapter will describe thoroughly the financial sector development and the regional diversity in Indonesia.

3 Chapter 3 – Banking Sector and Regional Differences in Indonesia

Chapter 2 in this study reviewed the literature as the foundation for this study. This chapter explains why the relationship between rural banks and regional growth and the poverty rate should be investigated. In this chapter, a description of the Indonesian banking sector and associated regional differences is provided. A review of the banking sector in Indonesia includes the evolution of banking in Indonesia and the development of rural banks. Regional differences in Indonesia are described based on regional domestic product, the poverty rate, banking conditions, and the development of small and medium enterprises.

3.1 The Evolution of Banking in Indonesia

The first bank in Indonesia was established in 1746. The bank was a Dutch bank and built to facilitate the growing trade of spices originating in Indonesia.[15] After Indonesia gained its independence in 1945, the government began to establish state-owned banks. Meanwhile, private and foreign banks still existed. There were also other financial institutions similar to banks such as village barns, village banks, and credit institutions. In 1953, the central bank, Bank Indonesia (BI) was established.

The first fundamental law of the banking system in Indonesia was Law No. 14, created in 1967 as part of the Banking Principal Regulations. The act stated that banks in Indonesia were to be categorised into four types, based on the products offered by the banks:

1. Central bank, which is the Bank Indonesia.
2. General (commercial) banks, which provide short-term (1 year) lending, financed by time and demand deposits.
3. Saving banks, which offer saving accounts and invest the accumulated funds in commercial paper (i.e. securities).
4. Development banks, which specialise in accepting time deposits, issuing medium and long-term bonds, and providing medium (1-3 years) and long-term (more than 3 years) lending to support development.

[15] Indonesia was colonialised by the Dutch from 1596 to 1942.

Rural banks, village barns, market banks, and other small banks were not categorised specifically in the law. They were expected to run their business in the same manner as before the enactment of the law and to report their activities to the central bank. McLeod (1992) categorised these banks as 'secondary banks', which is small, relatively informal institutions, usually having a single office, and not offering demand deposit services (that is, not participating in the payment system).

In 1992, the government amended Law No. 14 of 1967 to Law No. 7 on Banking. According to the new law, banks in Indonesia could be classified as commercial banks and rural banks. Commercial banks are basically the combination of general, saving, and development banks according to the 1967 law. The banks' operations include mobilising funds, providing lending, and conducting activities in foreign exchange. Basically, the banks conduct business commonly undertaken by financial intermediaries providing that the activities are not violated prevailing laws.

Those classed as 'Secondary banks' before the enactment of the 1992 Law, which includes rural banks, village barns, market banks, village credit institutions, district credit agencies, and/or other similar institutions, were granted the status of Rural Banks pursuant to the 1992 Law. Activities of rural banks are more restricted. They are prohibited from accepting demand deposits – and as a consequence, they cannot issue bank cheques or conduct business in foreign exchange, equity participation, and the insurance business. Rural banks mobilise their funds in the form of time deposits and saving deposits. They are also allowed to place funds in Bank Indonesia Certificates (SBIs), time deposits, certificate of deposits and/or savings in other banks. The 1992 Law also states that rural banks are expected to open their office in a sub-district.[16] However, they can open their offices in a district's capital city or in a province's capital with a consideration to serve the lower economic class/small businesses in city areas.

Figure 3.1 illustrates the evolution of the Indonesian banking system. *Sharia* banks in Indonesia were recognised formally in 1992. However, the 1992 Law had yet to give a strong legal basis for the development of such banks. The law used the term 'profit sharing' to describe the activities of the banks, while *sharia* includes broader activities

[16] A sub-district is the third tier of administrative division in Indonesia. The first tier is a province. The second tier is a district.

than mere profit sharing. In the 1998 Banking Law, regulations on the business activities of *sharia* banks were specifically described.

The banking institutions experienced rapid growth following the 1998 amendment of the Law.[17] However, it was not followed by proper supervision from the central bank. It was common for private banks to lend their money to internal groups without a sound credit analysis. In addition, government officials often intervened in state banks' lending decisions. These practices eventually led to a high level of credit defaults.[18] The credit defaults, frauds, and liquidity mismatches became very serious problems when Indonesia suffered exchange rate turmoil between 1997 and 1998.[19] Bank borrowers failed to return their lending because of a very high and sudden increase in prices. Banks[20] with bad loans suffered liquidity problems. The problems were even worse when depositors who felt less confident in the banks withdrew their funds in order to place them in other or overseas banks. This led to a major banking crisis in Indonesia. The government annulled the permit of 16 private national banks on 1 November 1997, closed 7 banks in April 1998 and 38 banks in March 1999 (Santoso, 2000). In 1998, the growth contracted as much as 13.13%.

[17] In October 1998, the central bank issued a regulation to create fair competition among banks by allowing new entry, either in the form of new banks or new branches.
[18] The defaults were from commercial banks. At that time, rural banks were not as popular as commercial banks because Indonesia was in the stage of developing large manufacturing industries.
[19] The USD/IDR exchange rate dropped from IDR 2,450 per USD in July 1997 to IDR 11,000 per USD in March 1998 (Santoso, 2000).
[20] These banks with bad loans were commercial banks. Most of the bad loans were related to foreign exchange markets (Santoso, 2000). Rural banks are not allowed to conduct activities in foreign exchange.

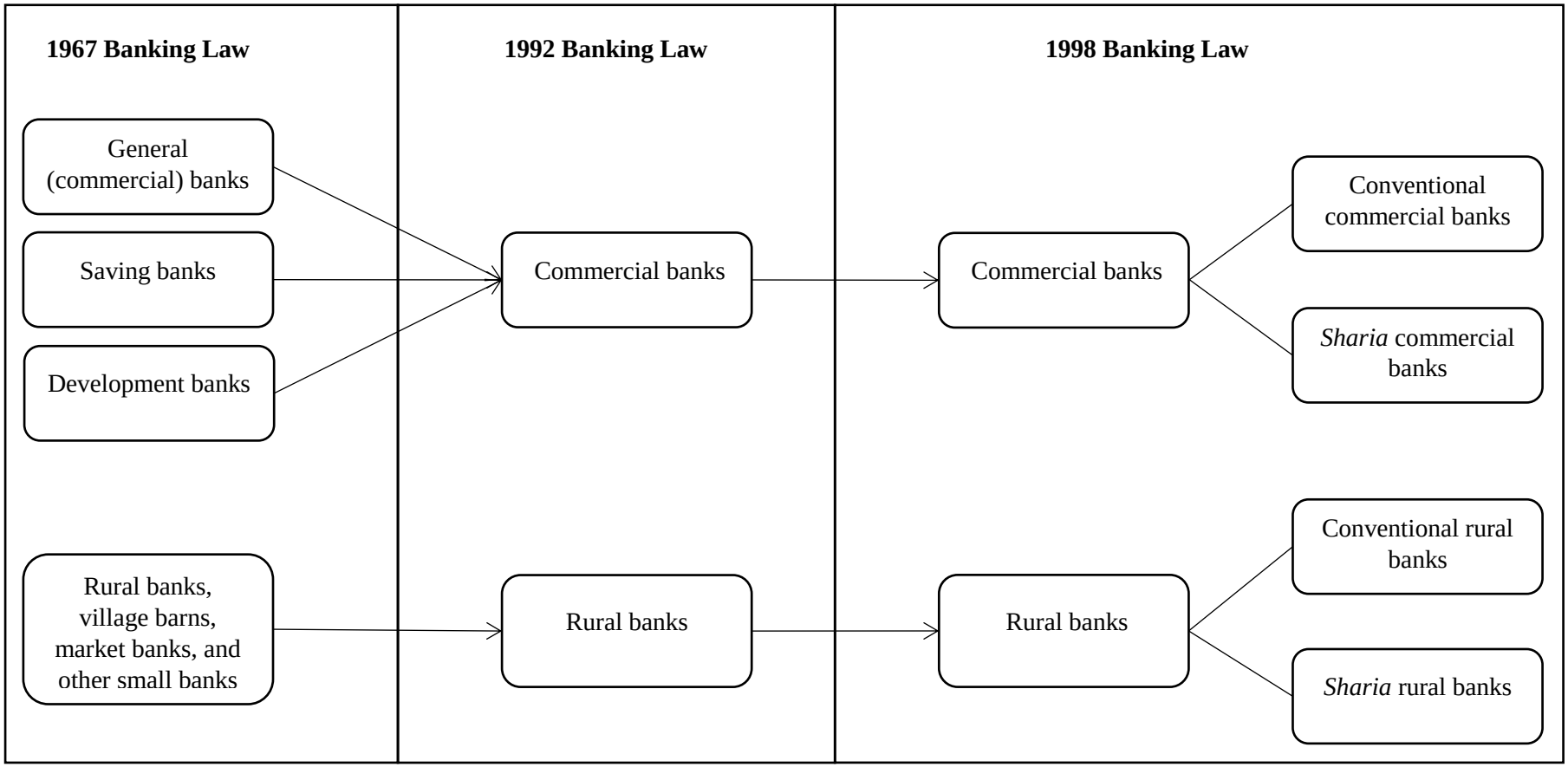

Figure 3.1: Evolution of Indonesian banking system

In the following years, the Indonesian banking system slowly recovered from this major crisis. Banks set high-interest rates[21] to attract deposits but were still reluctant to channel credit because of a high rate of bad loans and slower economic development. In this condition, *sharia* (Islamic) banks[22] started to attract certain conventional bank customers who refused to be serviced and catered to by conventional banks because they believed that the interest mechanism was against Islamic principles. *Sharia* banks offer products with interest-free mechanisms[23], eliminate unproductive speculation, and introduce a system of partnership with a high level of moral principles (Siregar & Ilyas, 2000). In 1998, the government amended the 1992 Banking Law with Law No. 10 in order to provide a wider opportunity and a stronger legal foundation for *sharia* banking. Since that year, Indonesia has been officially practising a dual banking system. This means banks in Indonesia can operate their business based on conventional or *sharia* principles. Commercial banks can be in the form of conventional or *sharia* commercial banks and rural banks can be in the form of conventional or *sharia* rural banks. The supervision of *sharia* banking is also conducted by Bank Indonesia. Since 1999, the central bank has been able to conduct *sharia*-based monetary operations.[24] Even though the market share of *sharia* banking in Indonesia has been growing since 1998, it remains low considering the fact that nearly 90 percent of the population adheres to Islam. Not only does Indonesia's sharia banking lag far behind the country's domestic conventional banking industry, it also lags far behind Islamic finance industries in other countries that contain a big Islamic community (such as Malaysia and Saudi Arabia) (Indonesia Investments, 2015).

The 1997 Asian Financial Crisis greatly affected the banking system in Indonesia. It exposed institutional weaknesses in the system. This raised a lot of questions about the

[21] In 1998, in the time of crisis, the annual deposit rate was 39.07%. In 1999, the rate was 25.7%. The rate continued in the range of two digits (10-15%) until 2003.
[22] In 2012, the asset of *sharia* banks was 4.31% of the total assets of banks in Indonesia.
[23] One of sharia banks' lending schemes is called *mudharabah*. *Mudharabah*, by definition, is a business partnership between a capital owner (the bank) and a working partner (the borrower). In this scheme, the interest rate mechanism is replaced by a profit sharing arrangement. Profit is distributed between the bank and the borrower in accordance with an agreed upon ratio/proportion at the time of the contract, whereas financial loss is borne by the bank and the borrower bears the opportunity cost of their own labour, which failed to generate income. In this mechanism, the parties involved justly benefit from the entire process of the business activities according to their contribution. Thus, it is unlike interest which has been predetermined at the beginning of the transaction process and is never allowed to change (Ajija, Annisa, & Hudaifah, 2012).
[24] Bank Indonesia issued the Islamic Bank Indonesia Certificate as an Islamic monetary instrument in 1998, in addition to Bank Indonesia Certificate as the conventional monetary instrument.

direction of the Indonesian banking sector after the crisis. The central bank formulated Indonesian Banking Architecture (*Arstektur Perbankan Indonesia*/API) to answer those questions. API is a comprehensive basic framework for the Indonesian banking system. It outlines the direction, framework, and structure of the banking industry for the next five to ten years to create financial system stability for the promotion of national economic growth. It explains in detail the future structure of the Indonesian banking industry, the long-term development strategy for *sharia* banking, promotion of lending to SMEs, and the institutional strengthening of rural banks. API was set in 2004. In addition, after the crisis, the financial market in Indonesia underwent a drastic reform. Some of the major changes in the financial market were the redeployment of regulatory agencies (Table 3.1).

The financial reform helped Indonesia to build a stronger banking system. It was verified by its resilience in the face of the 2008 Global Financial Crisis. Nowadays, the banking institutions in Indonesia are as shown in Figure 3.2. The figure shows that there are four state banks in Indonesia and three of them have *sharia* unit. That means the three state banks operate both in conventional and sharia system. There are 16 of regional development banks and 10 of conventional private banks operating in conventional and *sharia* system. The number of private banks and rural banks that purely operated in *sharia* system (Islamic commercial banks) is 11 and 160, respectively.

Table 3.1: Indonesian regulatory agencies before and after the 1997 Asian financial crisis

Before Crisis	After Crisis
• The Central Bank of Indonesia (*Bank Indonesia*/BI) - Had the responsibility of monetary authority, the regulatory and supervisory authority for the banking and payment system. - After the establishment of OJK in 2013, BI roles were limited to formulating and implementing monetary policy, regulating and ensuring payment system, ensuring financial system stability. • Capital Market Supervisory Agency and Financial Institution (*Badan Pengawas Pasar Modal dan Lembaga Keuangan*/Bapepam-LK) - Under the Ministry of Finance (MoF) - Responsible for granting licenses, setting rules and regulations, supervising market participants, and establishing capital market accounting standards. - Employees of Bapepam-LK were transferred to work in OJK.	• Indonesia Deposit Insurance Corporation (*Lembaga Penjamin Simpanan*/LPS) - Established in 2005. - Its responsibility is to insure depositors' funds and actively participates in maintaining stability in the banking system in accordance with its authorised mandate. - The maximum amount of deposit insured by LPS is IDR 2 billion[25] per depositor per bank. If a depositor has several accounts in one bank, the balance of all depositors' accounts will be cumulated to calculate the amount of deposit insured. - LPS insures deposits in all conventional and *sharia* banks for both commercial banks and rural banks. • The Financial Services Authority (*Otoritas Jasa Keuangan*/OJK) - Established in 2011. - Regulates and supervises financial services activities in banking, capital markets, and non-bank financial industries sectors.

[25] As of 1 October 2015, IDR 2 billion is equal to USD 137,000 (Reuters, 2015).

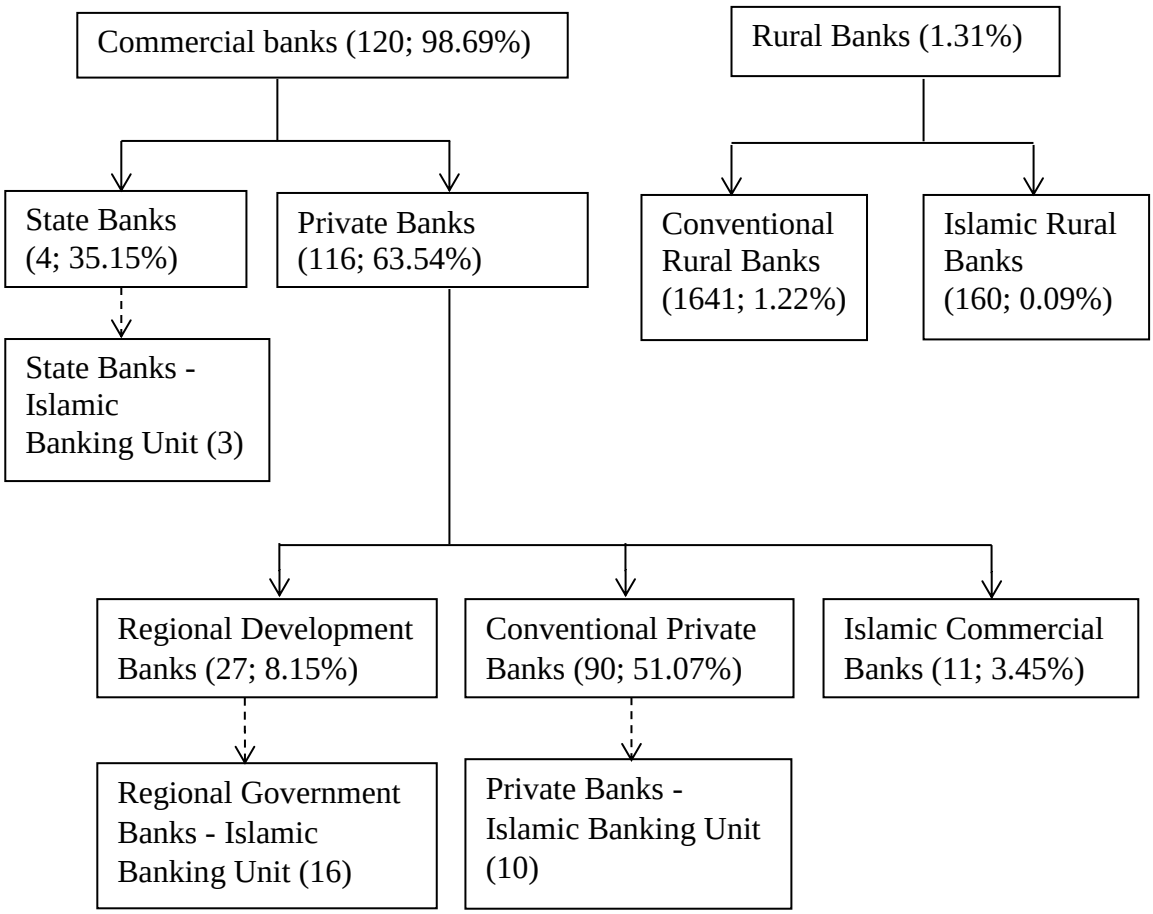

Figure 3.2: Banking institutions in Indonesia
Source: Bank Indonesia (2015)
Notes: Numbers in brackets are the number of banks and the percentage shows the share of the bank to total deposits. There is no data on Islamic banking units' total deposits for state banks, regional government banks, and private banks.

Regional Development Banks (RDBs) are owned by regional governments. There are 26 RDBs in Indonesia, while the number of provinces is 34. Each province has its own RDB, except for 8 provinces. Some of the banks are jointly-owned, for example, West Java-Banten RDB, Riau-Riau Islands RDB, South Sulawesi-West Sulawesi RDB, South Sumatera-Bangka Belitung RDB, Maluku-North Maluku RDB, South Sulawesi-Gorontalo RDB, and East Kalimantan-North Kalimantan RDB. In addition to acting as a general commercial bank, an RDB also acts as a cashier of a regional government. Employees who work for a regional government get their monthly salary through RBDs. This means a local government employee has to own an account at the region's RBD. RDBs' third-party funds are mostly from regional government funds (funds from

regional budgets). These government funds cannot be channelled to RBDs' customers as loans. Most of the funds are placed in the Bank Indonesia Certificate.[26] RBD loans in December 2014 only accounted for 8.05% of the total loans of commercial and rural banks (Bank Indonesia, 2015).

RBDs and rural banks seem to have one similar objective, which is to promote regional economic growth. However, in some regions, RBDs are merely cashiers for the local government. An RBD is not considered as having a strong position within the banking competition. RBDs are categorised into commercial banks which require bigger capital than rural banks, but in terms of intermediation, they are well behind other commercial banks ("Banyak BPD Hanya Jadi Kasir Pemerintah Daerah", 2014). In term of financing SMEs, Bank Indonesia has specifically stated that the role of rural banks should be directed to providing services to the SMEs and the local economy, even though all type of bank provides SME loans (Bank Indonesia, 2006).

Bank Indonesia (2006) argued that rural banks have advantages compared to commercial banks, which are simpler procedures (paperwork), shorter processing time, and more flexible credit schemes. Moreover, rural banks are conveniently located near their customers. They also have a better understanding of the local economy and community. Compared to non-bank microfinance institutions, rural banks have advantages of being regulated by the Financial Service Authority and supported by better infrastructures.

As shown in Figure 3.2, banking institutions in Indonesia consist of different distinct types. This study focuses on the role of rural banks because of their unique characteristics: locally owned and their special role of financing MSMEs. There has already been a great deal of research uncovering the role of banks in national economic growth within the Indonesian context (e.g., Hasiholan & Adiningsih, 2003; Hidayati, 2009: Inggrid, 2006: Setiawati, 2008; Zulverdi et al., 2005); however, research focusing on the relationship between rural banks and regional economic growth is still lacking. Moreover, data of commercial banks which include state banks, regional development

[26] Bank Indonesia Certificate is a short-term securities denominated in the Indonesian Rupiah issued by Bank Indonesia.

banks, private banks, and *sharia* banks are not available regionally. The data are only available at national level.

Table 3.2: Share of financial institution asset to GDP

Financial Institution	2008	2009	2010	2011	2012	2013
Commercial Banks to GDP (%)	46.67	45.14	43.83	46.64	49.47	52.02
Rural Banks to GDP (%)	0.66	0.67	0.71	0.71	0.78	0.81
Insurance to GDP (%)	4.92	5.62	6.22	6.48	6.65	7.26
Finance Companies to GDP (%)	3.40	3.11	3.59	3.92	3.97	4.21
Pension Fund to GDP (%)	1.82	2.00	2.02	1.81	1.84	1.71
Capital Market Capitalisation to GDP (%)	21.75	36.04	47.31	45.17	47.9	44.3

Source: OJK (2015)

The financial system in Indonesia is still dominated by the banking sector. However, since 2010, the role of the capital market has become more important. Table 3.2 shows that during the five-year period of 2008-2013, on average, commercial banks had the largest share of asset to GDP. The capital market was in close second place, followed by insurance, finance companies[27], pension fund, and rural banks. It should be noted that capital market investors in Indonesia are still concentrated in the capital city, Jakarta. Moreover, in 2013, almost 60% of stocks traded in the Indonesian capital market were owned by foreign investors (OJK, 2014).

Despite the fact that the banking sector plays an important role in Indonesia, the government still considers that Indonesian financial inclusion is still low (Bank Indonesia, 2013). Table 3.3 shows some indicators of financial inclusion which have been compiled by the World Bank. Numbers of the indicators are compared with low and middle-income countries[28] and developing countries in East Asia and Pacific. Compared to these countries, only 19.58% of Indonesian adults (age 15+) have an account at a financial institution. This number is low considering the fact that the number of commercial bank branches and ATMs is comparatively similar to other countries. Other relatively low numbers are the percentage of adults using financial institutions to receive wages (7.7%), owning a debit card (10.54%), and owning a credit card (0.5%). Based on the indicators, Indonesian adults also still rely on family and

[27] Business entities which are performing financing activities in the form of provision of funds or capital goods. These include companies which carry out *sharia*-based operations, venture capital companies, and infrastructure finance companies.

[28] Low and middle income countries are those with Gross National Income (GNI) per capita between USD 1,046 to USD 4,125.

friends if they need money and prefer ATMs, rather than bank tellers, to withdraw their money.

Bank Indonesia has been aware of the fact that financial inclusion in Indonesia is still low and for this reason, the central bank vigorously promotes the financial inclusion program. The program was nationally issued in 2012. Bank Indonesia considers that the financial inclusion program should be targeted at the poor, working poor, and near-poor. These groups usually do not have access to formal financial services and/or have a low financial education. The goal of the program is to achieve a financial system that is accessible by all layers of the community to promote economic growth, poverty reduction, income equality, and the creation of financial system stability in Indonesia (Bank Indonesia, 2014). As part of the program, Bank Indonesia has also joined the Alliance for Financial Inclusion, a global network of financial policymakers from developing and emerging countries that have one main objective – to increase access to appropriate financial services for the poor.

Table 3.3: Indicators of financial inclusion in Indonesia, low and middle income countries, and East Asia and Pacific developing countries in 2011

Indicators	Indonesia	Low and Middle Income Countries	East Asia and Pacific Developing Countries
Commercial bank branches (per 100,000 adults)	8.69	7.39	4.16
Automated teller machines (ATMs) (per 100,000 adults)	16.79	16.12	17.01
Account at a financial institution (% age 15+)	19.58	41.3	55.14
Used an account at a financial institution to receive wages (% age 15+)	7.7	13.78	16.9
Used an account at a financial institution for business purposes (% age 15+)	3.23	4.11	3.15
Saved at a financial institution (% age 15+)	15.29	17.63	28.52
Main mode of deposit: bank teller (% with an account, age 15+)	84.93	74.62	76.79
Main mode of withdrawal: ATM (% with an account, age 15+)	51.14	37.23	37.02
Main mode of withdrawal: bank teller (% with an account, age 15+)	43.92	55.48	58.81
Had debit card (% age 15+)	10.54	22.92	34.67
Had credit card (% age 15+)	0.5	6.56	6.66
Borrowed from family or friends (% age 15+)	42.3	25.18	27.18
Borrowed from a private informal lender (% age 15+)	1.97	3.75	1.89
Borrowed from a financial institution (% age 15+)	8.55	7.99	8.57

Source: World Bank (2015)

3.2 The Development of Rural Banks in Indonesia

In the beginning of the 19th century, rural banks in Indonesia were formed from village barns, village banks, agricultural banks, and rural commercial banks. In 1988, a financial market policy package called PAKTO 1988 provided clarity regarding the existence and business activities of rural banks. Even though the banks originated from rural financial institutions, the banks are now mostly found in urban areas. This is because the Indonesian economy has tended to grow through its manufacturing sector, like many other developing countries in the world. Urbanisation is growing with more people living in urban areas. In 2012, 54% of the population was living in urban areas, an increase from 49.8% in 2010 ("Hampir 54 Persen Penduduk Indonesia Tinggal di Kota," 2012).

The official name of rural banks in Indonesia is *Bank Perkreditan Rakyat* (BPR) or People Credit Banks. However, Bank Indonesia uses the term 'rural bank' as the official translation of BPR. Nowadays, the central bank considers rural banks as community banks because they have characteristics of community banks which are locally owned. Local owners are expected to have a better understanding of the economic activities of their community so that they can help the community to grow. Rural banks are expected to be banks which are able to provide financial services in a particular area with a financing focus on SMEs and rural communities. Bank Indonesia (2011b) proposed guidelines for those intending to open a rural bank. According to Bank Indonesia, a successful rural bank has important aspects as follows:

1. Owner. Ideally, the owner is a native individual and/or a legal entity of the region. Therefore, the owner will have a vision of local economic development.
2. Strong and robust capital.
3. Location. A new rural bank should be opened with the consideration of local economic need and potential, number of existing banks in the local area, and ease of access by its main customers (e.g., rural communities and micro and small enterprises).
4. Business strategy. A rural bank should focus its financing on micro and small enterprises, hence the bank should offer affordable and competitive lending rates (compared to other rural banks) and simplify the paperwork.

5. Management and human resources policy. Employees of a rural bank should have a thorough understanding of local economic potencies as well as traditions, customs, and characteristics of their local customers.
6. Relationship with the local community. A rural bank should be part of the local community where it serves.

Deposits at rural banks are also guaranteed by Indonesian deposit insurance agency (LPS). Because rural banks serve riskier customers, they set higher interest rates on deposits and loans. LPS guarantees deposits a maximum interest rate of 7.75% for commercial banks and 10.25% for rural banks (LPS, 2015). This higher deposit interest rate has attracted customers to save their funds in rural banks. The third party funds in rural banks are mostly in the form of time deposits, accounting for 53.83% of total deposits in rural banks (Bank Indonesia, 2015). Rural banks offer high deposit rates, but also charge high lending rates. In 2014, the banks charged an average lending rate of 27.8% p.a., while commercial banks' average lending rate was 12.6% p.a. (Bank Indonesia, 2015).

In 2013, 99.99% of total business units in Indonesia were considered to be SMEs. In the same year, this kind of business had absorbed 96.99% of Indonesia's total labour force and contributed to 57.56% of Indonesia's total GDP (Ministry of Cooperatives and SMEs of Indonesia, 2014). The importance of SMEs to Indonesian economic growth is because of SMEs (Bank Indonesia, 2012b):

1. Have become the backbone of the Indonesian economy, regionally and nationally;
2. Have become the main labour force and technology innovation absorber;
3. Can improve income distribution and community welfare;
4. Can be a foundation of a market economy and the embryo of large industries.

Tambunan (2007) stated that the main constraints faced by micro and small enterprises are the lack of working capital and marketing difficulties. Rudjito (2003) added that limited access to capital is considered an important problem in developing SMEs in Indonesia. The central bank of Indonesia summarised the role of SMEs in the economy and the central bank's efforts in promoting rural banks in order to finance enterprises in the following scheme (Figure 3.3).

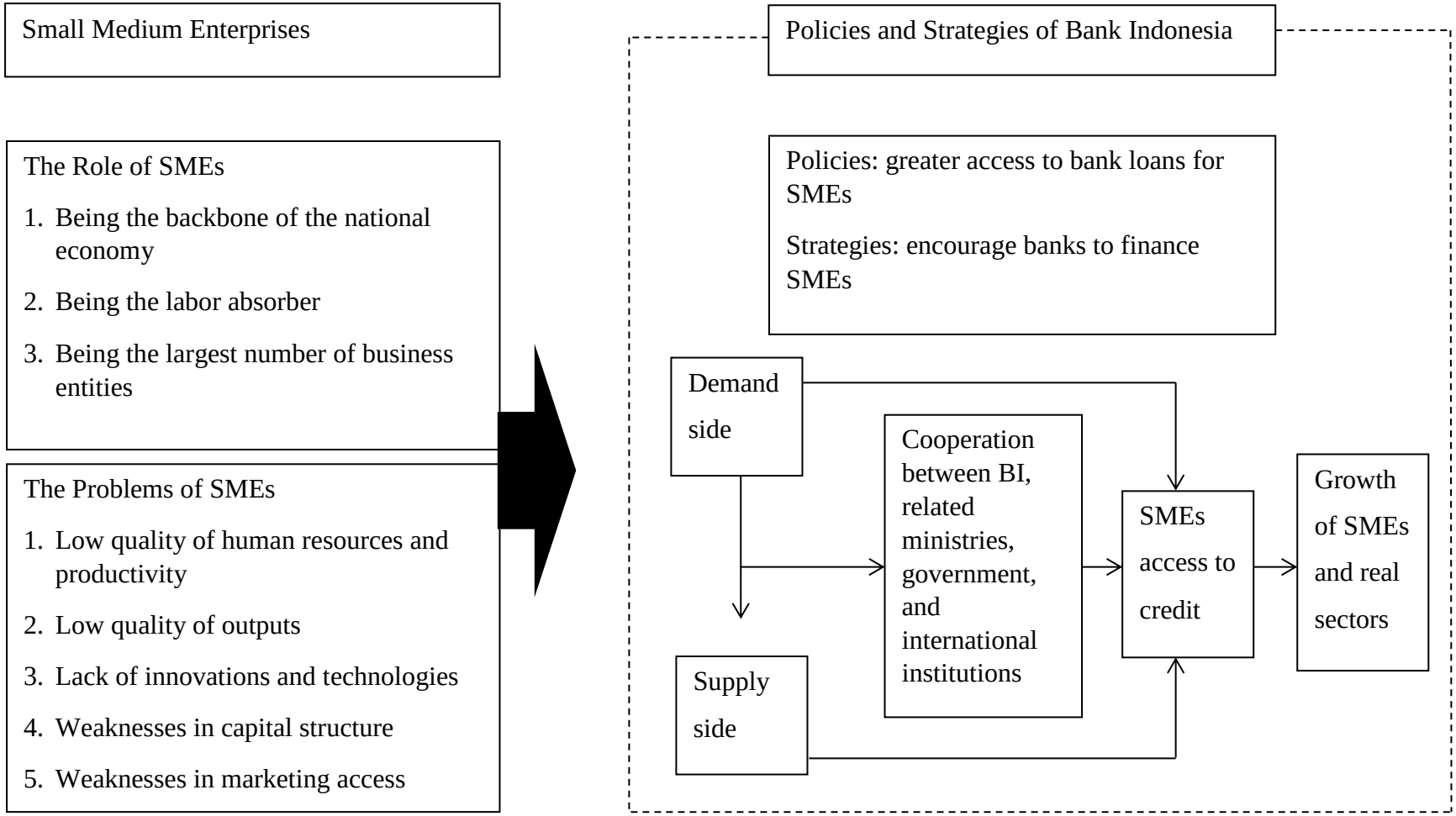

Figure 3.3: The role of SMEs and rural banks in the economy of Indonesia

Source: Bank Indonesia (2012)

Bank Indonesia's efforts to promote rural banks' contribution to regional economic growth, particularly to regional SMEs development, include (Bank Indonesia, 2012b):

1. Strengthening the structure (capital, ownership, business activities, and office network) of rural banks
2. Improving the quality of rural bank regulation
3. Improving the effectiveness and efficiency of rural bank supervision
4. Improving the management quality and operational quality of rural banks
5. Developing the infrastructure of rural banks
6. Protecting the customers of rural banks

SME loans were 26.7% of total loans disbursed by all banks in 2005, but they plummeted to only 18.7% in 2014 (Table 3.4). These loans grew 74.5% during the period 2005-2014, which was lower than the growth of non-SME loans of 175.4%. The decrease in the share of SME loans was because consumption loans were not included in the SME loans calculation (Solider, 2011), while consumption loans increased 121.2% over the same period. The central bank changed the data presentation of SME loans in 2011. Before 2011, SME loans were presented as a total of working capital, investment, and consumption loans. After 2011, SME loans were presented only as working capital and investment loans (productive loans). The change was based on Law No. 20 of 2008 on Micro, Small and Medium Enterprises[29] and Bank Indonesia Regulation of 2010 on Bank Monthly Report[30].

Table 3.4: Outstanding SMEs loans (in billions of IDR)

Outstanding	2005	Share of 2005 (%)	2014	Share of 2014 (%)	Growth 2005 – 2014 (%)
SMEs Loans	116,857.3	26.7	203,878.1	18.7	74.5
Non SMEs Loans	321,534.3	73.3	885,484.5	81.3	175.4
Total	321,759.8	100	1,089,362.6	100	

Source: Bank Indonesia (2015)
Notes: Real value, based on the year of 2000

[29] According to the law, SMEs are enterprises with assets less than IDR 50 million to IDR 10 billion and annual sales value less than IDR 300 million to IDR 50 billion.
[30] Bank Indonesia regulation No. 12/2/PBI/2010: SME loans are loans for enterprises as defined in the SMEs law of 2008 which do not include consumption loans. Non SMEs loans are loans for non-SME customers which include consumption loans.

The number of rural banks in Indonesia in 2014 was 1,643 units, more than 10 times the 119 commercial banks (Bank Indonesia, 2015). This is because opening a new rural bank does not require the large amount of capital as needed to open a commercial bank. The newest regulation on rural banks was formulated by Indonesia's Financial Service Authority (OJK), the macro prudential regulator of financial institutions in Indonesia. In OJK Regulation No.20/OJK/2014, OJK categorises the required capital based on the 'zone' where the new rural bank is to be established. The zone classification is based on economic potential and level of banking competition in a region. The zone is classified into 4 groups. Zone 1 shows a region with higher economic potential and tighter bank competition, while zone 4 shows lower potential and more relaxed competition. To open a new rural bank in zone 1, the required capital is IDR 14 billion. Zone 2, zone 3, and zone 4 require capital of IDR 8 billion, IDR 6 billion, and IDR 4 billion, respectively (OJK, 2014). In comparison, to open a new commercial bank, the required capital is IDR 3 trillion.

Table 3.5: Rural bank indicators

	2000	**2005**	**2014**
Number of rural banks	2,419	2,009	1,643
Assets (billions IDR, real value)	4,731	12,869.8	25,901.3
Loans (billions IDR, real value)	3,619	9,248.0	19,709.1
Deposits (billions IDR, real value)	3,082	8,316.5	16,930.7

Source: Bank Indonesia (2015)

The number of rural banks decreased during the 2000-2014 period because of mergers and liquidations. Bank Indonesia tightened the supervision of rural banks because of a large number of non-performing loans. However, assets, loans, and deposits of rural banks significantly increased during those years (Table 3.5).

Table 3.6: SME loans by group of banks (in billions of IDR)

Bank	**2005**	**Share of 2005 (%)**	**2014**	**Share of 2014 (%)**	**Growth 2005 – 2014 (%)**
Rural banks	5,807.3	5	10,300.0	5.1	77.4
Others	111,050	95	193,578.1	94.9	74.3
Total	116,857.3	100	203,878.1	100	

Source: Bank Indonesia, 2015

It should be noted that rural bank loans in Table 3.5 include all type of loans: working capital, investment and consumption loans, while SMEs loans distributed by rural banks in Table 3.6 include only working capital and investment loans.

The role of rural banks in disbursing SME loans was still very low in the 2005-2014 period. In 2005 and 2014, rural banks could only account for 5% and 5.1% of total SME loans, respectively (Table 3.6). The loan was still dominated by state banks, particularly by BRI (*Bank Rakyat Indonesia*/People's Bank of Indonesia), which has served SMEs since 1895. However, rural banks' SME loans grew 77.4% in the period 2005-2014, while other banks' SME loans grew 74.3%. By linking figures in Tables 3.5 and 3.6 it seems that Bank Indonesia's efforts to promote rural banks' contribution to SME loans were successful. The numbers of rural bank units decreased after API implementation in 2004, which meant that only strong rural banks (in terms of capital and infrastructure) could survive. Over the period 2005-2014, the share of SME loans to total loans decreased. However, the contribution of rural banks to the loans increased. This could be the result of tighter regulation on rural banks. The occurrence of credit defaults and mismanagement was minimised. The growth of SME loans provided by rural banks was also significantly higher than other banks' growth. As pointed out by Rosengard and Prasetyantoko (2011), this implied that commercial banks preferred to distribute large business loans rather than SME loans. Figure 3.4 summarises the development of rural banks, SME loans, GDP, and the poverty rate for the period 2005-2014.

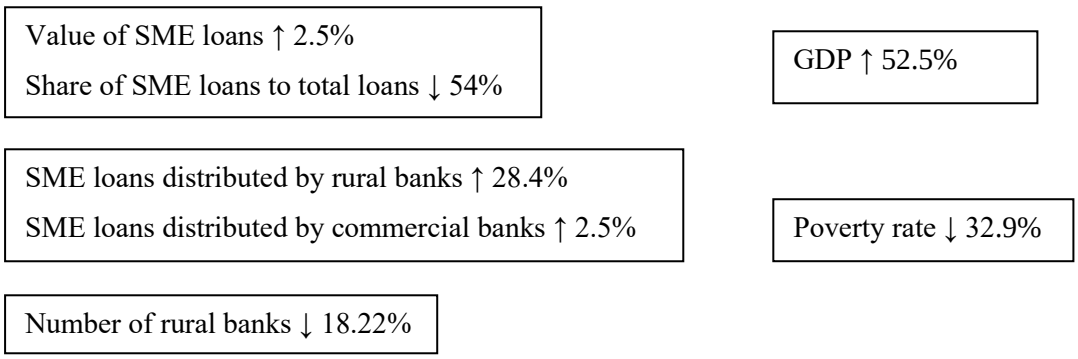

Figure 3.4: Growth of rural banks, SME loans, GDP, and poverty rate 2005-2014

The Center for Banking Research – Andalas University (2007) conducted a study on rural banks in West Sumatra. It found that rural banks in West Sumatra played significant roles in micro and small business financing, and that this financing contributed to improved business performance. Moreover, its findings identified the obstacles faced by rural banks in the province which were high interest rates, low awareness of rural banks' existence in the community, low human resource quality, and limited capital (Center for Banking Research Andalas University, 2007). Even though the study was restricted to data on rural banks in West Sumatra, the findings generally summed up the obstacles faced by rural banks in Indonesia. The findings were supported by Hiemann (2014) who listed challenges faced by rural banks:

1. Competition for creditworthy borrowers (particularly for SME loans) since commercial banks established microfinance units. The microfinance units were mostly established to comply with the BI regulation of 2004 that obligates commercial banks to provide SME loans.
2. State-owned banks offer loans to SMEs with 80% guarantee. The loans are known as KUR loans. KUR are credit/working capital and/or investment financing schemes specifically dedicated to SMEs in the productive enterprise sector, where enterprises are unable to meet certain requirements set by banks.
3. The state-owned pawnshop companies have extended their networks and products. The companies offer simple and fast-processing micro-loans that only need collateral of simple items, such as small appliances, ownership papers (for example of motorbikes), or even fabrics/clothes.
4. Rural banks have less advanced technology compared to commercial banks (e.g., transfer/remittance clearing system and affordable access to ATM network).

Aware of the limitations of rural banks, BI launched in 2011 the APEX Rural Bank program. Under the program scheme, a commercial bank and a rural bank are able to be involved in financial and technical cooperation. The (large) commercial bank acts as an APEX (a protector) for the (small) rural bank. As an APEX, the commercial bank is assigned as a provider of fund pooling, financial support, and technical support services to support the rural bank. The program is designed to bridge requirements of the rural

bank industry in order to create robust and highly competitive rural banks. Both banks can benefit from the cooperation because it will: 1) broaden services to MSMEs and support the development of local economic growth; 2) provide security for rural banks because large commercial banks can act as lenders of the first resort if the rural banks experience liquidity shortage; 3) enhance the roles and contributions of commercial banks financing SMEs; and 4) optimise the use of rural bank funds. The program is also considered as an ideal form of synergy to serve SMEs, which will minimise unhealthy business competition between commercial banks and rural banks (Bank Indonesia, 2011c). In 2012, there were five APEX cooperations recorded. In almost all of the cooperations, the APEX was a regional development bank (RDB). The cooperations were between RDB of West Sumatra and 15 rural banks, Andara Bank (a private bank) and 117 rural banks, RDB of East Java and 274 rural banks, RDB of South Kalimantan and 23 rural banks, and RDB of Central Java and 148 rural banks. In the same year, BI asked support from Japan International Cooperation Agency (JICA) to foster the APEX program in Indonesia.

In addition to the APEX program, to increase SMEs lending, BI enacted a regulation entitled the Granting of Credit or Financing and Technical Assistance in the Framework of Developing Micro, Small, and Medium Enterprises in December 2012. The regulation obliges commercial banks to distribute credit for the development of SMEs. By 2018, commercial banks need to have distributed SME loans amounting to at least 20% of their total loans.

In 2007, the Government of Indonesia launched the People's Business Credit (*Kredit Usaha Rakyat*/KUR) Programme. KUR is credit/working capital and/or investment financing schemes specifically dedicated to SMEs in the productive enterprise sector, where enterprises are unable to meet certain requirements set by banks. The amount of KUR is less than IDR 500 million. Six commercial banks and 13 regional development banks have the privilege of channelling KUR. They are called participating banks. Bank Indonesia categorises KUR as 'guaranteed credit' because a maximum of 80% from total loans is guaranteed by appointed companies. In presenting data of SME loans,

Bank Indonesia considers KUR as part of total SME loans. That means, not all SME loans are guaranteed.

KUR is distributed directly through participating banks or indirectly through linkage institutions. Linkage institutions can be in the form of secondary cooperatives, primary cooperatives (savings and loan cooperatives, savings and loan cooperative units), village credit agencies (BKD), *Baitul Maal Wat Tanwil* (BMT)[31], rural banks, non-bank financial institutions, venture groups, or microfinance institutions (Komite Kredit Usaha Rakyat, 2015).

3.3 Regional Differences in Indonesia

Most studies on the link between financial development and economic growth have been cross-country studies. One key aspect found from the studies is that financial development contributes more to growth in developing countries than in developed ones (Calderón & Liu, 2003; P. J. Dawson, 2010). Calderon and Liu (2003) pointed out that the reason behind this finding is because developing countries have more room for financial and economic improvement. If we want to focus on an individual developing country, we need to take into account the characteristics and geographical scope of the link on a sub-national level. According to Spiezia and Weiler (2007), this will provide better understanding of the sources of both the strengths and weaknesses of an economy, assuming a national economy is effectively an aggregation of its regional parts. (Samolyk, 1994) promoted the hypothesis that "the health of the regional financial sector (in terms of the credit quality of local banks and non-banks borrowers) can influence investment activity and regional economic growth by affecting a region's ability to fund local projects". In addition, Carbó-Valverde and Rodriguez-Fernández (2004) argued that a regional definition appears to provide more accurate measures when analysing the relationship between the banking sector and economic growth because the interaction between financial intermediaries and households and firms can be defined more precisely.

[31] Islamic financial cooperatives

Hill (1998) stated that Indonesia is well-suited to study regional development. Indonesia is the largest archipelago country in the world. Indonesia consists of five main islands and 17,508 smaller islands in total. Currently, the large area of Indonesia is divided into 34 provinces. The economy of Indonesia represents the geographical aggregation of the different economic conditions of those provinces. The spatial distribution of economic output in Indonesia is very uneven. Some areas experience high local growth, whereas others remain stagnant. A study conducted by the Asian Development Bank (2010) concluded that the growth and poverty rates in Indonesia vary substantially across the regions. Akita (1988) pointed that in response to this situation, the government of Indonesia has a major national policy objective to remove regional disparity in the population and within economic activities. Studying the link between financial development and economic growth in Indonesia is better done on a sub-national level. This would give the policy maker a better understanding of the potential role of financial institutions in regional economic growth.

The numerous islands of Indonesia can be divided into five major regions: Sumatera, Java and Bali, Kalimantan, Sulawesi, and Eastern Provinces (Maluku, Nusa Tenggara, and Papua). A province is the highest tier of local government in Indonesia. Currently, Indonesia consists of 34 provinces. The provinces have a regional autonomy which means they have rights, authorities, and obligations to manage government affairs and public interest in accordance with applicable laws and regulations. The provinces have the authority to manage their regional revenue and expenditure budget.

3.3.1 Regional Gross Domestic Product

Table 3.7 shows the differences in economic development among provinces in Indonesia. For example, the economy of DKI Jakarta province – the capital city of Indonesia – grew by 6.7% in 2011, while the economy of Papua province had negative growth of -5.3% in the same year (BPS, 2015). Of the main regions, the economies of Java and Bali are the most dominant and accounted for 58.87% of Indonesian GDP in 2012. Sumatra was a distant second, accounting for 23.77% of GDP. Kalimantan, Maluku, Nusa Tenggara, Papua, and Sulawesi, despite their rich natural resources,

together accounted for less than Sumatra's share of GDP and less than one third of that of Bali and Java.

Table 3.7: Growth rate of gross regional domestic product at 2000 constant market prices by provinces, 2009-2013 (%)

Province	2009	2010	2011	2012	2013	Average 2009-2013
Aceh	-5.51	2.74	4.84	5.14	4.18	2.28
North Sumatra	5.07	6.42	6.63	6.22	6.01	6.07
West Sumatra	4.28	5.94	6.26	6.38	6.18	5.81
Riau	2.97	4.21	5.04	3.54	2.61	3.67
Jambi	6.39	7.35	8.54	7.44	7.88	7.52
South Sumatra	4.11	5.63	6.50	6.01	5.98	5.65
Bengkulu	5.62	6.10	6.46	6.60	6.21	6.20
Lampung	5.26	5.88	6.43	6.53	5.97	6.02
Bangka Belitung	3.74	5.99	6.50	5.73	5.29	5.45
Riau Islands	3.52	7.19	6.66	6.82	6.13	6.07
DKI Jakarta	5.02	6.50	6.73	6.53	6.11	6.18
West Java	4.19	6.20	6.51	6.28	6.06	5.85
Central Java	5.14	5.84	6.03	6.34	5.81	5.83
DI Yogyakarta	4.43	4.88	5.17	5.32	5.40	5.04
East Java	5.01	6.68	7.22	7.27	6.55	6.54
Banten	4.71	6.11	6.38	6.15	5.86	5.84
Bali	5.33	5.83	6.49	6.65	6.05	6.07
West Nusa Tenggara	12.14	6.35	-2.69	-1.10	5.69	4.08
East Nusa Tenggara	4.29	5.25	5.62	5.41	5.56	5.23
West Kalimantan	4.80	5.47	5.98	5.81	6.08	5.63
Central Kalimantan	5.57	6.50	6.77	6.69	7.37	6.58
South Kalimantan	5.29	5.59	6.12	5.72	5.18	5.58
East Kalimantan	2.28	5.10	4.09	3.98	1.59	3.41
North Sulawesi	7.85	7.16	7.39	7.86	7.45	7.54
Central Sulawesi	7.71	8.74	9.12	9.24	9.38	8.84
South Sulawesi	6.23	8.19	7.61	8.39	7.65	7.61
Southeast Sulawesi	7.57	8.22	8.96	10.41	7.28	8.49
Gorontalo	7.54	7.63	7.68	7.71	7.76	7.66
West Sulawesi	6.03	11.89	10.32	9.01	7.16	8.88
Maluku	5.44	6.47	6.06	7.81	5.14	6.18
North Maluku	6.07	7.95	6.40	6.67	6.12	6.64
West Papua	13.87	28.47	27.01	15.90	9.30	18.91
Papua	22.22	-3.19	-5.32	1.08	14.84	5.92
Indonesia	4.77	6.14	6.35	6.28	5.90	5.89

Source: BPS (2015)

3.3.2 Regional Poverty Rate

The United Nations Development Programme (UNDP) in its Human Development Report (HDR) (1997) described two definitions of poverty: absolute poverty which refers to some absolute standard of minimum requirement, and relative poverty which refers to those falling behind most others in the community. The HDR stated that (UNDP, 1997, p.12):

*"*Based on income, a person is defined as poor if her income is less than the defined income poverty line*."*

Statistics Indonesia (*Badan Pusat Statistik*/BPS) has estimated poverty rates since 1984, yet it was only in 1992 that this topic received widespread public discussion (Asra, 2000). Basic data used to measure poverty are obtained from the results of the National Socio Economic Survey (SUSENAS). SUSENAS is a household survey conducted annually to collect information on the welfare aspects of the population (Maksum, 2004). Currently, BPS routinely releases the figures of poverty incidence twice a year (every March and September) which are presented by urban and rural areas.

To measure poverty, BPS uses the basic needs approach. Based on this approach, the Indonesian poverty line is the minimum standard expenditure required by an individual to fulfil his/her basic needs for both food and non-food items. Or, in other words, the poverty line is an addition to the food poverty line (FPL) and non-food poverty line (NFPL). FPL is the minimum requirement of food or the equivalent of 2100 kilocalories per capita per day. NFPL is the minimum requirement for housing, clothing, education, health, and other basic individual needs. Income data is unreliable in Indonesia. Thus, BPS uses expenditure data as a proxy of income for defining poverty. The number of people living in poverty can be obtained by applying the poverty line to data on population expenditures (Maksum, 2004).

BPS releases three poverty measurements, as follows:

1. Head-Count Index (P_0), measures the percentage of the population that is counted as poor;
2. Poverty Gap Index (P_1), measures the extent to which individuals fall below the poverty line (the poverty gaps) as a proportion of the poverty line. Higher value of the index shows that the gap between average expenditure of the poor and the poverty line is wider.
3. Poverty Severity Index (P_2), describes inequality among the poor. This is simply a weighted sum of poverty gaps (as a proportion of the poverty line), where the weights are proportionate poverty gaps themselves. Hence, by squaring the poverty gap index, the measure implicitly puts more weight on observations that fall well below the poverty line. Higher value of the index shows that inequality among the poor is higher.

BPS uses the following formula which is based on Foster-Greer-Thorbecke (1984) as cited in BPS (2015) to measure poverty:

$$P_a = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{z - y_i}{z}\right]^a$$

Where:

$a = 0, 1, 2$

$z = the\ poverty\ line$

$y_i = average\ expenditure\ per\ capita\ per\ month\ of\ poor\ (i = 1,2, \dots, q),\ y_i < z$

$q = the\ number\ of\ poor$

$n = the\ total\ population$

If $a = 0$, Head Count Index (P_0) is obtained; if $a = 1$, Poverty Gap Index (P_1) is obtained; and if $a = 2$, Poverty Severity Index (P_2) is obtained.

Table 3.8 shows data of regional poverty in Indonesia in September 2014. The poverty line is different for each province because the price of commodities included in the FPL and NFPL is different in each province. The poverty line also takes into account the occurrence of inflation in the region. However, all provinces calculate their regional

poverty using a national standard measurement. This means, the poverty line in Indonesia is an absolute measurement.

Table 3.8: Regional poverty (rural + urban area), September 2014

Province	Number of Poor People (000)	Percentage of Poor People (%)	Poverty Line (IDR/ Capita/Month)	Poverty Gap Index	Poverty Severity Index
Aceh	837.42	16.98	377049	3.14	0.86
North Sumatra	1360.60	9.85	330663	1.71	0.45
West Sumatra	354.74	6.89	365827	0.75	0.15
Riau	498.28	7.99	379223	1.20	0.29
Jambi	281.75	8.39	329181	1.12	0.23
South Sumatra	1085.80	13.62	307488	2.41	0.62
Bengkulu	316.50	17.09	356554	2.85	0.75
Lampung	1143.93	14.21	318822	2.30	0.56
Bangka Belitung	67.23	4.97	469814	0.60	0.12
Riau Islands	124.17	6.40	425967	0.74	0.18
DKI Jakarta	412.79	4.09	459560	0.60	0.13
West Java	4238.96	9.18	291474	1.39	0.33
Central Java	4561.83	13.58	281570	2.09	0.51
DI Yogyakarta	532.59	14.55	321056	2.35	0.61
East Java	4748.42	12.28	289945	1.86	0.45
Banten	649.19	5.51	315819	0.79	0.18
Bali	195.95	4.76	301747	0.86	0.26
West Nusa Tenggara	816.62	17.05	297907	2.92	0.72
East Nusa Tenggara	991.88	19.60	268536	3.25	0.79
West Kalimantan	381.92	8.07	298212	1.26	0.35
Central Kalimantan	148.83	6.07	330869	0.97	0.25
South Kalimantan	189.50	4.81	323594	0.65	0.15
East Kalimantan	252.68	6.31	444248	0.79	0.18
North Sulawesi	197.56	8.26	266528	1.28	0.30
Central Sulawesi	387.06	13.61	328063	2.11	0.55
South Sulawesi	806.35	9.54	229222	1.41	0.32
Southeast Sulawesi	314.09	12.77	243036	2.09	0.52
Gorontalo	195.10	17.41	247611	3.13	0.83
West Sulawesi	154.69	12.05	246524	1.94	0.51
Maluku	307.02	18.44	361022	4.11	1.37
North Maluku	84.79	7.41	316160	1.16	0.24
West Papua	225.46	26.26	428608	5.92	1.88
Papua	864.11	27.80	358204	6.42	2.18
Indonesia	27727.78	10.96	312328	1.75	0.44

Source: BPS (2015)

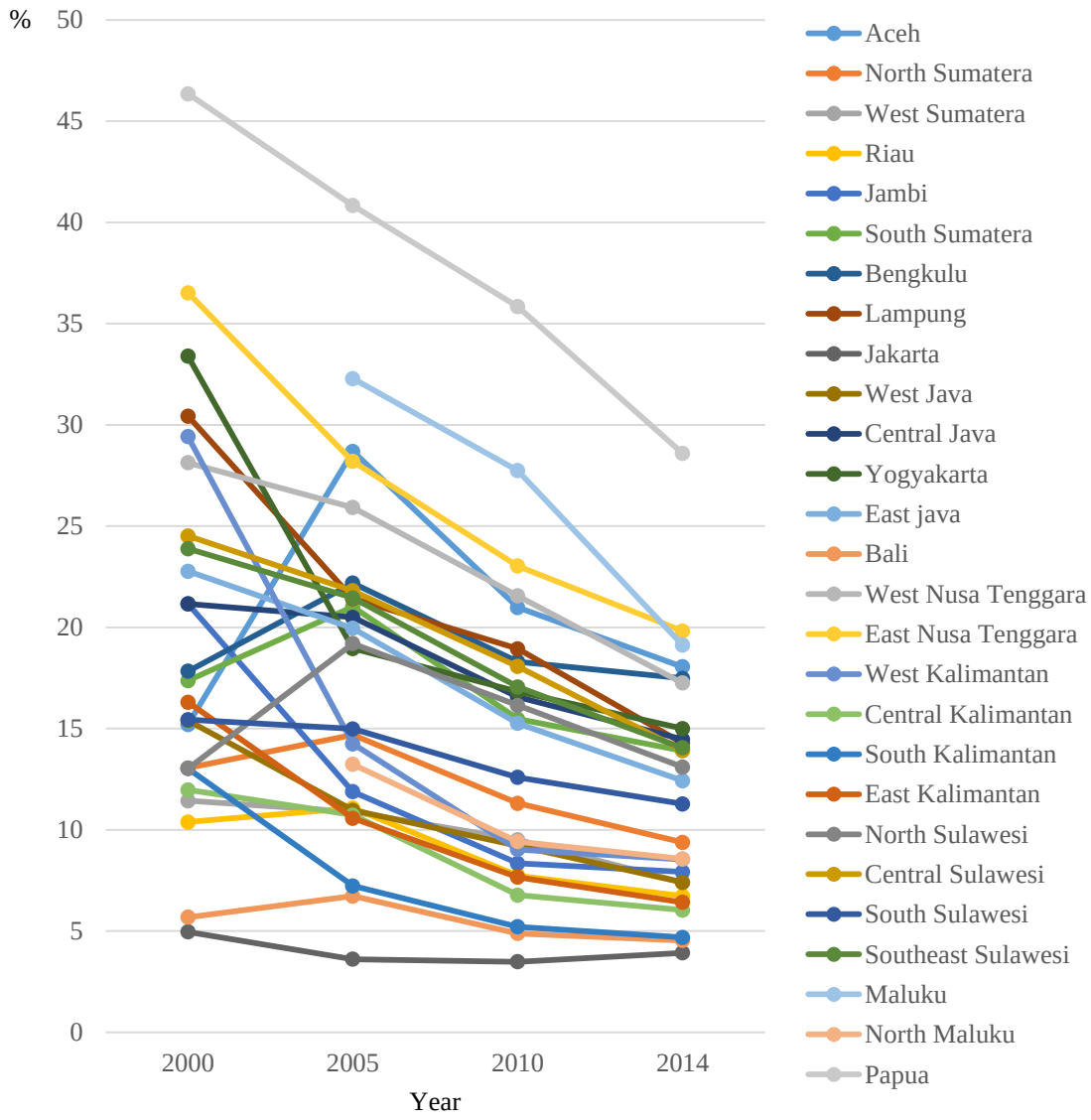

Figure 3.5: Regional poverty rate in Indonesia, 2000-2014(%)
Source: BPS (2015)

The central bank of Indonesia classifies the provinces into four regions which are Java, Sumatra, Kalimantan and the Eastern Region of Indonesia. The central bank publishes a quarterly regional studies based on the regional classification. Java includes DKI Jakarta, West Java, Central Java, DI Yogyakarta, East Java and Banten. Sumatra includes Aceh, North Sumatra, West Sumatra, Riau, Jambi, South Sumatra, Bengkulu, Lampung, Bangka Belitung and Riau Islands. Kalimantan includes West Kalimantan, Central Kalimantan, South Kalimantan and East Kalimantan. The eastern region

includes North Sulawesi, Central Sulawesi, South Sulawesi, Southeast Sulawesi, Gorontalo, West Sulawesi, Maluku, Papua, Bali, West Nusa Tenggara and East Nusa Tenggara Timur. Provinces in Kalimantan have the smallest poverty rate because they are rich in natural resources. In September 2014, the average poverty rates for Kalimantan provinces was 6.32%. Java was in second place with 9.87% living in poverty. The poverty rate in Sumatra, Sulawesi, and Eastern Provinces exceeded the national rate of 10.96%, accounting for 11.82%, 12.27%, and 17.33% respectively (BPS, 2015). It is widely believed that the higher the distance of a region from Java, the less prosperous the region. Figure 3.5 illustrates the poverty rate in Indonesian provinces over the period 2000-2014.

3.3.3 Banks in Regional Areas

The following Table 3.9 describes the total number of rural banks (head offices), number of rural banks per one million people in each province, deposits at rural banks, and deposits at rural banks per one million people in each province in 2014. In every province of Indonesia, there are different kinds of banks. For example, in the province of Central Java, there were 67 commercial banks and 286 rural banks in 2012 (BPS Jawa Tengah, 2013). The commercial banks in Indonesia, particularly large and foreign banks, mostly reside in wealthy provinces. In 2014, the region of Java[32] had the largest number of rural banks, at 62.15% of total rural banks in Indonesia. It also had the largest share of rural bank deposits, at 61.54% of total rural bank deposits in Indonesia (Bank Indonesia, 2015). In term of the highest ratio of rural banks per one million people, Bali, Riau Islands, and West Sumatera were the top three. Riau Islands and Bali also had the highest ratio of deposits at rural banks per one million people (ranked first and second, respectively). Meanwhile, West Sumatera only ranked tenth. DI Yogyakarta had the fourth highest ratio of rural banks per one million people and the third highest ratio of deposits at rural banks per one million people.

[32] The region of Java consists of six provinces which are DKI Jakarta, West Java, Central Java, DI Yogyakarta, East Java, and Banten.

Table 3.9: Distribution of rural banks in the provinces of Indonesia, 2014

Province	Number of rural banks	Number of rural banks per 1 million people	Deposits at rural banks (billion IDR)	Deposits at rural banks per 1 million people
Aceh	5	1.02	85	17.32
North Sumatra	54	3.92	774	56.22
West Sumatra	95	18.51	973	189.60
Riau	33	5.33	787	127.17
Jambi	19	5.68	567	169.54
South Sumatra	19	2.39	715	90.03
Bengkulu	4	2.17	32	17.35
Lampung	26	3.24	3,724	463.98
Bangka Belitung	3	2.23	70	52.09
Riau Islands	40	20.86	3,610	1,882.76
DKI Jakarta	25	2.48	1,209	120.00
West Java	299	6.50	10,754	233.63
Central Java	252	7.52	13,909	414.91
DI Yogyakarta	54	14.85	2,934	806.69
East Java	325	8.42	6,241	161.64
Banten	66	5.64	1,114	95.17
Bali	137	33.37	5,905	1,438.52
West Nusa Tenggara	29	6.07	690	144.54
East Nusa Tenggara	11	2.18	309	61.35
West Kalimantan	21	4.45	770	163.27
Central Kalimantan	4	1.64	232	95.09
South Kalimantan	25	6.37	338	86.16
East Kalimantan	14	3.53	191	48.12
North Sulawesi	18	7.54	772	323.47
Central Sulawesi	9	3.18	412	145.52
South Sulawesi	23	2.73	721	85.51
Southeast Sulawesi	17	6.94	94	38.40
Gorontalo	4	3.59	20	17.93
West Sulawesi	1	0.79	3	2.38
Maluku	2	1.21	329	198.50
North Maluku	2	1.76	17	14.93
West Papua	1	1.18	198	233.00
Papua	6	1.94	251	81.20

Source: Bank Indonesia (2015)

Table 3.10 shows indicators of financial inclusion in Indonesian provinces. BI categorises the indicators into two: access and usage. Access indicators include the number of bank branches and ATMs per 100,000 adults. Usage indicators include the number of credit and deposit accounts per 1,000 adults. DKI Jakarta, the capital city of Indonesia, has the highest number of all indicators. North Maluku has the lowest number of access indicators; however, its usage indicators are still above East Nusa Tenggara which has double the number of bank branches and ATMs. The indicators

illustrate the disparity of financial institution access among the regions. Enhancing the contribution of rural banks in the regions is one of the tools used by the central bank and the Financial Service Authority to narrow the disparity.

Table 3.10: Financial inclusion indicator in the provinces of Indonesia, 2014

Province	Bank Branches*	ATM*	Credit Accounts**	Deposit Accounts**
Aceh	20	26	116	942.8
North Sumatra	22	36	175	830.2
West Sumatra	23	26	148.7	844.6
Riau	22	37	171.6	837.3
Jambi	21	27	161.7	704.4
South Sumatra	16	29	143.8	700
Bengkulu	22	22	180.8	785.5
Lampung	13	19	102.8	499
Bangka Belitung	22	38	112.5	745.7
Riau Islands	29	75	196.5	1452
DKI Jakarta	71	215	1519	2782
West Java	17	40	181.4	719.6
Central Java	18	26	152	749.6
DI Yogyakarta	29	55	180.9	1096.1
East Java	17	34	151.3	741.7
Banten	17	63	216.5	699
Bali	31	81	171.6	914
West Nusa Tenggara	13	21	116.4	590
East Nusa Tenggara	15	17	84	666.8
West Kalimantan	23	26	116.7	765.4
Central Kalimantan	18	27	131	673
South Kalimantan	26	41	165.4	815
East Kalimantan	32	60	210.2	1173
North Sulawesi	21	43	187	855.7
Central Sulawesi	15	25	154.3	702.7
South Sulawesi	19	40	181.2	796.9
Southeast Sulawesi	17	23	133.2	793.8
Gorontalo	16	21	165.2	741.4
West Sulawesi	12	14	111.5	541.3
Maluku	15	23	104.4	750.1
North Maluku	6	8	94.9	747.2
West Papua	33	54	134.5	1073
Papua	54	97	102.4	682.5

Source: Bank Indonesia (2015)
Notes: * number per 100,000 adults; ** number per 1,000 adults

3.4 Small Medium Enterprises (SMEs) in Regional Area

The definition of SMEs in Indonesia differs among agencies. Statistics Indonesia categorises SMEs based on the number of workers, while the Ministry of Cooperatives and Small Medium Enterprises of Indonesia and Bank Indonesia refer to Law No. 20 of 2008 on Micro, Small, and Medium Enterprises. The law classifies enterprises based on their assets and annual sales value.

Table 3.11: Definition of SMEs

	Number of Workers	Assets	Annual Sales Value
Micro	1 - 4	< IDR 50 million, not including land and buildings	< IDR 300 million
Small	5-19	IDR 50 million to IDR 500 million, not including land and buildings	IDR 300 million to IDR 2.5 billion
Medium	20-99	IDR 500 million to IDR 10 billion, not including land and buildings	IDR 2.5 billion to IDR 50 billion

The development of SMEs, according to Tambunan (2007), is related to many factors including the level of economic development, changes in real income per capita, population growth, and technology progress. Because of the differences in regional gross domestic product and the poverty rate among provinces, MSME development in Indonesian provinces is also varied, as shown in Table 3.12.

In terms of unit, the largest number of micro and small enterprises can be found in Central Java. This province has a poverty rate below the Indonesian rate and has the third largest number of rural banks. The second poorest province in Indonesia, West Papua, has the smallest number of micro enterprises and only has one rural bank. The number of micro small enterprises and rural banks in DKI Jakarta, the wealthiest province, is even larger than those with the poverty rate above the national average.

Table 3.12: Micro and small enterprises in Indonesian provinces, 2014

Province	Number of Enterprises (Unit)		Number of Workers (Person)		Output Value (million IDR)	
	Micro	Small	Micro	Small	Micro	Small
Aceh	69316	1715	111695	13283	3309411	1241252
North Sumatra	76227	9836	152531	70824	7284515	6594124
West Sumatra	71413	5107	119158	39966	6513832	4663614
Riau	14355	1360	28775	9286	1745573	1011500
Jambi	25441	2006	49399	13884	2990666	1225109
South Sumatra	58751	5741	120280	44236	7470419	2981233
Bengkulu	11310	738	23727	5008	1171388	317826
Lampung	94739	8971	202090	72574	11542419	5964285
Bangka Belitung	7752	515	15202	3727	898689	364476
Riau Islands	14638	761	21512	5372	974984	1152716
DKI Jakarta	15110	22748	38336	205467	3263243	17522309
West Java	437985	60078	859857	473281	43484873	55018959
Central Java	766782	65690	1437952	497046	43490614	32847621
DI Yogyakarta	73266	7313	126729	59903	4663255	4939849
East Java	608774	39932	1195368	347668	48063617	54097963
Banten	75760	5652	131132	43656	5526181	5938593
Bali	107434	8659	182300	78022	8442821	6724668
West Nusa Tenggara	93645	13586	166862	153099	6647120	25501320
East Nusa Tenggara	109266	2776	187248	20509	5483912	1353696
West Kalimantan	36311	1101	67571	8737	2895402	1654074
Central Kalimantan	18936	996	35292	8243	1870499	724217
South Kalimantan	67674	3192	109164	25664	3985882	3280099
East Kalimantan	15866	1855	31717	14957	2173774	1491868
North Sulawesi	35527	60	61792	420	2878626	31413
Central Sulawesi	38511	1784	70867	12976	4105572	983207
South Sulawesi	100526	5893	185371	50698	8614740	19653066
Southeast Sulawesi	68711	2845	133545	18935	4813657	724687
Gorontalo	22610	1241	38775	8557	1168442	480066
West Sulawesi	27888	1210	44330	9618	1423955	1345627
Maluku	36422	218	55113	1266	1662787	90023
North Maluku	7851	107	11440	639	469526	67696
West Papua	2353	126	4372	891	331524	84513
Papua	9413	689	20353	4479	3087310	789056

Source: BPS (2015)

One explanation for this finding is that Indonesian people prefer to live on Java Island as the wealthiest island in Indonesia. The island is now the most populated island in the country. Thus, when people are unable to find work in the established companies, they build their own micro or small enterprises. In funding their enterprises, they not only seek loans from rural banks, but also from large commercial banks and even from informal sources such as relatives, friends, and informal microfinancing.

Another explanation is market failure as described by Stiglitz (1993). Banks still consider that the poor cannot provide the collateral needed for loans. Wealthier regions also have better infrastructure which is easier for delivering services. Therefore, banks prefer to establish their business in regions with better infrastructure and living condition.

Considering the importance of SMEs to the regional economy, some local governments have issued local regulations supporting the disbursement of SME loans and/or the existence of rural banks. The following list of regional regulations (Table 3.13) is composed based on information from the Ministry of Home Affairs of the Republic of Indonesia. Not all listed regulations are directly related to SME loans and/or rural banks. Some regulations support the empowerment of small enterprises which in turn could increase SME loans and support the existence of rural banks.

Table 3.13: Regional regulations

No	Region	Regulations related to BPR	Month/Year
1	Aceh	The empowerment of small enterprises	March/2004
2	North Sumatera	The development of cooperatives and small medium enterprises	September/2004
3	West Sumatera	The establishment of local credit guarantee institution	December/2012
4	Riau	-	
	Riau Islands	-	
5	Jambi	-	
6	South Sumatera	The establishment of local credit guarantee institution	June/2012
		Holding of provincial funds in local government-owned rural banks' accounts (2nd amendment)	November/2011
		Holding of provincial funds in local government-owned rural banks' accounts (amendment)	May/2009
	Bangka Belitung	The establishment of local credit guarantee institution	June/2010
7	Bengkulu	-	
8	Lampung	-	
9	DKI Jakarta	-	
10	West Java	The establishment of local credit guarantee institution	September/2011
		Management of revolving fund for micro and small enterprises	September/2011
		Local government-owned rural bank and sub-district credit institution (amendment)	December/2010
		The empowerment and development of cooperatives and micro small medium enterprises	August/2010
		Holding of provincial funds in local government-owned rural banks' accounts and sub-district credit institution	October/2008
		Holding of provincial funds in local government-owned rural banks' accounts and sub-district credit institution	August/2007
		Local government-owned rural bank and sub-district credit institution	December/2006
		Sub-district credit institution	December/2000

	Banten	Holding of provincial funds in local government-owned rural banks' accounts and sub-district credit institution (amendment)	June/2009
		Holding of provincial funds in local government-owned rural banks' accounts and sub-district credit institution	July/2007
		The establishment of local credit guarantee institution	December/2005
11	Central Java	The establishment of sub-district credit institution	December/2002
12	DI Yogyakarta	-	
13	East Java	The establishment of local credit guarantee institution	October/2009
14	Bali	The establishment of village credit guarantee institution (2nd amendment)	June/2012
		The empowerment and development of cooperatives and micro small medium enterprises	March/2012
		The establishment of local credit guarantee institution	April/2010
		The establishment of village credit guarantee institution (amendment)	March/2007
		The establishment of village credit institution	September/2002
15	West Nusa Tenggara	Holding of provincial funds in local government-owned rural banks' accounts (amendment)	2011
		The establishment of local credit guarantee institution	December/2008
		The establishment of local government-owned rural bank	December/2007
16	East Nusa Tenggara	The empowerment of small medium enterprises	February/2004
17	West Kalimantan	-	
18	Central Kalimantan	The establishment of local credit guarantee institution	December/2012
		The empowerment and development of cooperatives and micro small medium enterprises	December/2008
19	South Kalimantan	The establishment of local credit guarantee institution	October/2012
		Holding of provincial funds in cooperatives and small medium enterprises and local government-owned rural banks' accounts	2010
		Holding of provincial funds in local government-owned rural banks' accounts	July/2009
		Holding of provincial funds in local government-owned rural banks' accounts	2008
		Rural Bank	2008
		Holding of provincial funds in local government-owned rural banks' accounts	October/2005
		The establishment of local government-owned rural bank	August/2004
20	East Kalimantan	The establishment of local credit guarantee institution	June/2012
		The empowerment of cooperatives and micro small medium enterprises	February/2012
21	North Sulawesi	-	
	Gorontalo	-	
22	Central Sulawesi	The establishment of local credit guarantee institution	October/2009
23	South Sulawesi	The empowerment and development of cooperatives and micro small medium enterprises	April/2006
	West Sulawesi	-	
24	Southeast Sulawesi	-	
25	Maluku	-	
26	North Maluku	-	
27	Papua	A society-based economy	December/2008
	West Papua	-	

Source: Ministry of Home Affairs of the Republic of Indonesia

3.5 Summary

This chapter justified the preference of using regional areas and rural banks in Indonesia as the object of this study. The reasons underlying the preference are,

1. As a developing country, the financial system in Indonesia is a bank-based system. The banking sector is also important for the Indonesian economy. Failures in this sector led to a major financial crisis in 1997.
2. In Indonesia, banks are categorised into two major categories: commercial banks and rural banks. One study (Nasrudin & Soesilo, 2004) found that commercial banks made no contribution to regional economic growth. Thus, this study intends to investigate the contribution of rural banks, particularly because rural banks are designed to promote regional economic growth.
3. Indonesia is made up of 34 provinces. The stage of economic development and banking development in the provinces is varied.
4. Small and medium enterprises are considered as the backbone of the Indonesian economy. The main customers of rural banks are small medium enterprises.
5. Rural banks are established locally within one region. The central bank supports the development of rural banks to promote regional economic growth and to reducing the regional poverty rate. Some regions also have local regulations supporting the development of rural banks and small medium enterprises.

The following chapter, Chapter 4, will provide empirical evidence of relationship analysis between rural banks, regional GDP, and regional poverty. The analysis consists of descriptive statistics, unit root tests, cointegration tests, and causality tests. Results of sensitivity analysis also will be provided.

4 Chapter 4 – The Relationship between Rural Banks, Regional GDP Growth, and Regional Poverty Rates

This chapter presents the results of the estimated relationships between rural banks and both regional economic growth and poverty rates in Indonesia. The analysis consists of descriptive statistics, and unit root, co-integration, and causality tests. Results of sensitivity analysis are also provided.

The investigation of the relationship between financial development, economic growth, and poverty in Indonesian regions is based on the three following motivations:

1. Previous studies investigating the relationship in Indonesia have so far been similar. They have used national data (annual or quarterly), a similar method (cointegration and Granger causality tests), and similar variables (broad money, stock market capitalisation, credit). Thus, so far, there has been no study using Indonesian regional and specific bank type data.
2. The results of causality analysis in Indonesia, in general, show that there is bi-directional causality between financial development and economic growth. However, one study (Zulverdi et al., 2005) has used banking sector data (asset of bank) as a proxy of financial development. The result shows that causality runs from the development of bank assets to economic growth. Considering that the Indonesian financial system is mostly supported by the banking sector, this study attempts to assess the finding by conducting causality analysis using bank assets (particularly, rural bank assets) as a measurement of financial development.
3. So far, there has been no study of cointegration and causality analysis using specific bank type data and data on regional poverty in Indonesia.

4.1 Empirical Model

There have been various studies testing for Granger causality between financial development and economic growth with different samples and estimation techniques. Several studies have conducted the causality test on multiple countries. Examples of multi-country studies include that of of Apergis et al. (2007) who used data of 15 OECD

and 50 non-OECD countries covering the years 1975-2000; the study by Pradhan, Arvin, Norman, and Nishigaki (2014a) who used data of 34 OECD countries over the period 1960-2011; the study by Chortareas, Magkonis, Moschos, and Panagiotidis (2015) who used data of 20 advanced countries and 17 emerging countries over the period 1970-2007; and the study by Fowowe (2011) who used data of 17 countries in Sub-Saharan Africa over the period 1975-2005.

A multi-country study means that the data are more likely to form a panel dataset. Because of the nature of a panel dataset, multi-country studies conduct causality tests differently. The procedures are similar: unit root test, cointegration test, and direction of causality test. However, the methods to conduct the tests are adjusted to comply with the characteristics of the panel dataset.

Hurlin and Mignon (2004) distinguished panel unit root tests into two categories: first generation tests and second generation tests. The first generation tests are based on a cross-sectional independency hypothesis, while the second generation tests are based on cross-sectional dependencies. Those included in the first category are Levin–Lin–Chu (LLC); Harris–Tzavalis (HT); Breitung; Im–Pesaran–Shin (Phillips & Moon); Fisher-type; and Hadri Lagrange multiplier (LM) tests. The first five tests have the null hypothesis that all the panels contain a unit root, while the Hadri-LM test has the null hypothesis that all the panels are (trend) stationary. The majority of the tests require a balanced panel dataset, except for IPS and Fisher-type tests which allow an unbalanced panel (StataCorp, 2011). Within the first generation tests, several previous studies have preferred to use the IPS test (Apergis et al., 2007; Chortareas et al., 2015; Fowowe, 2011). According to Apergis et al. (2007), the IPS test is more powerful than some other panel unit root tests. However, considering the nature of panel data, Chortareas et al. (2015) argued that the IPS test has a shortcoming in that it does not take into account the possible cross-sectional dependence among the variables of the panel. Therefore, they applied the second generation tests which are Pesaran's cross-section dependence (Pesaran cross-sectionally augmented ADF statistics (CADF) and cross-sectionally augmented IPS (CIPS) tests).

In this study, financial development is measured by the natural logarthims of rural bank assets in the region *i* at particular time *t* (henceforth denoted by $lnasset$). The variable was also used by Zulverdi et al. (2005); however, they used assets of commercial banks. This analysis uses assets of rural banks as the measurement of financial development because it focuses on the contribution of rural banks to regional economic growth. Economic growth is measured by the natural logarithm of real regional gross domestic product per capita in the region *i* at particular time *t* (henceforth denoted by $lngcap$). The basic model is as follows:

$$lngcap_{it} = \beta_0 + \beta_1 lnasset_{it} + \beta_2 X_{it} + \alpha_i + \varepsilon_{it} \quad (1)$$

where X_{it} is a variety of factors that may be associated with economic growth (control variables), α_i is a regional-specific effect and ε_{it} is the error term. Changes in the regional poverty rates is measured by the natural logarithm of the regional poverty rates in the region *i* at particular time *t* (henceforth denoted by $lnpov$). In equation (2), P_{it} is a variety of factors that may be associated with regional poverty rates, σ_i is a regional-specific effect and ϵ_{it} is the error term. To analyse the relationship between rural banks and the regional poverty rate, the empirical model is as follows:

$$lnpov_{it} = \delta_0 + \delta_1 lnasset_{it} + \delta_2 P_{it} + \sigma_i + \epsilon_{it} \quad (2)$$

Employing equations (1) and (2) with OLS might result in biased coefficient estimates, as noted by previous studies. There is a possibility of reverse causality in the relationship between financial development and economic growth. Some previous studies have dealt with this issue by using instrument variables in their regressions. Others have carried out causality analysis to investigate the relationship. In this study, we will investigate the possibility of reverse causality between financial development and growth and poverty by conducting causality analysis.

The causality analysis in this study is implemented by using the general steps taken by previous studies: unit root tests to decide the level of stationarity, cointegration tests to

investigate the long-run relationship, and Granger causality analysis to investigate the direction of causality.

4.1.1 Unit Root Tests

There are several tests for panel unit roots (Baltagi & Kao, 2000). Among others are the Levin–Lin–Chu (LLC); Harris–Tzavalis (HT); Breitung; Im–Pesaran–Shin (IPS); Fisher-type; and Hadri Lagrange multiplier (LM) tests. The first five tests above have null hypotheses that all the panels contain a unit root, while the Hadri-LM test has the null hypothesis that all the panels are (trend) stationary. The majority of the tests require a balanced panel dataset, except for IPS and Fisher-type tests which allow an unbalanced panel (StataCorp, 2011).

The first stage in testing for co-integration between variables is to determine the degree of integration of individual time series. Because the dataset in this thesis is unbalanced, the test for the existence of a unit root in the levels and first-differences of each of the variables ($lnasset$, $lngcap$, and $lnpov$) is based on IPS procedure.

According to Apergis et al. (2007), the IPS test is more powerful than some other panel unit root tests. However, considering the nature of panel data, Chortareas et al. (2015) argued that the IPS test has a shortcoming in that it does not take into account the possible cross-sectional dependence among the variables of the panel. Therefore, this study also applies the second generation tests which are Pesaran's cross-section dependence tests (i.e., Pesaran cross-sectionally augmented ADF statistics (CADF) and cross-sectionally augmented IPS (CIPS) statistics).

Im-Pesaran-Shin Test

Unit root tests for this study are based on the model developed by Im, Pesaran and Shin (2003). The stochastic process y_{it} is generated by the first-order autoregressive process. If $\Delta y_{it} = y_{it} - y_{it-1}$, the model specification is as follows:

$$\Delta y_{it} = \beta_i y_{it-1} + \sum_{j=1}^{p_i} \rho_{ij} \Delta y_{it-j} + \alpha_{mi} d_{mt} + \varepsilon_{it} \qquad m = 1,2,3 \qquad (3)$$

where Δy_{it} stands for each variable under consideration in the respective model (i.e., $lngcap$, $lnasset$, and $lnpov$), p is the number of lags for correlation-free residuals and ε_{it} are white noise equation disturbance terms. The auto regressive parameter β_i is allowed to vary across units. The null hypothesis for the IPS test is that a unit root exists (or H_0: $\beta_i = 0$) for all *i.* The corresponding alternative hypothesis is no unit root or H_1: $\beta_i < 0$ for $i = 1, \dots, N_1$, $\beta_i = 0$ for $= N_1 + 1, \dots, N$. The IPS procedure is based on the average of the individual unit-specified ADF test statistics for testing the null hypothesis $\beta_i = 0$. If $t_{iT}(p_i, \rho_i)$ is the standard *t* statistic, the *t-bar* statistics is as follows:

$$\bar{t} = \frac{1}{N} \sum_{i=1}^{N} t_{iT}(p_i, \rho_i)$$

Under the null hypothesis of non-stationarity, IPS show that the $\bar{t}$-statistic follows asymptotically a standard normal distribution.

Pesaran CADF and CIPS Tests

First, we have y_{it} as the observed variable on the *i*th cross-sectional unit at time *t* and suppose that the variable is generated according to the simple dynamic linear heterogenous panel data model (Pesaran, 2007):

$$y_{it} = (1 - \emptyset_i)\mu_i + \emptyset_i y_{i,t-1} + \mu_{it}, \ i = 1, \dots, N; t = 1, \dots, T \qquad (4)$$

where initial value, y_{i0}, has a finite mean and variance, and the error term, μ_{it}, has the single factor structure:

$$\mu_{it} = \gamma_i f_t + \varepsilon_{it} \qquad (5)$$

where f_t is the unobserved common effect and ε_{it} is the individual-specific error. Combining equation (4) and (5), we have:

$$\Delta y_{it} = \alpha_i + \beta_i y_{i,t-1} + \gamma_i f_t + \varepsilon_{it} \quad (6)$$

where $\alpha_i = (1 - \emptyset_i)\mu_i$, $\beta_i = -(1 - \emptyset_i)$ and $\Delta y_{it} = y_{it} - y_{i,t-1}$. The unit root hypothesis of interest, $\emptyset_i = 1$, can now be expressed as $H_0: \beta_i = 0$ for all i against the alternative hypothesis $H_1: \beta_i < 0, i = 1, 2, \ldots, N_1, \beta_i = 0, i = N_1 + 1, N_1 + 3, \ldots, N$.

Then, we have $\bar{\gamma} = N^{-1} \sum_{j=1}^{N} \gamma_j$ and $\bar{\gamma} = 0$ for a fixed N and as $N \to \infty$. Now, the common factor f_t can be proxied by the cross-section mean of y_{it}, namely $\bar{y}_t = N^{-1} \sum_{j=1}^{N} y_{jt}$, and its lagged values(s) y_{t-1}, y_{t-2}, ... for N that are sufficiently large. In the case where μ_{it} is serially uncorrelated, $\bar{y}_t$ and $\bar{y}_{t-1}$ (or equivalently $\bar{y}_{t-1}$ and $\Delta\bar{y}_t$) are sufficient for asymptotically filtering out the effects of the unobserved common factor, f_t. The unit root test is based on the unit root hypothesis above, that is, on the *t*-ratio of the OLS estimate of b_i ($\hat{b}_i$) in the following CADF regression:

$$\Delta y_{it} = a_i + b_i y_{it-1} + c_i \bar{y}_{t-1} + d_i \Delta\bar{y}_t + e_{it} \quad (7)$$

CADF is based on the mean of individual DF (or ADF) t-statistics of each unit in the panel. Meanwhile, the CIPS equation is the mean of the individual CADF *t*-statistic:

$$CIPS(N, T) = \bar{t} = N^{-1} \sum_{i=1}^{N} t_i(N, T) \quad (8)$$

where $t_i(N, T)$ is the cross-sectionally augmented Dickey–Fuller statistic for the i^{th} cross-section unit given by the *t*-statistic of the coefficient of y_{it-1} in the CADF regression defined by equation (7).

4.1.2 Cointegration Tests

Pedroni Tests

Panel cointegration tests can be carried out after the order of stationarity has been defined. The Pedroni approach (Pedroni, 1999) is the general method to examine panel cointegration (Apergis et al., 2007; Fowowe, 2011; Pradhan et al., 2014a). The approach

is generally used not only for bivariate model (see Bangake & Eggoh, 2011; Dawson, 2010; Pradhan, 2013 for example), but also for trivariate model (see Ahmed, Cheng, & Messinis, 2011; Apergis, Katrakilidis, & Tabakis, 2006; Al-mulali & Normee, 2012; Farhani & Rejeb, 2012; Pao & Tsai, 2011; Pradhan, Arvin, Hall, & Bahmani, 2014b; Zagorchev, Vasconcello, & Bae, 2011 for example). The Pedroni approach allows different individual cross-sectional effects by taking into account heterogeneity in the intercepts and slopes of the cointegration equation (Apergis et al., 2007; Pedroni, 1999).

Pedroni (1999) proposed seven test statistics to test the occurrence of cointegration in non-stationary panels. The seven test statistics allow heterogeneity in the panel, both in the short-run dynamics as well as in the long-run slope and intercept coefficients. The seven test statistics are grouped into two categories: group-mean statistics that average the results of individual country test statistics and panel statistics that pool the statistics along the within-dimension. Non-parametric (ρ and t) and parametric (augmented Dickey-Fuller and v) test statistics are within both groups (StataCorp, 2011).

The first step to conduct a Pedroni test is to compute the regression residuals from the hypothesised co-integrating regression. For this study, it takes the form:

$$lngcap_{it} = \alpha_i + \beta_{1i} lnasset_{1it} + e_{it} \quad (9)$$

$$lnpov_{it} = \alpha_i + \delta_{1i} lnasset_{1it} + \epsilon_{it} \quad (10)$$

for $t = 1, \dots, T; i = 1, \dots, N$

where T refers to the number of observations over time; N refers to the number of individual region in the panel; β_{1i} is the slope coefficients; and α_i is the regional specific intercept or fixed effects parameter.

Pedroni (1999) stated that because there are *N* different members of the panel, we can assume that there are also *N* different equations. The slope coefficient β_{1i} is permitted to vary across individual regions in the panel. The regional specific intercept, α_i, is also allowed to vary across individual regions.

Pedroni's approach includes seven statistics for the test of the null hypothesis of no cointegration in heterogeneous panels. Four of the seven statistics are termed "within-dimensions". The within-dimension statistics are based on estimators that effectively pool the autoregressive coefficient across different members for the unit root tests on the estimated residuals. This group includes panel-*v*, panel-*ρ*, panel non-parametric, and panel parametric statistics. The other three statistics are called "between-dimensions". The between-dimensions statistics are based on estimators that simply average the individually estimated coefficients for each member *i*. This group includes group-*ρ*, group non-parametric, and group parametric statistics. The seven statistics are as follows (Pedroni, 1999):

1. Panel *v*- statistic: $T^2N^{3/2}Z_{\hat{v}_{N,T}} \equiv T^2N^{3/2}\left(\Sigma_{i=1}^{N}\Sigma_{t=1}^{T}\hat{L}_{11i}^{-2}\hat{e}_{i,t-1}^{2}\right)^{-1}$
2. Panel *ρ*-statistic:

   $$T\sqrt{N}Z_{\hat{\rho}_{N,T^{-1}}} \equiv T\sqrt{N}\left(\Sigma_{i=1}^{N}\Sigma_{t=1}^{T}\hat{L}_{11i}^{-2}\hat{e}_{i,t-1}^{2}\right)^{-1}\Sigma_{i=1}^{N}\Sigma_{t=1}^{T}\hat{L}_{11i}^{-2}\left(\hat{e}_{i,t-1}\Delta\hat{e}_{i,t}-\hat{\lambda}_i\right)$$

3. Panel *t*-statistic (non-parametric):

   $$Z_{t_{N,T}} \equiv \left(\tilde{\sigma}_{N,T}^{2}\Sigma_{i=1}^{N}\Sigma_{t=1}^{T}\hat{L}_{11i}^{-2}\hat{e}_{i,t-1}^{2}\right)^{-1/2}\Sigma_{i=1}^{N}\Sigma_{t=1}^{T}\hat{L}_{11i}^{-2}\left(\hat{e}_{i,t-1}\Delta\hat{e}_{i,t}-\hat{\lambda}_i\right)$$

4. Panel *t*-statistic (parametric):

   $$Z_{t\,N,T}^{*} \equiv \left(\tilde{s}_{N,T}^{*2}\Sigma_{i=1}^{N}\Sigma_{t=1}^{T}\hat{L}_{11i}^{-2}\hat{e}_{i,t-1}^{*2}\right)^{-1/2}\Sigma_{i=1}^{N}\Sigma_{t=1}^{T}\hat{L}_{11i}^{-2}\hat{e}_{i,t-1}^{*}\Delta\hat{e}_{i,t}^{*}$$

5. Group *ρ*-statistic:

   $$TN^{-1/2}\tilde{Z}_{\hat{\rho}_{N,T^{-1}}} \equiv TN^{-1/2}\Sigma_{i=1}^{N}\left(\Sigma_{t=1}^{T}\hat{e}_{i,t-1}^{2}\right)^{-1}\Sigma_{t=1}^{T}\left(\hat{e}_{i,t-1}\Delta\hat{e}_{i,t}-\hat{\lambda}_i\right)$$

6. Group *t*-statistic (non-parametric):

   $$N^{-1/2}\tilde{Z}_{t_{N,T}} \equiv N^{-1/2}\Sigma_{i=1}^{N}\left(\hat{\sigma}_i^{2}\Sigma_{t=1}^{T}\hat{e}_{i,t-1}^{2}\right)^{-1/2}\Sigma_{t=1}^{T}\left(\hat{e}_{i,t-1}\Delta\hat{e}_{i,t}-\hat{\lambda}_i\right)$$

7. Group *t*-statistic (parametric):

   $$N^{-1/2}Z_{t\,N,T}^{*} \equiv N^{-1/2}\Sigma_{i=1}^{N}\left(\Sigma_{t=1}^{T}\hat{s}_i^{*2}\hat{e}_{i,t-1}^{*2}\right)^{-1/2}\Sigma_{t=1}^{T}\hat{e}_{i,t-1}^{*}\Delta\hat{e}_{i,t}^{*}$$

From the seven statistics, an autoregressive coefficient, γ_i, could be derived from the estimated residuals under the alternative hypothesis of cointegration. The null hypothesis for the within-dimension group is $H_0: \gamma_i = 1$ for all *i* and the alternative hypothesis is: $H_1: \gamma_i = \gamma < 1$ for all *i*. Meanwhile, the null hypothesis for the between-dimension group is $H_0: \gamma_i = 1$ for all *i* and the alternative hypothesis is : $H_1: \gamma_i < 1$ for all *i* (Pedroni, 1999).

To estimate the long-run relationship between financial development and growth, previous studies have used different approaches. Apergis et al. (2007) and Meslier-Crouzille et al. (2012) used fully modified OLS (FMOLS) and dynamic OLS (DOLS). In this study, we use both FMOLS and DOLS. To build the FMOLS equation in this study, consider the previous equation (7). $lngcap_{it}$ and $lnasset_{it}$ are cointegrated with slopes β_i, which may or may not be homogenous across *i*. For a strong relationship between rural bank assets and regional GDP per capita to hold, the null hypothesis i that H_0 : $\beta_i = 1$ for all *i*. Let $\xi_{it} = (\hat{\mu}_{it}, \Delta lnasset_{it})'$ be a stationary vector consisting of the estimated residuals from the cointegrating regression and the difference in rural bank assets, and let $\Omega_i \equiv lim_{T\to\infty}\ E[T^{-1}(\Sigma_{t=1}^{T}\xi_{it})\ (\Sigma_{t=1}^{T}\xi_{it}')]$ be the long-run covariance for this vector process. This long-run covariance matrix is typically estimated using any one of a number of HAC esstimators, such as the Newey-West estimator. It can be decomposed as $\Omega_i = \Omega_i^0 + \Gamma_i + \Gamma_i'$, where Ω_i^0 is the contemporaneous covariance and Γ_i is a weighted sum of autocovariances (Pedroni, 2001). We have a group mean panel FMOLS estimator as follows:

$$\hat{\beta}_{GFM}^{*} = N^{-1}\sum_{i=1}^{N}\left(\sum_{t=1}^{T}\left(lnasset_{it} - \overline{lnasset_i}\right)^2\right)^{-1} \times \left(\sum_{t=1}^{T}\left(lnasset_{it} - \overline{lnasset_i}\right) lngcap_{it}^{*} - T\hat{\gamma}_i\right) \quad (11)$$

where

$$lngcap_{it}^{*} = lngcap_{it} - \overline{lngcap_i} - \frac{\hat{\Omega}_{21i}}{\hat{\Omega}_{22i}}\Delta lnasset_{it},$$

$$\hat{\gamma}_i = \hat{\Gamma}_{21i} + \hat{\Omega}_{21i}^{0} - \frac{\hat{\Omega}_{21i}}{\hat{\Omega}_{22i}}(\hat{\Gamma}_{21i} + \hat{\Omega}_{21i}^{0})$$

DOLS is considered as a better procedure than FMOLS. According to Apergis et al. (2007), DOLS allows for consistent and efficient estimators of the long-run relationship, deals with the endogeneity of the regressors, and takes into account the integration and co-integration properties of the data. Under the DOLS estimation, extra terms are added to the original co-integration equation, so that the bias is corrected. The terms consist of lags and terms of the first-order differences in the explanatory variables.

To construct a between-dimension, group-mean panel DOLS estimator, firstly we augment the cointegrating regression with lead and lagged differences of the regressor to control for the endogenous feedback effect. This functions similarly to the nonparametric correction term for $lngcap_{it}^{*}$ in terms of $\Delta lnasset_{it}$ in the FMOLS procedure. Therefore, we have the DOLS regression as follows:

$$lngcap_{it} = \alpha_i + \beta_i lnasset_{it} + \sum_{k=-K_i}^{K_i} \gamma_{ik} \Delta\, lnasset_{it} + \mu_{it}^{*} \tag{12}$$

and the group-mean panel estimator is as follows:

$$\hat{\beta}_{GD}^{*} = \left[N^{-1} \sum_{i=1}^{N} (\sum_{t=1}^{T} z_{it} z_{it}')^{-1} \left(\sum_{t=1}^{T} z_{it} \widetilde{lngcap}_{it}\right)\right]_1 \tag{13}$$

where z_{it} is the $2(K+1) \times 1$ vector of regressors;

$z_{it} = \left(lnasset_{it} - \overline{lnasset_i}, \Delta lnasset_{it-K}, \ldots, \Delta lnasset_{it+K}\right)$, $\widetilde{lngcap}_{it} = lngcap_{it} - \overline{lngcap_i}$

The subscript 1 outside the brackets indicates that we are taking only the first element of the vestor to obtain the pooled slope coefficient.

Westerlund Tests

Another test of panel cointegration is the Westerlund test (Persyn & Westerlund, 2008; Westerlund, 2007). Demetriades and James (2011) applied the Westerlund test to examine the relationship between finance and growth in Sub-Saharan Africa countries. They argued that the Westerlund test can investigate the long-run relationship for small samples and has high power relative to residual-based panel cointegration tests. Westerlund proposes four tests based on the following equation (Persyn & Westerlund, 2008):

$$\Delta y_{it} = \delta_1' d_t + \alpha_i y_{it-1} + \lambda_i' x_{it-1} + \sum_{j=1}^{p_t} \alpha_{ij} \Delta y_{it-j} + \sum_{j=0}^{p_i} \gamma_{ij} \Delta x_{it-j} + e_{it} \tag{14}$$

where d_t contains the deterministic components, for which there are three cases. In the first case, $d_t = 0$, so equation (14) has no deterministic terms; in the second case, $d_t = 1$, so Δy_{it} is generated with a constant; and in the third case, $d_t = (1, t)'$, so Δy_{it} is generated with a constant and a trend. Δx_{it-j} is independent of e_{it}, and the assumption is that these errors are independent across both *i* and *t*. $\lambda_i' = -\alpha_i \beta_i'$. The parameter α_i determines the speed at which the system corrects back to the equilibrium relationship $y_{it-1} - \beta_i' x_{it-1}$ after a sudden shock. Error correction exists if $\alpha_i < 0$, implying that y_{it} and x_{it} are cointegrated. Conversely, error correction does not exist if $\alpha_i = 0$, implying that there is no cointegration between y_{it} and x_{it}. The null hypothesis of no cointegration can be formulated as $H_0 : \alpha_i = 0$ for all *i*. The alternative hypothesis depends on the four tests of Westerlund. The four tests are the Ga and Gt test statistics test with $H_0: \alpha_i = 0$ for all *i* versus $H_1: \alpha_i < 0$ for at least one *i*. The other two tests are Pa and Pt tests. The tests pool information over all the cross-sectional units to test $H_0: \alpha_i = 0$ for all *i* versus $H_1: \alpha_i < 0$. Rejection of H_0 should therefore be taken as rejection of cointegration for the panel as a whole (StataCorp, 2011).

Gregory Hansen Tests

When dealing with time series data, we need to consider the possibility of a structural break. To investigate the existence of the cointegration relationship while simultaneously dealing with structural break, we use a technique developed by Gregory and Hansen (Gregory & Hansen, 1996a, 1996b). We will compare the results from Pedroni and Westerlund cointegration with the Gregory Hansen (GH) test, in order to check if there is any impact of structural break on the estimation. The null hypothesis of the GH test is no cointegration, while the alternative hypothesis is cointegration with a single shift at an unknown point in time. The Gregory and Hansen test does not allow gaps within the time series observations with structural breaks. Therefore, to do the test in this study, three regions are removed from the datasets.

The GH test consists of four models based on alternative assumptions about structural breaks: (i) level shift; (iii) level shift with trend; (iii) regime shift where both the intercept and the slope coefficients change, and (iv) regime shift where intercept, trend, and slope

coefficients change. Following Kumar, Webber, and Fargher (2013), we apply equation (1) to the four approaches and get the following equations:

GH-1 level shift:

$$lngcap_t = \mu_1 + \mu_2\varphi_{tk} + \alpha_1 lnasset_t + \alpha_2\pi_t + \varepsilon_t \quad (15)$$

GH-2: level shift (includes trend)

$$lngcap_t = \mu_1 + \mu_2\varphi_{tk} + \beta_1 t + \alpha_1 lnasset_t + \alpha_2\pi_t + \varepsilon_t \quad (16)$$

GH-3: regime shift (intercept and slope coefficients change)

$$lngcap_t = \mu_1 + \mu_2\varphi_{tk} + \beta_1 t + \alpha_1 lnasset_t + \alpha_{11} lnasset_t\varphi_{tk} + \alpha_2\pi_t + \alpha_{22}\pi_t\varphi_{tk} + \varepsilon_t \quad (17)$$

GH-4: regime shift (intercept, trend, and slope coefficients change)

$$lngcap_t = \mu_1 + \mu_2\varphi_{tk} + \beta_1 t + \beta_2 t\varphi_{tk} + \alpha_1 lnasset_t + \alpha_{11} lnasset_t\varphi_{tk} + \alpha_2\pi_t + \alpha_{22}\pi_t\varphi_{tk} + \varepsilon_t \quad (18)$$

4.1.3 Testing for Causality

The final step is exploring the direction of the panel data causal links among rural banks' assets, regional GDP per capita, and regional poverty rates. The previous procedures described above are only able to indicate whether or not the variables are cointegrated and if a long-run relationship exists between them. To identify the direction of causality, this study estimates a panel-based vector error correction model (VECM) and uses it to conduct Granger causality tests.

Granger (1996) developed the analysis of causal relationship between variables. If we have two variables, y_t and x_t, we can say that y_t causes x_t if the inclusion of y_t leads to a better prediction of x_t, compared to if y_t is excluded. Causality can be unidirectional (y_t causes x_t or x_t causes y_t), or bidirectional when y_t causes x_t and x_t also causes y_t. The Granger causality test can be estimated using simultaneous equations procedures as in the vector auto vector autoregression (VAR)/vector error correction model (VECM) system of Johansen (Carby, et al., 2012). Previous studies using this procedure can be found, among others, in Abu-Qarn and Abu-Bader (2008); Bangake and Eggoh (2011); Carby, et al. (2012); Odhiambo (2009); and Pradhan (2010).

A system VECM equation for the regional GDP per capita is constructed with a view that regional GDP per capita (*lngcap*) is a function of rural bank assets (*lnasset*) and regional poverty rates (*lnpov*). The empirical model for the rural bank-regional GDP per capita nexus is represented by two VECM equations as follows:

$$\Delta lngcap_{it} = \theta_{1i} + \lambda_{1i} EC_{i,t-1} + \sum_{k=1}^{m} \theta_{11ik} \Delta lngcap_{i,t-k} + \sum_{k=1}^{m} \theta_{12ik} \Delta lnasset_{i,t-k} + u_{1it} \quad (19)$$

$$\Delta lnasset_{it} = \theta_{2i} + \lambda_{2i} EC_{i,t-1} + \sum_{k=1}^{m} \theta_{21ik} \Delta lnasset_{i,t-k} + \sum_{k=1}^{m} \theta_{22ik} \Delta lngcap_{i,t-k} + u_{2it} \quad (20)$$

while the empirical model for the rural bank-regional poverty rate nexus is as follows:

$$\Delta lnpov_{it} = \theta_{1i} + \lambda_{1i} EC_{i,t-1} + \sum_{k=1}^{m} \theta_{11ik} \Delta lnpov_{i,t-k} + \sum_{k=1}^{m} \theta_{12ik} \Delta lnasset_{i,t-k} + u_{1it} \quad (21)$$

$$\Delta lnasset_{it} = \theta_{2i} + \lambda_{2i} EC_{i,t-1} + \sum_{k=1}^{m} \theta_{21ik} \Delta lnasset_{i,t-k} + \sum_{k=1}^{m} \theta_{22ik} \Delta lnpov_{i,t-k} + u_{2it} \quad (22)$$

where Δ is the first difference operator; $lngcap$ is the growth of regional GDP per capita; $lnpov$ is the regional poverty rate; $lnasset$ is assets of rural banks in the regions; m is the lag length; EC is the error correction term which is the residuals from the cointegration equation, lagged one period ($EC = y_{it-1} - \alpha_0 - \alpha_1 x_{it-1}$); λ is the coefficent of EC. We expect λ to be negative to represent the amount of "correction" of this period $-(t-1)$ disequilibrium that happens in period *t*. For example, if λ is –0.25, then one quarter of the gap between y_{it-1} and its equilibrium value would tend (all else equal) to be reversed (because the sign is negative) in period *t* (Faculty of Economic Informatics Bratislava, n.d.).

The sources of causation can be identified by testing for the significance of the coefficients of the dependent variables in equations (19), (20), (21), and (22). For short-run causality, the null hypothesis H_0: $\theta_{12ik} = 0$ for all *i* and *k* in equations (19) and (20) or H_0: $\theta_{22ik} = 0$ for all *i* and *k* in equations (21) and (22). The presence of long-run causality can be established by testing H_0: $\lambda_{1i} = 0$ for all *i* in equations (19) and (20) or H_0: $\lambda_{2i} = 0$ for all *i* in equations (21) and (22).

4.2 Data

4.2.1 Sources of Data

This thesis uses specific data on Indonesian regions. The macroeconomic regional data (regional GDP per capita and poverty rate) is from Statistics Indonesia (*Badan Pusat Statistik*/BPS). BPS is a national non-departmental agency which is under and directly responsible to the President of Indonesia. The agency has representatives in each Indonesian region, except in the newest region – North Kalimantan – which was only established in October 2012. The representatives collect regional data and report to the national agency. This means regional statistical data can be compiled from the national office or from the regional offices – regional BPS have their own website and annual publication (Region in Figures), in addition to the national BPS website and annual publication of Statistical Yearbook of Indonesia. Not all regional data can be gathered from national BPS. Therefore, this thesis uses data from both national and regional BPS. It should be noted that there is no conflict between the two sources. Bank regional data are from the Banking Statistics Indonesia (*Statistik Perbankan Indonesia*/SPI). SPI is a publication that presents data regarding the banking industry in Indonesia. SPI is published monthly by the Central Bank of Indonesia (BI).

Table 4.1: List of the regions

No	Province	Notes
1	Aceh	Original data
2	North Sumatra	Original data
3	West Sumatra	Original data
4	Riau	Split into two regions, Riau and Riau Islands, in 2002 Combination of Riau, Riau Islands, and Bangka Belitung[33]
5	Jambi	Original data
6	South Sumatra	Split into two regions, South Sumatera and Bangka Belitung, in 2000 Original data
7	Bengkulu	Original data
8	Lampung	Original data
9	DKI Jakarta	Original data
10	West Java	Split into two regions, West Java and Banten, in 2000 Combination of West Java and Banten
11	Central Java	Original data
12	DI Yogyakarta	Original data
13	East Java	Original data
14	Bali	Original data
15	West Nusa Tenggara	Original data
16	East Nusa Tenggara	Original data
17	West Kalimantan	Original data
18	Central Kalimantan	Original data
19	South Kalimantan	Original data
20	East Kalimantan	Split into two regions, East Kalimantan and North Kalimantan, in 2012 Combination of East Kalimantan and North Kalimantan
21	North Sulawesi	Split into two regions, North Sulawesi and Gorontalo, in 2000 Combination of North Sulawesi and Gorontalo
22	Central Sulawesi	Original data
23	South Sulawesi	Split into two regions, South Sulawesi and West Sulawesi, in 2004 Combination of South Sulawesi and West Sulawesi
24	Southeast Sulawesi	Original data
25	Maluku	Original data
26	North Maluku	Original data
27	Papua	Split into two regions, Papua and West Papua, in 2003 Combination of Papua and West Papua

The period under investigation is 2000 to 2014. Provinces are the first tier of local government division in Indonesia. Indonesia consists of 34 provinces. Each of these provinces has its own political legislature and is headed by a governor. The number of Indonesian provinces has been evolving. In the 1990s, there were 27 provinces. In 2000, three new provinces emerged: Bangka Belitung separated from South Sumatera;

[33] Even though Bangka Belitung split from South Sumatera, data of rural banks in Bangka Belitung over the period of 2000-2007 were included in Riau's data not in South Sumatera's data.

Gorontalo separated from North Sulawesi; and Banten separated from West Java. In 2002, the province of Riau Islands was established after separating from Riau province. In 2003, West Papua was formed after separating from Papua. In the following year, the province of West Sulawesi was established after separating from South Sulawesi. The newest province in Indonesia is North Kalimantan. North Kalimantan separated from East Kalimantan in 2012. This evolution has a significant impact on samples used for this study.

This study only employs 27 provinces based on the availability of consistent data over the time period. Even though three provinces were formed in 2000, which is the beginning of the studied time period, their regional data were not available until 2006. Table 4.1 lists the 27 provinces, complete with a description of the regions included. This gives us a maximum sample size of 405 taken from 15 annual observations on these 27 provinces.

4.2.2 Description of the Variables

Assets of rural banks ($lnasset$)

The variable is total rural bank assets in the region. Data for rural bank assets are missing for Southeast Sulawesi 2000-2003 and for North Maluku 2000-2004. The data are compiled from SPI. The unit is in billion Indonesian Rupiah (IDR). The data are in nominal value, and we deflate the value with GDP deflator (base year: 2000) to get real value data.

Regional gross domestic product per capita ($lngcap$)

Regional gross domestic product (regional GDP) per capita is the total of the final output of goods and services produced by residents and non-residents of a region, divided by the total population in the region. The data are compiled from national BPS and the unit is in million IDR. BPS presents regional GDP in constant price and current price. Regional GDP in constant price uses value in 2000 as its base year. Growth of regional GDP is calculated using natural logarithm.

Poverty ($lnpov$)

To measure poverty, BPS uses the concept of the basic needs approach. Based on this approach, the Indonesian poverty line is the minimum standard expenditure required by an individual to fulfil his/her basic needs for both food and non-food items. In other words, the poverty line is an addition to the food poverty line (FPL) and the non-food poverty line (NFPL). FPL is the expenditure value of food minimum requirements or the equivalent of 2100 kilocalories per capita per day. NFPL is minimum needs for housing, clothing, education, health, and other basic individual needs. This study uses the Head-Count Index data which measures the percentage of the population that is counted as poor, which is in accordance with the UNDP Human Development Report's definition of absolute poverty. The data are measured as the percentage of poor people in the region. The data is compiled from national BPS.

4.3 Empirical Results

4.3.1 Descriptive Statistics

There are five major islands in Indonesia: Sumatera, Java, Kalimantan, Sulawesi, and Papua. Java is the most prosperous island. In 1998, Hill stated that Indonesia's footloose industrial activities[34] were located almost entirely on Java. This island also has the most developed service economy because it is the provider of high value services such as finance, education, health, and international transport (Hill, 1998). The capital city of Indonesia, Jakarta, is located in Java Island.

The regional domestic product per capita for all regions is shown in Table 4.2. Among 27 provinces, only five regions having a mean higher than the national mean of regional gross domestic product per capita. Jakarta has the highest mean. The other four regions are East Kalimantan, Riau, Papua, and Aceh. Riau Islands is part of the SIJORI Growth Triangle, a partnership agreement between Singapore, Johor (in Malaysia), and Riau

[34] The footloose industry is one that is not tied to any particular location or country. It can relocated easily in response to changing economic conditions. (http://www.investorwords.com/17594/footloose_industry.html#ixzz4Cief6rQO).

Islands (in Indonesia).[35] Because of this agreement, according to Hill (1998), Riau Islands also has many footloose industries. The manufacturing industry constitutes about 50% of Riau Islands' GDP (BPS Kepulauan Riau, 2015). East Kalimantan is rich in oil and gas. About 50% of its regional GDP comes from mining and quarrying (BPS Kalimantan Timur, 2015). In the case of Aceh and Papua, the population in the regions only consist of 4% of the total Indonesian population. The contribution of each region to regional GDP per capita (average of percentage 2000-2014) is shown in Table 4.3 and Figure 4.1.

Table 4.2: Descriptive statistics for regional gross domestic product per capita (billion IDR), 2000-2014

Province	Mean	Std. Dev.	Obs.
1-Aceh	0.00868	0.00129	15
2-North Sumatra	0.00794	0.00152	15
3-West Sumatra	0.00710	0.00122	15
4-Riau (including Riau Islands and Bangka Belitung)	0.01671	0.00231	15
5-Jambi	0.00553	0.00171	15
6-South Sumatra	0.00796	0.00106	15
7-Bengkulu	0.00440	0.00082	15
8-Lampung	0.00466	0.00101	15
9-Jakarta	0.03667	0.00649	15
10-West Java (including Banten)	0.00727	0.00148	15
11-Central Java	0.00508	0.00108	15
12-Yogyakarta	0.00550	0.00084	15
13-East Java	0.00804	0.00167	15
14-Bali	0.00707	0.00104	15
15-West Nusa Tenggara	0.00386	0.00048	15
16-East Nusa Tenggara	0.00252	0.00034	15
17-West Kalimantan	0.00618	0.00098	15
18-Central Kalimantan	0.00771	0.00129	15
19-South Kalimantan	0.00768	0.00102	15
20-East Kalimantan	0.03275	0.00096	15
21-North Sulawesi (including Gorontalo)	0.00647	0.00377	15
22-Central Sulawesi	0.00591	0.00138	15
23-South Sulawesi (including West Sulawesi)	0.00533	0.00143	15
24-Southeast Sulawesi	0.00476	0.00143	15
25-Maluku	0.00281	0.00049	15
26-North Maluku	0.00283	0.00071	15
27-Papua (including West Papua)	0.00983	0.00128	15
All (Indonesia)	0.00856	0.00810	405

[35] The agreement was established because the areas are closely located. Its objective is to attract more investors in the three areas by linking the infrastructure, capital, and expertise of Singapore with the abundance of land and labour resources of Johor and Riau Islands (National Library Board Singapore, 1989).

Table 4.3: Contribution of regional area to national GDP per capita, 2000-2014 (%)

Province	%	Province	%
1-Aceh	3.75	15-West Nusa Tenggara	1.67
2-North Sumatra	3.44	16-East Nusa Tenggara	1.09
3-West Sumatra	3.07	17-West Kalimantan	2.67
4-Riau (including Riau Islands and Bangka Belitung)	7.22	18-Central Kalimantan	3.34
5-Jambi	2.39	19-South Kalimantan	3.32
6-South Sumatra	3.44	20-East Kalimantan	14.16
7-Bengkulu	1.90	21-North Sulawesi (including Gorontalo)	2.80
8-Lampung	2.01	22-Central Sulawesi	2.56
9-Jakarta	15.86	23-South Sulawesi (including West Sulawesi)	2.31
10-West Java (including Banten)	3.14	24-Southeast Sulawesi	2.06
11-Central Java	2.20	25-Maluku	1.22
12-Yogyakarta	2.38	26-North Maluku	1.22
13-East Java	3.48	27-Papua (including West Papua)	4.25
14-Bali	3.06		

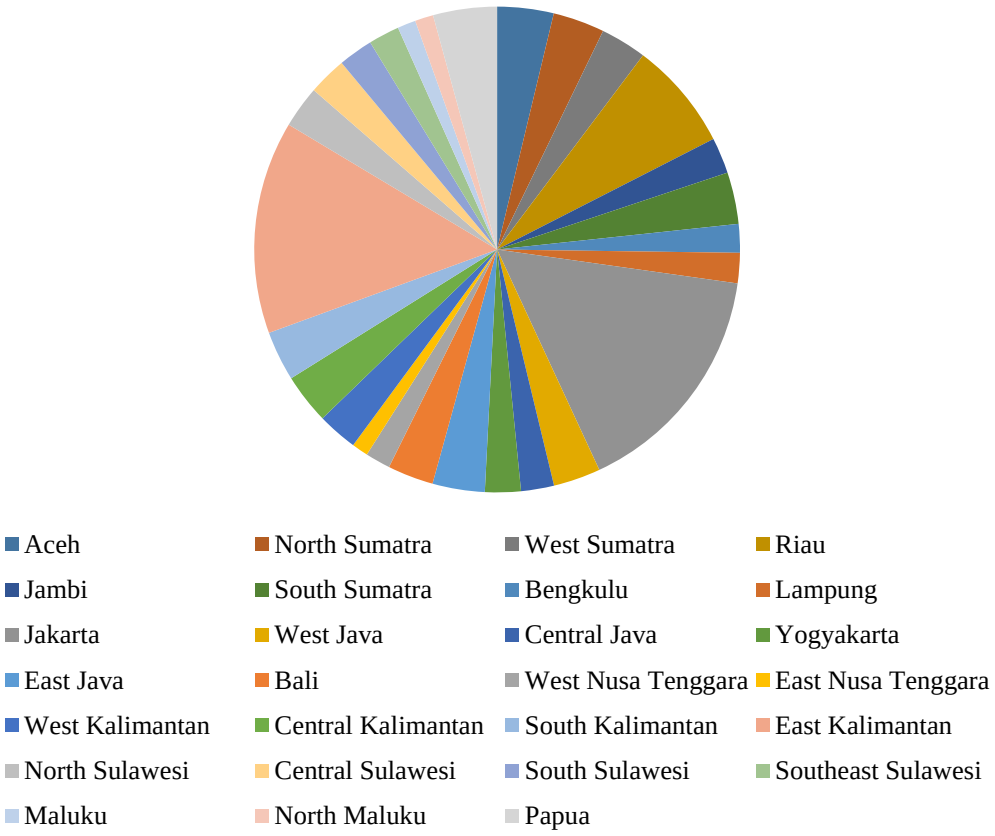

Figure 4.1: Contribution of each region to national GDP per capita, 2000-2014 (%)

Table 4.4 shows the descriptive statistics of rural bank assets per capita. The mean of all regions is 0.065. More than half of the regions (20 regions) have means lower than the national mean. Two provinces in Java have the highest rural bank assets per capita. Those provinces are Yogyakarta and Central Java. Central Java also has the largest number of micro and small enterprises in Indonesia. According to the BPS (2015), the number of micro and small enterprises in Central Java in 2014 was 832,472 enterprises. This number contributes 23.75% of the total number of micro and small enterprises in Indonesia.

Table 4.4: Descriptive statistics for rural bank assets per capita (billion IDR), 2000-2014

Province	Mean	Std. Dev.	Obs.
1-Aceh	0.010	0.002	15
2-North Sumatra	0.018	0.007	15
3-West Sumatra	0.072	0.030	15
4-Riau (including Riau Islands and Bangka Belitung)	0.092	0.076	15
5-Jambi	0.035	0.030	15
6-South Sumatra	0.026	0.017	15
7-Bengkulu	0.006	0.002	15
8-Lampung	0.217	0.079	15
9-Jakarta	0.029	0.023	15
10-West Java (including Banten)	0.064	0.029	15
11-Central Java	0.116	0.051	15
12-Yogyakarta	0.221	0.105	15
13-East Java	0.057	0.020	15
14-Bali	0.358	0.218	15
15-West Nusa Tenggara	0.048	0.019	15
16-East Nusa Tenggara	0.010	0.010	15
17-West Kalimantan	0.046	0.026	15
18-Central Kalimantan	0.009	0.014	15
19-South Kalimantan	0.027	0.013	15
20-East Kalimantan	0.021	0.012	15
21-North Sulawesi (including Gorontalo)	0.057	0.065	15
22-Central Sulawesi	0.059	0.071	15
23-South Sulawesi (including West Sulawesi)	0.017	0.016	15
24-Southeast Sulawesi	0.010	0.008	15
25-Maluku	0.086	0.077	15
26-North Maluku	0.002	0.003	15
27-Papua (including West Papua)	0.039	0.025	15
All (Indonesia)	0.065	0.098	405

It seems that the number of micro and small enterprises (MSEs) is in line with the value of regional rural bank assets. Regions with higher means of rural bank assets per capita also have the largest number of micro small enterprises. Data of regional MSEs in Statistics Indonesia can only be found from 2013. The conduction of a simple correlation

test between rural bank assets per capita and MSEs per capita using data of 2013 and 2014 shows a positive correlation between the two variables. Bali has the highest per capita rural bank assets and third largest number of MSEs per capita. Central Java occupies fourth rank in rural bank assets and also fourth rank in the number of micro small enterprises. However, the correlation result is negative in eight regions (West Sumatera, Riau, Jambi, South Sumatera, Jakarta, Yogyakarta, North Maluku and Papua). That means, in the eight regions, when unit of MSEs increases, rural bank assets decrease. This could be because, in the regions, commercial banks are more dominant. Commercial banks also offer SMEs loans, so that SMEs in the regions prefer to get the loans from the banks that they are more familiar with, rather than from rural banks.

The bottoms three provinces in rural bank assets are Central Kalimantan, Bengkulu, and North Maluku. North Maluku has the second smallest number of MSEs. Bengkulu and Central Kalimantan are in the bottom 10 of the smallest number of MSEs.

The region with the highest regional GDP is not the one that has the highest rural bank assets. West Java has the highest mean of regional GDP, but its rural bank assets are below the national average. One explanation is because the region is the largest business region in Indonesia and therefore relies on big commercial banks to serve the financial sector, rather than relying on rural banks that mostly serve MSEs. The phenomenon is also found in East Kalimantan. It has mean rural bank assets below the national average. Mining and quarrying is considered to be a big industry; thus, it needs more sophisticated and advanced bank services found in large commercial banks. The exceptions are Central Java and Riau. Both regions have high regional GDP and also high rural bank assets. Two regions found in the bottom five of the smallest regional GDP, Bengkulu and North Maluku, are also in the bottom five of the smallest rural bank assets.

Table 4.5 shows the descriptive statistics of the number of poor people per capita (poverty rate). The mean of all regions is 0.188. There are 13 regions with mean poverty rates above the national average. Three of the regions are located in Java, others are outside Java. Central Java, East Java, and Yogyakarta are three regions in Java Island with a high number of poor people. Not surprisingly, these three regions have regional

GDP per capita below the national average. Central Java and Yogyakarta also have a rural bank assets mean above the national average.

Table 4.5: Descriptive statistics for poverty rate, 2000-2014

Province	Mean	Std. Dev.	Obs.
1-Aceh	0.206	0.096	15
2-North Sumatra	0.127	0.021	15
3-West Sumatra	0.103	0.020	15
4-Riau (including Riau Islands and Bangka Belitung)	0.099	0.021	15
5-Jambi	0.114	0.040	15
6-South Sumatra	0.181	0.035	15
7-Bengkulu	0.203	0.025	15
8-Lampung	0.210	0.042	15
9-Jakarta	0.037	0.006	15
10-West Java (including Banten)	0.120	0.019	15
11-Central Java	0.190	0.032	15
12-Yogyakarta	0.188	0.046	15
13-East Java	0.180	0.037	15
14-Bali	0.059	0.013	15
15-West Nusa Tenggara	0.240	0.041	15
16-East Nusa Tenggara	0.261	0.053	15
17-West Kalimantan	0.132	0.051	15
18-Central Kalimantan	0.092	0.023	15
19-South Kalimantan	0.071	0.025	15
20-East Kalimantan	0.098	0.030	15
21-North Sulawesi (including Gorontalo)	0.152	0.045	15
22-Central Sulawesi	0.203	0.039	15
23-South Sulawesi (including West Sulawesi)	0.135	0.023	15
24-Southeast Sulawesi	0.197	0.044	15
25-Maluku	0.264	0.094	15
26-North Maluku	0.100	0.036	15
27-Papua (including West Papua)	0.368	0.050	15
All (Indonesia)	0.160	0.083	405

We conduct simple regressions using each of the three variables (*lngcap*, *lnpov*, *lnasset*) as the dependent variable and regional dummy as the independent variable to investigate how much variance is left in the dependent variables after we control for the region. The R-square figure when we use *lnasset* as the dependent variable is 0.6654, suggesting that there is 33.5% of variance left over after we control for the region effect. The R-square figure for *lngcap* and *lnpov* is 91.5% and 84.4%, respectively. The results indicate that 66.5%, 91.5%, and 84.4% of *lnasset*, *lngcap* and *lnpov* can be explained by region.

4.3.1.1 Panel Unit Root Tests

Unit root tests are conducted for the three variables (growth of real rural banks' assets (*lnasset*), growth of real regional gross domestic product per capita (*lngcap*), and changes in the regional poverty rate (*lnpov*)). When performing a unit root test for panel data, the number of cross-sections (*N*) and time series (*T*) should be considered. This study employs a short-time series. The suitable panel unit root tests for short time series are HT, and IPS tests. Both tests assume that the number of time periods, *T*, is fixed, whereas N tends to infinity. However, the HT test requires balanced panel data. Because panel data in this study is unbalanced, only the IPS test can be applied.

The first thing to do before carrying out unit root tests is to choose the appropriate lag length. In this study, the lag length is chosen using *pvarsoc*, a Stata command which was introduced by Abrigo and Love (2015). They constructed the command based on another Stata command, *varsoc*, which is widely used to select the most appropriate lag in time series data (StataCorp, 2011). *pvarsoc* is part of panel VAR (panel vector autoregressive) model. Canova and Ciccarelli (2013) pointed out that panel VAR is basically a standard VAR with a cross-sectional dimension. According to Canova and Ciccarelli (2013), panel VAR has advantages because it is able to: (i) capture both static and dynamic interdependencies, (ii) treat the links across units in an unrestricted fashion, (iii) easily incorporate time variation in the coefficients and in the variance of the shocks, and (iv) take into account the cross sectional dynamic heterogeneities. *pvarsoc* command provides the selection of lag order for panel VAR which is estimated using GMM. Results of *pvarsoc* command report the value of MMSC-Akaike's information criterion (MAIC), MMSC-Bayesian information criterion (MBIC), and MMSC-Hannan and Quinn information criterion (MQIC). Similar to maximum likelihood-based information criteria (AIC, BIC, and HQIC), the VAR model with the smallest value of MAIC, MBIC, or MQIC is the preferred model. In this study, the results show that the appropriate lag length is 1. Therefore, we use 1 lag for all tests in this study (Table 4.6).

Table 4.6: Results of *pvarsoc*

lag	CD	J	J pvalue	MBIC	MAIC	MQIC
1	0.9999926	27.13101	.4567438	-123.0074	-26.86899	-65.51791
2	0.9999954	8.95865	.9606929	-91.13362	-27.04135	-52.80729
3	0.9999926	4.506572	.8750298	-45.53956	-13.49343	-26.37640

Table 4.7 presents the results of the IPS unit root tests. The null hypothesis of each test is that the variable has a unit root while the alternative is that the variable is stationary. Firstly, the variables are tested in levels and subsequently on the first differences. The value of the IPS test is not significant in level for all variables, while the value in first difference is all significant. The results indicate that all variables are non stationary in level and stationary in first differences.

Table 4.7: Panel unit root tests (IPS test)

Series	level	first difference
lnasset	0.1324	-6.5403***
lngcap	6.7837	-1.5259*
lnpov	2.8278	-8.9518***

Notes: * significant at the 10% level, *** significant at the 1% level. H_0: unit root.

4.3.1.2 Panel Cointegration

Because the variables are *I(1),* cointegration tests to examine the presence of a long-run stable relationship between rural bank assets and regional economic growth can be carried out (equation (9) and equation (10)). It should be noted that rural bank assets is an endogenous variable. Table 4.8 presents the results of Pedroni panel cointegration tests where the null hypothesis of a Pedroni cointegration test is that there is no cointegration between variables, while the alternative hypothesis is that variables in the model are cointegrated.

Table 4.8: Pedroni cointegration

lngcap* and *lnasset			***lnpov* and *lnasset***		
Stats.	**Panel**	**Group**	**Stats.**	**Panel**	**Group**
v	7.525326***		v	3.326737***	
rho	-1.470639	0.399654	rho	-3.385417***	-0.591699
t	-0.629489	-2.327888**	t	-4.961486***	-5.409484***
adf	-1.907560**	-3.326657*	adf	-3.754801***	-3.480202***

Notes: * significant at the 10% level ** significant at the 5% level, *** significant at the 1% level. IPS and Fisher-type tests, H_0: no cointegration.

In this study, the assumption is that disturbances in panel data models are cross-sectionally independent. Gallin (2003) stated that the underlying assumption of Pedroni's tests validity is that any cross-sectional correlations are adequately captured by an aggregate time effect. Pesaran (2004) added that cross-sectionally independence is particularly found in panel data with large cross section dimension. That kind of panel data is the data used in this study, short time-series (T) and large cross-sections (N).

Neal (2013) pointed out that different Pedroni test statistics can give contradictory results. Therefore, assessing which of the statistics are the most reliable is not straightforward. Pedroni (1999) stated that the group and panel ADF statistics have the best power properties when T<100, whereas the panel-*v* and group-*rho* statistics perform comparatively worse. Table 4.8 shows that, for *lngcap* and *lnasset*, the group and panel ADF statistics are significant. Referring to Pedroni (1999) that the statistics have the best power properties, we can interpret that rural bank assets and growth of regional GDP per capita are co-integrated even though other statistics except for panel-*v* are not significant. For the relationship between *lnpov* and *lnasset*, all statistics are significant except for group-*rho*. Because the majority of the tests are significant, we can interpret that the null hypothesis of no cointegration between rural bank assets and the regional poverty rate can be rejected. Thus, the cointegration tests support the existence of a long-run relationship between rural bank assets and the regional poverty rate.

4.3.1.3 PDOLS and FMOLS

The next step is to estimate equation (11) which is FMOLS and (13) which is DOLS. The estimated coefficient on rural bank assets in equation (11) is positive and significant (Table 4.9). Therefore, we can say that the presence of rural banks increases the growth of regional gross domestic product per capita. We have similar result when we use DOLS. The coefficient of rural bank assets for the DOLS estimation in equation (13) is also positive and significant at the 1% level.

Table 4.9: FMOLS and DOLS estimates

	FMOLS	**DOLS**
Dependent variable	**Coefficient**	**Coefficient**
lngcap	0.171096***	0.147781***
lnpov	-0.189589***	-0.202897***

Notes: *** significant at the 1% level

Employing FMOLS estimation, the coefficient of rural bank assets is negative and significant when we use *lnpov* as the dependent variable. The result of FMOLS is also consistent with the result of DOLS when we use *lnpov* as the dependent variable, which is that rural bank assets have a negative and significant coefficient. It should be noted that the use of DOLS is preferable because the DOLS estimator out-performs the FMOLS and OLS estimators in estimating cointegrated panel regressions. DOLS performs very well in estimating both homogenous and heterogenous panels, while FMOLS is severely biased for the heterogenous panel (Kao & Chiang, 1999).

4.3.1.4 Granger Causality Test

Panel Granger causality can be carried out using Eviews software. The Granger causality test is conducted using a vector error-correction model because the variables are co-integrated.

Equations (23) and (24) express the long-run as well as short-run associations between *lngcap* and *lnasset*. The first coefficient, C(1), represents the speed of adjustment. It should be negative and significant for the model to be correct. The negative signs imply that the series cannot drift too far apart and convergence is achieved in the long-run. Each ECT coefficient indicates that a deviation from long-run equilibrium value in one period is corrected in the next period by the value (size) of that coefficient.

$$\Delta lngcap_{it} = \lambda_{1i}(lngcap_{it-1} - 6.72408766912 lnasset_{it-1} - 18.2639272151) + \theta_{11i1}\Delta lngcap_{i,t-1} + \theta_{11i2}\Delta lngcap_{i,t-2} + \theta_{12i1}\Delta lnasset_{i,t-1} + \theta_{12i2}\Delta lnasset_{i,t-2} + u_{1it} \quad (23)$$

$$\Delta lnasset_{it} = \lambda_{2i}(lnasset_{it-1} - 0.148719060371 lngcap_{it-1} + 2.7161940941) + \theta_{21i1}\Delta lnasset_{i,t-1} + \theta_{21i2}\Delta lnasset_{i,t-2} + \theta_{22i1}\Delta lngcap_{i,t-1} + \theta_{22i2}\Delta lngcap_{i,t-2} + u_{2it} \quad (24)$$

The values of all coefficients and their probabilities are presented in Table 4.10. In equations (23) and (24), λ_{1i} and λ_{2i} show the speed of adjustment of *lngcap* and *lnasset* in the long-run. θ_{11i1}, θ_{11i2}, θ_{12i1}, θ_{12i2}, θ_{21i1}, θ_{21i2}, θ_{22i1} and θ_{22i2} are short-run causality coefficients of respective variables, while u_{1it} and u_{2it} are constant terms. λ_{1i} in equation (23) is negative but not significant, implying that there is no long-run causality from *lnasset* to *lngcap*. In equation (24), λ_{2i} is negative and significant, implying that long-run causality exists from *lngcap* to *lnasset*. That means, in the long-run, in Indonesia, the growth of regional GDP Granger-causes the development of rural banks.

Table 4.10: Coefficients and probability values equations (23) and (24)

lnasset → lngcap		
	Coefficient	**Probability**
λ_{1i}	-0.000461	0.3836
θ_{11i1}	-0.010025	0.9219
θ_{11i2}	0.024170	0.8144
θ_{12i1}	0.000951	0.9561
θ_{12i2}	0.021173	0.2132
u_{1it}***	0.034465	0.0000
lngcap → lnasset		
λ_{2i}***	-0.053415	0.0000
θ_{21i1}	-0.033023	0.5330
θ_{21i2}	0.067353	0.1964
θ_{22i1}*	0.573488	0.0677
θ_{22i2}	-0.128742	0.6833
u_{2it}***	0.138572	0.0000

Notes: * significant at the 10% level, *** significant at the 1% level

Equations (25) and (26) express the long-run as well as the short-run associations between *lnpov* and *lnasset*:

$$\Delta lnpov_{it} = \lambda_{1i}(lnpov_{it-1} + 1.90014728259 lnasset_{it-1} + 8.54368842959) + \theta_{11i1}\Delta lnpov_{i,t-1} + \theta_{11i2}\Delta lnpov_{i,t-2} + \theta_{12i1}\Delta lnasset_{i,t-1} + \theta_{12i2}\Delta lnasset_{i,t-2} + u_{1it} \quad (25)$$

$$\Delta lnasset_{it} = \lambda_{2i}(lnasset_{it-1} + 0.526274994136 lnpov_{it-1} + 4.49632957818) + \theta_{21i1}\Delta lnasset_{i,t-1} + \theta_{21i2}\Delta lnasset_{i,t-2} + \theta_{22i1}\Delta lnpov_{i,t-1} + \theta_{22i2}\Delta lnpov_{i,t-2} + u_{2it} \quad (26)$$

Table 4.11 shows long-run causal relationships between *lnasset* and *lnpov*. There is no long-run causality from *lnasset* to *lnpov*. However, long-run causality exists from *lnpov* to *lnasset*. The results imply that, in the long-run, in Indonesia, the regional poverty rate Granger-causes the development of rural banks.

Table 4.11: Coefficients and probability values equations (25) and (26)

lnasset → lnpov		
	Coefficient	**Probability**
λ_{1i}	0.000943	0.6391
θ_{11i1}	0.015291	0.7922
θ_{11i2}	-0.029461	0.5523
θ_{12i1}	-0.007974	0.6713
θ_{12i2}	0.006443	0.7242
u_{1it}***	-0.037745	0.0000
lnpov → lnasset		
λ_{2i}***	-0.055248	0.0000
θ_{21i1}	-0.036735	0.4909
θ_{21i2}	0.069171	0.1822
θ_{22i1}*	-0.018042	0.9128
θ_{22i2}	-0.118170	0.4009
u_{2it}***	0.148224	0.0000

The combined short-run causality analysis is conducted by testing the Wald Statistics for the respective restrictions. Table 4.12 shows that the null hypotheses for equations (23), (24), (25), and (26) are not rejected on the bases of Chi square and p-value of the Wald test. The results imply that short-run causality does not exist for *lnasset* to *lngcap*, *lngcap* to *lnasset*, *lnasset* to *lnpov*, and *lnpov* to *lnasset*.

Table 4.12: Short-run causality in VECM construction

Null hypothesis	**Restriction**	**p-value**
lnasset does not cause *lngcap*	$\theta_{12i1} = \theta_{12i2} = 0$	0.4600
lngcap does not cause *lnasset*	$\theta_{22i1} = \theta_{22i2} = 0$	0.1484
lnasset does not cause *lnpov*	$\theta_{12i1} = \theta_{12i2} = 0$	0.8555
lnpov does not cause *lnasset*	$\theta_{22i1} = \theta_{22i2} = 0$	0.6939

Notes: *** significant at the 1% level

4.3.2 Sensitivity Analysis

In this study, sensitivity analysis is carried out by comparing the results from all regions to the results from analysis based on a regional group (developed regions, intermediate developed regions, and less-developed regions). In addition, the results from bi-variate causality analysis are compared to the results of tri-variate causality analysis.

4.3.2.1 Regional Group Analysis

In view of possible heterogeneity in the stages of economic development, the regions in this study are classified into three groups: less developed, intermediate developed, and developed regions, based on the average regional GDP over the period 2000-2014. This classification is also found in the study of Meslier-Crouzille et al. (2011). Regions with high regional GDP are Jakarta, West Java, and East Java. Regions with medium regional GDP are Riau and Central Java. The rest fall into the low regional GDP category. The classification is conducted using a simple statistic calculation (Table 4.13).

Table 4.13: Regions by regional GDP (tertiles)

Less Developed	Intermediate Developed	Developed
Aceh, North Sumatra, West Sumatra, Jambi, South Sumatra, Bengkulu, Lampung, Yogyakarta, Bali, West Nusa Tenggara, East Nusa Tenggara, West Kalimantan, Central Kalimantan, South Kalimantan, East Kalimantan, North Sulawesi, Central Sulawesi, South Sulawesi, Papua	Riau, Central Java	Jakarta, West Java, East Java

Panel unit root tests for each classification are shown in Table 4.14. The results indicate that all variables, except for *lngcap* in less developed regions and *lnasset* for intermediate regions are non stationary in level and stationary in first differences.

Table 4.14: Unit root tests

Series		Less developed	Intermediate	Developed
lnasset	level	0.74228	-0.8295	-1.05737
	first diff.	-6.22732***	-0.19901	-1.40184*
lngcap	level	6.69123	1.28001	1.28001
	first diff.	-0.49054	-2.03040**	-2.03040**
lnpov	level	2.62331	1.03549	1.03549
	first diff.	-6.29611***	-4.78186***	-4.78186***

As shown in Table 4.15, *lngcap* and *lnasset* are co-integrated for less developed regions. The long-run relationship between *lnpov* and *lnasset* also can only be found in less developed regions.

Table 4.15: Results of Pedroni panel cointegration test

Less Developed					
lngcap* and *lnasset			***lnpov* and *lnasset***		
Stats.	**Panel**	**Group**	**Stats.**	**Panel**	**Group**
v	7.064652***		v	2.392999**	
rho	-1.002945	0.630333	rho	-2.626521***	-0.469740
t	-0.022668	-1.799624**	t	-3.783454***	-4.842553***
adf	-1.474566*	-3.158771***	adf	-2.822326***	-2.670269***
Intermediate Developed					
lngcap* and *lnasset			***lnpov* and *lnasset***		
Stats.	**Panel**	**Group**	**Stats.**	**Panel**	**Group**
v	1.569070		v	0.431018	
rho	-0.982577	-0.165083	rho	-0.578414	0.230316
t	-1.459553*	-1.129769	t	-1.444101*	-1.022734
adf	-0.933358	-0.480911	adf	-0.723143	-0.190467
Developed					
lngcap* and *lnasset			***lnpov* and *lnasset***		
Stats.	**Panel**	**Group**	**Stats.**	**Panel**	**Group**
v	1.569070*		v	0.431018	
rho	-0.982577	-0.165083	rho	-0.578414	0.230316
t	-1.459553*	-1.129769	t	-1.444101	-1.022734
adf	-0.933358	-0.480911	adf	-0.723143	-0.190467

FMOLS and DOLS can only be applied to less developed regions because the variables are co-integrated. Table 4.16 shows the DOLS estimates. The estimated coefficient of rural bank assets is positive and statistically significant when the dependent variable is *lngcap*. For the equation with *lnpov* as the dependent variable, the coefficient of rural bank assets is negative and statistically significant. The sign of the coefficient carries the sign as expected. It implies that the presence of rural banks reduces the regional poverty rate in less developed regions.

Table 4.16: FMOLS and DOLS estimates (less developed regions)

	FMOLS	DOLS
Dependent variable	**Coefficient**	**Coefficient**
lngcap	0.167730***	0.135436***
lnpov	-0.203903***	-0.207306***

Notes: *** significant at the 1% level

The panel causality test also can only be applied to less developed regions. As shown in Table 4.17, short-run causality occurs from *lngcap* to *lnasset*. Long-run causality occurs from *lngcap* to *lnasset* and from *lnpov* to *lnasset*. This means, regional economic growth supports the development of rural banks, but not the other way around. Moreover, it seems that rural banks serve the correct customers which are poor people, reflected by the existence of long-run causality from *lnpov* to *lnasset* in this study. The expected relationship is that the development of rural banks can support regional economic growth and reduces regional poverty rates. Such relationship is not found in this study. The result indicates that regional economic growth does not rely on the development of financial sector, particularly rural banks. Nasrudin and Soesilo (2004) also found that commercial banks had no contribution to regional economic growth over the period 1987-1998. The development of rural banks has no significant contribution to reduce regional poverty rates might be because there are other poverty reduction programs carried out by the national and regional government, such as a subsidised rice programme for low-income households (raskin) or a social assistance programme that provides financial aid to very poor households.

Table 4.17: Panel causality test

	Short-run	Long-run
lnasset → lngcap	0.4828	0.000651
lngcap → lnasset	1.812516	-0.051936***
lnasset → lnpov	0.999854	0.002327
lnpov → lnasset	0.696946	-0.053743***

Notes: *** significant at the 1% level

4.3.2.2 Tri-variate Causality

Caporale, Howells, and Soliman (2004), Luintel and Khan (1999), and Odhiambo (2009) emphasised the weakness associated with the bivariate causality framework. Causality studies based on the trivariate framework are considered more reliable than the bivariate framework as the introduction of a third important variable can change both the inference and the magnitude of the estimates (Caporale et al., 2004; Caporale & Pittis, 1997). Caporale and Pittis (1997) explained the mechanism of the bivariate and trivariate framework. Suppose we have previous bivariate tests that indicate some casual relationships between financial development and economy growth. We then include a third variable, the poverty rate, which was omitted in the bivariate model but could be causally related to financial development and growth. If the poverty rate does not cause financial development and growth, the previously drawn inferences are valid. A problem arises if the poverty rate causes either financial development or growth. In these circumstances, the following apply (Caporale & Pittis, 1997):

1. If the poverty rate affects both financial development and growth, inference on causality between financial development and growth is invalid in both directions;
2. If the poverty rate affects financial development (or growth only), causality inference is invalid in one direction, growth causing financial development (or financial development causing growth).

The results obtained in the earlier bivariate framework (financial development and economic growth only) should change if the third variable is ‘relevant’ and condition (1) or (2) are met. The essential condition for inference is invariant to the previous model selection if the omitted variable does not cause either financial development or economic growth. If it is caused by either of the two, but does not cause them, then inference in the bivariate or trivariate system is equivalent.

The tri-variate Granger causality model based on the error-correction mechanism can be expressed as follows:

$$lngcap_{it} = \theta_{1j} + \lambda_{1i}EC_{i,t-1} + \sum_{k=1}^{m}\theta_{11ik}lngcap_{i,t-k} + \sum_{k=1}^{m}\theta_{12ik}lnasset_{i,t-k} + \sum_{k=1}^{m}\theta_{13ik}lnpov_{i,t-k} + u_{1it} \quad (27)$$

$$lnasset_{it} = \theta_{2j} + \lambda_{2i}EC_{i,t-1} + \sum_{k=1}^{m}\theta_{21ik}lngcap_{i,t-k} + \sum_{k=1}^{m}\theta_{22ik}lnasset_{i,t-k} + \sum_{k=1}^{m}\theta_{23ik}lnpov_{i,t-k} + u_{2it} \quad (28)$$

$$lnpov_{it} = \theta_{3j} + \lambda_{3i}EC_{i,t-1} + \sum_{k=1}^{m}\theta_{31ik}lngcap_{i,t-k} + \sum_{k=1}^{m}\theta_{32ik}lnasset_{i,t-k} + \sum_{k=1}^{m}\theta_{33ik}lnpov_{i,t-k} + u_{3it} \quad (29)$$

where $lngcap$ is the growth of regional GDP per capita, $lnpov$ is change in the poverty rate, $lnasset$ is the total assets of regional rural banks, EC is the error correction term which is the residual from the cointegration equation lagged one period, and m, the lag length, is chosen optimally for each region using the Schwarz Bayesian Criterion. The sources of causation can be identified by testing for the significance of the coefficients of the dependent variables in equations (27), (28), and (29). For short-run causality, the null hypothesis H_0: $\theta_{12ik} = 0$ for all *i* and *k* in equation (27), or H_0: $\theta_{22ik} = 0$ for all *i* and *k* in equation (28), or H_0: $\theta_{32ik} = 0$ for all *i* and *k* in equation (29). The presence of long-run causality can be established by testing H_0: $\lambda_{1i} = 0$ for all *i* in equation (27) or H_0: $\lambda_{2i} = 0$ for all *i* in equation (28) or H_0: $\lambda_{3i} = 0$ for all *i* in equation (29).

However, if there is no cointegration between variables, the model specification is as follows:

$$lngcap_{it} = \theta_{1j} + \sum_{k=1}^{m}\theta_{11ik}lngcap_{i,t-k} + \sum_{k=1}^{m}\theta_{12ik}lnasset_{i,t-k} + \sum_{k=1}^{m}\theta_{13ik}lnpov_{i,t-k} + u_{1it} \quad (30)$$

$$lnasset_{it} = \theta_{2j} + \sum_{k=1}^{m}\theta_{21ik}lngcap_{i,t-k} + \sum_{k=1}^{m}\theta_{22ik}lnasset_{i,t-k} + \sum_{k=1}^{m}\theta_{23ik}lnpov_{i,t-k} + u_{2it} \quad (31)$$

$$lnpov_{it} = \theta_{3j} + \sum_{k=1}^{m} \theta_{31ik} lngcap_{i,t-k} + \sum_{k=1}^{m} \theta_{32ik} lnasset_{i,t-k} + \sum_{k=1}^{m} \theta_{33ik} lnpov_{i,t-k} + u_{3it} \quad (32)$$

Table 4.18: Pedroni cointegration

lngcap, lnasset, lnpov			***lnpov, lngcap, lnasset***		
Stats.	**Panel**	**Group**	**Stats.**	**Panel**	**Group**
v	2.261363		v	0.552500	
rho	-0.640342	0.037287	rho	-0.419307	0.197287
t	-2.561133**	-2.115913**	t	-1.709130**	-1.412163*
adf	-1.803953**	-1.126716	adf	-0.332940	0.013298

Notes: * significant at the 10% level, ** significant at the 5% level. H_0: no cointegration.

Table 4.18 shows little evidence of cointegration between *lngcap, lnasset*, and *lnpov*. Little evidence of cointegration is also found in the relationship between *lnpov*, *lngcap*, and *lnasset*.

4.3.2.3 Second Generation Panel Unit Root and Cointegration Tests

IPS unit root tests (Im et. al., 2003) and Pedroni cointegration tests (Pedroni, 1999) are considered as first generation tests. Pesaran (2007) introduced the second generation tests of unit root, which are cross-sectionally augmented ADF statistics (CADF) and cross-sectionally augmented IPS (CIPS). To test the robustness of IPS unit root tests, CADF and CIPS are employed to the datasets.

Table 4.19: Results of IPS, CADF and CIPS unit root tests

Variable	**IPS**		**CADF**		**CIPS**	
	Level	**First diff.**	**Level**	**First diff.**	**Level**	**First diff.**
lnasset	0.1324	-6.5403***	-1.025	0.027**	-2.297*	-3.311***
lngcap	6.7837	-1.5259*	2.478	0.470	-1.102	-1.929
lnpov	2.8278	-8.9518***	-7.910***	-8.348***	-3.780***	-4.106***

Notes: * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

CIPS tests need balanced panel datasets. Because the data in this study are unbalanced, we remove three regions from the datasets in order to get a balanced panel. It gives us a total of 24 regions as cross sections. Table 4.19 shows the results of IPS, CADF, and

CIPS tests. The lag length for all tests and all variables is 1. For *lnasset*, IPS and CIPS tests give the same results. Meanwhile, CADF and CIPS give the same results for *lngcap*. All tests have the consistent results for *D.lnpov*. All variables are mostly *I(1)*.

Table 4.20: Results of Pedroni and Westerlund cointegration

lngcap* and *lnasset					***lnpov* and *lnasset***				
Pedroni			**Westerlund**		**Pedroni**			**Westerlund**	
Stats.	**Panel**	**Group**	**Stats.**	**Z-value**	**Stats.**	**Panel**	**Group**	**Stats.**	**Z-value**
v	7.525***		Gt	-1.782	v	3.3267***		Gt	-3.228***
rho	-1.4706*	0.3997	Ga	-7.332	rho	-3.3854***	-0.5917	Ga	-8.599*
t	-0.6295	-2.3279**	Pt	-6.563	t	-4.9615***	-5.4094***	Pt	-13.762***
adf	-1.9076**	-3.3267*	Pa	-6.040**	adf	-3.7548***	-3.4802***	Pa	-10.619***

Notes: * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

Results of Pedroni and Westerlund cointegration tests are shown in Table 4.20. Cointegration exists between *lngcap* and *lnasset*, as well as between *lnpov* and *lnasset* when Pedroni tests are implemented. However, Westerlund tests show that only *lnpov* and *lnasset* are co-integrated.

4.3.2.4 Cointegration with Structural Break

Gregory and Hansen (1996a) stated that when conventional tests fail to reject the null hypothesis of no cointegration, but their test rejects it, it implies that structural change is present in the pattern of the variable comovements. Results of the Gregory and Hansen test can be found in Appendix 1. The test is carried out individually for each region using four models: change in level (GH-1), change in trend (GH-2), change in slope and coefficient (GH-3), and change slope, coefficient, and trend (GH-4). The results of the test show clearly that evidence of cointegration between *lngcap* and *lnasset* and between *lnpov* and *lnasset* is found in the majority of the regions even when we allow for a structural break.

The break point is different for each region. In the cointegration between *lngcap* and *lnasset*, the most break points are 2005, 2006, 2007 and 2012. The break year in 2005

corresponds to several major natural disasters that happened in Indonesia during the year. In 2005, there were a major earthquake and a massive tsunami in Sumatra Island.[36] In addition, the government raised the fuel price in 2005. The year of 2006 marked the event of a major earthquake in Yogyakarta, Java Island. In 2012, Indonesian export value decreased due to the impact of the slowing global economy and the drop in commodity trading prices.

In the cointegration between *lnpov* and *lnasset*, the most break points are 2005, 2007, 2008 and 2009. The Global Financial Crisis in 2008 affected the poverty rate in Indonesia. The important event in 2009 that might affect the poverty rate in Indonesia was a large earthquake in West Sumatra.

4.3.3 Discussion

The results of this study indicate that, in Indonesia, there is a long-run relationship between rural bank assets, growth in real per capita GDP, and poverty rates. All of the variables are cointegrated. The estimation of the long-run relationship is performed using fully modified ordinary least-squares (FMOLS) and the dynamic ordinary least-squares (DOLS). The results of DOLS and FMOLS indicate that rural bank assets have a positive and statistically significant impact on growth of regional GDP per capita. When the dependent variable is poverty, the coefficient of rural bank assets is negative and statistically significant.

When two variables are cointegrated, then it suggests that there should be Granger causality in at least one direction. In this study, rural bank assets are said to Granger-cause regional GDP per capita if lagged values of rural bank assets are helpful in predicting regional GDP per capita above and beyond the information contained in lagged values of regional GDP per capita alone. In this study, there is no evidence that rural bank assets Granger-cause regional GDP per capita and the regional poverty rate.

[36] The massive tsunami hit Aceh in Sumatra Island in the end of 2004. The tsunami claimed more than 230,000 lives. Also in Sumatra Island, on Mach 2005, Nias was hit by a major earthquake which killed at least 905 people.

The results show that the direction is the other way around. Regional GDP per capita Granger-cause rural bank assets and the regional poverty rate Granger-cause rural bank assets.

Previous studies have found bi-directional causality between commercial bank loans and economic growth at the national level in Indonesia (see Hasiholan & Adiningsih, 2003; Hidayati, 2003; Inggrid, 2006). Rural banks, based on the results of this study, have unidirectional causality, from regional economic growth to rural banks and from regional poverty to rural banks.

It should be noted that the results in this study are case-sensitive. Results of regional classification analysis and tri-variate analysis are not similar to results of all-region analysis. The variables are not co-integrated in the tri-variate analysis. In regional classification analysis, the variables are only co-integrated for less-developed regions. The sensitivity of the results are often explained by the difficulty to specify correctly the origin of non-stationary variables (Dufrénot, Mignon, & Peguin-Feissolle, 2008).

In the region-classification analysis, the variables are cointegrated only for less developed regions. DOLS and FMOLS estimations give similar results to the estimation using the full sample. For less developed regions, causality runs from regional growth to rural bank assets and from regional poverty to rural bank assets – a similar result as found in full sample analysis. The findings imply that rural banks are more important for less developed regions, compared to intermediate and developed regions.

The use of Pesaran CADF and CIPS for unit root tests is to check the robustness of first generation unit root tests (IPS and Fisher-type tests). These second generation tests give similar results to the first generation ones. The Westerlund cointegration test is used to check the robustness of the Pedroni test. The Pedroni test shows that both regional GDP and regional poverty have a long-run relationship with rural bank assets, while the Westerlund test shows that only rural bank assets have a long-run relationship with the regional poverty rate. The Gregory Hansen test indicates that the co-integrated

relationship found in the Pedroni test still exists even when we allow a structural break in the variables.

4.4 Summary

This chapter provided evidence of the contribution of rural banks to regional economic growth and regional poverty. From the research that has been carried out, it is possible to conclude that there is evidence of a positive impact of rural bank assets on regional economic development and the regional poverty rate. When we classify Indonesian regions into the three categories of less developed, intermediate, and developed regions, the positive impact is only found in less developed regions. The Granger causality test indicates that lagged values of rural bank assets cannot predict regional GDP per capita and the regional poverty rate. The relationship is the other way around; that is, regional GDP per capita and the regional poverty rate Granger-cause rural bank assets. In Chapter 5, we will investigate the contribution of rural banks when we take into accout local and national regulations supporting the development of SMEs and rural banks.

5 Chapter 5 – Policy Analysis on Rural Bank Development, Economic Growth, and Poverty

Chapter 4 presents empirical results of causality analysis between rural bank assets, regional gross domestic product, and regional poverty. This chapter analyses the strength of the correlation between rural bank development and regional economic growth and between rural bank development and regional poverty. The analyses take into account local regulations aimed to develop rural banks and small and medium enterprises.

Structurally, this chapter consists of five sections. First, it discusses the construction of the models. Next it describes the data. Estimation results are presented in the third section, followed by sensitivity analyses in the fourth section. The last section discusses the results.

5.1 Empirical Model

Some regions have regulations to promote the development of small and medium enterprises (SMEs). There are also regions that have local regulations on rural banks and credit guarantee institutions. Moreover, two regulations have been issued by the Central Bank of Indonesia to increase SME loans and rural bank development. These regulations might or might not affect regional rural bank loan quantity. Therefore, this chapter attempts to analyse the impact of local regulations and national regulations on rural bank assets.

The basic model is replicated from Levine and Zervos (1996). Levine and Zervos examined whether there was strong empirical association between the stock market and long-run growth using two stage least squares (2SLS) regressions. They used the predetermined component of stock market development to explain economic growth. Herger, Hatler and Lobsiger (2007) employed some instrument variables to account for endogeneity in their endeavour to investigate factors determine financial development. They considered colonial history, culture, and geography as predetermined variables.

That means the variables may serve as exogenous variation uncorrelated with stochastic components of endogenous determinants of financial development. Thus, financial development can be estimated by means of 2SLS. This study also employs 2SLS regressions. First, we regress the endogenous regressor against the instruments and other predetermined variables in the system. We then replace this endogenous regressor with its fitted value from the first stage.

The path diagram of the following Figure 5.1 attempts to summarise the relationships between exogenous and endogenous variables in this study:

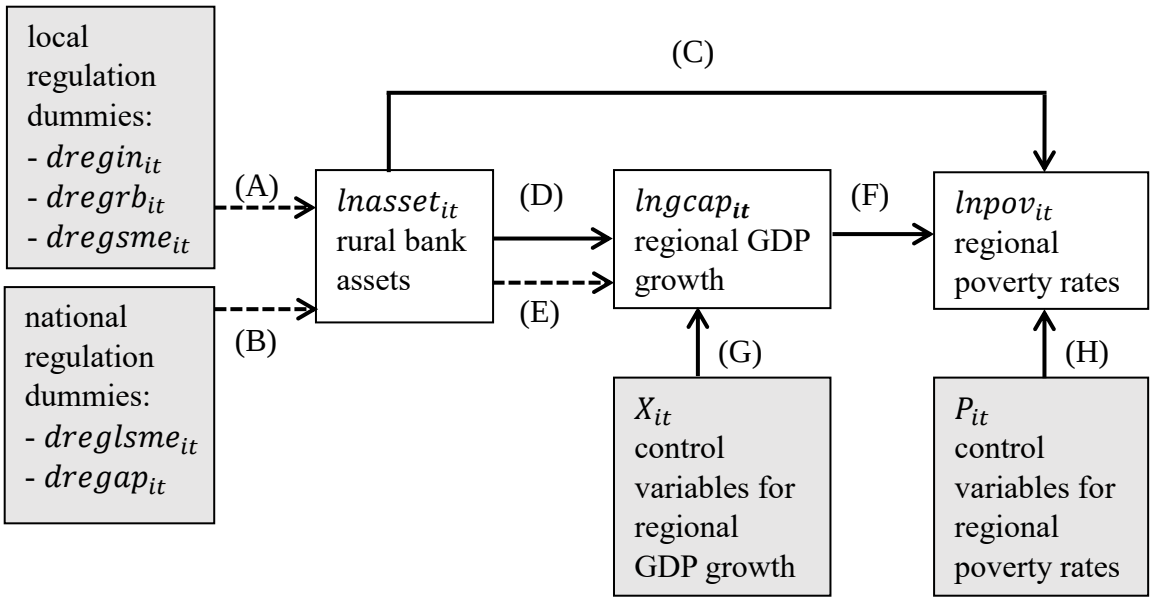

Figure 5.1: Path diagram of relationships between rural bank assets, regional GDP growth and regional poverty rates

We assume that policy (local regulation and national regulation) is exogenous. That means policy is not affected by rural bank assets. This scheme was used by Burnside and Dollar (1997). They assumed that policy is unaffected, contemporaneously, by aid or growth when investigating the relationships among foreign aid, economic policies and growth of per capita GDP. In Figure 5.1, shaded boxes illustrate exogenous variables and unshaded boxes illustrate endogenous variables. Dashed arrows show indirect effect, while solid arrows show direct effect. Local regulation dummies may affect regional GDP growth by developing rural banks (A). Similarly, national regulation dummies may affect regional GDP growth by developing rural banks (B).

Determinants of regional GDP growth and regional poverty rates are endogenous variables, which are designated by unshaded boxes. Path (D) and (F) illustrate the relationship. The development of rural banks may affect regional poverty rates directly (C) and directly through regional GDP growth (E). X_{it} affects regional GDP growth through path (G) and P_{it} affects regional poverty rates through path (H).

The panel data technique is used to estimate the equations. The basic approach to estimating 2SLS with panel data, according Wooldridge (2009), involves two steps: 1) using the fixed effects transformation or first differencing to eliminate the unobserved effects from the equations of interest, and 2) finding instrumental variables for the endogenous variables in the transformed equations. We apply a fixed effects estimator in the panel estimations because there are many different regional units in the data set and each of them has a different intercept. The data processor program is Stata.

The first stage of the regression employs the following empirical model:

$$lnasset_{it} = \alpha_1 + \alpha_2 dregin_{it} + \alpha_3 dregrb_{it} + \alpha_4 dregsme_{it} + \alpha_5 dreglsme_{it} + \alpha_6 dregap_{it} + \alpha_7 X_{it} + \rho_i + \varepsilon_{it} \quad (1)$$

where $lnasset_{it}$ is rural bank assets in the region; $dregin_{it}$ is a dummy variable for local regulation on local credit guarantee institutions; $dregrb_{it}$ is a dummy variable for local regulation on the development of rural banks; $dregsme_{it}$ is a dummy variable for local regulation on the development of SMEs; $dreglsme_{it}$ is a dummy for the central bank regulation that suggests a form of cooperation between rural banks and commercial banks; and $dregap_{it}$ is a dummy variable for central bank regulation in 2004 that obligates commercial banks to provide credits to SMEs.

The second stage empirically evaluates whether rural bank development is strongly linked to regional economic growth and the regional poverty rate. The regression equations are as follows:

$$lngcap_{it} = \beta_0 + \beta_1 lnasset_{it} + \beta_2 X_{it} + \alpha_i + \varepsilon_{it} \quad (2)$$

$$lnpov_{it} = \delta_0 + \delta_1 lnasset_{it} + \delta_2 lngcap_{it} + \delta_3 P_{it} + \sigma_i + \epsilon_{it} \quad (3)$$

where $lngcap_{it}$ is growth of regional gross domestic product, $lnpov_{it}$ is the number of poor people in the region, β_1 and δ_1 are the estimated coefficient on $lnasset$, X and P are set of control variables, β_2 is a vector of coefficients on the variables in X, δ_2 are the estimated coefficient on $lngcap_{it}$, δ_3 is a vector of coefficients on the variables in P, α_i and σ_i are the region-specific intercepts (i=1….n), ε_{it} and ϵ_{it} are error terms. The goal of the empirical analysis is to assess the strength of the independent partial correlation between rural bank development and regional economic growth, also between rural bank development and poverty. As a consequence, we use a large set of control variables (X and P) to control for a variety of factors that may be associated with economic growth and poverty, respectively.

X_{it} includes regional openness, regional labour force, decentralisation, and regional construction. According to Todaro and Smith (2012), labour force and capital stock are considered as important components of economic growth. Other control variables are based on Mahi, Resosudarmo, and Adirinekso (2002). They argued that regional economic growth is determined by endowment capacity, openness of the economy, and government policy. Capital stock and labour force are regional endowment capacity. We use total export minus import to measure openness of the economy. As a proxy of government policy, we use decentralisation. P_{it} includes regional inflation, regional openness, and decentralisation. Higher openness and decentralisation could reduce poverty (Jütting et al., 2004; Rosenzweig, 2003). We add another control variable which is inflation, because higher inflation generally leads to higher poverty (Cardoso, 1992).

5.2 Data

The studied period is from 2000 to 2014. The data set consists of 27 provinces in Indonesia. The data set could not start prior to 2000 as the organisation of regional data in Indonesia was different. The macroeconomic regional data (regional GDP per capita and the poverty rate) is from Statistics Indonesia (*Badan Pusat Statistik*/BPS). Bank

regional data are from Banking Statistics Indonesia (*Statistik Perbankan Indonesia*/SPI). Data of regional budget statements are compiled from the Ministry of Finance Republic of Indonesia.

Description of the Variables

Assets of rural banks ($lnasset$)

The variable is total rural bank assets in the region. Data for rural bank assets are missing for Southeast Sulawesi 2000-2003 and for North Maluku 2000-2004. The data are compiled from SPI. The unit is in billion Indonesian Rupiah (IDR). The data are in nominal values, and we deflate the value with GDP deflator (base year 2000).

Local regulation dummies ($dregin, dregrb, dregsme$)

The regulation dummies attempt to capture local regulations supporting the development of SME loans and/or the development of rural banks. The following list of regional regulations (Table 5.1) is composed based on information from the Ministry of Home Affairs of the Republic of Indonesia. The regulations can be classified into regulations on the empowerment of SMEs (*dregsme*), regulations on rural bank development (*dregb*), and regulations on provincial credit guarantee institutions (*dregin*).

Regulations on the empowerment of SMEs were issued because the local government was aware of the role of enterprises in supporting the local economy and thereby creating jobs. In the regulations, the government committed to support the development of the enterprises by encouraging them to seek help and/or advice from the Provincial Office of SMEs and Cooperatives. This office is the provincial working unit under the Ministry of SMEs and Cooperatives of Indonesia. The office can facilitate enterprises, including but not limited to promoting and marketing their products, advancing their technologies and dealing with issues over intellectual property rights. Over the study period, only eight regions had the SME regulation. They were Aceh, North Sumatra, West Java, Bali, East Nusa Tenggara, Central Kalimantan, East Kalimantan, and South Sulawesi.

Some of the local governments attempted to support the development of rural banks by establishing local government-owned rural banks. Assets of these banks were backed up by the government. The money to support these banks was taken from local government budgets. The local governments officially stated the amount of the supported money in the local regulation. Five regions having this kind of regulation: South Sumatra, West Java, East Java, West Nusa Tenggara, and South Kalimantan.

To mitigate the occurrence of bad SME loans and to increase the value of the loans, some local governments established provincial credit guarantee institutions. These institutions take over the loan payment on behalf of the debtors when the debtors are unable to fulfil their obligation. The debtors pay insurance premiums to the institution to get their loan insured. This institution can also serve as "collateral" for SME loans debtors. When the debtors apply for the loan in a bank, they and the bank also apply for a loan bond from the credit guarantee institution. The bank can also apply for the loan bond on behalf of its customers. The credit guarantee institution can guarantee loans from financial institutions and non-bank financial institutions, such as cooperatives. Only 10 regions in Indonesia have a provincial credit guarantee institution. These regions are West Sumatra, Riau, South Sumatra, West Java, East Java, West Nusa Tenggara, Central Kalimantan, South Kalimantan, East Kalimantan, and Central Sulawesi. The establishment of this institution is officially stated in the regions' local regulation.

The dummy variables are constructed as follows:

1. *dregin*: 1 if a region has a regulation on the establishment of provincial credit insurance guarantee, 0 = otherwise;
2. *dregrb*: 1 if a region has a regulation to promote the development of rural banks, 0 = otherwise; and
3. *dregsme*: 1 if a region has a regulation to promote the development of SMEs, 0 = otherwise.

Table 5.1: Local regulations on the development of SMEs and rural banks

No	Province	Regulations		
		The Development of SMEs	The Development of Rural Banks	Provincial Credit Guarantee Institutions
1	Aceh	March 2004	-	-
2	North Sumatra	September 2004	-	-
3	West Sumatra	-	-	December 2012
4	Riau	-	-	June 2010
5	Jambi	-	-	-
6	South Sumatra	-	May 2009	June 2012
7	Bengkulu	-	-	-
8	Lampung	-	-	-
9	DKI Jakarta	-	-	-
10	West Java	August 2010	December 2006	December 2005
11	Central Java	-	-	-
12	DI Yogyakarta	-	-	-
13	East Java	-	June 2000	October 2009
14	Bali	March 2012	-	-
15	West Nusa Tenggara	-	December 2007	December 2008
16	East Nusa Tenggara	February 2004	-	-
17	West Kalimantan	-	-	-
18	Central Kalimantan	December 2008	-	December 2012
19	South Kalimantan	-	August 2004	October 2012
20	East Kalimantan	February 2012	-	June 2012
21	North Sulawesi	-	-	-
22	Central Sulawesi	-	-	October 2009
23	South Sulawesi	April 2006	-	-
24	Southeast Sulawesi	-	-	-
25	Maluku	-	-	-
26	North Maluku	-	-	-
27	Papua	-	-	-

Source: Ministry of Home Affairs of the Republic of Indonesia

National regulation dummies ($dreglsme, dregap$)

Two important regulations issued by the central bank are the regulation in 2004 that obligates commercial banks to provide SME loans that are the exclusive market segment serviced by rural banks (*dreglsme*) and the regulation in 2011 that suggests cooperation between rural banks and commercial banks (*dregap*). The hypothesis is that the former regulation will reduce the number of rural bank loans. Meanwhile, for the latter regulation, the hypothesis is that it will improve the number of rural bank loans.

The dummy variables are constructed as follows:

1. *dreglsme*: 1 for periods after the implementation of Bank Indonesia regulation on SME loans, 0 = otherwise;
2. *dregap*: 1 for periods after the implementation of Bank Indonesia regulation on APEX program, 0 = otherwise

Dummy for regional development banks (*drdb*)

We put a dummy of regional development banks in the model to control the existence of these regional development banks. These banks are commercial banks that are owned by local government. Nonetheless, not all regions have their own regional development bank. From the 27 samples in this study, one sample (North Maluku) does not have its own regional development bank. This bank and rural bank seem to have one similiar objective which is to promote regional economic growth. However, in some regions, the regional development bank merely acts as a cashier for the local government. The dummy variable is created to check if regional development banks have a significant effect on regional economic growth and regional poverty.

Regional gross domestic product per capita ($lngcap$)

Regional gross domestic product (regional GDP) per capita is the total of the final output of goods and services produced by residents and non-residents of a region, divided by population in the region. The data are compiled from national BPS and the units are in millions of IDR. BPS presents regional GDP in constant price and current price. Regional GDP in constant price uses value in the year of 2000 as its base year. Growth of regional GDP is calculated using a natural logarithm.

Labour force (*labour*)

To analyse the relation between rural bank development and regional growth, other determinants of the growth have to be taken into account. Mahi, et al. (2002) suggested several variables that are assumed to determine regional growth in Indonesia. The variables can be classified as endowment capacity (natural, human, and fiscal resources), openness of the economy (volumes of traded goods), and government policy (decentralisation, wage[37]). To measure endowment capacity, we use the aggregate labour force in the region. The labour force is defined as the number of people aged 15 years old and over who, in the previous week, were working, temporarily absent from work but having jobs, and those who did not have work and were looking for work. The data are gathered from national BPS.

Construction (*cons*)

This variable is used to measure the capital stock which is considered to be an important component of economic growth according to Todaro and Smith (2012). The World Bank (1994) also argued that a country's success and failure can be determined by the adequacy of its infrastructure because it helps to diversify products, expand trade, cope with population growth, reduce poverty, and improve environmental conditions. Construction activities include, for example, building construction, roads, bridges, railways, tunnels, subways, viaducts and drainage, sanitary construction, dams, electricity generating buildings, distribution, and transmission and communication networks. The activities include planning, preparation, execution, demolition, and repair of buildings and other construction. Construction value is the value of work completed by a contractor during a period of enumeration based on a contract value on the letter of contract and the project realized by the contractor. The units are in thousand IDR. The data are in nominal values, therefore we deflate the data with GDP deflator in 2000 to get real-valued construction. After that, we divide the value with population in the region to measure construction per capita. The data are from national BPS.

Regional trade (*trade*)

Openness measures total trade of goods and services in the region. This variable is obtained by calculation of export minus import in the regions. The value of both export

[37] The regional governments in Indonesia have the autonomy to fix minimum wages at the regional level.

and import are obtained from national BPS. The data are in billion USD, presented in real value.

Decentralisation (dec)

In 1999, the Government of Indonesia enacted a law on regional autonomy as well as a law on fiscal balance between the central and local governments. Based on this law, local governments now have fiscal autonomy. The sources of a regional government's revenue are original local revenues, balance funds, regional loans, and other legal revenues. Original local revenues consist of local taxes, regional retributions, profits from locally owned enterprises, and/or other local wealth, and other legal revenues. Balance funds refer to the level of transfer between the central and provincial as well as district governments. They consist of a provincial and district share of the revenues from land and property tax, as well as the tax on acquisition of land, building rights, natural resources (forestry, public mining, fisheries, oil mining, and gas), the General Allocation Fund (GAF), and the Special Allocation Fund (SAF). GAF varies amongst provinces, depending on local needs and the economic potential of the province. SAF is designed to help needy areas. It includes a reforestation fund and can also be used for unpredicted or national priority needs. GAF and SAF are grants from central government to local government. According to the law on Fiscal Balance between Central and Local Government, the grants are intended to help local governments finance their needs so that there is less inequality between regions. The formula used to calculate the decentralisation is replicated from Mahi et.al. (2002):

$$dec_{nominal} = 1 - \left(\frac{grant_{nominal}}{total\ expenditure_{nominal}}\right)$$

Based on the formula, a region with $dec = 1$ means the region is self-sufficient. In other words, the region can finance its expenditure with its own local revenue. In contrast, if the value of dec is closer to 0, the region is highly depended on the central government grant. It can be concluded that a higher number of dec represents prosperous regions and vice versa. DKI Jakarta, the capital city of Indonesia, has a dec value of between 0.9 and 1, while the number for North Maluku is between 0.2 and 0.4. The average percentage of poor people living in DKI Jakarta and North Maluku between 2000 and 2014 was 3.8 percent and 10.4, respectively. The data are compiled from Directorate General of Budget (DJPK), Ministry of Finance Republic of Indonesia.

The value is in million IDR. We deflate the data with GDP deflator in 2000 to get real-valued decentralisation.

Regional poverty rate ($lnpov$)

To measure poverty, BPS uses the concept of the basic needs approach. Based on this approach, the Indonesian poverty line is the minimum standard expenditure required by an individual to fulfil his/her basic needs for both food and non-food items. In other words, the poverty line is an addition to the food poverty line (FPL) and the non-food poverty line (NFPL). FPL is the expenditure value of food minimum requirements or is equivalent of 2100 kilocalories per capita per day. NFPL is the minimum needs for housing, clothing, education, health, and other basic individual needs. This study uses the Head-Count Index data which measures the percentage of the population that is counted as poor, which is in accordance with the UNDP Human Development Report's definition of absolute poverty. The data are measured as the percentage of poor people in the region. The data is compiled from national BPS.

Inflation (inf)

The Consumer Price Index (CPI) is the indicator of inflation in Indonesia. Since January 2014, CPI has included 82 cities which consist of 33 capital provinces and 49 big cities in Indonesia. Inflation is the percentage change of the yearly CPI. The data is compiled from national BPS.

5.3 Data Analysis and Findings

5.3.1 Descriptive Statistics

The estimated results reported in this study are based on four datasets: all regions, less developed regions, intermediate regions, and developed regions. Classification of the regions is based on regional GDP. Developed regions include Jakarta, West Java, and East Java. Intermediate regions include Riau and Central Java. The other 22 regions are included in the less developed classification.

Table 5.2 provides descriptive statistics of the variables for all categories. The table highlights that there is substantial variation between regions. Poverty and regional gross

domestic product per capita are lower in developed regions, compared to intermediate and less developed regions. Rural banks are more accepted in intermediate and developed regions, shown by the higher mean of rural bank assets. Less developed regions have the highest value of commercial bank loans per capita. The difference between the mean of commercial bank loans per capita in developed regions, intermediate regions, and less developed regions is very high (0.005, 0.003, and 1.383, respectively).

Table 5.2: Summary of the statistics

Var.	Definition	Mean (SD)			
		All regions	**Less dev.**	**Intermediate**	**Developed**
lngcap	Growth of regional gross domestic product per capita (in natural logarithm)	-5.012462 (0.6406251)	-5.128431 (.5560109)	-4.702822 (0.637217)	-4.36845 (0.7736943)
lnpov	Regional poverty rate (in natural logarithm)	-1.957764 (0.5514356)	-1.894491 (0.5164075)	-2.003941 (0.3851482)	-2.388173 (0.6912123)
lnasset	Regional rural bank assets per capita (in natural logarithm)	-5.961781 (1.420973)	-6.10057 (1.482066)	-4.953568 (0.8573031)	-5.643891 (0.8547094)
cloan	Commercial bank loan in a region (does not include SME loan), per capita	0.0063412 (0.0107092)	1.382887 (.0593726)	0.0030546 (0.002911)	0.0051614 (0.0083237)
trade	Export minus import in a region, per capita	1.581779 (4.810755)	0.0068009 (.0.0113768)	3.929328 (3.943705)	0.6918577 (3.652485)
labour	Total labour force in a region, per capita	473.9399 (69.06083)	471.22 (73.03615)	474.3994 (51.31693)	493.5796 (41.47426)
inflation	Changes of year-on-year price in a region	8.349679 (4.261005)	8.414076 (4.383934)	8.486167 (3.922205)	7.786444 (3.652485)
dec	Ratio of total grant over total regional expenditure	0.5946514 (0.2338093)	0.5403474 (0.2200305)	0.7691247 (0.1174027)	0.8741522 (0.0890921)
cons	Value of completed construction work in the region, per capita	0.4501963 (0.4811714)	0.3712129 (0.2159078)	0.4656198 (0.2525359)	1.019126 (1.165009)
dregin	Dummy variable: 1 if a region has a regulation on the establishment of provincial credit insurance guarantee, 0 = otherwise	0.1111111 (0.3146584)	0.066667 (0.2498226)	0.1666667 (0.379049)	0.3333333 (0.4767313)
dregrb	Dummy variable: 1 if a region has a regulation to promote the development of rural banks, 0 = otherwise	0.1160494 (0.3206803)	0.0545455 (0.2274357)	0	0.5111111 (0.505525)
dregsme	Dummy variable: 1 if a region has a regulation to promote the development of SMEs, 0 = otherwise	0.145679 (0.3532205)	0.5757576 (0.494978)	0	0.6666667 (0.4767313)
dreglsme	Dummy variable: 1 for periods after the implementation of Bank Indonesia regulation on SME loans, 0 = otherwise	0.6666667 (0.4719876)	0.6666667 (0.4721204)	0.6666667 (0.4794633)	0.6666667 (0.4767313)
dregap	Dummy variable: 1 for periods after the implementation of Bank Indonesia regulation on APEX program, 0 = otherwise	0.2666667 (0.4427636)	0.2666667 (0.4428882)	0.2666667 (0.4497764)	0.2666667 (0.4472136)
drdb	Dummy variable: 1 if a region has a regional development bank, 0 = otherwise	0.962963 (0.1890862)	0.9545455 (0.2086152)	1 (0)	1 (0)

The macroeconomic variables also tell interesting facts. Less developed regions have the lowest trade values per capita, while intermediate regions have the highest trade values per capita. This could mean less developed regions import more than intermediate and developed regions because we obtain trade values by subtracting exports with imports. Developed regions have the highest labour force. Inflation is the lowest in developed regions. Decentralisation and construction are the highest in developed regions. This proves that construction is still centralised in the capital area and its surrounding regions.

The dummy variables show that developed regions have more regulations on SMEs and rural banks. Yet, the regions have the lowest rural bank loans. Intermediate regions do not even have these kinds of regulations. This suggests that local regulations do not significantly affect rural bank loan supply.

5.3.2 Regression Results

The 2SLS procedure cannot generate precise estimates if the first stage regression produces poor predictors of endogenous variable. In this study, the endogenous variable is rural bank assets. There are several ways to test if the instrument variables are valid. The data processing software Stata has built-in commands to do validity tests based on the first-stage regression results as well as tests of overidentifying restrictions. The first stage regression output includes Sanderson-Windmeijer (SW) F-statistic, Anderson-Rubin Wald χ^2-statistic and Stock-Wright LM S-statistic.

The Sanderson-Windmeijer (SW) first-stage χ^2 is a test of underidentification of individual endogenous regressors. The SW χ^2 Wald statistic has null hypothesis that the particular endogenous regressor in question is unidentified (Statacorp, 2011). The Anderson-Rubin and Stock-Wright test have null hypothesis that the coefficients of the endogenous regressors in the structural equation are jointly equal to zero, and, in addition, that the overidentifying restrictions are valid. Both tests are robust to the presence of weak instruments (Baum, Schafer & Stillman, 2007).

Table 5.3 reports the results of validity tests based on first stage regression. The SW χ^2 Wald statistic for all samples rejects the null hypothesis that the endogenous regressor in this study is unidentified. The Anderson–Rubin Wald test and Stock–Wright LM test also reject their null hypothesis and indicate that the endogenous regressor is relevant.

Table 5.3: Validity instruments (first stage regression)

lngcap				
	All regions	**Less developed regions**	**Intermediate regions**	**Developed regions**
Sanderson-Windmeijer test of excluded instrument				
F-stat	9.09***	11.32***	3.93**	4.15***
p-value	0.0000	0.0000	0.0235	0.0078
Anderson-Rubin Wald test of weak instrument				
χ^2	136.02***	169.50***	8.81**	189.69***
p-value	0.0000	0.0000	0.0319	0.0000
Stock-Wright LM test of weak instrument				
χ^2	19.22***	14.43**	8.86**	21.35***
p-value	0.0017	0.0131	0.0312	0.0003
lnpov				
	All regions	**Less developed regions**	**Intermediate regions**	**Developed regions**
Sanderson-Windmeijer test of excluded instrument				
F-stat	5.72***	76.04***	3.75**	2.32*
p-value	0.0011	0.0000	0.0275	0.0776
Anderson-Rubin Wald test of weak instrument				
χ^2	48.70***	34.88***	8.19**	16.03***
p-value	0.0000	0.0000	0.0422	0.0030
Stock-Wright LM test of weak instrument				
χ^2	19.20***	14.62**	9.14**	13.39**
p-value	0.0018	0.0121	0.0274	0.0095

Notes: * significant at the 10% level, ** significant at the 5% level *** significant at the 1% level

Stata's output of second stage regression includes the statistics of instrument variable (IV) redundancy, weak identification, or overidentification test. The IV redundancy test is a Lagrange Multiplier (LM) test. The LM statistic is distributed as χ^2 with degrees of freedom (df) = number of endogenous regressors × number of instruments. The null hypothesis is that the specified instruments are redundant (Statacorp, 2011). The overidentification test in this study is Hansen's test. The joint null hypothesis of Hansen's test is that the instruments are valid instruments, i.e., uncorrelated with the error term and that the excluded instruments are correctly excluded from the estimated equation (Statacorp, 2011).

To investigate if the instrument variables are reliable, we use Stock-Yogo test. Stock and Yogo (2005) tabulated critical values that enable using Cragg-Donald (1993) statistic (for multiple endogenous regressors) to test whether given instruments are weak. There are two types of Stock–Yogo weak-instruments tests: maximal relative bias

and maximal size. The first type is based on the ratio of the bias of the estimator to the bias of OLS. The null is that instruments are weak. Weak instruments are defined as instruments that can lead to an asymptotic relative bias greater than some value *b*. The maximal size test is based on the performance of the Wald test statistic for β. The test statistic is based on the rejection rate *r* (10%, 15%, 20% and 25%) that we are willing to tolerate if the true rejection rate should be the standard 5%. Weak instruments are defined as instruments that will lead to a rejection rate of *r* when the true rejection rate is 5% (Baum, Schafer & Stillman, 2007). Stata reports Stock-Yogo critical values with 5%, 10%, 20%, 30% maximal IV relative bias and 10%, 15%, 20%, 25% maximal IV size . Stock and Yogo (2005) suggested to choosing the critical value of 10% maximal IV relative bias in order to fulfil the rule of thumb of identifying weak instruments proposed by Staiger and Stock (1997). The rule of thumb proposed by Steiger and Stock (1997) is that, in the n = 1 case, instruments be deemed weak if the F-statistic from first stage regression is less than ten. When the number of instruments is one or two, the Staiger-Stock's rule of thumb corresponds to a 5% level test that the maximum size is no more than 15% (so the maximum 2SLS size distortion is no more than 10%) (Stock & Yogo, 2005).

Table 5.4: Validity of instruments (second stage regression)

lngcap				
	All regions	**Less developed regions**	**Intermediate regions**	**Developed regions**
LM test of redundancy of specified instruments				
χ^2	15.091**	11.661**	8.048**	15.046***
p-value	0.0100	0.0397	0.0450	0.0046
Cragg-Donald Wald F statistic for weak identification test				
F-stat	31.777	25.298	4.143	3.252
Stock-Yogo critical values	18.37^	18.37^	9.08^^	10.27^^
Hansen-J test				
χ^2	7.795*	6.854	2.340	13.263***
p-value	0.099	0.1438	0.3104	0.0041
lnpov				
	All regions	**Less developed regions**	**Intermediate regions**	**Developed regions**
LM test of redundancy of specified instruments				
χ^2	10.96*	11.457**	8.531**	8.717*
p-value	0.0522	0.0430	0.0362	0.0686
Cragg-Donald Wald F statistic for weak identification test				
F-stat	17.50	15.011	4.047	3.777
Stock-Yogo critical values	10.83^^	10.83^^	9.08^^	10.27^^
Hansen-J test				
χ^2	12.686**	7.254	2.420	0.749
p-value	0.0129	0.1231	0.2983	0.8616

Notes: * significant at the 10% level, ** significant at the 5% level *** significant at the 1% level, ^ Stock-Yogo F critical values 5% maximal IV relative bias, ^^ Stock-Yogo F critical values 15% maximal IV size

Table 5.4 reports results of instrument validity tests. The statistic of LM test for all samples rejects the null, implying that the instruments are not redundant. The Cragg-Donald Wald F statistic rejects the null that the instruments are weak for all regions and developed regions. The Hansen-J statistics for all samples, except all regions, are far from the rejection of the null hypothesis. This indicates that the instrument set is appropriate.

Table 5.5 presents the estimated results using all samples (all regions, less developed, intermediate, and developed regions)[38]. The statistics are robust to heteroskedasticity and clustering on province for all regions and less developed regions. For intermediate and developed regions, the statistics are only robust to heteroskedasticity because of the small number of the cross-sections (two provinces in intermediate regions and three provinces in developed regions). In the beginning, we use dummy variable *drdb* to control the existence of regional development banks in the model. The dummy variable is dropped by Stata because of the problem of collinearity (the reported estimated coefficient of *drdb* is 0 for all regressions). Therefore, we will not report the estimated coefficient of *drdb* in Table 5.5.

Firstly, we discuss the first stage regression of equation (2) which is the regression of *lnasset* as a dependent variable and dummy variables and X_{it} as the independent variables. X_{it} includes commercial bank loans per capita, regional trade, regional labour force, decentralisation, and regional construction.

The findings reveal that local regulations on SMEs helps to increase the value of rural bank assets in developed regions. The establishment of local credit guarantee institutions (*dregin*) has no significant effect on rural bank assets in all samples. Local credit guarantee institutions are built to mitigate the occurrence of bad SME loans and to increase the value of the loans. The institutions will take over the loan payment on behalf of the debtors when the debtors are unable to fulfil their obligation. The central

[38] The regression is estimated in levels and first differences. The model in levels seems more robust than the model in first differences. Three second-stage regressions have negative value of R^2 when fitted in first differences. The negative value means that the model does not follow the data trend. Sribney, Wiggins, & Drukker (1999) pointed out that negative value of R^2 is possible with the 2SLS model. The negative value of model sum of squares (MSS) and R^2 will be obtained when the residual sum of squares (RSS) exceeds the total sum of squares (TSS). The results from the first-differences estimation are shown in Appendix 3.

bank acknowledges that the institution has yet to add the increased value of rural bank loans ("KPBI: penjamin kredit daerah belum bekerja optimal", 2016). *dregrb*, the local regulation on rural banks also has no significant effect on the development of rural banks.

Table 5.5: Results of 2SLS regressions

Variables	**Coefficients**			
	All regions	**Less developed regions**	**Intermediate regions**	**Developed regions**
Regional GDP per capita				
First stage regression				
dregap	0.502169***	0.797728***	0.5051558*	-0.11276
dregsme	0.248677	0.352417		0.409832***
dregrb	-0.23672	-0.08676		-0.10283
dregin	0.132983	-0.33327	0.250358	-0.02662
dreglsme	0.63327***	0.425473**	0.6755865**	0
trade	0.032583	0.052711	-0.2013254	0.037633
cloan	0.237142	-1.11558	16.48857	4.311182
dec	0.870963***	1.0145***	-0.1498242	1.798979**
labour	0.00148***	0.001975***	-0.002889	0.002964**
cons	0.67116***	-0.01258	10.86635***	1.063244***
Second stage regression				
Variables	**All regions**	**Less developed regions**	**Intermediate regions**	**Developed regions**
lnasset	0.208596***	0.211931***	0.108279**	0.304843***
trade	0.003162	0.005882	-0.04902	-0.00078
cloan	5.810511***	5.913954***	39.06226**	7.602867**
dec	-0.10395	-0.09084	0.101999	-0.33696
labour	0.000584**	0.000646*	0.001488	0.000935
cons	-0.06125	-0.16092	-2.50415***	-0.15339
R^2	0.6057	0.5964	0.844	0.675
Regional poverty				
First stage regression				
Variables	**All regions**	**Less developed regions**	**Intermediate regions**	**Developed regions**
dregap	0.246792***	0.454061***	0.0089678	0.095448
dregsme	0.312542	0.170712		0.630495***
dregrb	-0.34742	-0.25544		0.033025
dregin	0.166119	-0.3707188**	0.3557248	-0.59631**
dreglsme	0.469323***	0.381674***	0.8924014***	0
lngcap	1.738294***	1.806589***	-0.1320505	1.478287
trade	-0.01179	0.025839	-0.4379674**	-0.03975**
cloan	-9.1098	-10.9917*	151.5047***	-3.38454
dec	0.894851***	0.935958***	-0.0550501	1.342314
inflation	-0.01776***	-0.01838***	-0.0187883	-0.02629
Second stage regression				
Variables	**All regions**	**Less developed regions**	**Intermediate regions**	**Developed regions**
lnassetcap	-0.34014***	-0.32326***	-0.1909224***	0.340503***
lngcap	0.480508*	0.446835	-0.1844078	-1.3812***
trade	-0.00864	0.006761	-0.0422588	0.007387
cloan	-4.76029*	-3.69493*	9.045055	1.901375
dec	0.102973	0.023434	-0.3283127	-0.64231
inflation	0.002105	0.002325	0.0059045	-0.00317
R^2	0.2680	0.4081	0.8624	0.321

Notes: * significant at the 10% level, ** significant at the 5% level *** significant at the 1% level

The central bank regulation on the cooperation between rural banks and commercial banks (*dregap*) has a significant and positive effect for all samples, except for developed regions. Similarly, the central bank regulation on SME loans (*dreglsme*) increases rural bank assets for all samples, except for developed regions. *dreglsme* is omitted by Stata in the regression for developed regions.

The result from the second regression shows that the coefficient of rural bank assets is positive and significant for all samples. The result suggests that rural bank assets increase regional GDP per capita for the samples. Commercial bank loans also have a positive and significant effect on regional GDP per capita for all samples. Trade and decentralisation have no significant effect on regional GDP per capita for all samples. The estimated coefficients of labour are positive and statistically significant for all regions and less developed regions. Construction has negative and significant effect on regional GDP per capita for intermediate regions.

Secondly, we discuss the first stage regression of equation (3) which is the regression of *lnasset* as a dependent variable and five dummy variables and P_{it} as the independent variables. P_{it} includes regional commercial bank loans, regional trade, regional inflation, and decentralisation. The findings reveal that two of the local regulations have significant effect on rural bank assets. The establishment of local credit guarantee institutions has a significant effect on rural bank assets in less developed and developed regions. It should be noted that the coefficient sign of *dregin* is negative, indicating that the institution has yet to add the increased value of rural bank assets. The local regulation on SMEs (*dregsme*) only has a significant effect on the development of rural banks for developed regions. The central bank regulation on SME loans (*dreglsme*) increases rural bank assets for all regions, intermediate and less developed regions. Meanwhile, *dregap* are positive and significant for all regions and less developed regions.

Given the hypothesis that financial development reduces poverty, in the second stage regression of equation (3), we expect negative coefficients on rural bank assets. The results show that rural bank assets contribute to the reduction of poverty for all samples. The growth of regional GDP per capita reduces poverty for developed regions.

Commercial bank loans reduce poverty in all regions and less developed regions. The other variables (trade, decentralisation, inflation) have no significant effect on poverty.

5.3.3 Sensitivity Analysis

We compare the results of 2SLS, two stage GMM and OLS for sensitivity analysis. Table 5.6 tabulates the comparison. Table 5.6 shows that the OLS results differ significantly from the 2SLS and two stage GMM results, most likely reflecting a combination of endogenous regressors and weak instruments. The 2SLS and two-stage GMM estimates are similar, implying that the results are robust.

In addition, the sensitivity analysis is carried out by replacing the measurement of regional output and regional poverty. We use growth of regional gross domestic product as the measurement of regional output. The poverty gap index and the poverty severity index are used to measure regional poverty, replacing the regional poverty rate. The poverty gap index measures the extent to which individuals fall below the poverty line (the poverty gap) as a proportion of the poverty line. Higher value of the index shows that the gap between the average expenditure of the poor and the poverty line is wider. The poverty severity index describes inequality among the poor. Higher value of the index shows that inequality among the poor is higher.

Table 5.6: Results of OLS, GMM and 2SLS

All regions							
	OLS (1)	**2SLS (2)**	**GMM (3)**		**OLS (1)**	**2SLS (2)**	**GMM (3)**
Dep var: regional GDP per capita				**Dep var: regional poverty rates**			
lnasset	0.119***	0.209***	0.211***	lnasset	-0.137***	-0.340***	-0.242***
trade	0.007*	0.003	0.002	lngcap	-0.063	0.481*	0.266
cloan	8.008***	5.81***	7.167***	trade	-0.001	-0.009	0.004
dec	0.047	-0.104	-0.084	cloan	-4.155***	-4.760*	-5.945***
labour	0.001***	0.0006**	0.0004	dec	0.006***	0.103	0.028
cons	0.090**	-0.061	-0.038	inflation	-0.174**	0.002	0.002
R^2	0.682	0.606	0.594	R^2	0.474	0.2680	0.411
F-stat	129.51	13.75	22.43	F-stat	54.22	16.87	18.5
Less developed regions							
	OLS (1)	**2SLS (2)**	**GMM (3)**		**OLS (1)**	**2SLS (2)**	**GMM (3)**
Dep var: regional GDP per capita				**Dep var: regional poverty rates**			
lnasset	0.121***	0.212***	0.196***	lnasset	-0.163***	-0.323***	-0.259***
trade	0.008*	0.006	0.006	lngcap	0.010	0.447	0.370
cloan	7.653***	5.914***	6.792***	trade	0.011*	0.007	0.014**
dec	0.023	-0.091	0.009	cloan	-3.340**	-3.695*	-5.298***
labour	0.001***	0.001	0.001	dec	0.005**	0.023	0.042
cons	0.082	-0.161*	-0.212**	inflation	-0.200**	0.002	0.001
R^2	0.681	0.596	0.621	R^2	0.533	0.408	0.477
F-stat	104.05	13.59	15.40	F-stat	55.26	25.78	44.06

Intermediate regions							
	OLS (1)	**2SLS (2)**	**GMM (3)**		**OLS (1)**	**2SLS (2)**	**GMM (3)**
Dep var: regional GDP per capita				**Dep var: regional poverty rates**			
lnasset	0.062	0.108**	0.112***	lnasset	-0.164***	-0.191***	-0.162***
trade	-0.068	-0.049	-0.038	lngcap	-0.200	-0.184	-0.274
cloan	43.122***	39.062**	29.931**	trade	-0.021	-0.042	-0.022
dec	0.010	0.102	0.101	cloan	3.255	9.045	7.476
labour	0.001	0.001	0.001	dec	-0.329**	-0.328	-0.323
cons	-1.928*	-2.504***	-1.949***	inflation	0.006	0.006	0.006
R^2	0.852	0.844	0.832	R^2	0.865	0.862	0.861
F-stat	21.07	35.47	35.44	F-stat	23.39	17.45	18.78
Developed Regions							
	OLS (1)	**2SLS (2)**	**GMM (3)**		**OLS (1)**	**2SLS (2)**	**GMM (3)**
Dep var: regional GDP per capita				**Dep var: regional poverty rates**			
lnasset	0.136**	0.305***	0.307***	lnasset	0.140**	0.341***	0.332***
trade	0.009	-0.001	-0.004	lngcap	-0.953***	-1.381***	-1.440***
cloan	7.203*	7.603**	9.657***	trade	-0.004	0.007	0.006
dec	0.066	-0.337	-0.700**	cloan	-0.334	1.901	4.767
labour	0.002**	0.001	0.001*	dec	-0.235	-0.642	-0.551
cons	0.058	-0.153	-0.173	inflation	-0.004	-0.003	-0.002
R^2	0.731	0.675	0.662	R^2	0.484	0.321	0.326
F-stat	16.28	32.68	35.71	F-stat	5.63	10	12.92

Notes: * significant at the 10% level, ** significant at the 5% level *** significant at the 1% level

Some results of sensitivity analysis are similar to those of original regressions (Table 5.7). For all region samples, rural banks increase the growth of regional gross domestic product, reduce the poverty gap index and reduce the poverty severity index. Regression estimation of less developed regions shows that rural bank assets have a significant effect on regional gross domestic product, the same result we get when we use regional GDP growth per capita as a dependent variable. Rural bank assets also reduce the poverty gap index and the poverty severity index in less developed regions.

For intermediate regions, rural bank assets have a positive and significant effect both on regional GDP per capita and regional GDP. Moreover, the assets reduce the poverty gap and poverty severity. For developed regions, rural bank assets reduce regional poverty, but increase the poverty gap and poverty severity index. Regional GDP and GDP per capita are positively and significantly affected by rural bank assets in developed regions.

Table 5.7: Results of sensitivity analysis, 2SLS regression

Variables	Coefficients			
	All regions	**Less developed regions**	**Intermediate regions**	**Developed regions**
Regional GDP				
lnasset	0.354785***	0.318987***	0.228157***	0.487286***
trade	-0.00499	-0.00373	-0.01412	-0.01688
cloan	5.000238***	4.858823**	42.03962**	14.83121***
dec	-0.13201	-0.10698	0.187368	-0.63085
labour	-0.00036***	-0.00037**	0.001396	-0.00141*
cons	-0.12656*	-0.00889	-3.76471***	-0.31583*
Poverty gap				
Variables	**All regions**	**Less developed regions**	**Intermediate regions**	**Developed regions**
lnasset	-0.83882***	-0.50542***	-1.777796**	1.251769***
lngcap	-0.15349	-0.41283	-4.399241*	-5.52545***
trade	0.030752	0.147694***	-0.7916415	0.007595
cloan	-0.83857	-4.91432	388.1684	32.44725*
dec	0.356122	-0.32301	0.1313557	-3.5703**
inflation	0.001972	0.004024	0.0995291**	0.000323
Poverty severity				
Variables	**All regions**	**Less developed regions**	**Intermediate regions**	**Developed regions**
lnasset	-0.38988***	-0.22166**	-0.6768145**	0.453131***
lngcap	0.241028	0.063537	-1.568216*	-1.83913***
trade	-0.01819	0.010733	-0.3331769	0.004334
cloan	1.807842	-1.10598	152.2167	13.17117**
dec	-0.1313	-0.29898	0.0257913	-1.26858**
inflation	0.004371	0.002498	0.0341712*	0.000977

Notes: * significant at the 10% level, ** significant at the 5% level *** significant at the 1% level

5.3.4 Discussion

Certain caveats and design limitations should be noted before discussing the implication of the results of this study. First, there is the possibility of omitted variables in the equations. This is common for studies on public policies (Feiock, 1991). Vidyattama (2010) argued that transportation infrastructure (the length of the road), trade openness, and human capital (the average year of schooling) are the important region growth determinants in Indonesia. However, Mahi et al. (2002) pointed out that decentralisation is the most important factor affecting regional growth. The important determinants of regional growth in Indonesia are still inconclusive. Second, the findings may be limited to the studied time period. Over the period, there were changes in the number of provinces in Indonesia. This expansion may have significant effect on rural bank development, regional growth, and regional poverty. Yet, the effects might not be captured in the model of this study.

In view of these design limitations, the results of this study suggest that national regulation affects rural bank assets. In the case of local regulations, only local regulations supporting the development of SMEs (*dregsme*) seem to have expected significant effect on rural bank assets. The significant effect of local regulations (*dregsme*) is found in developed regions. This is probably because SME development will encourage more SMEs to seek SME loans to increase their capital. Another local regulation, that is, the establishment of local credit guarantee institutions (*dregin*), has a significant effect on rural bank assets in less developed and developed regions. However, the coefficient sign is negative, which is not as expected. We expect a positive sign because the establishment of local credit guarantee institutions will increase the value of SMEs loans. The negative sign indicates that the institution has yet to add the increased value of the loans. It can be concluded that not all local regulations are effective.

There is evidence that national regulations could support the development of rural banks. National regulation on the disbursement of SME loans (*dreglsme*) increases rural bank assets in all samples, except in developed regions. The coefficient of national regulation on commercial bank-rural bank joint cooperation is positive and significant for all samples, except for developed regions.

Meslier-Crouzille et al. (2012) found that rural bank presence was positive and significant for less-developed and intermediate-developed regions in the Philippines. We have similar findings in this study. The findings in this study indicate that rural bank assets improve regional economic growth per capita for all samples. Rural banks presence reduces poverty in all samples. The impact of rural bank assets on poverty rate reduction is strongest for intermediate regions. This might be because the other regions rely more on commercial banks, rather than rural banks.

5.4 Summary

This chapter provided evidence of the contribution of rural banks to regional economic growth and regional poverty when taking into account the effect of local and national regulations related to the development of rural banks. From the estimations that were carried out using two stage least squares, it is possible to conclude that rural bank assets

promote regional economic growth and reduce regional poverty. The findings also suggest that only one from three considered local regulations has a positive significant effect on the development of rural banks, which is the regulation on the development of SMEs. Meanwhile, the central bank (national) regulations have a positive and significant effect on rural bank assets, except for developed regions. Discussion on the policy implications and future researches will be described in Chapter 6.

6 Chapter 6 – Conclusions and Implications

6.1 Conclusions

This present study empirically examined the links between rural bank development, economic growth, and the poverty rate at the sub-national (regional) level in Indonesia. The contribution of this research is to utilise regional variation in rural bank development (over time) in explaining the complex relationship between this development and both economic growth and the poverty rate.

The hypotheses of this study were that rural banks in Indonesia support regional economic growth and reduce regional poverty rates. The first objective of this study was to address the relationship between rural bank development and either economic growth or the poverty rate. The second objective was to analyse whether central bank policies or regional government policies on rural banks have an impact on the development of the banks in Indonesia, and particularly whether the policies have impacts on the contribution of rural banks to regional economic growth and regional poverty rate reduction.

By reviewing theoretical and empirical literatures on the relationship between rural bank development and either economic growth or the poverty rate, there are some important points to be noted in this study:

1. This study used data on the banking sector because banks are the main player in the financial systems in developing countries.
2. The choice to focus on the role of rural banks was based on results of previous studies that have shown rural banks act differently from commercial banks. Therefore, an investigation of the contribution of rural banks would be beneficial for policy makers.
3. The data in this study came from the regional level. This study used regional data because regional studies are able to better explain the complex relationship between financial development and growth in a country.
4. This study used Indonesian data. Previous Indonesian studies, in general, have used data on financial development at a national level. They have also generated similar results that there is bi-directional causality between financial

development and growth. So far, there has only been one study that has used data at a regional level, but with a focus on the data of commercial banks.

The decision to focus on regional areas and rural banks in Indonesia as the object of this study was based on the following justifications:

1. As a developing country, the financial system in Indonesia is a bank-based system. The banking sector is also important for the Indonesian economy. Failures in this sector led to a major financial crisis in 1997.
2. In Indonesia, banks are categorised into two major categories: commercial banks and rural banks. One study found that commercial banks made no contribution to regional economic growth. Thus, this study investigated the contribution of rural banks, particularly because rural banks are designed to promote regional economic growth.
3. Indonesia is made up of 34 provinces. The stage of economic development and banking development in the provinces is varied.
4. Small and medium enterprises are considered as the backbone of the Indonesian economy. The main customers of rural banks are small and medium enterprises.
5. Rural banks are established locally within one region. The central bank supports the development of rural banks to promote regional economic growth and to reducing the regional poverty rate. Some regions also have local regulations supporting the development of rural banks and small medium enterprises.

The studied period was from 2000 to 2014. The data set consisted of 27 provinces in Indonesia. Two methodologies were used in this study. The first methodology was the cointegration test and error correction based causality following the model used by King and Levine (1993a). The second methodology was two stage least squares. The estimation finds the following empirical findings. Cointegration tests indicate that there is a long-run relationship between rural bank assets and regional GDP per capita, and between rural bank assets and the regional poverty rate. DOLS and FMOLS estimations show that rural banks promote economic growth and reduce regional poverty. There is no evidence that rural bank assets Granger-cause regional GDP per capita and the regional poverty rate. The direction of causality is the other way around, from regional GDP per capita to rural bank assets and from the regional poverty rate to rural bank assets.

This study also finds evidence, by using 2SLS, that rural bank assets promote regional economic growth and reduce regional poverty. The findings also suggest that local regulation on SMEs development has a positive and significant effect on the development of rural banks, particularly for developed regions. The central bank (national) regulations have a positive and significant effect on the development of rural banks, except for developed regions.

6.2 Implications

Thus far, there is no specific research on the rural banks-regional growth nexus or rural banks-regional poverty rate nexus in Indonesia. This study fills this gap by analysing the specific effect of rural banks on regional performance and the effect of rural banks on regional poverty reduction. Considering that the direction of causality is crucial for development policy, particularly financial development policy, this study also provides evidence on the causal relationship between rural banks, regional economic growth, and the regional poverty rate in Indonesia. The study shows that the presence of rural banks, which have an expertise in financing SMEs, should be supported in order to stimulate regional economic activity and to reduce the regional poverty rate.

In addition, this study provided an analysis of rural bank-related policies that are enacted both by the central bank and regional governments. The analysis answered the question whether the policies have positive impacts on the development of rural banks and whether the policies have positive impacts on increasing rural bank contribution to regional economic growth and regional poverty reduction. The Financial Service Authority (OJK) states that financing SMEs has been the focus of the Indonesian government and rural banks should have a major contribution to financing. The OJK plans to issue regulations to promote the development of rural banks in 2017 and 2021. This analysis of the existing regulations on rural bank development could be an additional consideration for the OJK when formulating future regulations on rural banks. The findings also suggested that, among three reviewed local regulations, only one has impact on the development of rural banks. Therefore, local governments could use the findings to review and improve their existing regulations on rural banks and SMEs. Moreover, local governments could develop rural banks by raising their regional

GDP because, based on the results of this study, the direction of causality is from regional GDP per capita to rural bank assets.

6.3 Limitation of the Study and Suggestions for Future Studies

This study offered an evaluative perspective on the importance of rural banks in Indonesia. The study was conducted at a regional level and, as a direct consequence of this methodology, this study encountered a number of limitations which need to be considered. The most obvious one is incomplete regional data. Some data was not available which resulted in unbalanced panel data and a short time series.

In the future, similar studies using data of other types of banks (commercial banks and sharia banks) could show which banks make the biggest contribution to regional economic growth. Moreover, there should be a thorough study on the most preferable type of financial institution in a region, based on the region-specific characteristics.

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Appendix

1. Results of Gregory and Hansen test

lngcap* and *lnasset					
			Specification		
Region		**Break date**	**GH test statistic**	**5% critical value**	**Existence of cointegration**
1	Aceh				
	GH-1	-4.44	2006	-4.61	No
	GH-2	-5.50	2006	-5.45	Yes
	GH-3	-5.21	2006	-4.95	Yes
	GH-4	-	-	-	-
2	North Sumatra				
	GH-1	-3.70	2007	-4.61	No
	GH-2	-3.81	2012	-4.99	No
	GH-3	-7.01	2007	-4.95	Yes
	GH-4	-	-	-	-
3	West Sumatra				
	GH-1	-3.29	2009	-4.61	No
	GH-2	-4.78	2012	-4.99	No
	GH-3	-3.85	2006	-4.95	No
	GH-4	-	-	-	-
4	Riau				
	GH-1	-4.06	2001	-4.61	No
	GH-2	-3.63	2001	-4.99	No
	GH-3	-4.59	2004	-4.95	No
	GH-4				
5	Jambi				
	GH-1	-	-	-	-
	GH-2	-5.75	2012	-4.99	Yes
	GH-3	-	-	-	-
	GH-4	-9.36	2009	-5.50	Yes
6	South Sumatra				
	GH-1	-4.04	2009	-4.61	No
	GH-2	-4.50	2001	-4.99	No
	GH-3	-4.03	2010	-4.95	No
	GH-4	-4.28	2002	-5.50	No
7	Bengkulu				
	GH-1	-3.27	2001	-4.61	No
	GH-2	-4.13	2012	-4.99	No
	GH-3	-4.78	2004	-4.95	No
	GH-4	-4.41	2010	-5.50	No
8	Lampung				
	GH-1	-2.38	2010	-4.61	No
	GH-2	-6.67	2012	-4.99	Yes
	GH-3	-4.82	2007	-4.95	No

	GH-4	-6.21	2009	-5.50	No
9	Jakarta				
	GH-1	-4.38	2008	-4.61	No
	GH-2	-5.57	2012	-4.99	Yes
	GH-3	-5.47	2006	-4.95	Yes
	GH-4	-10.04	2010	-5.50	Yes
10	West Java				
	GH-1	-4.73	2008	-4.61	Yes
	GH-2	-4.52	2008	-4.99	No
	GH-3	-3.34	2001	-4.95	No
	GH-4	-	-	-	-
11	Central Java				
	GH-1	-5.16	2001	-4.61	Yes
	GH-2	-4.10	2009	-4.99	No
	GH-3	-4.55	2004	-4.95	No
	GH-4	-	-	-	-
12	Yogyakarta				
	GH-1	-3.41	2001	-4.61	No
	GH-2	-4.84	2009	-4.99	No
	GH-3	-6.11	2004	-4.95	Yes
	GH-4	-6.47	2008	-5.50	Yes
13	East Java				
	GH-1	-3.71	2006	-4.61	No
	GH-2	-3.81	2009	-4.99	No
	GH-3	-4.47	2005	-4.95	No
	GH-4	-7.12	2007	-5.50	Yes
14	Bali				
	GH-1	-5.04	2010	-4.61	Yes
	GH-2	-3.11	2010	-4.99	No
	GH-3	-4.34	2009	-4.95	No
	GH-4	-3.72	2010	-5.50	No
15	West Nusa Tenggara				
	GH-1	-5.73	2007	-4.61	Yes
	GH-2	-4.71	2007	-4.99	No
	GH-3	-6.22	2006	-4.95	Yes
	GH-4	-4.06	2006	-5.50	No
16	East Nusa Tenggara				
	GH-1	-4.64	2012	-4.61	Yes
	GH-2	-4.14	2012	-4.99	No
	GH-3	-5.32	2011	-4.95	Yes
	GH-4	-5.82	2005	-5.50	Yes
17	West Kalimantan				
	GH-1	-3.96	2002	-4.61	No
	GH-2	-4.60	2002	-4.99	No
	GH-3	-7.53	2005	-4.95	Yes
	GH-4	-	-	-5.50	-
18	Central Kalimantan				

	GH-1	-4.60	2003	-4.61	No
	GH-2	-5.18	2005	-4.99	Yes
	GH-3	-5.81	2005	-4.95	Yes
	GH-4	-6.40	2007	-5.50	Yes
19	South Kalimantan				
	GH-1	-4.72	2009	-4.61	Yes
	GH-2	-5.06	2012	-4.99	Yes
	GH-3	-5.13	2009	-4.95	Yes
	GH-4	-4.02	2009	-5.50	No
20	East Kalimantan				
	GH-1	-3.41	2008	-4.61	No
	GH-2	-3.55	2012	-4.99	No
	GH-3	-4.15	2009	-4.95	No
	GH-4	-	-	-5.50	-
21	North Sulawesi				
	GH-1	-4.93	2002	-4.61	Yes
	GH-2	-5.37	2002	-4.99	Yes
	GH-3	-6.13	2006	-4.95	Yes
	GH-4	-6.66	2005	-5.50	Yes
22	Central Sulawesi				
	GH-1	-5.86	2006	-4.61	Yes
	GH-2	-5.77	2006	-4.99	Yes
	GH-3	-6.06	2006	-4.95	Yes
	GH-4	-7.25	2005	-5.50	Yes
23	South Sulawesi				
	GH-1	-8.29	2002	-4.61	Yes
	GH-2	-4.01	2001	-4.99	No
	GH-3	-7.35	2010	-4.95	Yes
	GH-4	-4.31	2005	-5.50	No
24	Southeast Sulawesi				
	GH-1	-4.12	2001	-4.61	No
	GH-2	-6.22	2008	-4.99	Yes
	GH-3	-7.79	2003	-4.95	Yes
	GH-4	-	-	-5.50	-
25	Maluku				
	GH-1	-4.26	2001	-4.61	No
	GH-2	-5.16	2012	-4.99	Yes
	GH-3	-5.66	2002	-4.95	Yes
	GH-4	-	-	-5.50	-
26	North Maluku				
	GH-1	-4.15	2007	-4.61	No
	GH-2	-5.01	2007	-4.99	Yes
	GH-3	-	-	-4.95	-
	GH-4	-	-	-5.50	-
27	Papua				
	GH-1	-4.52	2012	-4.61	No
	GH-2	-5.16	2012	-4.99	Yes

	GH-3	-4.64	2010	-4.95	No
	GH-4	-5.47	2010	-5.50	No

lnpov* and *lnasset

		Specification			
Region		**Break date**	**GH test statistic**	**5% critical value**	**Existence of cointegration**
1	Aceh				
	GH-1	-4.29	2009	-4.61	No
	GH-2	-4.45	2002	-4.99	No
	GH-3	-5.16	2004	-4.95	Yes
	GH-4	-	-	-5.50	-
2	North Sumatra				
	GH-1	-3.30	2008	-4.61	No
	GH-2	-7.81	2008	-4.99	Yes
	GH-3	-5.28	2005	-4.95	Yes
	GH-4	-	-	-5.50	-
3	West Sumatra				
	GH-1	-3.32	2009	-4.61	No
	GH-2	-3.88	2008	-4.99	No
	GH-3	-4.43	2008	-4.95	No
	GH-4	-	-	-5.50	-
4	Riau				
	GH-1	-4.89	2003	-4.61	Yes
	GH-2	-4.85	2003	-4.99	No
	GH-3	-7.73	2005	-4.95	Yes
	GH-4	-	-	-5.50	-
5	Jambi				
	GH-1	-6.81	2009	-4.61	Yes
	GH-2	-4.63	2010	-4.99	No
	GH-3	-7.48	2009	-4.95	Yes
	GH-4	-4.94	2007	-5.50	No
6	South Sumatra				
	GH-1	-5.31	2003	-4.61	Yes
	GH-2	-5.32	2003	-4.99	Yes
	GH-3	-6.72	2005	-4.95	Yes
	GH-4	-5.43	2004	-5.50	No
7	Bengkulu				
	GH-1	-4.24	2008	-4.61	No
	GH-2	-4.80	2002	-4.99	No
	GH-3	-5.80	2008	-4.95	Yes
	GH-4	-5.63	2008	-5.50	Yes
8	Lampung				
	GH-1	-3.56	2009	-4.61	No
	GH-2	-3.42	2004	-4.99	No
	GH-3	-5.94	2008	-4.95	Yes
	GH-4	-5.70	2008	-5.50	Yes
9	Jakarta				
	GH-1	-3.08	2004	-4.61	No

	GH-2	-2.95	2012	-4.99	No
	GH-3	-3.11	2004	-4.95	No
	GH-4	-3.76	2007	-5.50	No
10	West Java				
	GH-1	-5.54	2004	-4.61	Yes
	GH-2	-3.80	2011	-4.99	No
	GH-3	-5.13	2004	-4.95	Yes
	GH-4	-	-	-5.50	-
11	Central Java				
	GH-1	-3.90	2002	-4.61	No
	GH-2	-4.28	2009	-4.99	No
	GH-3	-5.09	2007	-4.95	Yes
	GH-4	-	-	-5.50	-
12	Yogyakarta				
	GH-1	-5.12	2004	-4.61	Yes
	GH-2	-5.23	2002	-4.99	Yes
	GH-3	-5.56	2002	-4.95	Yes
	GH-4	-6.17	2004	-5.50	Yes
13	East Java				
	GH-1	-3.14	2001	-4.61	No
	GH-2	-3.78	2003	-4.99	No
	GH-3	-5.87	2007	-4.95	Yes
	GH-4	-6.17	2007	-5.50	Yes
14	Bali				
	GH-1	-8.05	2008	-4.61	Yes
	GH-2	-8.55	2008	-4.99	Yes
	GH-3	-7.58	2008	-4.95	Yes
	GH-4	-9.45	2008	-5.50	Yes
15	West Nusa Tenggara				
	GH-1	-4.42	2010	-4.61	No
	GH-2	-5.54	2010	-4.99	Yes
	GH-3	-5.68	2008	-4.95	Yes
	GH-4	-6.23	2010	-5.50	Yes
16	East Nusa Tenggara				
	GH-1	-6.66	2007	-4.61	Yes
	GH-2	-4.14	2008	-4.99	No
	GH-3	-5.93	2007	-4.95	Yes
	GH-4	-4.20	2008	-5.50	No
17	West Kalimantan				
	GH-1	-3.40	2010	-4.61	No
	GH-2	-3.88	2005	-4.99	No
	GH-3	-6.37	2005	-4.95	Yes
	GH-4	-	-	-5.50	-
18	Central Kalimantan				
	GH-1	-3.74	2010	-4.61	No
	GH-2	-4.78	2005	-4.99	No
	GH-3	-5.38	2005	-4.95	Yes

	GH-4	-5.44	2005	-5.50	No
19	South Kalimantan				
	GH-1	-5.67	2005	-4.61	Yes
	GH-2	-3.68	2008	-4.99	No
	GH-3	-5.52	2005	-4.95	Yes
	GH-4	-4.30	2004	-5.50	No
20	East Kalimantan				
	GH-1	-4.21	2008	-4.61	No
	GH-2	-3.94	2008	-4.99	No
	GH-3	-4.45	2008	-4.95	No
	GH-4	-	-	-5.50	-
21	North Sulawesi				
	GH-1	-3.72	2012	-4.61	No
	GH-2	-4.81	2009	-4.99	No
	GH-3	-5.68	2009	-4.95	Yes
	GH-4	-5.56	2009	-5.50	Yes
22	Central Sulawesi				
	GH-1	-4.63	2010	-4.61	Yes
	GH-2	-4.09	2005	-4.99	No
	GH-3	-4.64	2010	-4.95	No
	GH-4	-4.99	2010	-5.50	No
23	South Sulawesi				
	GH-1	-6.09	2009	-4.61	Yes
	GH-2	-5.83	2009	-4.99	Yes
	GH-3	-6.44	2007	-4.95	Yes
	GH-4	-8.89	2008	-5.50	Yes
24	Southeast Sulawesi				
	GH-1	-3.55	2002	-4.61	No
	GH-2	-5.85	2001	-4.99	Yes
	GH-3	-3.55	2005	-4.95	No
	GH-4	-	-	-5.50	-
25	Maluku				
	GH-1	-5.69	2008	-4.61	Yes
	GH-2	-5.66	2009	-4.99	Yes
	GH-3	-5.80	2007	-4.95	Yes
	GH-4	-	-	-5.50	-
26	North Maluku				
	GH-1	-4.13	2005	-4.61	No
	GH-2	-6.37	2008	-4.99	Yes
	GH-3	-	-	-4.95	-
	GH-4	-	-	-5.50	-
27	Papua				
	GH-1	-6.06	2008	-4.61	Yes
	GH-2	-5.27	2008	-4.99	Yes
	GH-3	-6.26	2008	-4.95	Yes
	GH-4	-10.37	2006	-5.50	Yes

2. Stata syntaxs and outputs--2SLS

We use three dummy variables for lnasset in the *lngcap* equation, treating all the remaining explanatory variables as being uncorrelated with the error term in the *lngcap* equation. We use the following Stata syntax:

```
. xtivreg2 lngcap1 open cloancap dec lab cons drdb (lnassetcap=dregap dregsme
dregrb dregin dreglsme), first robust fe cluster(province) redu
> ndant(dregrb dregin dreglsme dregap dregsme)
Warning - collinearities detected
Vars dropped:       drdb

FIXED EFFECTS ESTIMATION
------------------------
Number of groups =        27                    Obs per group: min =         10
                                                               avg =       14.6
                                                               max =         15

Warning - collinearities detected
Vars dropped:  drdb

First-stage regressions
-----------------------

FIXED EFFECTS ESTIMATION
------------------------
Number of groups =        27                    Obs per group: min =         10
                                                               avg =       14.6
                                                               max =         15

First-stage regression of lnassetcap:

Statistics robust to heteroskedasticity and clustering on province
Number of obs =                    395
Number of clusters (province) =     27
------------------------------------------------------------------------------
             |               Robust
  lnassetcap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      dregap |   .5021694   .1315553     3.82   0.000     .2434511    .7608876
     dregsme |   .2486774   .3736217     0.67   0.506    -.4860916    .9834465
      dregrb |  -.2367242   .2666136    -0.89   0.375    -.7610499    .2876015
      dregin |   .1329834   .2651038     0.50   0.616    -.3883731      .65434
    dreglsme |   .6332698   .1290524     4.91   0.000     .3794738    .8870658
        open |   .0325831   .0326499     1.00   0.319    -.0316267    .0967928
    cloancap |   .2371418   6.236065     0.04   0.970    -12.02678    12.50106
         dec |    .870963   .2588952     3.36   0.001     .3618165     1.38011
       labour |   .0014803   .0006132     2.41   0.016     .0002744    .0026862
        cons |   .6711604   .2742433     2.45   0.015     .1318301    1.210491
        drdb |          0  (omitted)
------------------------------------------------------------------------------
F test of excluded instruments:
  F(  5,    26) =     9.09
  Prob > F      =   0.0000
Sanderson-Windmeijer multivariate F test of excluded instruments:
  F(  5,    26) =     9.09
  Prob > F      =   0.0000

Summary results for first-stage regressions
-------------------------------------------
                                        (Underid)             (Weak id)
Variable     | F(  5,    26)  P-val | SW Chi-sq(  5) P-val | SW F(  5,    26)
lnassetcap   |       9.09    0.0000 |       48.28   0.0000 |        9.09

NB: first-stage test statistics cluster-robust
```

```
Stock-Yogo weak ID F test critical values for single endogenous regressor:
                                 5% maximal IV relative bias    18.37
                                10% maximal IV relative bias    10.83
                                20% maximal IV relative bias     6.77
                                30% maximal IV relative bias     5.25
                                10% maximal IV size             26.87
                                15% maximal IV size             15.09
                                20% maximal IV size             10.98
                                25% maximal IV size              8.84
Source: Stock-Yogo (2005).  Reproduced by permission.
NB: Critical values are for i.i.d. errors only.

Underidentification test
Ho: matrix of reduced form coefficients has rank=K1-1 (underidentified)
Ha: matrix has rank=K1 (identified)
Kleibergen-Paap rk LM statistic          Chi-sq(5)=15.09    P-val=0.0100

Weak identification test
Ho: equation is weakly identified
Cragg-Donald Wald F statistic                                        31.78
Kleibergen-Paap Wald rk F statistic                                   9.09

Stock-Yogo weak ID test critical values for K1=1 and L1=5:
                                 5% maximal IV relative bias    18.37
                                10% maximal IV relative bias    10.83
                                20% maximal IV relative bias     6.77
                                30% maximal IV relative bias     5.25
                                10% maximal IV size             26.87
                                15% maximal IV size             15.09
                                20% maximal IV size             10.98
                                25% maximal IV size              8.84
Source: Stock-Yogo (2005).  Reproduced by permission.
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.

Weak-instrument-robust inference
Tests of joint significance of endogenous regressors B1 in main equation
Ho: B1=0 and orthogonality conditions are valid
Anderson-Rubin Wald test           F(5,26)=       25.60     P-val=0.0000
Anderson-Rubin Wald test           Chi-sq(5)=    136.02     P-val=0.0000
Stock-Wright LM S statistic        Chi-sq(5)=     19.22     P-val=0.0017

NB: Underidentification, weak identification and weak-identification-robust
    test statistics cluster-robust

Number of clusters             N_clust  =         27
Number of observations               N  =        395
Number of regressors                 K  =          6
Number of endogenous regressors      K1 =          1
Number of instruments                L  =         10
Number of excluded instruments       L1 =          5

IV (2SLS) estimation
--------------------

Estimates efficient for homoskedasticity only
Statistics robust to heteroskedasticity and clustering on province

Number of clusters (province) =     27               Number of obs =      395
                                                     F(  6,    26) =    13.75
                                                     Prob > F      =   0.0000
Total (centered) SS     =   13.3052137               Centered R2   =   0.6057
Total (uncentered) SS   =   13.3052137               Uncentered R2 =   0.6057
Residual SS             =  5.246059942               Root MSE      =    .1194

------------------------------------------------------------------------------
             |               Robust
     lngcap1 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  lnassetcap |   .2085963   .0474416     4.40   0.000     .1156124    .3015801
```

```
        open |   .0031617   .0064449     0.49   0.624    -.0094701    .0157935
    cloancap |   5.810511   2.405878     2.42   0.016     1.095076    10.52595
         dec |  -.1039462   .0915091    -1.14   0.256    -.2833007    .0754082
      labour |   .0005843   .0003235     1.81   0.071    -.0000498    .0012183
        cons |  -.0612478   .0567612    -1.08   0.281    -.1724976    .0500021
        drdb |          0  (omitted)
------------------------------------------------------------------------------
Underidentification test (Kleibergen-Paap rk LM statistic):             15.091
                                                   Chi-sq(5) P-val =    0.0100
-redundant- option:
IV redundancy test (LM test of redundancy of specified instruments):    15.091
                                                   Chi-sq(5) P-val =    0.0100
Instruments tested:   dregrb dregin dreglsme dregap dregsme
------------------------------------------------------------------------------
Weak identification test (Cragg-Donald Wald F statistic):               31.777
                         (Kleibergen-Paap rk Wald F statistic):          9.087
Stock-Yogo weak ID test critical values:  5% maximal IV relative bias    18.37
                                         10% maximal IV relative bias    10.83
                                         20% maximal IV relative bias     6.77
                                         30% maximal IV relative bias     5.25
                                         10% maximal IV size             26.87
                                         15% maximal IV size             15.09
                                         20% maximal IV size             10.98
                                         25% maximal IV size              8.84
Source: Stock-Yogo (2005).  Reproduced by permission.
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.
------------------------------------------------------------------------------
Hansen J statistic (overidentification test of all instruments):         7.795
                                                   Chi-sq(4) P-val =    0.0994
------------------------------------------------------------------------------
Instrumented:         lnassetcap
Included instruments: open cloancap dec labour cons
Excluded instruments: dregap dregsme dregrb dregin dreglsme
Dropped collinear:    drdb
------------------------------------------------------------------------------
```

The syntax for lnpov equation is as follows:

```
. xtivreg2 lnpov1 lngcap1 open cloancap dec inf drdb (lnassetcap=dregap
dregsme dregrb dregin dreglsme), first robust fe cluster(province) re
> dundant(dregrb dregin dreglsme dregap dregsme)
Warning - collinearities detected
Vars dropped:       drdb

FIXED EFFECTS ESTIMATION
------------------------
Number of groups =        27                    Obs per group: min =        10
                                                               avg =      14.6
                                                               max =        15

Warning - collinearities detected
Vars dropped:  drdb

First-stage regressions
-----------------------


FIXED EFFECTS ESTIMATION
------------------------
Number of groups =        27                    Obs per group: min =        10
                                                               avg =      14.6
                                                               max =        15

First-stage regression of lnassetcap:

Statistics robust to heteroskedasticity and clustering on province
Number of obs =                   394
Number of clusters (province) =     27
```

```
------------------------------------------------------------------------------
             |               Robust
  lnassetcap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      dregap |   .2467921   .1037392     2.38   0.018     .0427754    .4508088
     dregsme |   .3125424    .327837     0.95   0.341    -.3321921    .9572768
      dregrb |   -.347423    .241331    -1.44   0.151    -.8220321    .1271862
      dregin |   .1661186   .2324562     0.71   0.475     -.291037    .6232742
    dreglsme |   .4693231   .1233136     3.81   0.000     .2268107    .7118354
     lngcap1 |   1.738294   .3492098     4.98   0.000     1.051527    2.425061
        open |  -.0117933   .0202587    -0.58   0.561    -.0516346     .028048
    cloancap |  -9.109804   6.558097    -1.39   0.166    -22.00716    3.787554
         dec |   .8948505   .2429564     3.68   0.000     .4170448    1.372656
   inflation |  -.0177578   .0029829    -5.95   0.000    -.0236241   -.0118915
        drdb |           0  (omitted)
------------------------------------------------------------------------------
F test of excluded instruments:
  F(  5,    26) =     5.72
  Prob > F      =   0.0011
Sanderson-Windmeijer multivariate F test of excluded instruments:
  F(  5,    26) =     5.72
  Prob > F      =   0.0011



Summary results for first-stage regressions
-------------------------------------------

                                          (Underid)             (Weak id)
Variable     | F(  5,    26)  P-val | SW Chi-sq(  5) P-val | SW F(  5,    26)
lnassetcap   |       5.72    0.0011 |       30.40   0.0000 |        5.72

NB: first-stage test statistics cluster-robust

Stock-Yogo weak ID F test critical values for single endogenous regressor:
                                 5% maximal IV relative bias    18.37
                                10% maximal IV relative bias    10.83
                                20% maximal IV relative bias     6.77
                                30% maximal IV relative bias     5.25
                                10% maximal IV size             26.87
                                15% maximal IV size             15.09
                                20% maximal IV size             10.98
                                25% maximal IV size              8.84
Source: Stock-Yogo (2005).  Reproduced by permission.
NB: Critical values are for i.i.d. errors only.

Underidentification test
Ho: matrix of reduced form coefficients has rank=K1-1 (underidentified)
Ha: matrix has rank=K1 (identified)
Kleibergen-Paap rk LM statistic          Chi-sq(5)=10.96    P-val=0.0522

Weak identification test
Ho: equation is weakly identified
Cragg-Donald Wald F statistic                                    17.50
Kleibergen-Paap Wald rk F statistic                               5.72

Stock-Yogo weak ID test critical values for K1=1 and L1=5:
                                 5% maximal IV relative bias    18.37
                                10% maximal IV relative bias    10.83
                                20% maximal IV relative bias     6.77
                                30% maximal IV relative bias     5.25
                                10% maximal IV size             26.87
                                15% maximal IV size             15.09
                                20% maximal IV size             10.98
                                25% maximal IV size              8.84
Source: Stock-Yogo (2005).  Reproduced by permission.
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.

Weak-instrument-robust inference
Tests of joint significance of endogenous regressors B1 in main equation
```

```
Ho: B1=0 and orthogonality conditions are valid
Anderson-Rubin Wald test          F(5,26)=        9.16     P-val=0.0000
Anderson-Rubin Wald test          Chi-sq(5)=     48.70     P-val=0.0000
Stock-Wright LM S statistic       Chi-sq(5)=     19.20     P-val=0.0018

NB: Underidentification, weak identification and weak-identification-robust
    test statistics cluster-robust

Number of clusters             N_clust  =         27
Number of observations               N  =        394
Number of regressors                 K  =          6
Number of endogenous regressors      K1 =          1
Number of instruments                L  =         10
Number of excluded instruments       L1 =          5

IV (2SLS) estimation
--------------------

Estimates efficient for homoskedasticity only
Statistics robust to heteroskedasticity and clustering on province

Number of clusters (province) =     27               Number of obs =      394
                                                     F(  6,    26) =    16.87
                                                     Prob > F      =   0.0000
Total (centered) SS     =  18.55349389               Centered R2   =   0.2680
Total (uncentered) SS   =  18.55349389               Uncentered R2 =   0.2680
Residual SS             =  13.58033405               Root MSE      =    .1924

------------------------------------------------------------------------------
             |               Robust
      lnpov1 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  lnassetcap |   -.340142   .0916154    -3.71   0.000    -.5197048   -.1605791
     lngcap1 |   .4805084   .2878927     1.67   0.095    -.0837508    1.044768
        open |  -.0086367   .0111786    -0.77   0.440    -.0305464     .013273
    cloancap |  -4.760288   2.438549    -1.95   0.051    -9.539756    .0191805
         dec |   .1029725   .1851872     0.56   0.578    -.2599877    .4659327
   inflation |   .0021054   .0015721     1.34   0.180    -.0009758    .0051866
        drdb |          0  (omitted)
------------------------------------------------------------------------------
Underidentification test (Kleibergen-Paap rk LM statistic):             10.961
                                                   Chi-sq(5) P-val =    0.0522
-redundant- option:
IV redundancy test (LM test of redundancy of specified instruments):    10.961
                                                   Chi-sq(5) P-val =    0.0522
Instruments tested:   dregrb dregin dreglsme dregap dregsme
------------------------------------------------------------------------------
Weak identification test (Cragg-Donald Wald F statistic):               17.499
                         (Kleibergen-Paap rk Wald F statistic):          5.722
Stock-Yogo weak ID test critical values:  5% maximal IV relative bias    18.37
                                         10% maximal IV relative bias    10.83
                                         20% maximal IV relative bias     6.77
                                         30% maximal IV relative bias     5.25
                                         10% maximal IV size             26.87
                                         15% maximal IV size             15.09
                                         20% maximal IV size             10.98
                                         25% maximal IV size              8.84
Source: Stock-Yogo (2005).  Reproduced by permission.
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.
------------------------------------------------------------------------------
Hansen J statistic (overidentification test of all instruments):        12.686
                                                   Chi-sq(4) P-val =    0.0129
------------------------------------------------------------------------------
Instrumented:         lnassetcap
Included instruments: lngcap1 open cloancap dec inflation
Excluded instruments: dregap dregsme dregrb dregin dreglsme
Dropped collinear:    drdb
```

3. Results of 2SLS Regressions (First Difference Estimation)

Variables	Coefficients			
	All regions	**Less developed regions**	**Intermediate regions**	**Developed regions**
Regional GDP per capita				
First stage regression				
dregap	0.0240806	0.0192252	0.1392359	0.0337438
dregsme	0.1895542**	0.2413847**		
dregrb	-0.0212666	-0.1887134**		0.0135241
dregin	-0.0943976***	-0.1092405	0.3084167	-0.0229886
dreglsme	-0.0107494	-0.2608819***	0.2442103	0.1150281
trade	0.0046242	0.0066903	-0.1367996	0.0144995
cloan	-0.0714036	0.0785376	-2.016813	21.55737
dec	0.0870119	0.0681522	-0.2781423	0.5239857
labour	0.0005271	0.000297	0.0035252	0.0003939
cons	0.3441472	0.5820773	4.660566	-0.3909368
Second stage regression				
Variables	**All regions**	**Less developed regions**	**Intermediate regions**	**Developed regions**
lnasset	-0.0259461	-0.2035329	-0.0344991	0.2147573
trade	0.0055671	0.0123599*	-0.0335933	0.0004185
cloan	8.212871***	6.791279	2.639762	2.651951
dec	-0.0174348	-0.0040014	-0.020306	-0.0676127
labour	0.0005717***	0.0005458	0.0017728	0.0012898***
cons	0.2545394**	0.4764478**	-2.11385	0.2172911
R^2	0.3589	-0.1725	0.1707	0.3864
Regional poverty				
First stage regression				
Variables	**All regions**	**Less developed regions**	**Intermediate regions**	**Developed regions**
dregap	0.0051469	0.0043784	0.1090499	-0.0229513
dregsme	0.169429**	0.2944034**		
dregrb	-0.0260744	-0.1746706*		-0.0154931
dregin	-0.1049376***	-0.1177128	0.2947961	-0.1281861
dreglsme	0.0273142	-0.2738796***	0.2063692	0.2107362
lngcap	0.346379*	0.4233937**	-0.2271768	0.5013509
trade	0.0025375	0.0023522	-0.1596595	0.0076244
cloan	8.740252	8.086541	-44.99312	12.12657
dec	0.1062629	0.0862351	-0.2260712	0.482045
inflation	-0.0032246**	-0.0026096*	0.0071773	-0.0095965
Second stage regression				
Variables	**All regions**	**Less developed regions**	**Intermediate regions**	**Developed regions**
lnassetcap	0.0529418	0.0550587	0.2926687	0.76882
lngcap	0.3284854**	0.3679614***	0.2493992	-0.4613148
trade	0.0044462*	0.003076	0.0368997	-0.008512
cloan	13.78174**	12.96218*	62.29779	22.22201
dec	0.0064214	-0.0342103	0.0067778	0.0336934
inflation	-0.0001941	0.0002195	-0.0064143	-0.0036378
R^2	0.1681	0.1858	-1.0587	-0.1714

Notes: * significant at the 10% level, ** significant at the 5% level *** significant at the 1% level