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Impacts of Liquidity Preference on Loan-to-Deposit Ratio and Regional Economic Growth: A Post-Keynesian View*

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In this study, we analyze the loan-to-deposit ratios (LDRs) and regional economic growth from the perspectives of Post-Keynesian endogenous money theory and liquidity preference theory. We also discover policy implications from the simulation results of a stock-flow consistent model. Contrary to the interpretation of exogenous money theory, we find that a low LDR in a region implies a high level of economic activity. Furthermore, regional economic gaps may emerge through the differences in the liquidity preferences of regions, that is, the liquidity preference differences among regions may lead to differences in various economic behavior, such as willingness to lend, investment propensity, and consumption propensity, which may exacerbate the regional economic gap. Therefore, regional finance should be examined from the perspectives of endogenous money theory and Keynesian theory of liquidity preference.

JEL Classification: E12, E41, E47, R11
Keywords: Endogenous Money, Liquidity Preference, Stock-Flow Consistent Model, Regional Finance

I. Introduction

Since the 2007–08 global financial crisis, many researchers have emphasized the importance of regional finance. Some researchers have argued that regional financial institutions can mitigate the effects of economic crises (Sohn and Park, 2011), whereas others have pointed out that independent regional financial

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institutions with weak interrelationships with nationwide commercial banks can serve as means of reducing the systemic risk of the entire financial system, which has recently become a major concern (Yang et al., 2014). Some empirical analyses also show that the development of local finance has a significant impact on regional economic growth. This study then evaluates alternative policy proposals to address regional finance issues from the perspective of Post-Keynesian money theory.

Many researchers and institutions have pointed out that the functioning of regional finance in Korea has shrunk since the 1997–98 currency crisis (Kim, 2012). Many studies have described shrinking regional finance in terms of the flow of funds from peripheral to central regions (Sohn and Park, 2011). Most of these studies show that the amount of funds flowing from the periphery is equal to the difference between the amount of credit extended by and the amount of deposits received by financial institutions in the region. From this perspective, a higher loan-to-deposit ratio (LDR) in a region corresponds to a more active intermediary function of financial institutions in this region, thereby leading such institutions to absorb deposits from the surrounding regions.

However, in modern capitalist economies, deposit banks are not simply fund intermediaries but financial institutions that create deposits through loans. From this perspective, the problem of regional fund outflow can be interpreted differently from previous studies. Specifically, a high LDR suggests that the money generated from loans flows out of the region through outside consumption, outside asset purchases, and factor income outflow. At the same time, the economic disparity between two regions arising from differences in their liquidity preferences cannot be overlooked. Regional differences in liquidity preferences can lead to differences in lending tendencies, investment preferences, and propensities to consume, thereby widening the inter-regional economic gap. The problem of regional finance should therefore be carefully reinterpreted from the perspectives of endogenous money theory coupled with Keynesian liquidity preference theory.

The rest of this paper is organized as follows. Section II surveys Post-Keynesian theory on regional finance in terms of endogenous money theory and liquidity preference theory. Section III presents a Post-Keynesian stock-flow consistent (SFC) model simulation without the inter-regional flows of finance. Section IV presents the results and policy implications. Section V summarizes and concludes the paper.

II. Post-Keynesian Theory on Regional Finance

1. Endogenous Money Theory

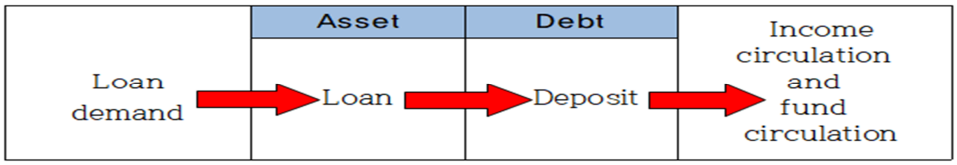
According to monetarist theory, money is an exogenous variable whose price is determined by the amount of money that is created by monetary authorities. By

contrast, according to Post-Keynesian endogenous money theory, firms create demand for bank loans as a means of making new investments, and when banks supply loans in response to such demand, deposit money is created. In this credit supply process, money is created ex nihilo given that no advance deposits are needed (Min, 2012). In sum, those banks faced with demand for loans provide credit supply through lending activities on its asset side, thereby leading to the creation of deposit money as debt and triggering the circulation of various types of income and money. As a result, real economic activity and money are connected on the balance sheets of banks. According to endogenous money theory, money stock is an endogenous variable determined by the mutual interaction between private credit demand and banking sector, where the causality between money stock and prices is reversed. In other words, money supply does not unilaterally determine the price level; instead, the price level determines the money supply via the demand for money. While the Keynesian theory of effective demand, which claims that total demand determines the total supply of an economy, is a demand-led theory in the real sector, Post-Keynesian endogenous money theory is a demand-led theory in the money sector.

According to endogenous money theory, the essence of money is (bank) credit, and banks are no longer simply financial intermediaries but agencies that create credit by issuing loans, which differentiates them from other non-bank financial institutions, such as savings banks, life insurance firms, and investment firms. Therefore, contrary to the traditional way of thinking, while banks are viewed as places that collect deposits and loan deposit money, these institutions do not require advanced deposits or reserves to issue loans. Given that money stock is determined by private credit (loan) demand, the central bank cannot control the money stock with a reserve base. Instead, the central bank serves only as a lender of last resort that provides the reserves necessary for the deposits created by banks only on a post-mortem basis; however, the central bank can intervene indirectly in the money market by taking advantage of its position as a monopolistic supplier of legal tender and lender of last resort to determine the base interest rate and basis of the market interest rate structure.

For individual banks that are tied to various institutional constraints, such as a reserve requirement system, and are subject to the supervision of the central bank and monetary authorities, securing deposits can be a means of expanding their credit potential. Under certain institutional constraints, individual banks can compete in the deposit market to secure customer deposits, which form the basis of their credit potential; however, when the deposit banking system is viewed as a whole, the causal relationship of money flows from loans to deposits (Graziani, 2003).

[Table 1] Process of Money Creation Using the Bank System's Balance Sheet



Source: Graziani (2003) and Min (2012).

2. Reinterpretation of LDR from the Perspective of Endogenous Money Theory

If bank loans are considered sources of money, then a comparison of LDR across regions takes on a different meaning. Most regional finance studies have used the LDR of banks as an indicator of the workings of the financial brokerage function in a region.

From the same perspective, Kim (2012) asserted that while non-bank financial institutions outside the Seoul metropolitan region suffer from the outflow of funds, the deposit banks in this region experience fund inflows because the LDR of deposit banks in regions outside Seoul is higher than that of deposit banks within Seoul. Similarly, Sohn and Park (2011) found that eight Korean provinces (excluding Gyeonggi) are suffering from an outflow of KRW 23.9 trillion, whereas six metropolitan areas are seeing an outflow of KRW 15 trillion. The money outflow amounts were calculated by subtracting the total amount of credit from the total amount of money received by banks, non-bank financial institutions, and life insurance companies. All the above studies treat deposit banks as non-bank financial institutions that collect savings deposits and facilitate loans.

From this perspective, LDR can be viewed as an indicator of the level of lending activities in a region compared with its deposit base; a high LDR indicates a higher level of lending activities than deposit activities, and the inflow of funds from other regions can be assumed. However, while this perspective shows the LDR may be valid for non-bank financial institutions that carry out lending activities based on their deposits as they do not have the capability to create credit, this perspective is certainly not valid for commercial banks that are capable of creating deposits. In addition, from the perspective of endogenous money theory, the LDRs of regional deposit banks can be used to measure the inflow and outflow of regional funding in an opposite manner. A region with higher LDR than others means that the money created in this region through bank loans does not remain as deposits within the region but instead flows out into other regions.

In addressing the issue of regional balance, Dow (1993) found that LDR can be an indicator of the regional balance of payments and the listed offshore consumption, offshore asset purchases, and factor income (operating surplus and

employee income) outflow, which act as channels through which a regional balance deficit can occur. They likened these channels to current account, capital account, and net factor income deficits in terms of the international balance of payments. However, many other channels of money flow are present in reality; for instance, the deposits created by a deposit bank can flow into a non-bank financial institution as savings deposits (Table 2). Therefore, a simple interpretation of the LDR would not be appropriate. In the simulation results below, this study demonstrates the existence of various real variables that influence LDR.

[Table 2] Composition of Regional Balance

Regional exports of goods and services – Regional imports of goods and services
= balance of regional trade + regional net transfers + regional net payment of interest and dividends + others
= regional balance on current account + regional net direct investment inflows + regional net portfolio investment inflows
= regional loan-to-deposit variance

Source: Dow (1993).

A close examination of the regional LDR data reveals that the LDRs of Gyeonggi-do and Incheon have been the highest among the metropolitan areas of Korea since the 2010s. By contrast, the LDR of Seoul has been one of the lowest in the nation, falling short of 100 percent. From the perspective of endogenous money theory, the relationship between Gyeonggi-do/Incheon and Seoul is a typical example of a financial center and its periphery. For instance, a considerable amount of money from the deposits created through bank loans in Gyeonggi-do is absorbed as operating surplus by financial and non-financial firms located in Seoul or into the consumer or real estate markets.[1] Gyeonggi-do, in particular, has a higher deposit bank LDR compared with the other regions, hence forming the perspective that this region receives a large influx of money from the other regions. As a result,

[1] Meanwhile, Gyeonggi-do appears to be a region that experiences an inflow of income, as its gross regional income is higher than its GRDP. In 2015, Gyeonggi-do had the second-largest income inflow in the country, at KRW 28.1 trillion (Source: Statistics Korea (KOSTAT)), regional account). At first glance, this seems to counter this study's interpretation of the data, which relates a high LDR to a high potential for capital outflow. However, there are other channels of capital outflow besides factor income outflow, such as offshore consumption and offshore asset purchases. Therefore, it is highly likely that deposits within Gyeonggi-do decreased due to capital outflow, such as the outflow of consumption to Seoul and real estate purchases.

public opinion regarding the establishment of regional banks has been negative. However, based on endogenous money theory, a high LDR may not only indicate capital outflow but can also be a sign of a general economic downturn, such as slow capital and income circulation.

In addition, an examination where Korea is divided into three regions, namely, Seoul metropolitan area (Seoul, Gyeonggi-do, and Incheon), five metropolitan areas, and eight provinces, as shown in Table 3 reveals disparities in the institutional LDRs of these regions. Among them, the LDR of Seoul is consistently the lowest. Since the 2010s, the same LDR structure has been maintained, with the Seoul metropolitan region at the bottom. According to endogenous money theory, this result implies that the funds generated in other regions have likely flowed into Seoul in the form of deposits.

[Table 3] Loan-to-Deposit Ratios of Deposit Banks (%)

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total	113.0	112.2	111.1	114.4	115.7	115.7	114.8	115.2	114.7	112.1
Seoul	87.4	88.6	84.6	86.8	87.4	87.5	86.7	85.7	83.3	81.1
Gyeonggi-do	182.1	174.9	172.3	172.3	174.6	168.1	165.6	167.0	169.5	168.8
Incheon	199.7	204.6	204.2	199.9	203.6	193.6	183.3	186.4	193.2	197.1
Seoul metropolitan region (Seoul, Gyeonggi-do, and Incheon)	110.0	110.2	106.8	109.2	110.3	109.2	108.3	108.1	106.5	104.6
Metropolitan cities (5)	119.7	116.7	120.1	123.9	123.8	126.4	128.4	132.9	141.0	138.0
Provinces (8)	121.7	117.1	122.7	128.6	131.7	133.8	129.7	130.9	131.0	123.9

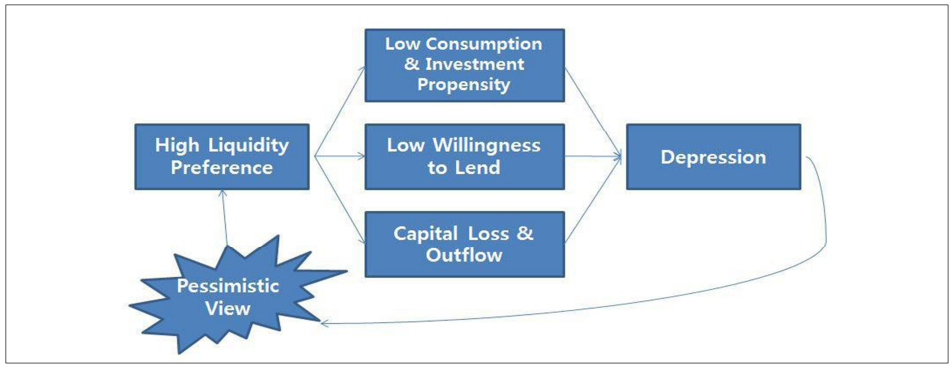
Source: Bank of Korea.

3. Liquidity Preference in Regions and Regional Disparity

Liquidity preference theory is central to Keynesian economics. Liquidity preference refers to the demand for liquid assets or money stocks. In this case, money is demanded not only as a simple medium of exchange but also as a form of wealth. Economic entities wish to hold onto money stocks for a certain period rather than immediately using them to engage in transactions due to the uncertainty of the future. On the one hand, when the prospects for the future are pessimistic or uncertain, the liquidity preference of economic entities increases, thereby leading such entities to change the composition of their assets through liquidation. On the other hand, when their prospects for the future are optimistic, the liquidity preferences of these entities decrease, and they move their assets to high-yielding, long-term investments. In this way, liquidity preference becomes a theory of portfolio asset selection and can be extended to households, banks, and financial institutions.

Liquidity preference theory can also explain the path by which economic crises and disparities occur and spread through finance. According to this theory, the speculative expansion and rapid contraction of finance increase the risks and financial costs of real investment, ultimately hindering economic growth and employment. Applying these issues at the local level, liquidity preference theory explains the path by which the differences or variability in liquidity preference among regions lead to regional economic disparities. Those regions with high regional income, positive economic outlook, and mild economic fluctuations generally have low liquidity preference, whereas those regions with low income, negative outlook, and strong economic fluctuations have high liquidity preference due to their anxiety regarding the future. Moreover, given that a low liquidity preference is relatively favorable for economic development, regional disparities tend to expand and repeat. The vicious cycle of the expansion of regional economic disparities is summarized in Fig. 1.

[Figure 1] Effect of Regional Liquidity Preference on Regional Disparities

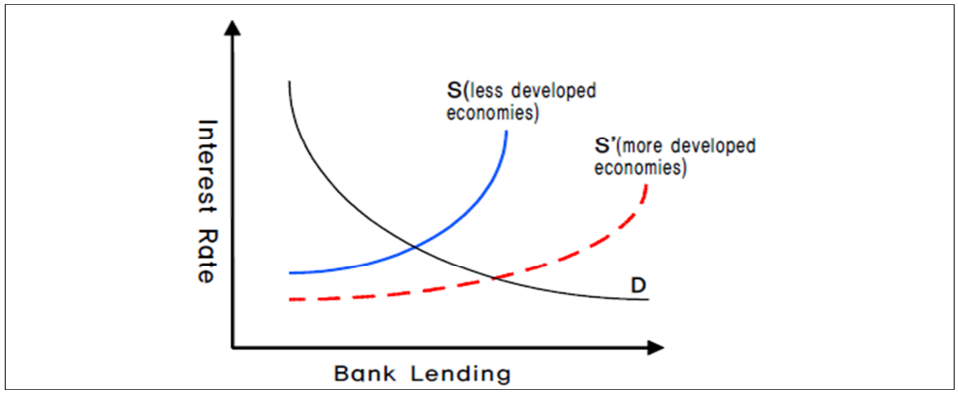


Source: Dow (1993) and Rodríguez-Fuentes (2006).

The regional differences in liquidity preferences lead to an unbalanced regional development primarily due to the differences in their investment propensity and their propensity to consume in the real sector. In other words, the more widespread the tendency to hold liquid assets for a long period, the less the demand for investment and consumption. From the perspective of endogenous money theory, the differences in liquidity preference result in differences in the lending propensities of banks, which can subsequently lead to regional disparities in credit supply as shown in Fig. 2. An increase in the liquidity preference of banks fosters a strong urge to hold onto secure assets, thereby discouraging banks from providing loans, which are relatively high-risk assets. Moreover, the regional disparity in liquidity preference can result in loss of property value and capital outflow. A rapid increase in liquidity preference in one region not only reduces property value as the prices of non-liquid assets plunge but also results in a regional imbalance through

capital outflow as the tendency of regions with high liquidity preferences to purchase secure assets from other regions with low liquidity preferences intensifies. Specifically, when the liquidity preference of one region increases due to such property value loss and capital outflow, a liquidity paradox emerges, in which the level of liquidity to turn assets into cash within the region decreases (Dow, 1993).

[Figure 2] Difference in Bank Lending Tendencies in Less Developed and More Developed Economies



Source: Rodríguez-Fuentes (2006).

In sum, Post-Keynesian liquidity preference theory explains the phenomenon where regional differences in asset choices cause regional disparities in finance and the real economy. This theory will be reflected in the SFC model simulation in a later section.

Liquidity preference theory also implies that regional development policies need to consider the economic prospects and financial behavior of economic entities in the region (Rodríguez-Fuentes, 2006). For instance, policies that supply money to regions with economic entities that have a high liquidity preference without disrupting the economic outlook of such entities may lead the region into a liquidity trap or result in capital outflow, thereby making it difficult to achieve policy effectiveness.

III. Construction of a Stock–Flow Consistent Model

1. Assumptions

We construct a model in which a separate regional bank exists in a region based on the Neo-Kaleckian growth model. The basic characteristics of the Neo-Kaleckian growth model are as follows. First, investment is a function of capacity

utilization and profit rates. An increase in capacity utilization rate increases demand pressure, which in turn increases capital investment; likewise, an increase in profit rate increases both investment prospects and investment. Second, the capacity utilization rate is maintained at a normal level below 1.00 (incomplete utilization is normal), and given the sufficient idle workforce in the labor market, underemployment (unemployment) always exists. Third, under an oligopolistic market, price is determined not through supply and demand but by using the cost-plus pricing method (Kim and Lee, 2016).

To simplify the discussion, the following assumptions are made regarding two separate regional economies based on the characteristics of the Neo-Kaleckian growth model:

- There are two regions: Regions A and B.
- These two regions are separate and have no economic interactions.
- These regions have a unit banking system, with each system having one commercial bank.
- These regions do not have any government but have a central bank.
- All firms in these regions have excess facilities, and both regions have idle workforce and unemployment in their labor markets.
- Firms decide the price of goods according to a simple mark-up method.
- Firms raise funds through bank loans.
- Cash does not exist, only deposit money exists, loan interest rate differs from deposit interest rate, and the banks own equity.
- The only difference between these two regions is that the liquidity preference of households in Region A is lower than that of households in Region B.[2]
- The assets of each regional economy are housing and deposit money.

This study explicitly introduces a speculative housing demand in the sense of Keynes and Minsky. In Keynes's sense, housing demand is based on the convenience of housing services and is derived from the expected capital gains (or expected future price minus current price). Meanwhile, in Minsky's sense, households partially finance the housing demand by using bank loans but they merely pay interest without repaying principal (Lee and Min, 2015).

2. Balance Sheet and Transaction Matrix

The economic sectors are households, firms (f^A and f^B), local banks (b^A

[2] In order to abstract the problems that arise in two regions due to differences in their real economies, the two economies are assumed to be identical in all respects, with the sole exception of liquidity preference. To simplify the model as much as possible, we assume that there is no trade between the two regions.

and b^B), and the central bank (cb). We take a look at the basic structure of the model through the balance sheet, asset revaluation table, and transaction matrix. First, the balance sheet, which shows the stocks and the transaction matrix, which shows the flow, illustrate the overall structure of the model. Table 4 presents the balance sheet of the entire economy and combines the balance sheets of all economic actors into one. The plus sign (+) in this table represents the assets, the minus sign (–) represents the liabilities, the capital letters represent the nominal values, and the lowercase letters represent the real values. Capital letters A and B in superscripts indicate the respective regions (see Appendix 1 for the symbol notations).

[Table 4] Balance Sheet of the Two Regions Model

	Region A			Region B			Central Bank	Total
	House holds	Firms	Banks	House holds	Firms	Banks		
1. Capital		$+K^A$			$+K^B$			$+K$
2. Housing	$+H^A$			$+H^B$				$+H$
3. Deposits	$+M^A$		$-M^A$	$+M^B$		$-M^B$		0
4. Business loans		$-L^A$	$+L^A$		$-L^B$	$+L^B$		0
5. Household loans	$-MO^A$		$+MO^A$	$-MO^B$		$+MO^B$		0
6. Central bank loans			$+A^A$			$+A^B$	$-A$	0
7. Bank capital	$+BC^A$		$-BC^A$	$+BC^B$		$-BC^B$		0
Net assets	$-Vh^A$	$-Vf^A$	0	$-Vh^B$	$-Vf^B$	0	$-Vcb$	$-(K+H)$
Total	0	0	0	0	0	0	0	0

Note: This model deals only with the differences in liquidity preferences within an economy. Certainly, such criticism is appropriate. However, what we intend to show is that the differences between the two economies can be attributed to the differences in their liquidity preferences. The gap in liquidity preferences can widen the regional economic gap by increasing the gap between asset purchasing propensity and consumption propensity between the two regional economies. We assume that no trade takes place between these two regions.

Among the assets listed on the balance sheet, long-term assets fluctuate in value over time as shown in Table 5 (asset revaluation table). The revalued assets in this model include bank capital (BC) and housing (h). To simplify the model, bank capital is assumed to be owned by the bank itself. Meanwhile, housing, as a real asset held by households, is automatically revalued through housing price (q) fluctuation.

[Table 5] Revaluation Matrix of the Two Regions Model

	Region A		Region B		Total
	Households	Banks	Households	Banks	
Bank Capital		$\pm\Delta BC^A$		$\pm\Delta BC^B$	0
Housing	$\Delta q^A \cdot h^A(-1)$		$\Delta q^B \cdot h^B(-1)$		$\Delta q^A \cdot h^A(-1) + \Delta q^B \cdot h^B(-1)$

The transaction matrix in Table 6 shows the changes in the flow of economic activities of each economic sector. In the transaction matrix, the source of income or funds is represented by the plus sign (+), whereas the expenditure or use of funds is represented by the minus sign (–). In this way, Table 6 illustrates the flow of current and capital transactions of each economic sector during a given period. Each column represents the budget constraints of the economy, whereas each row represents the supply and demand of the real and financial sectors of the market. The last row shows the net assets of each sector[3] (see Appendix 1 for the symbol notations).

3. Decision Making in Economic Sectors

Each economic sector in a region plays a unique role in the economy. By applying the assumptions of Post-Keynesian economics, each sector in this model is not an economic agent that seeks to maximize profits (as is assumed in neoclassical economics) but only acts as an institutional unit that performs its assigned functional roles. The decision making of each economic entity, which we will examine next, corresponds to the explanation of the matching conditions of the capital and current accounts of each sector as shown in Table 6.[4]

[3] Contrary to a traditional stock-flow model, in this model the central bank is a black hole because the government sector is not included. With a government sector that issues bonds, the central bank's (–) net asset are offset by the government debt. The bonds are demanded by households, banks, and the central bank, and the black hole disappears.

[4] Because areas A and B are identical, apart from households' liquidity preference, only one equation each was written for both areas, omitting only the regional symbols A and B.

[Table 6] Transaction Matrix of the Two Regions Model

	Region A					Region B					Central bank	Total
	House holds	Firm		Bank		House holds	Firm		Bank			
		Current	Capital	Current	Capital		Current	Capital	Current	Capital		
01. Consumption	$-C^A$	$+C^A$				$-C^B$	$+C^B$					0
02. Housing	$-q^A \cdot \Delta h^A$	$+q^A \cdot \Delta h^A$				$-q^B \Delta h^B$	$-q^B \Delta h^B$					0
03. Investment		$+\Delta K^A$	$-\Delta K^A$				$+\Delta K^B$	$-\Delta K^B$				0
		$[Y^A]$					$[Y^B]$					0
04. Wages	$+wN^A$	$-wN^A$				$+wN^B$	$-wN^B$					0
05. Rent	$\pm RT^A$					$\pm RT$						0
06. Corporate profit		$-F_f^A$	$+F_f^A$				$-F_f^B$	$-F_f^B$				0
07. Bank profit				$-F_b^A$	$+F_b^A$				$-F_b^B$	$+F_b^B$		0
08. Interest on business loans		$-rL^A$		$+rL^A$			$-rL^B$		$+rL^B$			0
09. Interest on households' loans	$-rMO^A$			$+rMO^A$		$-rMO^B$			$+rMO^B$			0
10. Interest on deposits	$+r_{mt}M^A$			$-r_{mt}M^A$		$+r_{mt}M^B$			$-r_{mt}M^B$			0
11. Central bank loans					$+\Delta A^A$					$+\Delta A^B$	$-A$	0
12. Change in business loans			$+\Delta L^A$		$-\Delta L^A$			$+\Delta L^B$		$-\Delta L^B$		0
13. Change in home loans	$+\Delta MO^A$				$-\Delta MO^A$	$+\Delta MO^B$				$-\Delta MO^B$		0
14. Change in deposits	$-\Delta M^A$				$+\Delta M^A$	$-\Delta M^B$				$+\Delta M^B$		0
Total	0	0	0	0	0	0	0	0	0	0	$-A$	

(1) Households

In the economic model, the households in each region are consumers, laborers, and owners of housing assets. In this model, households engage in consumption activities (C) by using their labor income ($w \cdot N$) and asset income (RT), and they hold their own assets in the form of residential or speculative housing (H) and deposits (M). Some SFC models assume that bank capital is privately owned by households (Godley and Lavoie, 2007). However, for the sake of simplicity, this study omits this assumption.[5] In addition, households take out mortgage loans (MO) from banks to purchase houses.

Households use their income to engage in consumption and purchase housing, in that order. Therefore, the decision making of a household is divided into four categories, namely, income, consumption, purchases of residential housing, and asset purchases (speculative housing demand). We will initially describe disposable income and changes in wealth before describing the expenses, such as decisions on purchases of consumer goods and residential housing, and examining asset selection in households.

Nominal regular disposable income (YD_h) consists of wage income and capital income, of which wage income is determined by wage rate (w) and labor supply (N^S), whereas capital income, in the case of financial assets, refers to interest income from deposits ($r_m \cdot M$). The demand for consumer goods is determined by nominal income and the marginal propensity to consume (β).[6] Therefore, household savings (Sav_h) can be defined as nominal regular disposable income excluding consumption.

The asset selection of households is based on the assumption that the demand for new housing, which is a non-liquid asset, is proportional to the changes in consumption demand (α) and is influenced by speculative factors represented by ε. An increase in the value of ε increases the housing demand, whereas a decline decreases the housing demand. The money left over after purchasing housing, which is an investment asset, becomes a liquid asset, and the housing mortgage loan (MO) is determined by the loan-to-value ratio (LTV, λ), which is part of the amount used for a new housing purchase. In the following equations, e in superscript indicates the expected value, subscript (-1) denotes the previous period,

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[5] If the assumption that bank capital is owned by households is made, household consumption increases significantly due to the bank's dividend income and capital gains, ultimately widening the growth rate gap between the two areas.

[6] Regarding setting the value function, see Lee and Min (2015, pp. 83-84). The summary is as follows.
$H^D = \alpha C + \varepsilon H$ (5); hence, $H^D = \frac{\alpha}{(1-\varepsilon)} C^D$ and $\Delta H^D = \frac{\alpha}{(1-\varepsilon)} \Delta C^D$. Households finance their house demand partly through collateralized bank loans at a loan-to-house value ratio λ, and make down payments $(1-\lambda) q \Delta H$ out of current gross savings. $Sav_h = r_{(-1)} \cdot \lambda \cdot q \cdot h^D + (1-\lambda) \cdot q \cdot \Delta h^D$. Substituting the above two equations into equation (4) and given the growth rate of consumption (g_c) and the steady state growth, we can get the β value.

and capital letters S and D in superscripts represent Supply and Demand, respectively.

$$YD_h = w \cdot N^S + r_{m(-1)} \cdot M^D_{(-1)} \tag{1}$$

$$C^D = \beta \cdot YD^e_h \tag{2}$$

$$\beta = (1-\varepsilon) / [(1-\varepsilon) + q \cdot h \cdot r_{(-1)} \cdot \lambda + q \cdot h(1-\varepsilon) g^e_c] \tag{3}$$

$$Sav_h = YD_h - C^D \tag{4}$$

$$H^D = \alpha C + \varepsilon H \tag{5}$$

$$M^D = M^D_{(-1)} + Sav_h + \Delta MO^D - q \cdot \Delta h^D - r_{(-1)} \cdot MO^D_{(-1)} \tag{6}$$

$$MO^D = \lambda \cdot q \cdot h^D \tag{7}$$

(2) Firms

Firms make financing decisions based on price, output, and investment. According to the model used by Kalecki (1954), firms set their prices by mark-up, and the price of consumer and capital goods in each region is assumed to be equal to 1 for the sake of simplicity. The price of housing is also arbitrarily set to 1.[7]

Firms' profit (F_f) is computed as the value of sales excluding payments of workers' wages and interest on bank debts. Nominal wage payments are determined by wage rate (w) and labor demand (N^D), whereas interest payments are determined by loan interest rate (r) and business loan amount (L^S). The nominal total output of a firm (Y^S) is computed as the sum of the supply of consumer goods (C^S), supply of new housing (ΔH^S), and supply of new capital goods (ΔK^D). The labor demand of a firm is determined by its average labor productivity (a) and total output.

We now examine the investment decisions of a firm. The demand for new investment (I^D) in each firm is determined by growth rate (g_k), and firms make investment decisions by setting the capital growth rate while considering both capacity utilization rate (u) and profit rate (r_{cf}). Here, capacity utilization rate is represented by the ratio of actual output (Y^S) to full-capacity output (Y_F). In addition, the full-capacity output of a firm is proportional to its amount of capital. This study assumes that the full-capacity output coefficient (v) for capital is constant and defines the profit rate of firms as the ratio of corporate profits to capital.

We then examine the procurement of investment funds for firms. Firms use their retained earnings to make investments. This study assumes that firms use all their profits as internal reserves (FU_f). If the investments exceed the internal reserves,

[7] In this model, the prices were set to 1. It is possible to obtain the mark-up ratio through back-calculation. Zezza (2008) assumed that the rate of change in housing prices is inversely proportional to the rate of change in housing inventory, but this study assumes that the rate of change in housing prices is also given, for the sake of simplicity.

then the amount lacking is covered by bank loans. This argument can be expressed as follows:

$$F_f = Y^S - w \cdot N^D - r_{(-1)} \cdot L^D_{(-1)} \tag{8}$$

$$Y^S = C^S + \Delta H^S + I^S \tag{9}$$

$$N^D = Y^S / a \tag{10}$$

$$I^D = g_k \cdot K^D_{(-1)} \tag{11}$$

$$g_k = \gamma_0 + \gamma_1 \cdot u_{(-1)} + \gamma_2 \cdot r_{cf\,(-1)} \tag{12}$$

$$u = Y^S / Y_F \tag{13}$$

$$Y_F = K / v \tag{14}$$

$$r_{cf} = F_f / K \tag{15}$$

$$\Delta L^D = I^D - FU_f \tag{16}$$

$$FU_f = F_f \tag{17}$$

(3) Commercial Banks (Regional Banks) and the Central Bank

Commercial banks are financial institutions that specialize in lending activities, such as issuing household loans (MO) and business loans (L) and receiving deposits from households (M). We first examine the decision making of commercial banks concerning their assets and liabilities before discussing how they determine their interest rates on loans, their capital, and their profit.

According to endogenous money theory, banks are receptive to the demand for business and home loans. Specifically, banks are receptive to the demand of firms for capital investment loans (L^D) and the demand of households for home loans (MO^D) given that firms and households have a certain level of credit. Any loan demand in excess of the capital and deposits of banks is ultimately covered by the demand for the liabilities of the central bank.

In terms of liabilities, banks also supply deposits (M^S), in accordance with the demand of households for deposits (M^D), at a predetermined interest rate (r_m). Interest rates for business or household loans are assumed to be surcharged at the interest rate for household deposits.[8] Therefore, bank profits (F_b) are determined by the difference between the interest income from business and household loans and the interest payments on household deposits. This study assumes that banks use all their profits to accumulate capital (BC). The deposit interest rate (r_m) is determined by the policy interest rate ($\bar{r}$) and deposit discount rate ($add1$[9] (>0))

[8] For simplification, the interest rates for business and household loans were assumed to be identical. We also assumed that banks have no overhead costs.

[9] "add1" is just an expression that means mark-up. The model assumes that it is given. In more complex models, the mark-up rate can be adjusted to match the capital adequacy ratio (see Godley and

set by the central bank.

$$L^S = L^D \tag{18}$$
$$MO^S = MO^D \tag{19}$$
$$M^S = M^D \tag{20}$$
$$F_b = r_{(-1)} \cdot (L^S_{(-1)} + MO^S_{(-1)}) - r_{m(-1)} \cdot M^S_{(-1)} \tag{21}$$
$$BC = BC_{(-1)} + F_b \tag{22}$$
$$r = \overline{r} \tag{23}$$
$$r_m = r - add1 \tag{24}$$

The demand of commercial banks for central bank lending (A^D) is determined by the difference between the assets and the total equity and deposits of commercial banks. Following endogenous money theory, we assume that the central bank pursues the financial stability of the overall economy and, therefore, takes a fully accommodating attitude toward the demand of commercial banks for liabilities.

$$A^D = (L^S + MO^S) - (M^S + BC) \tag{25}$$
$$A^S = A^D \tag{26}$$

(4) Market Equilibrium and Expectations Formation of Economic Sectors

To solve this model, we need additional equations concerning the equilibrium of markets and the payments and receipts of various incomes as shown in the top row of the transaction matrix (Table 6). These horizontal constraints make up the balanced equation of demand and supply in each market. This model consists of four real markets, namely, consumer goods, housing, capital goods, and labor, and three financial markets, namely, deposits, business loans, and housing loans. The equilibrium between supply and demand for the three financial markets has been explained in the bank section above (equations (18) to (20)), whereas the equilibrium of the real market is expressed in equations (27) to (30). Given the presence of idle facilities in the commodity market, the supply in each real market is determined according to the demand. The labor market is also assumed to have enough reserves; therefore, the labor supply of households is determined by the demand for labor in each region and sector.

$$C^S = C^D \tag{27}$$
$$\Delta H^S = \Delta H^D \tag{28}$$
$$\Delta K^S = \Delta K^D \tag{29}$$

Lavoie, 2007, pp. 400-404 and Min, 2013, pp. 99-101), but this model is assumed to be given for simplicity.

$$N^S = N^D \tag{30}$$

If the expectations for each economic sector are adaptive, then we set the expectations by revising the expectation errors of the previous period.

$$X^e = X_{(-1)} + \theta \cdot (X_{(-1)} - X^e_{(-1)}) \tag{31}$$

IV. Simulation Results

Most SFC models involve a complex system of equations that are difficult to solve by hand. Therefore, computer programs are used to solve these equations and to perform simulations for analyzing dynamic changes. A simulation is performed in this work because an irregular continuous process cannot be examined via static or equilibrium analysis. According to Lavoie and Godley,

The advantage of this approach is that it is always possible to find out exactly why the model generates the results it does. The disadvantage is that we can only analyze local stability: we do not know if there are other equilibria, or if these other equilibria are stable. What we do show is that over a reasonable range of parameter values, including, obviously, the values that we chose, the model does yield a stable solution (Lavoie and Godley, 2001, p. 296).

As a result, instead of measuring the empirical effects (or making predictions), the SFC methodology analyzes the results of simulations within the theoretical framework, which is significant in itself.[10]

The analysis will first apply simulations to find the long-term growth path under the assumption that Regions A and B are identical. Second, we will examine the changes in the economy caused by the differences in the liquidity preferences of households in these two regions. This experiment is significant in that it was designed to prove that liquidity preferences and various real factors affect both regional economic growth and LDR. Through this experiment, we will reveal the limitations of the existing perspectives, in which the high LDRs in regional economies are simply explained by active financial brokerage activities. In addition, our results illustrate that the differences in the liquidity preferences of households alone can influence the level of real economic activities and the asset–liability structure of banks. We will demonstrate that this explanation is in line with endogenous money theory.

[10] For discussions concerning this, see Caverzasi and Godin (2015).

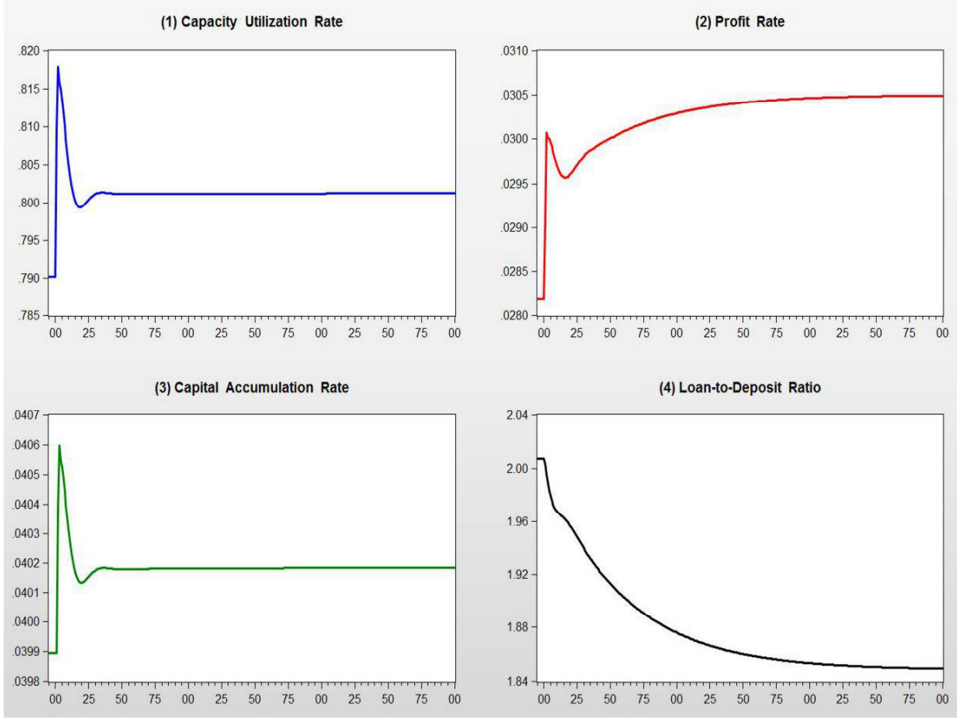
1. Characteristics of a Long-Term Growth Path

Before conducting the full analysis, we first examine whether the long-term growth path of the model devised in this study is consistent with the paradox of saving in Neo-Kaleckian growth theory, that is, an increase in savings leads to a decline in economic growth. Second, we will examine whether the model is a wage-led growth regime (in which an increase in the share of wage income, due to a rising wage rate and decreasing mark-up, leads to an increase in consumption and economic growth rates) or a profit-led growth regime (in which an increase in the share of wage income leads to a decrease in profit rate, investments, and economic growth rate).

(1) Paradox of Saving

To illustrate whether this model is consistent with the paradox of saving, we examine the changes in economic growth when the marginal propensity to consume (β) increases. In this model, lowering the interest rate on housing loans (r) increases the marginal propensity to consume in equation (3). The result is shown in Fig. 3.

[Figure 3] Increasing the Propensity to Consume

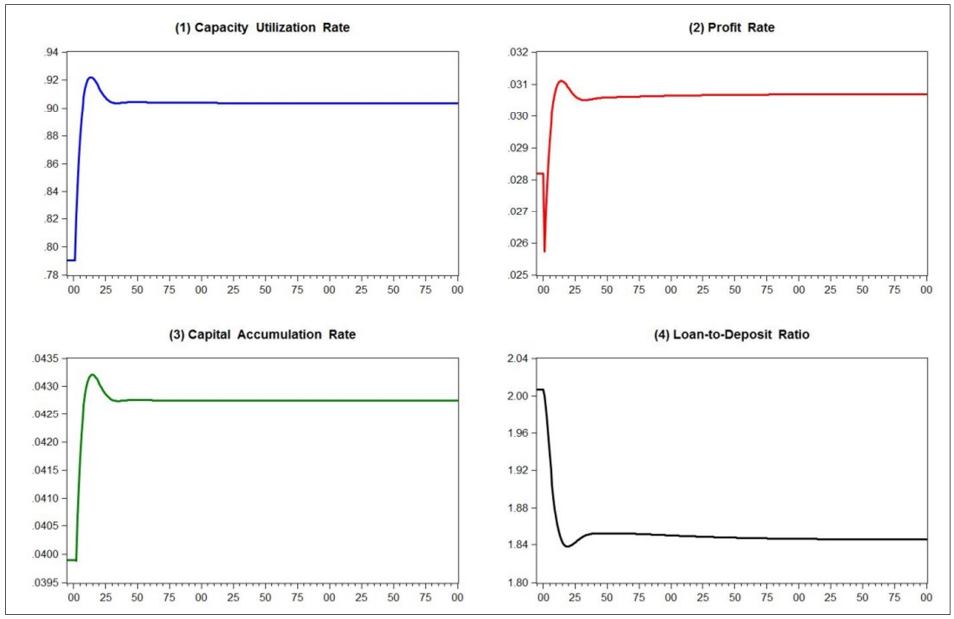


The results of the simulation experiment based on an increase in the propensity to consume include an increase in utilization rate, profit rate, and economic growth rate and a decrease in LDR, which suggests that an increase in the propensity to consume will also increase the demand for consumer goods, utilization and profit rates, and economic growth according to equation (12), which is an investment function. In addition, a decrease in the LDR of banks seems to occur because the decrease in business loans (driven by an increase in corporate profitability and consequently increases the internal reserves of firms) is greater than the increase in home mortgage loans (due to an increase in household income). In sum, the paradox of saving, in which a decline in savings (corresponding to an increase in propensity to consume) drives economic growth, holds in this model.

(2) Wage-Led Growth Regime

Given that prices are fixed in this model, increasing the wage rate (w) will decrease the mark-up of firms and, ultimately, their profit rate and profit share. We examine the direction of economic growth and the variables under such circumstances, the results of which are illustrated in Fig. 4.

[Figure 4] Increasing Wage Share



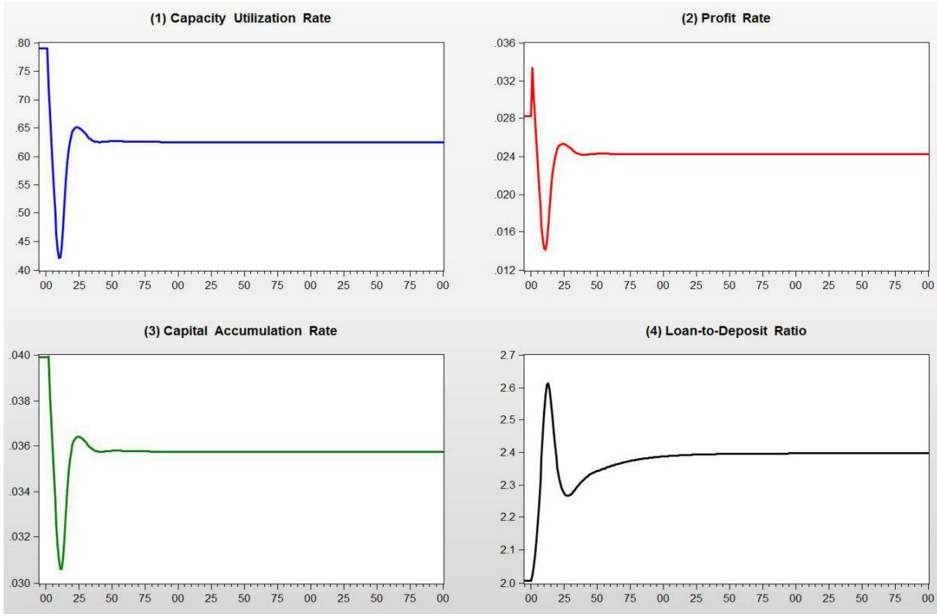
Increasing household wages and the demand for consumer goods will increase the capacity utilization rate and subsequently reduce the business profit rate in the short term yet increase such rate in the long term through adjustments. Increasing the capacity utilization rate and profit rate will also increase the capital

accumulation rate and ultimately drive economic growth. At the same time, the LDRs of banks decrease due to the reduction in the number of business loans—spurred by increased corporate profits—and a greater increase in deposits from increased household income than from increased home loans. Therefore, the economy of this model is a wage-led growth regime, in which an increase in wage share (decline in profit share) drives economic growth.

(3) Labor-Saving Technological Progress

In the discourse on the Fourth Industrial Revolution, which has attracted much research attention in recent years, some researchers have expressed their concerns over the potential for mass unemployment. Therefore, in this model, we examine the effects of labor-saving technological progress, which involves new technologies, such as artificial intelligence and autonomous cars, on the economy. To do so, we increase the value of average labor productivity (a), the result of which can be seen in Fig. 5.

[Figure 5] Labor-Saving Technological Progress



In this model, labor-saving technological progress decreases the labor demand, wage income, and consumption demand and further reduces the capacity utilization and business profit rates. Ultimately, an increase in labor productivity that is not accompanied by an increase in wages brings about a decrease in capital accumulation and economic growth rates. For the LDR of banks, business loans and household loans both decrease due to economic downturns. However,

paradoxically, the LDR increases in the long term due to the relatively large drop in deposits amid a simultaneous decline in deposits and loans.

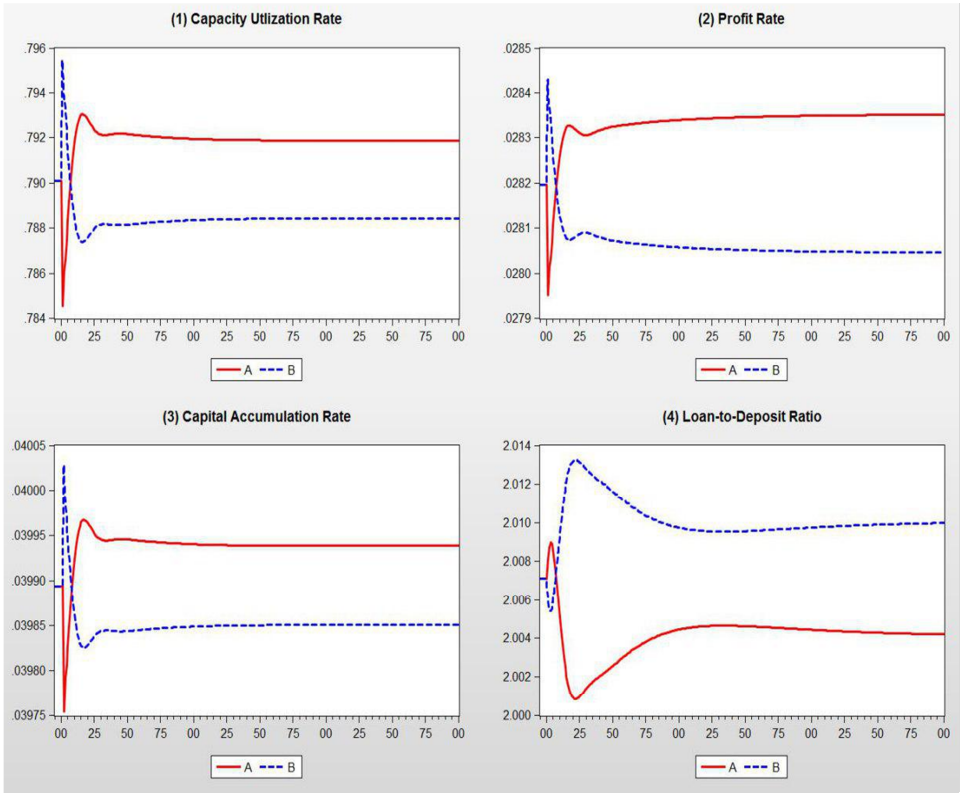
According to Lavoie (2016), neoclassical economists argue that technological development has positive effects on employment. However, those economists who recognize the existence of a "technological unemployment" assert that technological progress can induce an overall decline in employment at the macroeconomic level. According to the Kaleckian model, curbing the decrease in employment and effective demand, which is driven by an increase in labor productivity, requires an increase in real wages with a magnitude that is equal to that of an increase in labor productivity. Lavoie argued that "in order to avoid technological unemployment following an increase in labor productivity, generally both real wages and real independent expenditures should be increased" (Lavoie, 2016, p. 171). Ultimately, from the perspective of the Kaleckian model, the technological unemployment caused by increased labor productivity is a result of both wages and independent expenditures increasing at rates that are lower than that of labor productivity. This study follows these same Kaleckian policy implications.

2. Disparities in the Liquidity Preferences of Households in the Two Regions

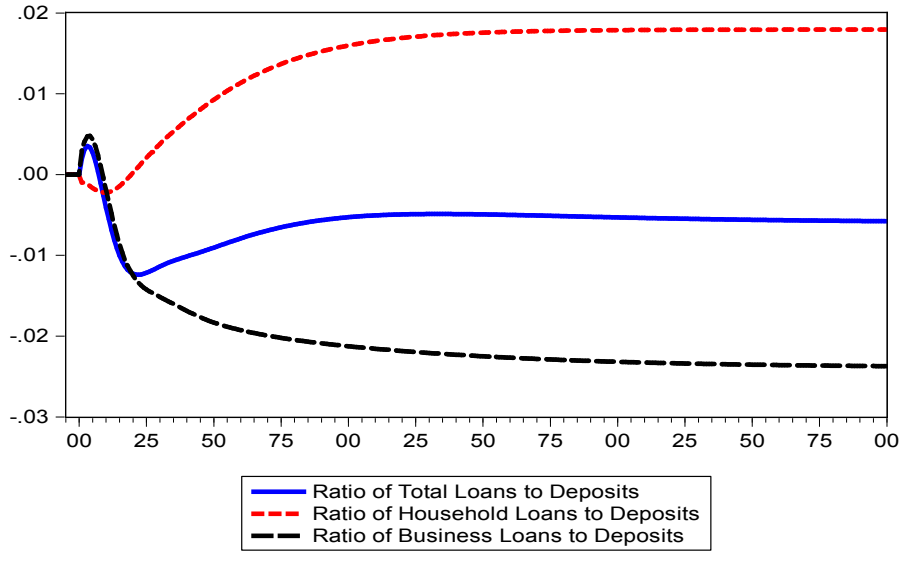
We now look at the economic changes under the assumption that a gap exists in the liquidity preferences of households in both Regions A and B. In this model, an increase in liquidity preference is accompanied by an increase in deposit demand and a decrease in speculative housing demand (ε). Therefore, we compare Regions A and B, which have so far been identical, after reducing and increasing the liquidity preferences in the former and the latter, respectively. The results are shown in Fig. 6.

Region B has a high liquidity preference yet low capacity utilization and profit rates, thereby resulting in low capital accumulation and economic growth rates. To our interest, the LDR of Region B is higher than that of Region A due to the differences in profit rates. For instance, due to its high profit rate, a firm in Region A tends to procure funding through internal reserves instead of borrowing from banks. Therefore, the LDR of Region A is lower than that of Region B. However, given that Region A, which has a high growth rate, has a higher housing demand than Region B, its ratio of household loans to deposits is also higher than that of Region B. Nevertheless, given that the decline in the ratio of corporate loans to deposits in Region A is larger than the rise in the ratio of household loans to deposits, the overall LDR in Region A appears to be lower than that in Region B. Fig. 7 illustrates these results.

[Figure 6] Disparities in Liquidity Preferences



[Figure 7] Difference in the Regional Loan-to-Deposit Ratio



Ultimately, LDR appears to be higher in the region with a high liquidity preference than in the region with a low liquidity preference because the liquidity preference of households can affect both the real economy and the loan demand, thereby changing the LDR. Moreover, the results of all simulation experiments show that LDR is relatively low in regions with relatively high economic growth rates.

According to loanable fund theory, which sees deposit banks as funding intermediaries, LDR is considered an important measure of the flow of funds. Those regions with relatively high LDRs show more active financial intermediation and attract money from regions with low LDRs. However, from the perspective of endogenous money theory, this interpretation should be reversed. Moreover, contrary to the simulation results, various factors in the endogenous money system, including the changes in liquidity preference, propensity to consume, wages, and technology, can influence LDR. The results of this simulation experiment indicate that a one-sided analysis of LDR can lead to a misunderstanding of the economic circumstances of a region.

V. Conclusion

This simulation experiment started from the perspective that making policy suggestions regarding existing regional finance problems is possible when examining this issue through the lens of Post-Keynesian endogenous money theory. First, we confirm that under an endogenous monetary environment where loans create deposits, the differences in real economic variables will drive changes in the demand for loans and deposits and ultimately lead to changes in LDR. Second, the simulation experiment shows that LDR increases along with declining economic conditions, thereby challenging the dominant perspective which views a high LDR as a positive phenomenon. Moreover, we find that the differences in the liquidity preference of two regions can also drive differences in their tendency to own assets without the inter-regional flows of finance, thereby leading to not only a difference at the real economy level but also a difference in LDR. From these findings, we confirm the significance of applying Keynes' liquidity preference theory in interpreting LDR.

In a region with a relatively low liquidity preference, the demand for non-liquid assets increases, thereby facilitating the investment funding procurement for firms that supply such assets and ultimately driving regional economic growth. However, this finding also implies that a large increase in asset prices can create a bubble in regions with low LDRs. Meanwhile, the regional disparity arising from the differences in household liquidity preferences can be linked to the real economy and

has formed a vicious cycle that is currently accelerating. In regions with low economic growth rates and income levels, a pessimistic economic outlook can maintain a high liquidity preference and induce additional declines in economic growth rates. Therefore, to solve the problem of inter-regional disparity, this vicious cycle should be stopped at both the financial and real levels and a new virtuous cycle system should be created.

The major limitation of this study is that a meaningful economic interaction between the two regions in both financial and real terms remains lacking. This limitation may be overcome by expanding the model by explicitly considering such interaction. While introducing inter-regional trade, various assumptions regarding the behavior of economic agents and the business scope of each regional firm or bank can be adopted. These interactions may either relax or exacerbate the economic gap driven by the gaps in liquidity preferences. This problem will be addressed in a follow-up study.

Appendix 1: Notations

A	Central bank advances made to private banks
BC	Equity capital of banks
C	Nominal consumption goods
F_b	Bank profits
F_f	Entrepreneurial profit of firms
FU_f	Retained earnings of firms
g_c	Consumption growth rate
g_k	Capital accumulation growth rate
H	House stock in nominal terms
h	House stock in real terms
I	New fixed capital goods in nominal terms
K	Fixed capital stock in nominal terms
L	Loans supplied by banks to firms
M	Money deposits actually held by households
MO	Mortgage loans supplied by banks to households
N	Demand for labor
RT	Housing rental fee
r	Interest rate on bank loans
r_{cf}	Profit rate of firms
r_m	Interest rate on deposits
Sav_h	Household savings
V_{cb}	Wealth of the central bank in nominal terms
V_f	Wealth of firms in nominal terms
V_h	Wealth of households in nominal terms
w	Wage rate
Y	Regional income in nominal terms, actual nominal total output
Y_F	Full-capacity total output
YD_h	Nominal regular disposable income

Appendix 2: Exogenous Variable Values for Simulation

[Household sector]

Speculative housing demand (Equation 3, 6) $\varepsilon = 0.02$ ($\Rightarrow$ $\varepsilon^A = 0.03$, $\varepsilon^B = 0.01$)
Non-speculative housing demand (Equation 6) $\alpha = 6$
Loan-to-value (LTV: Equation 7) $\lambda = 0.4$

[Firm sector]

Nominal wage rate (Equation 8) $w = 0.86$ ($\Rightarrow$ 0.87)
Labor–output ratio (Equation 10) $a = 1.0$ ($\Rightarrow$ 1.025)
Investment function (Equation 12) $\gamma_0 = 0.02$, $\gamma_1 = 0.025$, $\gamma_2 = 0.005$
Output–capital ratio (Equation 14) $v = 3.2$
Housing price $q = 1$
Consumption goods price $p = 1$

[Bank sector]

Interest rate (Equation 23) $\overline{r} = 0.025$ ($\Rightarrow$ 0.0225)
Deposit discount rate (Equation 24) $add1 = 0.015$

[Expectation formation]

Expectation formation (Equation 31) $\theta = 0.7$

References

Caverzasi, E. and A. Godin (2015), "Post-Keynesian Stock-flow-consistent Modelling: A Survey," *Cambridge Journal of Economics*, Vol. 39, No. 1, 157–187.

Dow, S. C. (1993), *Money and the Economic Process*, Vermont: Edward Elgar.

Godley, W. and M. Lavoie (2007), *Monetary Economics: An Integrated Approach to Credit, Money, Income, Production and Wealth*, New York: Palgrave Macmillan.

Graziani, A. (2003), *The Monetary Theory of Production*, Cambridge: Cambridge University Press.

Kim, Kukhyun (2012), "Enhancement Measures of Regional Bank for Local Economic Development: In Reference to Japanese Case," *The Study of Regional Development*, Vol. 44, No. 2, 25–40.

Kim, Junghoon and Dagyeom Lee (2016), *A Study on Uneven Economic Growth in a Two-Region Model*, Gyeonggi Research Institute.

Lavoie, M. and W. Godley (2001), "Kaleckian Models of Growth in a Coherent Stock-Flow Monetary Framework: A Kaldorian View," *Journal of Post Keynesian Economics*, Vol. 24, No. 2, 277–311.

Lavoie, M. (2016), *Introduction to Post-Keynesian Economics* (J. H. Kim, Trans.) Seoul, Korea: Humanitas.

Lee, Sangheon and Byoungkil Min (2015), "A Kaldorian Macro-dynamic Model with Speculative House Demands," *The Review of Social & Economic Studies*, No. 46, 79–101.

Min, Byoungkil (2012), "The Post-Keynesian Endogenous Money Theory and Banks' Dual Functions: A New Understanding of Horizontalism and Structuralism," *The Review of Social & Economic Studies*, No. 38, 199–240.

Min, Byoungkil (2013), "Comparison of Policy Alternatives for Macroprudence," *Three Essays in Post Keynesian Financial Theory*, Doctoral Dissertation, Korea University, Seoul, Korea.

Rodríguez-Fuentes, C. J. (2006), *Regional Monetary Policy*, New York: Routledge.

Sohn, Wook and Jangho Park (2011), "Policy Issues in Advancement of Regional Financial System," *Journal of Korean Economy Studies*, Vol. 29, No. 3, 191–232.

Yang, Joonmo, Kisan Choi, Jangyeon Lee and Insook Cho (2014), "Regional Economic Development and the Role of the Financial System," *Journal of Korea Regional Development*, Vol. 23, No. 1, 31–58.

Zezza, G. (2008), "U. S. Growth, the Housing Market, and the Distribution of Income," Journal of Post Keynesian Economics, Vol. 30, No. 3, 375–401.

Bank of Korea (http://www.bok.or.kr).

Statistics Korea (KOSTAT: http://kostat.go.kr).