The Impact of Domestic Monetary Policy and External Liquidity Shocks on Inequality in the Republic of Korea

Dong Jin Lee[1+], Joon-Ho Hahm[2], and Cyn-Young Park[3]

[1]*Sangmyung University, Seoul, Republic of Korea*
[2]*Yonsei University, Seoul, Republic of Korea*
[3]*SEACEN Center, Kuala Lumpur, Malaysia*

Abstract This paper investigates the relationship between monetary policy and economic inequalities in the Republic of Korea. We consider both domestic and external monetary conditions in the analysis, allowing us to examine their varied impacts on income and wealth inequalities. Using data from the Household Income and Expenditure Survey and the Korean Labor and Income Panel Study, we find that an expansionary domestic monetary policy shock tends to reduce income inequality, while its effect on net wealth inequality is negligible. Conversely, an expansionary external liquidity shock, as indicated by unanticipated net capital inflows, tends to reduce income inequality but exacerbates net asset inequality. These findings suggest that both domestic monetary policy and external liquidity shocks affect economic inequalities, but through different channels.

Keywords: Income Inequality, External Liquidity Shock, Monetary Policy, Sign Restricted VAR, Wealth Inequality

JEL Classifications: D30, D63, E52, E58, F42

I. Introduction

In the aftermath of the global financial crisis of 2007-08 and the COVID-19 pandemic, unconventional monetary policies, such as large-scale asset purchase programs, have sparked debate about their redistributive effects. Monetary policy can have intricate and unexpected

+Corresponding Author: Dong Jin Lee
  Associate Professor, Faculty of Economics and Finance, Sangmyung University, 03016, 20, Hongjimun 2-gil, Jongno-gu, Seoul, Republic of Korea. Tel: +82-2-2287-6123, E-mail: rheedj@smu.ac.kr
Co-Author: Joon-Ho Hahm
  Professor, Graduate School of International Studies, Yonsei University, 03722, 50, Yonsei-ro, Seodaemun-gu, Seoul, Republic of Korea. Tel: +82-2-2123-4210, E-mail: jhahm@yonsei.ac.kr
Co-Author: Cyn-Young Park
  Executive Director, SEACEN Center, Sasana Kijang Bank Negara Malaysia, 2 Jalan Dato' Onn, 50480, Kuala Lumpur, Malaysia. Tel: +603-9195-1888, E-mail: cypark@seacen.com

impacts on household income and wealth by influencing employment, resource allocation, inflation, asset prices, and other economic factors. However, the effects of monetary policy on income and wealth inequality remain theoretically ambiguous and contentious. Although timely monetary accommodation may have alleviated the severity of recessions, the subsequent increases in asset prices and inflation often lead to criticism that these policies may disproportionately benefit the wealthy over the poor.

The debate on the distributional effects of monetary policy dates back to the 18th century when Richard Cantillon observed that an increase in money supply might impact various sectors of the economy at different times. For instance, when new money is injected into an economy, the initial beneficiary group may experience enhanced spending power before the increased money supply leads to higher prices for subsequent groups. Gradual price adjustments due to price rigidity can create a distributional effect known as the 'Cantillon Effect.'

Since then, the relationship between monetary policy and economic inequality has become a significant subject of research. Numerous factors and multiple channels influence how monetary policy can affect economic inequality. At the macroeconomic level, expansionary monetary policy can stimulate the economy and increase employment, thereby reducing job losses and income inequality. Price stability can also prevent unexpected inflation from arbitrarily redistributing wealth among different groups.

Monetary policy can also have financial effects through changes (or expectations thereof) in interest rates and asset prices. Some argue that expansionary policy can penalize poor savers who rely on fixed incomes while benefiting wealthy investors through capital gains. However, as modern households have more diverse income sources and greater access to financial products and services, household heterogeneity becomes an important factor in analyzing the effects of monetary policy on income and wealth inequality.

The complexity of monetary policy transmission and its interactions with various factors influencing household income makes assessing its distributional effects challenging. Given the theoretical ambiguity, the distributional effects of monetary policy are ultimately an empirical question. Regarding income inequality, recent studies suggest that expansionary monetary policy can help mitigate income inequality, at least temporarily (Coibion et al. 2017, Furceri, Loungani, and Zdzienicka 2016, Mumtaz and Theophilopoulou 2017, Park 2021). However, for wealth inequality, there is considerable disagreement about the impact of monetary policy, partly due to data limitations on household net wealth (Domanski, Scatigna, and Zabai 2016, O'Farrell and Rawdanowicz 2017, Saez and Zucman 2014).

It is noteworthy that most existing studies on the distributional effects of monetary policy have concentrated on domestic contexts. However, as Rey (2015) emphasized, monetary and financial conditions in advanced economies can exert significant spillover impacts on open emerging economies. For instance, an expansionary monetary policy shock originating in the

United States (US) can induce substantial fluctuations in international capital flows, subsequently affecting household incomes and wealth in open emerging economies. Despite this, the existing literature has largely concentrated on the financial spillover effects of external shocks on macroeconomic variables in emerging market economies, with limited analysis of their impact on household incomes and inequality.

The presence of international monetary spillover effects suggests that external liquidity shocks can potentially have significant distributional consequences in open emerging economies, yet evidence in this area remains scarce. Our study aims to address this gap by investigating both domestic monetary policy and external liquidity shocks as factors influencing distributional outcomes in an open economy. By examining these factors, we seek to elucidate the complex interplay between monetary policies and their impacts on inequality in such economies.

In this context, this paper examines the impacts of domestic monetary policy and external liquidity shocks on income and wealth inequalities in the Republic of Korea (Korea) using detailed data from the Household Income and Expenditure Survey and the Korean Labor and Income Panel Study. The country-specific survey datasets span twenty years, providing a comprehensive view of the time-varying characteristics of household heterogeneity. These datasets are among the most exclusive and detailed for the country, offering unique insights into the factors determining the distributional effects of monetary policy.

The Korean case is particularly noteworthy as it represents a major emerging market economy with highly open capital markets that are well-integrated into global financial networks. Consequently, household incomes and wealth in Korea are susceptible to international spillover effects from monetary policies in advanced economies. For instance, the net worth of Korean households is significantly influenced by housing prices, with over 80% of Korean household wealth reportedly held in real estate. Unconventional monetary policies of the US Federal Reserve can affect interest rates and asset prices in Korea through fluctuations in capital flows. As much as Korean household incomes and wealth are linked to financial assets and real estate prices, fluctuations in net capital flows could impact household income and wealth inequality.

To our knowledge, this paper represents the first effort in the literature to explore and compare the distributional effects of both domestic monetary policy and external liquidity shocks within an emerging market economy characterized by open and globally integrated financial markets. The two survey datasets provide a comprehensive overview of household incomes and track the evolution of various income sources over time in Korea. This enables us to analyze how domestic monetary policy and external liquidity shocks affect household incomes and inequality through different transmission channels. For instance, while credit and bank lending channels typically play a significant role in transmitting domestic monetary policy shocks, external liquidity shocks may impact household incomes and wealth through asset prices and exchange rate channels.

Specifically, we aim to address the following questions:

- How have household income and wealth distributions evolved in Korea over the past few decades?
- What are the major channels through which monetary policy affects income and wealth distributions in Korea, considering household heterogeneity?
- What impact do external liquidity shocks have on income and wealth inequalities in Korea, and how do these effects differ from those of domestic monetary policy shocks?

Section 2 provides a literature review on the effects of monetary policy on income and wealth inequalities, summarizing the distributional effects through alternative transmission channels. Section 3 discusses the data, inequality measures, and recent trends in income and wealth inequalities in Korea. Section 4 describes the structural vector autoregression (VAR) model employed to estimate the distributional effects of domestic monetary policy and external liquidity shocks and presents the empirical findings. Finally, section 5 concludes with a summary of key findings and their policy implications.

II. Literature Review

The distributional effects of monetary policy have regained research interest in recent years given the potentially distortionary impact of historically low interest rates on asset markets over the past decade. Considerable disputes exist over the transmission channels of monetary policy on income and wealth inequalities while evidence showing the net effect of monetary policy through multiple transmission channels remains inconclusive. This section summarizes the potential channels through which monetary policy can affect income and wealth inequalities and reviews recent findings for each channel.

A. Monetary policy and income inequality

First, monetary policy can have a redistributive impact on household labor income through *the earnings heterogeneity channel.* Specifically, monetary policy may affect the key determinants of household earnings - hourly wages, hours worked, and the unemployment rate - heterogeneously across households. For instance, Heathcote, Perri, and Violante (2009) find that while changes in hourly wages have a greater effect on high-income households, low-income households are more affected by changes in hours worked and the unemployment rate. Hence, an expansionary monetary policy in business cycle recessions might mitigate income inequality if it leads to a lower unemployment rate to a larger extent than it raises hourly wages.[1]

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1) As for business income, Gertler and Gilchrist (1994) find that a contractionary monetary policy shock depresses

Second, monetary policy can influence total household income through *the income composition channel*. Households derive incomes from diverse sources, including labor income, business and capital income, and transfer income such as unemployment benefits. To the extent that income composition varies across households and the respective income component responds to a monetary policy shock in heterogenous ways, monetary policy may have differential redistributive effects. For instance, an expansionary monetary policy would lower the interest income but raise the capital income of wealthier households. Meanwhile, for lower-income households, it may increase labor income but reduce transfer income. The overall effect of such a policy would depend on the relative responsiveness of each income source.

Third, monetary policy may also have redistributive effects through *the savings redistribution channel*, by altering returns on assets and debt-service costs. Doepke and Schneider (2006) show that an expansionary monetary policy shock that lowers the real interest rate benefits borrowers while harming savers, thereby reducing income inequality. O'Farrell and Rawdanowicz (2017) argue that the impact of an interest rate cut on income inequality is more complex, depending on the skewness of income and net asset distributions across households. They theoretically demonstrate that, for interest-paying assets and liabilities, an interest rate cut reduces income inequality when net wealth is more skewed toward high-income groups than when income is more concentrated among high-income groups.

Numerous authors have attempted to estimate the effects of monetary policy on income inequality and to empirically assess which transmission channels are more significant. Overall, research suggests that contractionary monetary policy tends to increase income inequality, while expansionary policy tends to reduce it. Carpenter and Rodgers (2004) show that a contractionary monetary policy disproportionately raises unemployment rates among minority and less-skilled workers. Gornemann, Kuester, and Nakajima (2012) also confirm that contractionary shocks tend to prolong periods of high unemployment. Mumtaz and Theophilopoulou (2017) find comparable results using longer time-series data from the United Kingdom. Coibion et al. (2017) argue that the income composition channel is more influential than other channels, showing that contractionary monetary policy raises total income for the top deciles while reducing labor income for the bottom deciles. They estimate that a contractionary policy shock— measured by the unanticipated change in the fed funds rate—tends to raise income inequality, as reflected in the Gini coefficient, within 3 to 5 years.[2]

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the sales of small firms more than it does the sales of large firms. Hence, contractionary monetary policy may aggravate income inequality.

2) On a different note, Ybrayev (2022) examines the distributional effects of monetary policy in the context of an emerging market economy, which is typically characterized by greater financial frictions, underdeveloped financial markets, and a relatively high level of dollarized liabilities and unequal access to dollar assets. The study's findings indicate that wealthy households with the ability to save in foreign currencies can benefit from an increase in the purchasing power of their incomes by hedging against domestic inflation. On the other hand, poor households retain a larger share of liquid assets denominated in the domestic currency, leading them to

B. Monetary policy and wealth inequality

In this section, we review existing research on the redistributive impacts of monetary policy on wealth inequality. The first channel through which monetary policy affects household wealth is *the unexpected inflation channel* (also known as *the inflation tax channel*). Unexpected inflation reduces the real value of nominal assets and liabilities, thereby redistributing wealth from lenders to borrowers. Expansionary monetary policy can therefore reduce wealth inequality if lenders, who tend to be wealthier, hold more assets than borrowers. For instance, Doepke and Schneider (2006) find that in the US, middle-class households hold more long-term debts, such as fixed-rate mortgages, while wealthy households are typically net savers. Consequently, expansionary monetary policy reduces wealth inequality by relieving the real debt burden on middle-class mortgage borrowers more than it benefits wealthier savers.

The second channel is *the interest rate exposure channel* (or *portfolio channel*). Financial assets and liabilities have different price responsiveness to monetary policy shocks. A cut in interest rates raises the value of both assets and liabilities by lowering the discount rate, with longer-duration assets and liabilities experiencing a greater effect. Hence, the impact of interest rate exposure would materialize differently across households depending on differences in the duration structure of the assets and liabilities they hold. Net savers with long-duration assets and net debtors with relatively short-duration liabilities would benefit most from expansionary monetary policy.

The redistributive effects of monetary policy on household net wealth also depend on the degree of leverage. Since lower-income households tend to rely more on borrowing to purchase assets such as housing, they will benefit proportionately more from rising asset prices than wealthier, less leveraged households. O'Farrell and Rawdanowicz (2017) show that asset price increases driven by expansionary monetary policy can have conflicting impacts on net wealth inequality. They find that leverage is a key factor, as higher asset prices reduce net wealth inequality when liabilities are more concentrated at the bottom of the wealth distribution than assets. This occurs because poorer households, with higher leverage, gain more from asset price increases than wealthier households. They also show that an increase in the price of assets that are more equally distributed (such as housing) reduces net wealth inequality, while an increase in the price of assets heavily concentrated among wealthy households (such as stocks and bonds) increases inequality.

The third channel is *the financial segmentation channel.* Monetary policy may affect wealth distribution if some households participate more actively in financial markets than others, due to

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suffer more losses from local currency inflation. The author also demonstrates that contractionary monetary policy is associated with periods of higher income inequality in emerging market economies. This increased income inequality can exacerbate the damaging impact of inflation on the bottom groups of the income distribution.

differences in market access across income groups. Williamson (2009) finds that an expansionary monetary policy shock tends to aggravate wealth inequality if wealthier households are more involved in stock and bond markets.

In this context, the recent unconventional monetary policies in advanced economies have sparked renewed interest in their redistributive impacts on wealth, as they caused significant effects on global asset prices (Gagnon, Raskin, and Sack 2011, Rosa 2012). Overall, the empirical results are largely mixed.

Adam and Tzamourani (2015), using eurozone data, find that asset price increases impact wealth inequality differently based on asset type. Rising housing prices reduce wealth inequality, as housing constitutes a large portion of middle-class assets, while rising equity prices increase inequality. Similarly, Bivens (2015) finds that large-scale asset purchases in the US increased inequality in stock holdings but decreased it in housing. Domanski, Scatigna, and Zabai (2016) also observe that unconventional policies have raised wealth inequality in the US. The Bank of Portugal (2017) analyzed the distributional effects of monetary policy and found that accommodative policies reduce wealth inequality. This is primarily due to lower housing loan interest rates, which alleviate financial burdens for lower-income households, along with rising employment and housing prices. However, rising self-employment business values and financial wealth increase inequality.

O'Farrell et al. (2016) examine the impact of unconventional monetary policies on income and wealth inequality across OECD countries, noting that the effects are generally modest but vary by country. Rising house prices tend to reduce wealth inequality, while increases in equity and bond prices exacerbate it. Casiraghi et al. (2018) assess the European Central Bank's unconventional monetary policies, finding negligible effects on income inequality but a U-shaped response in wealth inequality. Less wealthy households benefit from leveraged positions, while wealthier households profit from larger financial asset holdings. Dossche et al. (2021) review the eurozone, finding that lower interest rates do not significantly increase income inequality, as wealthier households lose more interest income. They also find that the European Central Bank's asset purchase program reduces income inequality by lowering unemployment among poorer households. The overall impact on net wealth inequality is minimal, as changes in stock and house prices balance each other out.

C. Income and wealth inequality in Korea

Research on income and wealth inequalities in Korea, particularly in relation to monetary policy, is limited. Park (2021) analyzes the impact of monetary policy shocks on income inequality using data from 1990 to 2017, finding that contractionary policy worsens income inequality, though its overall effect is modest. Park identifies the earnings heterogeneity channel

as most significant in Korea.

Although the impact of monetary policy has not been explicitly investigated, several studies have documented the evolution of Korea's economic inequalities after the global financial crisis. First, as for income inequality, Choi, Kim, and Park (2018) find a post-crisis decline in income inequality, with transfer and social security income contributing to this trend, while real estate and financial income had minimal negative effects. Yoon, Rhee, and Lee (2019) show that rising housing prices and unemployment in Korea are linked to worsening income inequality, particularly given the country's relatively low tax progressiveness. Kwark (2018) confirms that income inequality in Korea is countercyclical, worsening during recessions and improving in expansions. Labor income, a key source for low-income households, plays a crucial role in this dynamic. Jung and Lim (2020) report a gradual rise in Gini coefficients from 1990 to 2020, with aging and educational disparities driving the increase in market income inequality.

On wealth inequality, Cheon (2019) highlights that asset price growth, particularly in real estate, has driven wealth accumulation in Korea, with net wealth inequality stabilizing since 2006 due to stricter real estate regulations. Compared to other countries, Korea's wealth inequality is moderate, with lower inequality than the US but similar levels to Spain and Italy. Jeong and Cheon (2017) show that housing assets contribute significantly to wealth inequality in Korea, especially the divide between homeowners and non-homeowners, which is more pronounced than in countries like the US and Spain. Kim (2018), using inheritance tax data, finds that wealth concentration in Korea is higher than income concentration, though lower than in the UK and US. Wealth held by the top 10% increased modestly post-2008. Shin (2020) reveals that wealth inequality in Korea surpasses income inequality, driven by higher-income households leveraging more loans to invest in rising housing markets. Finally, Jeong and Cheon (2020) show that while Korea's net wealth inequality is lower than the OECD average, the correlation between income and wealth is stronger, suggesting that income significantly reinforces wealth inequality in Korea.

III. Measuring Income and Wealth Inequalities in Korea

A. Data and measures of income and wealth inequalities

The Gini coefficient is one of the most widely employed measures of income inequality. However, *the Statistics Korea* changed the formula for the Gini coefficient from 2016 data to comply with OECD guidelines and stopped releasing the series on a quarterly basis. Hence, the official Gini coefficient of *the Statistics Korea* cannot be used for our empirical analysis. Another widely used measure is the ratio of the upper bound value of the ninth decile (i.e., the lower bound of the top 10% in income amount) to that of the lower decile. As household

income distribution data are available on a quarterly basis in the Household Income and Expenditure Survey, these are used to obtain our income inequality measures. Specifically, we consider the first decile and the fifth decile as the lower decile to obtain income inequality ratios: p90/p10 and p90/p50, respectively.

As for the wealth inequality measure, we employ two widely used measures: the first is the share of the top 10% of asset holders out of total household assets. The second is the upper bound value of the ninth decile (i.e., the lower bound of the top 10% in asset amount) to that of the fifth decile. Unlike the income inequality case, we consider the fifth decile because more than 10% of households report no assets. We use inequalities of both total assets and net assets as well as subcategories of total assets such as real assets and financial assets. In Korea, Household asset data are available in two surveys: the Survey of Household Finances and Living Conditions and the Korean Labor and Income Panel Study (KLIPS). The first dataset is available from 2011, which is not sufficiently long for our time-series analysis. Hence, we use the KLIPS data, which is available from 1999. Therefore, our sample period spans from 1999 to 2019, avoiding the COVID-19 pandemic crisis period.

Another difficulty in obtaining asset inequality data is that they are available only on an annual basis, which presents a hurdle to our time series analysis described below. Hence, we interpolate the annual household asset distribution data to quarterly data by applying the best linear unbiased interpolation method of Chow and Lin (1971). The method is to use one or several quarterly indicators and run a regression on the annual series to obtain interpolated quarterly data. We use the housing price index, the Korea Composite Stock Price Index (KOSPI), the 3-year treasury bill rate, GDP, and the consumer price index as quarterly indicators. Finally, we construct our asset inequality measures utilizing the interpolated quarterly data.

B. Trends of income and wealth inequalities

Figure 1 shows the trend of our income inequality measures. We report two ratios constructed from alternative measures of household income. Market income is a household's total pretax income obtained from its market activities, including wages and salaries, financial income, and small business profits, excluding government transfer payments. Total income includes transfer income. However, in our empirical analysis, we use market income-based measures because since the objective of our study is to identify the potential effects of monetary policy on household income distribution, it is important to control the effect of fiscal transfers. As in many countries, the Korean government provided fiscal transfers during the pandemic. To avoid any distortionary effects on market income of households, our sample excludes the pandemic period. Note that, consistent with the findings of past economic literature, income inequality measures show a moderately declining trend after the global financial crisis but have increased considerably since

2016. Note also that the gap between the two p90/p10 ratios based on market income and total income has widened substantially in recent years as the Korean government has expanded redistributive policies.

Figure 1. Trends of income inequality in the Republic of Korea

P90/P50 of income   P90/P10 of income
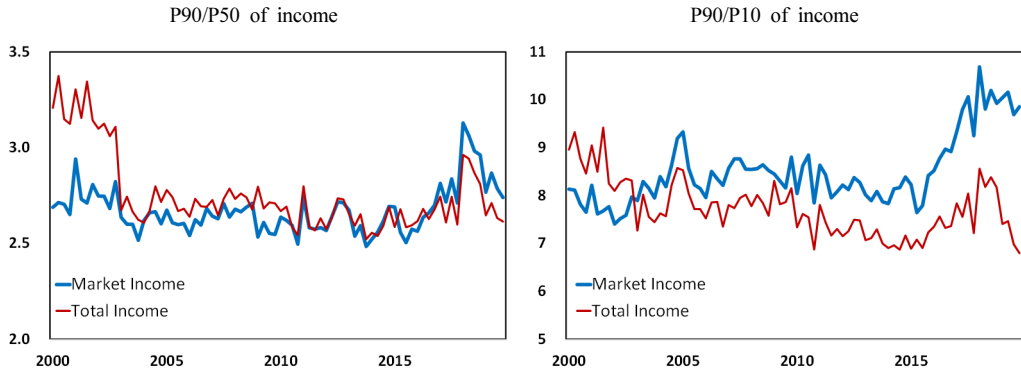
Note. 1) P90, P50, and P10 are 90 percent, 50 percent, and 10 percent percentiles of total pretax household incomes
(Source) Korean Statistical Information Service. www.kosis.kr

Figure 2 shows the trend of our wealth inequality measures obtained from various asset categories. Both the P90/50 ratio and the share of the top 10% show in general a decreasing trend since the global financial crisis, which is consistent with the literature reviewed above. In the case of the top 10% share, the upward and subsequent downward trend is more commonly observed across alternative asset categories. However, the P90/P50 ratios show some volatility, especially in the measures based on real assets and financial assets reflecting the real estate boom in the early 2000s and the subsequent global financial crisis. Also note that, in terms of the share of the 10%, net assets are a little bit more concentrated than total assets, and financial assets are much more concentrated than real estate assets.

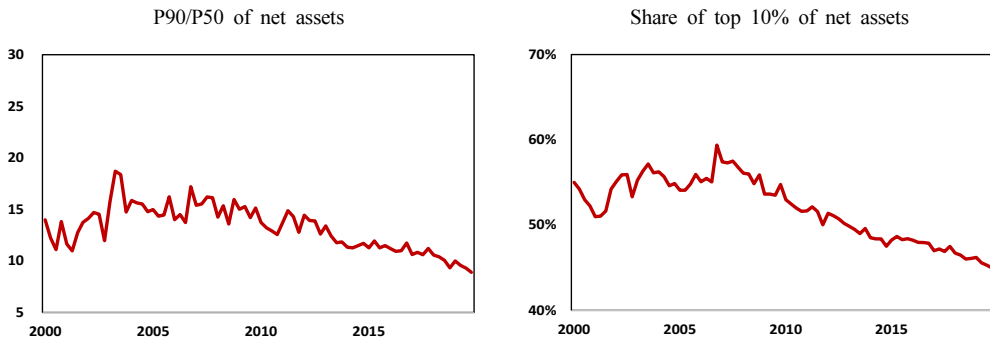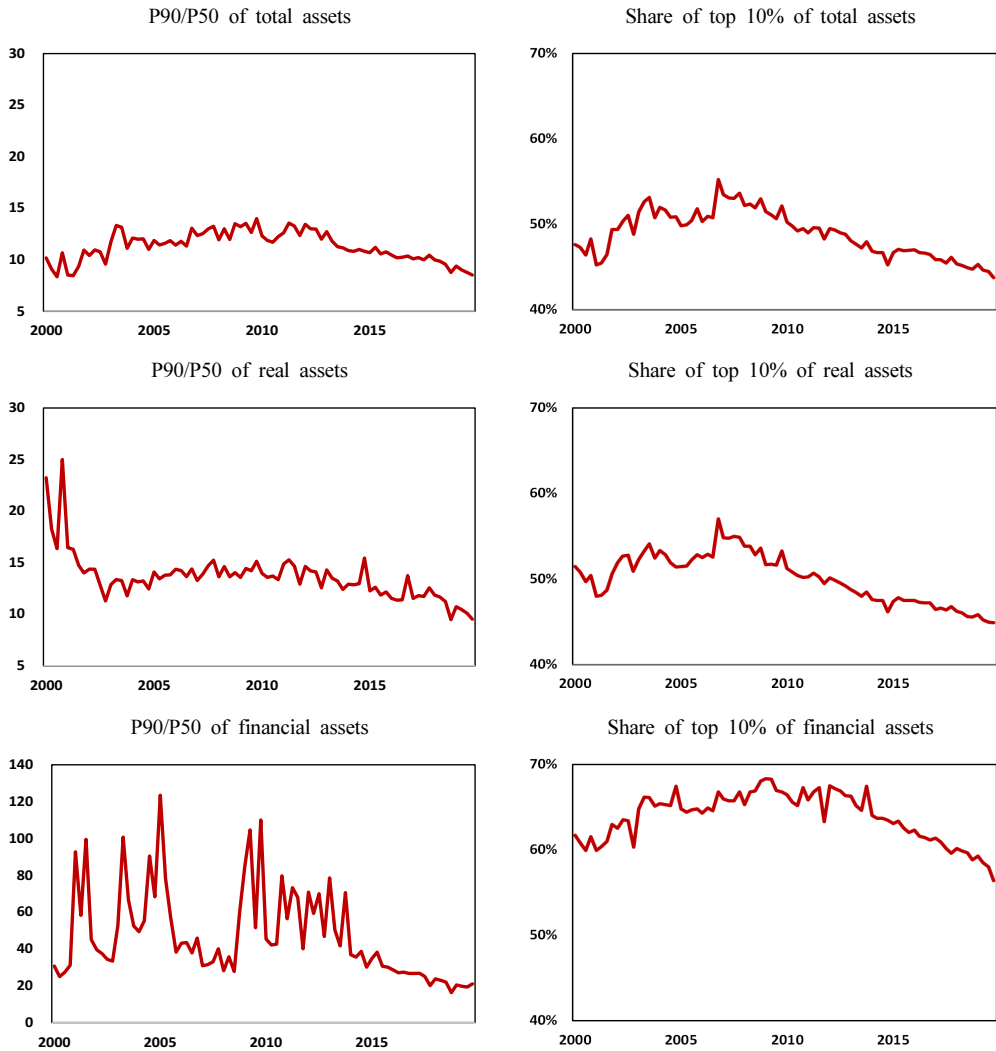**Figure 2.** Trends of wealth inequality in the Republic of Korea

P90/P50 of net assets   Share of top 10% of net assets

Figure 2. Continued

P90/P50 of total assets

Share of top 10% of total assets

P90/P50 of real assets

Share of top 10% of real assets

P90/P50 of financial assets

Share of top 10% of financial assets

Note. 1) P90, P50, and P10 are 90 percent, 50 percent, and 10 percent percentiles of various household wealth measures, Share of the top 10 percent is the ratio of the sum of the top 10 percent household wealth out of the sum of the total household wealth.

(Source) Korean Statistical Information Service. www.kosis.kr

IV. Effects of Monetary Policy Shocks on Economic Inequalities

A. Identification of monetary policy shocks and the VAR model

To thoroughly investigate the redistributive effects of monetary policy in Korea, it is essential

to consider both domestic monetary policy shocks and external monetary shocks. Following the standard literature, we use the overnight call rate to identify domestic monetary policy shocks. For the external monetary policy variable, a natural candidate is the US federal funds rate. However, this is not an effective proxy since it remained near zero following the global financial crisis due to the US quantitative easing regime. Moreover, external monetary shocks to Korea are not solely influenced by US Federal Reserve policy but also by the policies of other advanced economies.

Therefore, we opted to use net capital flows to Korea as a better proxy for global monetary conditions. Although capital flows to emerging markets are far more strongly driven by external push factors than domestic pull factors (Fratzscher 2011), since net capital flows may not be entirely driven by the monetary policies of advanced economies, we use the term "external liquidity shock" rather than "external monetary policy shock." As a case in point, during the period of US quantitative easing, capital inflows significantly contributed to accommodative monetary conditions in open emerging economies, as evidenced by the fact that long-term interest rates in Korea tracked US long-term rates more closely than they responded to the Bank of Korea's interest rate policy.

We examine the effects of domestic monetary policy and external liquidity shocks on income and wealth inequalities using structural vector autoregression (VAR) method. The benchmark VAR model is set as;

$$A(L)y_t = \epsilon_t, \ \epsilon_t \sim (0, \ I) \tag{1}$$

where y_t is an N-dimensional vector, and $A(L) = \sum_{\{i=0\}}^{p} A_i L^i$ is a vector lag operator polynomial. The corresponding reduced form is;

$$B(L)y_t = u_t \tag{2}$$

where $\mathrm{B}(L) = \sum_{\{i=0\}}^{p} B_i L^i$, $B_0 = I_n$, I_n is an $n \times n$ identity matrix, $B_i = A_0^{-1} A_i$, and $u_t = A_0^{-1} \epsilon_t$.

The standard VAR method for measuring monetary policy effect is known to have a "price puzzle" problem: a rise in the price level in response to a contractionary monetary policy shock that contradicts mainstream theory. We found that the price puzzle still exists in the standard VAR model of Korea. Several methodologies have been proposed to address this issue, including the approach by Romer and Romer (2004) and the factor-augmented VAR ($FAVAR$) method by Bernanke, Boivin, and Eliasz (2005). However, the application of Romer and Romer (2004) method to the Korean context is challenging due to unavailability of the Bank of Korea's

equivalent to the US Federal Reserve's *Green Book* forecast prior to 2005. The *FAVAR* method is also not applicable in our model because of the small sample size problem. Instead, we use the sign-restricted *VAR* of Uhlig (2005). Instead of simply imposing zero restriction on A_0, the sign restriction method imposes the direction of the response to specified shocks.

We use the rejection method, of which the algorithm is: (1) Estimate the reduced form *VAR* using Bayesian method; (2) randomly draw $\{B_i\}$ and the covariance matrix of u_t from the posterior distribution; (3) construct the impulse response vector based on Cholesky decomposition. (4) randomly draw an orthogonal unit impulse vector α from a standard normal distribution and multiply the impulse responses in step (3) by α to get the revised impulse responses; and (5) if the resulting impulse responses in (4) satisfy the sign imposed, keep the result and drop the draw otherwise.

The vector of endogenous variables y_t includes the measure of external liquidity factor, GDP, consumer price index (CPI), the measures of income and wealth inequalities, and the overnight call rate. As for the external liquidity factor, we employ two alternative measures of net capital flows; net foreign assets of Korea and net US bank claims to Korean banks. As both measures are in nominal value terms, we divide them by nominal GDP. While the former is useful to examine the overall effect of net capital flows into and out of Korea, the latter would help focus on the effect of US monetary policy through international bank lending channels.

To identify domestic and external shocks, we impose the restriction that an expansionary domestic monetary policy shock lowers the overnight call rate and increases both GDP and CPI. As for the external liquidity shock, we assume that an expansionary external liquidity shock increases net capital inflows and also increases GDP and CPI.

Our sample period spans the first quarter of 1999 through the last quarter of 2019 as described above. GDP and CPI are logged and all variables besides interest rates are seasonally adjusted. We also apply the penalty function method of Arias et al. (2018) as an alternative to the rejection method and find no significant differences except that the confidence intervals are slightly wider. Considering that the responses of the level data are permanent, we impose that the sign restrictions last for 10 quarters. The lag order of *VAR* is set to two quarters, but extending the order up to six does not change the results beyond some minor differences in statistical significance. The draws were done until we obtained 1,000 results that matched the sign restriction.

B. Empirical findings

1. VAR model with income inequality and net asset inequality

Figure 3 shows the impulse responses of income and net asset inequalities to an expansionary domestic monetary policy shock in our benchmark model with the overnight call rate as a proxy for domestic monetary policy and the net foreign asset as a proxy for external liquidity shock.

An expansionary domestic monetary policy initially reduces income inequality for a few quarters, after which the effect disappears. The sign of the responses aligns with the findings by Coibion et al. (2017) and Park (2021). The effect of an expansionary monetary shock suggests that earnings heterogeneity and savings redistribution channels are generally operative in Korea. However, the effect appears to be temporary, even though the call rate remains low for an extended period.

Figure 3. Impulse responses to an expansionary domestic monetary policy shock
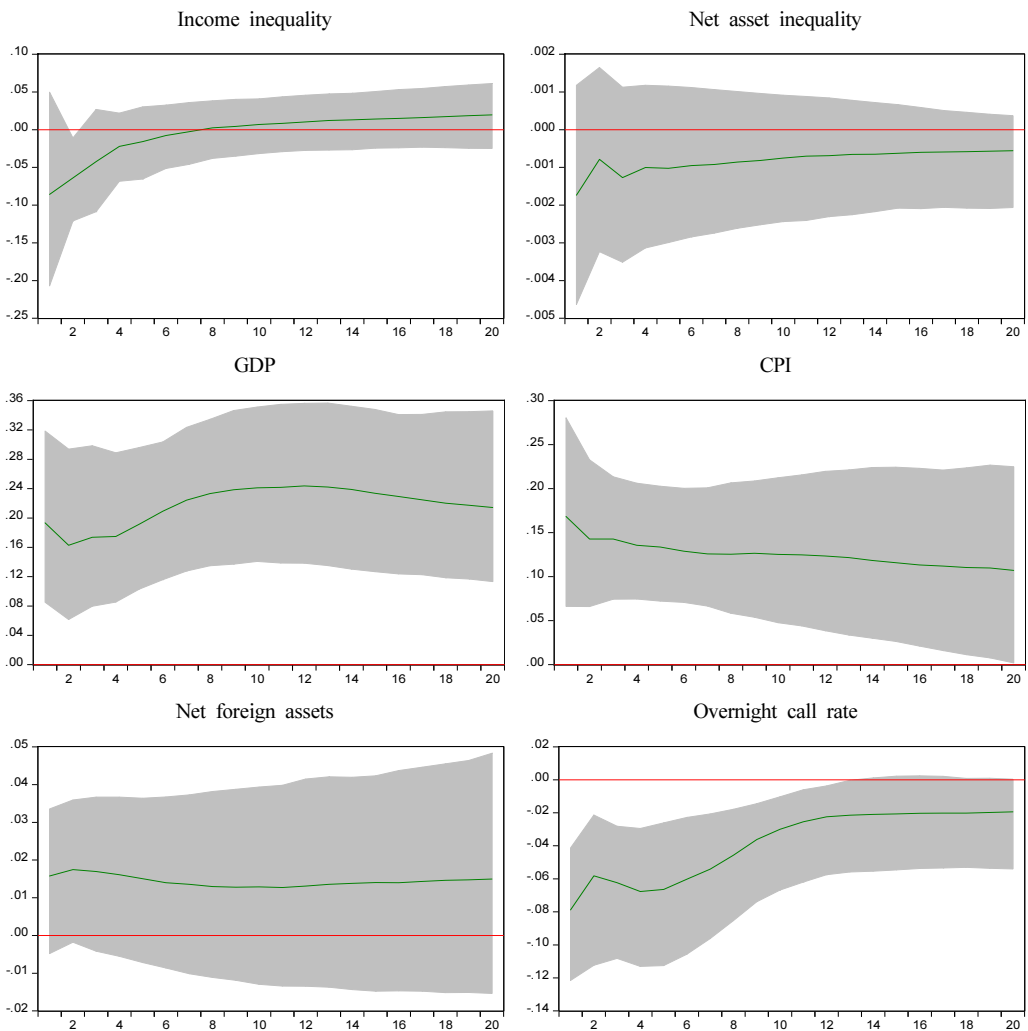
Notes. (1) Responses to one standard deviation decrease in overnight call rate.
(2) Endogenous variables = (net foreign asset/GDP, log(GDP), log(CPI), P90/P10 of market income, share of top 10% of net asset, overnight call rate). The lag order of vector autoregression (VAR) is set to 2. The shaded area represents the 68% confidence interval.

As for wealth inequality, an expansionary domestic monetary policy shock tends to reduce net asset inequality, which is more consistent with the wealth transfer effect of unexpected inflation or the interest rate exposure of low- and middle-class households with high leverage. However, the response of net asset inequality is statistically insignificant for all periods. As discussed, the ultimate effect of monetary policy on net asset inequality will be determined by the interaction of various complex channels. Specifically, two channels may have opposing effects. One is the effect through the bank lending, and the other is through the asset price. In Korea, one of the primary monetary policy transmission channels is the interest rate and bank lending channel. For instance, a cut in policy interest rate is immediately reflected in bank loan interest rate, which reduces debt service burdens and facilitates wealth accumulation of leveraged households. Consequently, an expansionary domestic policy tends to reduce net asset inequality, which is consistent with the wealth transfer effect of unexpected inflation and the heavy interest rate exposure of low- and middle-class households with high leverage. Considering that the proportion of variable-rate loans in Korea hovers around 70%, this effect is expected to be even more significant. Apart from such inequality-improving effect, however, the expansionary monetary policy may lead to rising asset prices and worsen net asset inequality, turning the overall effect insignificant.

Figure 4. Household debt to GDP ratio, and the shares of portfolio investments and loans in external liabilities of Korea
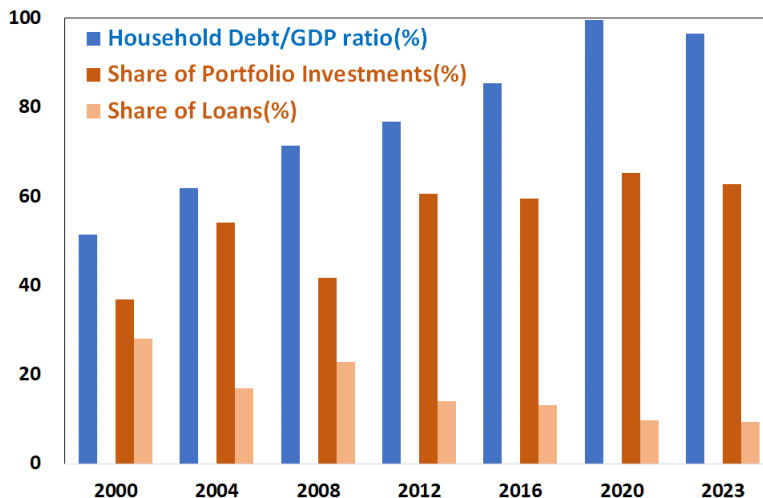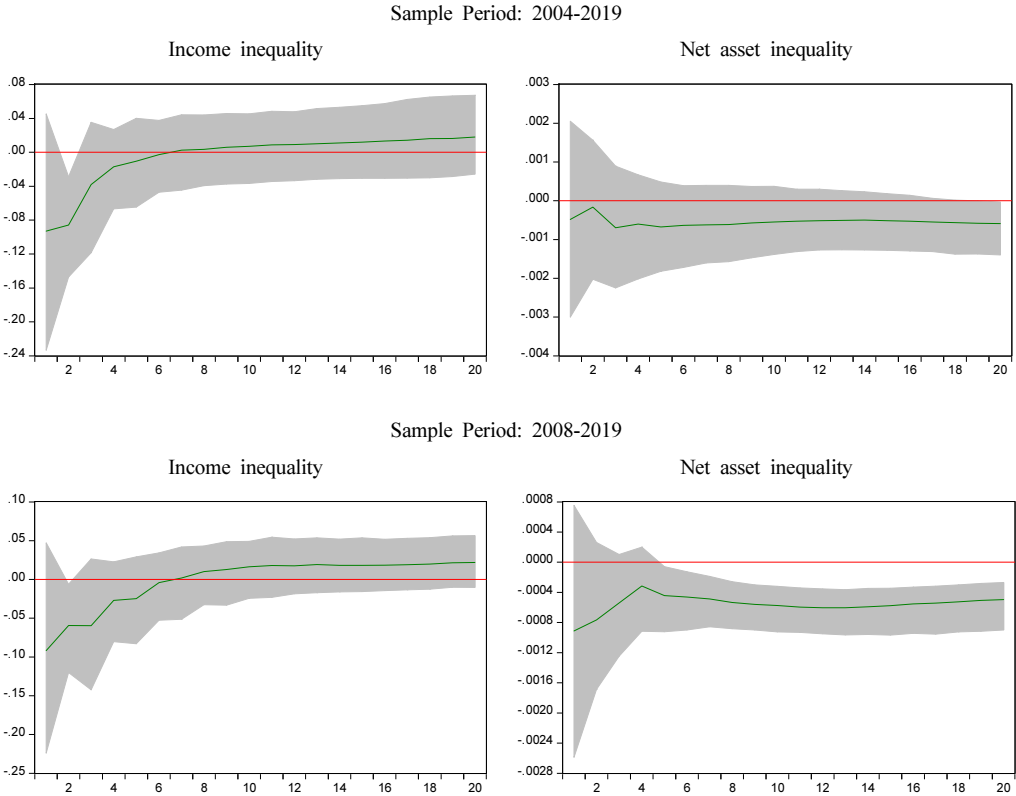

(Source) The Bank of Korea Statistics (ECOS)

The household debt burden in Korea has increased significantly over the past two decades. As shown in Figure 4, the household debt-to-GDP ratio was approximately 50% in 2000, but

it has doubled by 2020. Given the high debt-to-GDP ratio, the bank lending effect may dominate the asset price effect, such that the expansionary monetary policy shock may reduce wealth inequality. To examine this effect, we resample the data to focus more on the periods of high debt burden. Figure 5 shows the impulse responses of income and wealth inequality for the sample periods 2004-2019 and 2008-2019. The statistical significance of wealth inequality increases as we focus on more recent periods, which is consistent with our expectation.

Figure 5. Impulse responses to an expansionary domestic monetary policy shock with different sample periods

Sample Period: 2004-2019

Income inequality

Net asset inequality

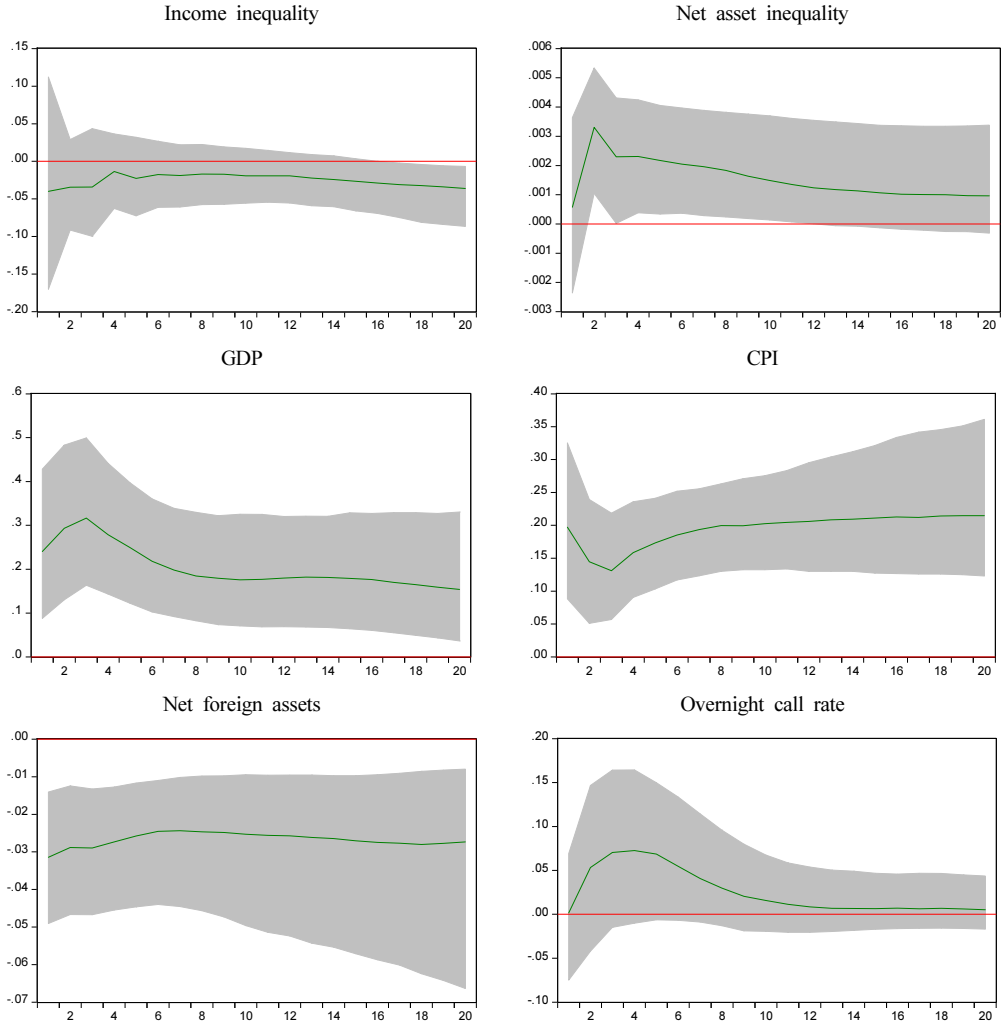Sample Period: 2008-2019

Income inequality

Net asset inequality

Notes. (1) Responses to one standard deviation decrease in overnight call rate.
(2) Endogenous variables = (net foreign asset/GDP, log(GDP), log(CPI), P90/P10 of market income, share of top 10% of net asset, overnight call rate). The lag order of vector autoregression (VAR) is set to 2. The shaded area represents the 68% confidence interval.

Figure 6 describes the impulse responses to an expansionary external liquidity shock where the external liquidity shock is represented by a change in the net foreign asset position. The net foreign asset position is foreign assets held by Korean residents minus Korean assets held by foreigners. Hence, if foreign capital flows into Korea due to an expansionary external liquidity condition, the net foreign asset position deteriorates. We use the p90/p10 ratio of market income as

a measure of income inequality and the share of the top 10% of net assets to gauge asset inequality.

Figure 6. Impulse responses to an expansionary net foreign asset shock

CPI = consumer price index.
Notes. (1) Responses to one standard deviation decrease in net foreign assets of Korea to GDP ratio.
(2) Endogenous variables = (net foreign asset/GDP, log(GDP), log(CPI), P90/P10 of market income, share of top 10% of net asset, overnight call rate). The lag order of vector autoregression (VAR) is set to 2. The shaded area represents the 68% confidence interval.

An expansionary external shock that increases net capital inflows to Korea has asymmetric effects on income and asset inequalities. An expansionary external shock tends to reduce income inequality but increase net asset inequality. The reduction in income inequality can be explained by the earnings heterogeneity channel, where labor income and the unemployment rate have a greater effect on lower-income households. These households are more dependent on labor

income and are thus more significantly impacted by positive shocks to the real economy brought about by capital inflows. The increase in wealth inequality following a foreign capital inflow shock can be attributed to the observation that financial market asset prices, such as stocks and bonds, are highly sensitive to foreign portfolio investments.

Interestingly, the result shows that an external liquidity shock appears to have stronger and more significant effects on wealth inequality compared to a domestic monetary policy shock. This finding aligns with recent observations that long-term interest rates in Korea may be significantly influenced by the global financial cycle even more than domestic monetary policy. Another reason of this is that an external liquidity shock could generate greater asset price effect than bank lending effect. As shown in Figure 4, net capital inflows from abroad have been largely driven by portfolio investments, a trend that has strengthened since 2010. Therefore, foreign portfolio investment accounts for over 60% of total foreign debt since 2010. By contrast, the proportion of private borrowing has been very small, approximately 10%. Consequently, the bank lending effect on wealth inequality would be negligible. That is, an expansionary external liquidity shock would boost asset prices, which increases overall wealth inequality.

Note that we do not impose sign restriction on the domestic policy rate so that the domestic monetary policy responds to the domestic economy. Thus, call rates would increase in response to the increase in real growth and inflation. We also consider the case of monetary easing in response to the external expansionary liquidity shock. The results are similar to the mixture of responses of domestic and external shocks. The response of income inequality is more evident while the statistical significance of asset inequality mildly decreases. The result is provided in the online Appendix.

Figure 7 shows the impulse responses of an expansionary external liquidity shock when net US banks' claims to Korea are used as an alternative proxy variable. We employ this proxy to focus on the effect of US monetary policy through the international bank lending channel. The foreign bank claims are primarily composed of debt securities and lending. Therefore, they affect both asset prices and domestic bank lending. In terms of lending effect, domestic banks' overseas borrowings are mainly used for corporate lending, such as trade finance and foreign currency loans, which is expected to have different effects compared to the domestic bank lending channel, where household lending plays a crucial role in Korea. Now an expansionary policy shock is identified with a positive shock to the net US banks' claim. As seen in Figure 7, the asymmetric effects of an expansionary external shock on income and net asset inequalities are stronger and more lasting. That is, an increase in capital flows to the banking sector reduces income inequality and the effect is statistically significant.

Figure 7. Impulse responses to an expansionary net US bank claims shock

Income inequality

Net asset inequality

GDP

CPI

Net US bank claims

Overnight call rate
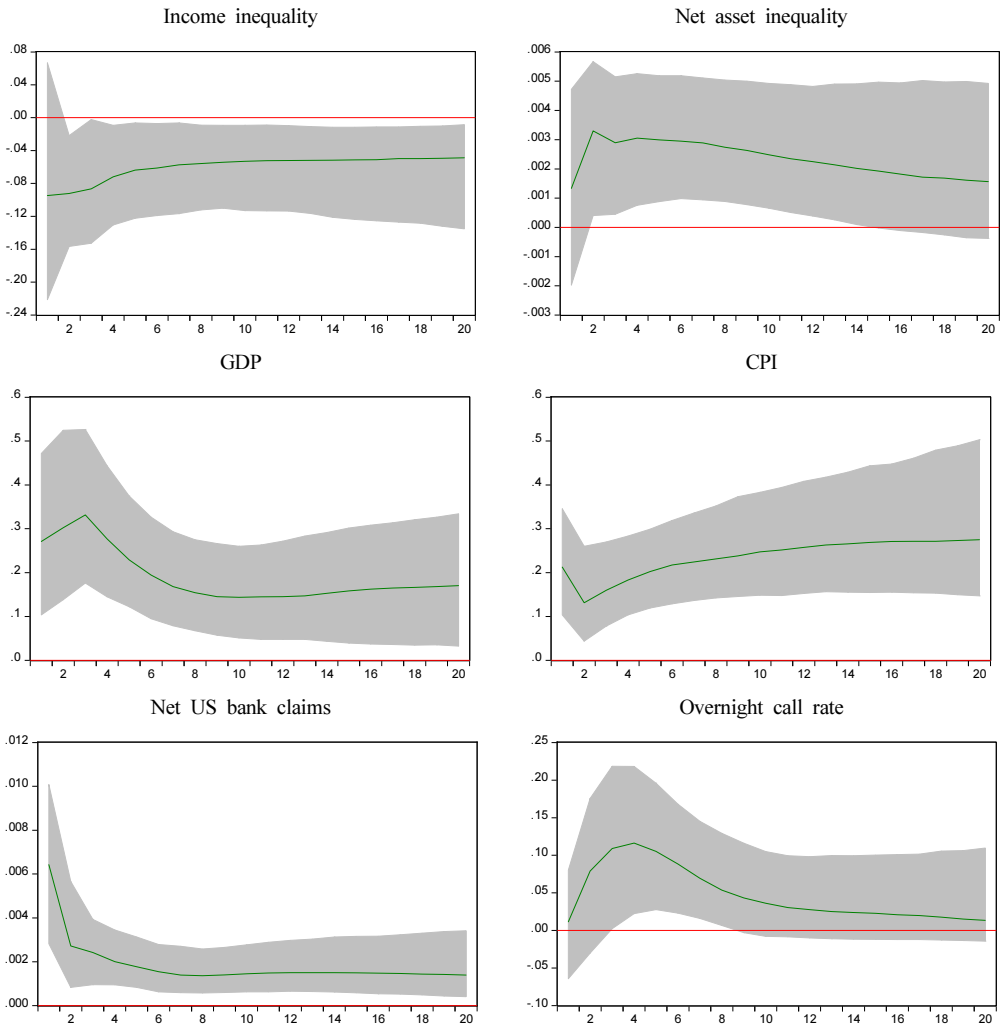
CPI = consumer price index; US = United States.
Notes. (1) Responses to one standard deviation increase in net US bank claims/GDP.
(2) Endogenous variables = (net US bank claims to Korea/GDP, log(GDP), log(CPI), P90/P10 of market income, share of top 10% of net asset, overnight call rate). The lag order of vector autoregression (VAR) is set to 2. The shaded area represents the 68% confidence interval.

The effect on net asset inequality shows an opposite sign and is also statistically significant. Unlike domestic monetary policy shock, the effect of an external liquidity shock on income inequality is statistically significant and more persistent.[3] This result suggests that changes

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3) To save space, we do not report the impulse responses to an expansionary domestic monetary policy shock, which is similar to Figure 3, except that the impact on income inequality becomes weaker and insignificant when net US bank claims are used in the *VAR* model.

in global monetary condition via international bank lending exert significant impact on both income and wealth inequalities in open emerging market economies such as Korea.

2. VAR models with income inequality and other asset inequalities

We also estimate the *VAR* models employing alternative measures of wealth inequality, using different asset types such as real estate and financial assets together with total assets. Figure 8 shows the impulse responses of income and wealth inequalities in different asset types to a domestic monetary policy shock in *VAR* models. where the overnight call rate is a proxy for domestic monetary policy shock and the net foreign asset position is used as an external liquidity variable. Consistent with the other results in this paper, an expansionary domestic monetary policy shock leads to a significant reduction in income inequality. However, the domestic monetary policy shock appears to have insignificant impacts on wealth inequality measured in various asset classes.

Figure 8. Impulse responses to an expansionary domestic monetary policy shock
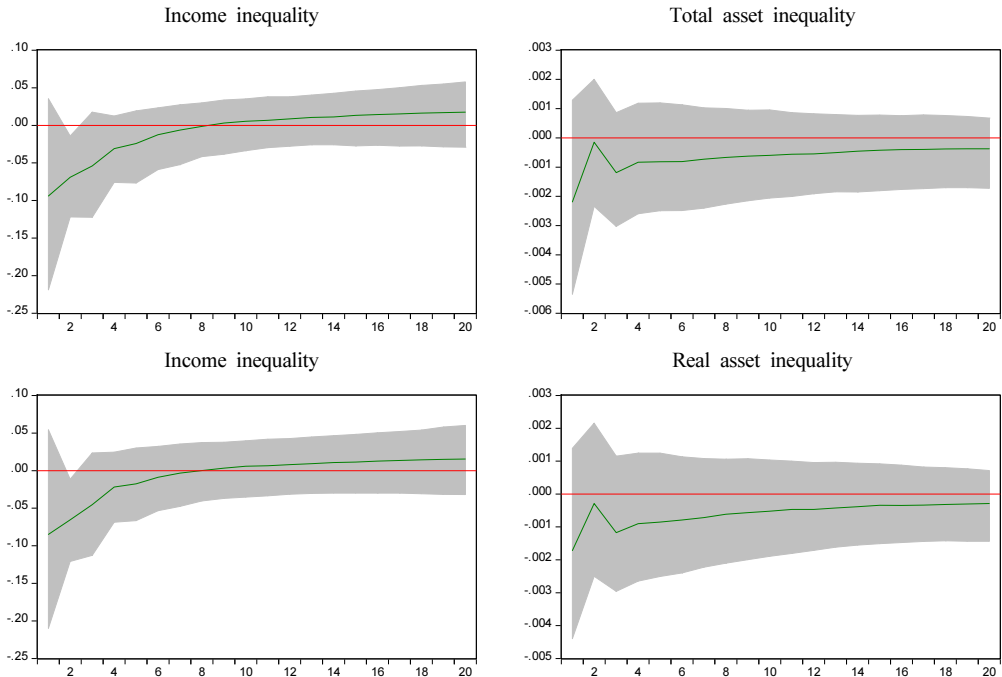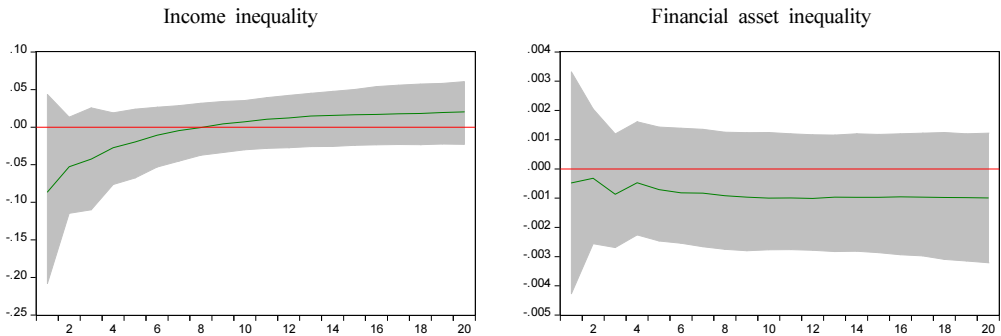(using alternative wealth inequality measures)

Income inequality

Total asset inequality

Income inequality

Real asset inequality

Figure 8. Continued

Income inequality

Financial asset inequality

Note. 1) Responses to one standard deviation decrease in overnight call rate.
2) Endogenous variables = (net foreign asset/GDP, log(GDP), log(CPI), P90/P10 of market income, share of top 10% of various assets, overnight call rate). The lag order of vector autoregression (VAR) is set to 2. The shaded area represents the 68% confidence interval.

Figure 9 shows the impulse response of income and various asset inequality measures to an expansionary external liquidity shock in *VAR* models where net foreign asset position is used as an external policy variable. Similar to our benchmark model using net assets, an expansionary net foreign assets shock leads to a reduction in income inequality, and this effect tends to persist longer. Conversely, an economic downturn following financial crises - such as those experienced in Korea after the credit card crisis of 2002-2003 and the global financial crisis a few years later - can exacerbate income inequality. An expansionary net foreign assets shock also results in a uniform increase in wealth inequality across different asset classes. In subcategories of assets, the impact is stronger for real asset inequality in the short term, while the effect tends to persist longer for financial asset inequality.

Figure 9. Impulse responses to an expansionary net foreign assets shock
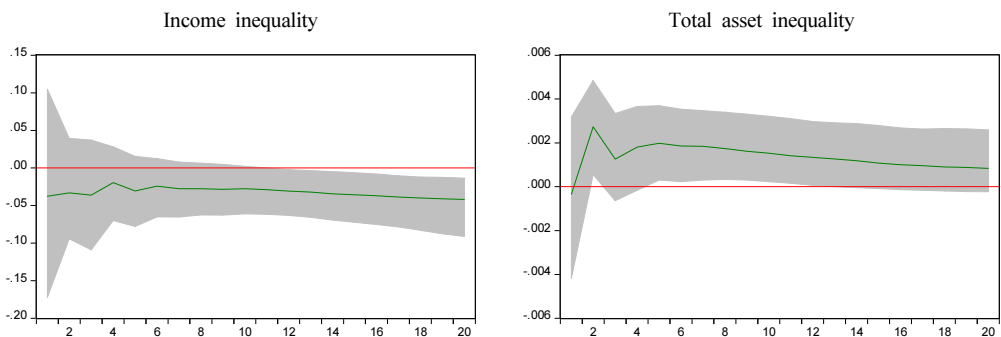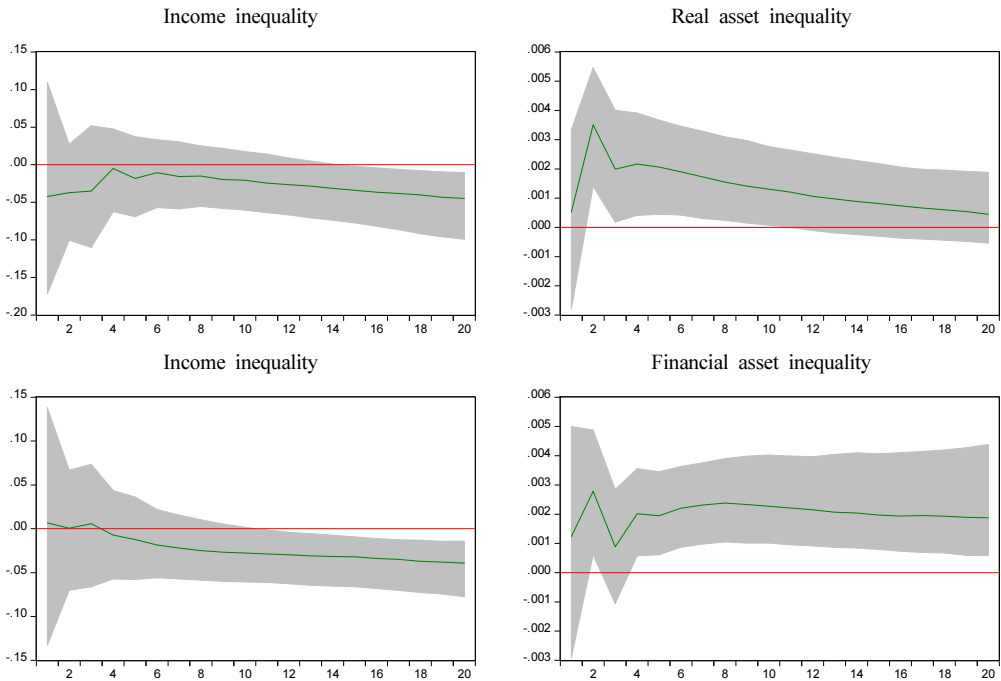(using alternative wealth inequality measures)

Income inequality

Total asset inequality

Figure 9. Continued

Income inequality

Real asset inequality

Income inequality
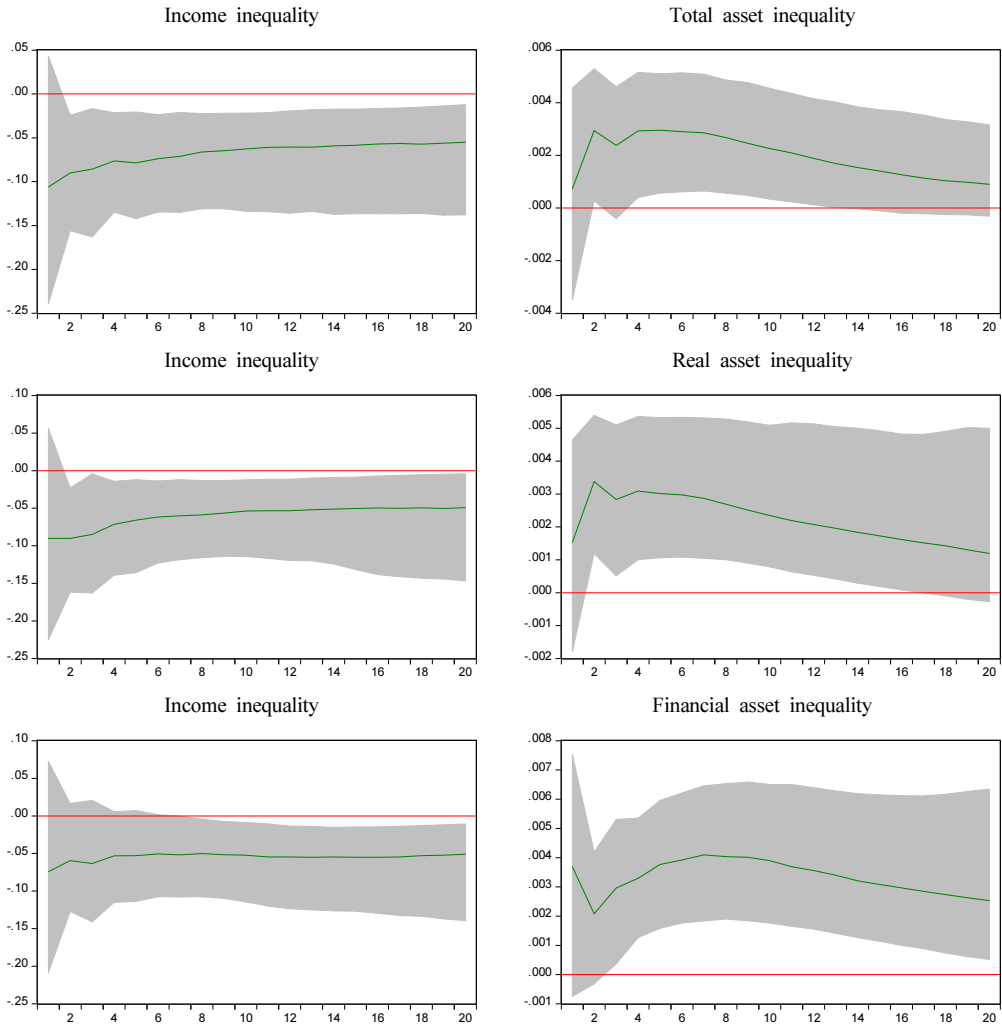
Financial asset inequality

Notes. (1) Responses to one standard deviation decrease in net foreign asset/GDP.
(2) Endogenous variables = (net foreign asset/GDP, log(GDP), log(CPI), P90/P10 of market income, share of top 10% of various assets, overnight call rate). The lag order of vector autoregression (VAR) is set to 2. The shaded area represents the 68% confidence interval.

Finally, the impulse responses of income and wealth inequality measures to an expansionary net US bank claims shock are reported in Figure 10. Consistent with our previous findings, an expansionary shock leads to an improvement in income inequality while causing a deterioration in various measures of asset inequality. Especially for income inequality, the impact seems to be stronger both in magnitude and statistical significance relative to the case of net foreign assets. This result also implies that the reversal of international bank lending flows exerts a greater impact on the income inequality in Korea relative to other types of capital flows such as portfolio investments.

Figure 10. Impulse responses to an expansionary net US bank claims shock
(using alternative wealth inequality measures)

Overall, our findings suggest that an external liquidity shock exert stronger impacts on wealth inequality than a domestic monetary policy shock. This might be due to the fact that domestic monetary policy and external liquidity shocks work their ways through different transmission channels in an open economy. While domestic monetary policy may be transmitted through channels such as bank lending and credit markets, external liquidity shocks are transmitted through asset market channels via changes in stocks and bond market prices as well as exchange

rates. Since financial asset holdings are typically concentrated among higher-income households, the impact of an external liquidity shock may be disproportionately favorable to wealthier households, thereby increasing wealth inequality.

In addition, multiple channels through which domestic monetary policy is transmitted may have opposing effects on wealth redistribution. For instance, an expansionary domestic policy may induce unanticipated inflation that reduces wealth inequality by hurting lenders more. However, it also increases asset prices which may aggravate wealth inequality. On the other hand, an expansionary external liquidity shock could mitigate the effect of unanticipated inflation as net capital inflows may cause a local currency to appreciate.

It is also interesting to note that the wealth effect of external liquidity shocks appears to be more significant when we focus on international bank lending flows. Namely, a shock to US bank claims on Korean banks exerts significant impacts on both income and wealth inequalities. In Korea, due to prudential regulations on the open foreign exchange position of Korean banks, banks' foreign borrowings are mostly channeled to funding non-financial corporate firms in foreign currency. Such capital flow effects on corporate financing may have indirect redistributive effects on household income through changes in aggregate outputs and employment. Similarly, net bank capital flows could also affect wealth inequality since a significant portion of these bank flows are associated with foreign banks' investment in local bond markets. For instance, at the onset of the global financial crisis in 2007, foreign bank branches in Korea actively borrowed from global banks to invest in Korean bonds using swap markets to profit from the interest rate differential.

V. Policy Implication and Concluding Remarks

This paper investigates the relationship between monetary policy and economic inequalities in an open emerging market economy. By considering both domestic and external monetary conditions, our analysis allows us to explore various channels of monetary policy transmission and their varied impacts on income and wealth inequalities. The key findings and policy implications are summarized as follows.

First, an expansionary domestic monetary policy shock tends to reduce income inequality, while its impact on net wealth inequality is negligible. This finding aligns with existing literature.

Second, a positive external liquidity shock, as measured by unanticipated net capital inflows, reduces income inequality but exacerbates net asset inequality. This implies that the distributional effects of external liquidity shocks are very different between income and wealth inequalities. To our knowledge, this opposing effect of net capital flows on income and wealth inequalities has not been documented in prior research.

Third, our empirical results suggest important policy considerations for managing financial stability risks associated with volatile capital flows in emerging market economies. The global monetary policy cycle and its spillover effects through net capital flows can have significant redistributive impacts. Excessive capital inflows during global monetary expansions can create financial imbalances, such as asset market bubbles, and exacerbate wealth inequality by inflating asset prices. Conversely, if the global monetary cycle shifts to a tightening phase, a reversal of capital flows may deflate asset price bubbles and worsen income inequality. Therefore, macroprudential policies designed to manage capital flow volatility could also help mitigate fluctuations in income and wealth inequalities.

Despite these interesting findings and implications, our study has notable limitations. We use net capital flows as a proxy for external liquidity shocks. While existing research highlights the significant influence of global monetary conditions, particularly US Federal Reserve monetary policies, on net capital inflows to emerging market economies, other factors also play a role. Thus, the precise impact of US Federal Reserve and other major central bank policies on capital flows remains unclear. A recent study (Clark et al. 2016) indicates that factors such as output growth and creditworthiness of emerging market economies, and changes in global commodity prices also significantly influence capital flows.

Additionally, our VAR model examines only the short-term effects of countercyclical monetary policy on economic inequalities. Although wealth inequality in Korea has been declining since 2007 - a period that coincides with extraordinarily low global interest rates driven by the US Federal Reserve's quantitative easing - our model does not address structural and long-term factors contributing to this trend. Separate research is needed to explore these structural determinants of economic inequalities.

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