

Hahm, Joon-ho; Lee, Dong Jin; Park, Cyn-Young

Working Paper

Domestic and external monetary policy shocks and economic inequality in the Republic of Korea

ADB Economics Working Paper Series, No. 654

Provided in Cooperation with:

Asian Development Bank (ADB), Manila

Suggested Citation: Hahm, Joon-ho; Lee, Dong Jin; Park, Cyn-Young (2022) : Domestic and external monetary policy shocks and economic inequality in the Republic of Korea, ADB Economics Working Paper Series, No. 654, Asian Development Bank (ADB), Manila, <https://doi.org/10.22617/WPS220121-2>

This Version is available at:

<https://hdl.handle.net/10419/259492>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



<https://creativecommons.org/licenses/by/3.0/igo/>

DOMESTIC AND EXTERNAL MONETARY POLICY SHOCKS AND ECONOMIC INEQUALITY IN THE REPUBLIC OF KOREA

Joon-Ho Hahm, Dong Jin Lee, and Cyn-Young Park

NO. 654

April 2022

**ADB ECONOMICS
WORKING PAPER SERIES**

ADB Economics Working Paper Series

Domestic and External Monetary Policy Shocks and Economic Inequality in the Republic of Korea

Joon-Ho Hahm, Dong Jin Lee, and Cyn-Young Park

No. 654 | April 2022

Joon-Ho Hahm (jhahm@yonsei.ac.kr) is a professor at the Graduate School of International Studies, Yonsei University. Dong Jin Lee (rheedj@smu.ac.kr) is an associate professor at the Department of Economics and Finance, Sangmyung University. Cyn-Young Park (cypark@adb.org) is the director of the Regional Cooperation and Integration Division, Economic Research and Regional Cooperation Department, Asian Development Bank.



Creative Commons Attribution 3.0 IGO license (CC BY 3.0 IGO)

© 2022 Asian Development Bank
6 ADB Avenue, Mandaluyong City, 1550 Metro Manila, Philippines
Tel +63 2 8632 4444; Fax +63 2 8636 2444
www.adb.org

Some rights reserved. Published in 2022.

ISSN 2313-6537 (print), 2313-6545 (electronic)
Publication Stock No. WPS220121-2
DOI: <http://dx.doi.org/10.22617/WPS220121-2>

The views expressed in this publication are those of the authors and do not necessarily reflect the views and policies of the Asian Development Bank (ADB) or its Board of Governors or the governments they represent.

ADB does not guarantee the accuracy of the data included in this publication and accepts no responsibility for any consequence of their use. The mention of specific companies or products of manufacturers does not imply that they are endorsed or recommended by ADB in preference to others of a similar nature that are not mentioned.

By making any designation of or reference to a particular territory or geographic area, or by using the term “country” in this document, ADB does not intend to make any judgments as to the legal or other status of any territory or area.

This work is available under the Creative Commons Attribution 3.0 IGO license (CC BY 3.0 IGO) <https://creativecommons.org/licenses/by/3.0/igo/>. By using the content of this publication, you agree to be bound by the terms of this license. For attribution, translations, adaptations, and permissions, please read the provisions and terms of use at <https://www.adb.org/terms-use#openaccess>.

This CC license does not apply to non-ADB copyright materials in this publication. If the material is attributed to another source, please contact the copyright owner or publisher of that source for permission to reproduce it. ADB cannot be held liable for any claims that arise as a result of your use of the material.

Please contact pubsmarketing@adb.org if you have questions or comments with respect to content, or if you wish to obtain copyright permission for your intended use that does not fall within these terms, or for permission to use the ADB logo.

Corrigenda to ADB publications may be found at <http://www.adb.org/publications/corrigenda>.

Note:

In this publication, “\$” refers to United States dollars.
ADB recognizes “Korea” and “Korean” as referring to the Republic of Korea.

The ADB Economics Working Paper Series presents data, information, and/or findings from ongoing research and studies to encourage exchange of ideas and to elicit comment and feedback about development issues in Asia and the Pacific. Since papers in this series are intended for quick and easy dissemination, the content may or may not be fully edited and may later be modified for final publication.

CONTENTS

FIGURES	iv
ABSTRACT	v
I. INTRODUCTION	1
II. LITERATURE REVIEW	2
A. Monetary Policy and Income Inequality	2
B. Monetary Policy and Wealth Inequality	3
C. Income and Wealth Inequality	5
III. MEASURING INCOME AND WEALTH INEQUALITIES	7
A. Data and Measures of Income and Wealth Inequalities	7
B. Trends of Income and Wealth Inequalities	7
IV. EFFECTS OF MONETARY POLICY SHOCKS ON ECONOMIC INEQUALITIES	10
A. Identification of Monetary Policy Shocks and the Vector Autoregression Model	10
B. Empirical Findings	11
V. CONCLUSION	18
REFERENCES	21

FIGURES

1	Trends of Income Inequality	8
2	Trends of Wealth Inequality	9
3	Impulse Responses to an Expansionary Domestic Monetary Policy Shock	11
4	Impulse Responses to an Expansionary Net Foreign Asset Shock	13
5	Impulse Responses to an Expansionary Net United States Bank Claims Shock	14
6	Impulse Responses to an Expansionary Domestic Monetary Policy Shock	15
7	Impulse Responses to an Expansionary Net Foreign Assets Shock	16
8	Impulse Responses to an Expansionary Net United States Bank Claims Shock	17

ABSTRACT

This paper investigates the effects of monetary policy shocks on income and wealth inequalities in the Republic of Korea. Using the detailed *Household Income and Expenditure Survey* and *Korean Labor and Income Panel Study* data, we construct measures of income and wealth inequality for the Korean economy. Empirical results show that both domestic and external monetary policy shocks exert significant countercyclical effects on income inequality. For wealth inequality, however, the effects are very different. Whereas domestic monetary policy shocks are insignificant, external policy shocks proxied by fluctuations in net capital flows seem to have significant effects on net wealth inequality.

Keywords: monetary policy, income inequality, wealth inequality, external monetary policy shock, emerging market economies

JEL codes: E52, D31, G51, E44, F42

I. INTRODUCTION

The coronavirus disease (COVID-19) pandemic has raised renewed concerns about economic and social inequality. The pandemic-induced global recession has left visible economic scars with the impact falling disproportionately on the poor and disadvantaged. Even as economic recessions are typically associated with widening income inequality, the latest reports on global unemployment, poverty, and income inequality are particularly somber.

Monetary policy responses to economic shocks, especially during the global financial crisis of 2007–2008 and the COVID-19 pandemic, with unconventional measures at times, may have redistributive effects on household income and wealth by affecting employment, resource allocation, and inflation. However, the redistributive effects of monetary policy remain controversial. While the recession might have been worse without the timely support, the subsequent rises in asset price inflation and net wealth among the world's top richest stir controversy over the effect of monetary policy on inequality.

The debate on the distributional effect of monetary policy dates to the 18th century when Richard Cantillon noted that an increase in money supply may affect different sectors of the economy at different times. For example, when new money is injected into an economy, the first beneficiary group may be able to enjoy high spending power before new money supply leads to higher prices for the next group. Gradual price adjustments due to price rigidity can create a distributional effect known as the *Cantillon Effect*.

As for income inequality, recent studies find that expansionary monetary policy helps mitigate income inequality, at least temporarily (Coibion et al. 2017; Furceri, Loungani, and Zdzienicka 2016; Mumtaz and Theophilopoulou 2017; Park 2021). But for wealth inequality, disagreement about the degree of impact is considerable (Domanski, Scatigna, and Zabai 2016; O'Farrell and Rawdanowicz 2017; Saez and Zucman 2014). This is also related to the relatively limited research into the evolution of household income and wealth distribution over time.

Within this context, this paper investigates the effects of monetary policy shocks on income and wealth inequalities in the Republic of Korea (ROK). The ROK is unique in that detailed survey data are available both in income and assets of households. The ROK is also a small open economy subject to changes in global monetary conditions and exposed to the international spillover effects of monetary policies in advanced economies. For instance, unconventional measures in foreign monetary policy operations can feed into domestic monetary and financial conditions through changes in capital flows and global asset price inflation.

Using the detailed *Household Income and Expenditure Survey* and *Korean Labor and Income Panel Study* data in the context of the Korean economy, our study contributes to the existing literature in two ways. First, we distinguish domestic versus external monetary policy shocks. The ROK is an attractive market for foreign investors whose investment decisions are influenced by changes in global liquidity conditions and monetary policies of advanced economies. Foreign participation in Korean asset markets acts as a conduit of external monetary policy shock, affecting household income and wealth. Second, we investigate different transmission mechanisms through which monetary policy affects income and wealth inequalities in an open economy. The monetary policy impacts may differ significantly. For

example, while expansionary monetary policy may prevent income inequality from worsening during a recession, asset price inflation may benefit the wealthy and aggravate wealth concentration.

More specifically, we attempt to answer the following questions:

- How has household income and wealth distribution evolved in the ROK over the past few decades?
- What would be the major channels of monetary policy transmission for the income and wealth redistribution in the ROK?
- What impact do domestic and external monetary policy shocks have on income and wealth inequalities in the ROK?
- Do domestic monetary policy shocks have differential impacts between income and wealth inequalities? How about the impacts of external monetary policy shocks?

Exploration of these questions starts in Section II with a review of the past literature on the effects of monetary policy on income and wealth inequalities and a summary of the transmission channels for the distribution of income and wealth. Section III discusses data, inequality measures, and recent trends of income and wealth inequalities in the ROK. Section IV describes estimation methodologies and empirical findings on the effects of domestic and external monetary policy shocks on economic inequalities in the ROK. Finally, Section V summarizes key findings and discusses policy implications.

II. LITERATURE REVIEW

The effects of monetary policy on income and wealth inequality have regained interest in recent years given the potentially distortionary impact of historically low interest rates over the past decade. While the goal of monetary policy is to stabilize aggregate price and output fluctuations, to the extent that households have different sources of income and wide ranges of asset and liability holdings, the distributional effects of monetary policy will vary across countries and over time.

According to monetary theory, money should be “neutral” in the long term, in that a change in money supply will lead to a proportional and permanent increase in prices. Therefore, most empirical studies have examined the transitory effects of monetary policy on income inequality driven by changes in economic growth and employment. Only recently have some studies begun looking into the effect of monetary policy on wealth inequality. Considerable dispute exists over the transmission channels of monetary policy on income and wealth inequalities and evidence showing the net effect of monetary policy through multiple transmission channels remains inconclusive. This section reviews recent research focused on theoretical channels along with empirical findings.

A. Monetary Policy and Income Inequality

(1) Earnings Heterogeneity Channel

Monetary policy may exert heterogeneous impacts on the determinants of household earnings: hourly wages, hours worked, and the unemployment rate. For instance, Heathcote, Perri, and Violante (2009) find that while high income household earnings are more affected by changes in hourly wages, low-

income household earnings 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. As for business income, Gertler and Gilchrist (1994) find that a contractionary monetary policy shock depresses sales of small firms more than it does the sales of large firms. Hence, contractionary monetary policy may aggravate income inequality.

(2) Income Composition Channel

Households earn incomes from diverse sources—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 heterogeneous 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. As for the lower-income households, it may increase labor income but reduce transfer income. The combined effect of an expansionary policy would depend on the relative responsiveness of incomes.

(3) Savings Redistribution Channel

Monetary policy affects household income through its impact on returns on assets and debt-service costs. An expansionary monetary policy shock which lowers the real interest rate would benefit borrowers and hurt savers. This tends to reduce income inequality, according to Doepke and Schneider (2006). O'Farrell and Rawdanowicz (2017) show an interest rate cut could have a complex impact on income inequality depending on the skewness of income and net asset distributions of households. They show that for interest-paying assets and liabilities, theoretically an interest rate cut reduces income inequality when net wealth is more skewed to high-income groups than when income is more skewed to high-income groups.

Many authors have tried to estimate the effects of monetary policy on income inequality and to assess empirically which transmission channel is more important than others. Findings indicate that contractionary (expansionary) monetary policy tends to increase (reduce) income inequality. Carpenter and Rodgers (2004) show that a contractionary monetary policy shock disproportionately raises unemployment rates of minority and less-skilled workers. Gornemann, Kuester, and Nakajima (2012) also confirm that a contractionary shock tends to prolong the period of high unemployment. Mumtaz and Theophilopoulou (2017) obtain comparable results using a longer time-series data of the United Kingdom. They find that contractionary monetary policy shocks lead to an increase in income inequality as they have a larger negative effect on low-income households. Coibion et al. (2017) argue that the income composition channel is more important than others and show that contractionary monetary policy raises total income at top deciles and reduces labor income at bottom deciles. They estimate that a contractionary policy shock—as measured by the unanticipated change in the Fed funds rate—tends to raise subsequent income inequality, as measured by the Gini coefficient after 3 to 5 years.

B. Monetary Policy and Wealth Inequality

(1) Unexpected Inflation Channel (Inflation Tax Channel)

Unexpected inflation leads to a decline in real values of nominal assets and liabilities, thereby redistributing wealth from lenders to borrowers. Expansionary monetary policy may therefore reduce

wealth inequality if we assume lenders are generally wealthier than borrowers. For instance, using United States (US) data, Doepke and Schneider (2006) find that middle-class households hold more long-term debts such as fixed rate mortgages while wealthy households tend to be net savers. Hence, expansionary monetary policy reduces wealth inequality by relieving the real debt burden of middle-class mortgage borrowers relatively more than it benefits wealthy savers.

(2) Interest Rate Exposure Channel (Portfolio Channel)

Financial assets and liabilities have different price responsiveness to monetary policy shocks. An interest rate cut will increase the value of assets and liabilities by lowering the discount rate. The longer the duration of assets and liabilities, the higher the effect. Hence, interest rate exposure effects 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 the net wealth of households will also depend on the degree of leverage. As lower-end households tend to depend more on borrowing for buying assets such as housing, they will benefit proportionately more from the rise in asset prices relative to wealthier, less leveraged households. O'Farrell and Rawdanowicz (2017) show that the asset price increase induced by an expansionary monetary policy may have conflicting impacts on net wealth inequality. They find the degree of leverage to be an important determinant, and that an increase in asset prices reduces net wealth inequality if liabilities are more skewed to the bottom of the net wealth distribution than assets. That is because poor households have higher leverage and so benefit more from asset price increases than wealthy 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 that are highly skewed toward wealthy households (such as stocks and bonds) would increase inequality.

(3) Financial Segmentation Channel

Monetary policy may change wealth distribution across households if some households trade more actively in financial markets than others due to differences in accessibility to financial market across income groups. Williamson (2009), for instance, shows that an expansionary monetary policy shock tends to aggravate wealth inequality if wealthier households are more connected to stock and bond markets.

(4) Unconventional Monetary Policies and Wealth Inequality

The unconventional monetary policies of advanced economies seem to have profound effects on global asset prices. For instance, Gagnon et al. (2011) and Rosa (2012) show that the quantitative easing policies of the US Federal Reserve have not only raised the price of US long-term bonds but also prices of a variety of securities. Along with the hike in asset prices, researchers began paying attention to their implications on the redistributive effects of unconventional monetary policies on net wealth of households. Using data in euro area countries, Adam and Tzamourani (2015) find that rising asset prices have differential impacts on net wealth inequality, depending on the types of assets. While an increase in housing prices reduces net wealth inequality because housing accounts for a large share in assets of middle-decile households, an increase in equity prices increases net wealth inequality of European households. Bivens (2015) finds similar effects in the US, where the large-scale asset purchase program raised wealth inequality in stocks but decreased it in housing. Using US and European country data, Domanski, Scatigna, and Zabai (2016) find that the unconventional monetary

policies have increased wealth inequality in the US. However, O'Farrell and Rawdanowicz (2017) find the redistributive impact of unconventional monetary policy to be insignificant.

C. Income and Wealth Inequality

Few empirical studies exist on the relationship between monetary policy and economic inequalities in the ROK. Park (2021) investigates the effects of monetary policy shocks on income inequality using *Household Income and Expenditure Survey* data from 1990 to 2017. Using the block-exogeneity vector autoregression (VAR) model, he finds that a contractionary monetary policy shock aggravates income inequality after a year, as measured by market income Gini coefficient. However, the contribution of monetary policy shocks to variations in income inequality was relatively modest. Among the potential channels described above, Park (2021) finds that earnings heterogeneity channel appears to be the most important.

Although the impact of monetary policy has not been explicitly investigated, several studies have documented the evolution of the ROK's economic inequalities after the global financial crisis. First, as for the income inequality, Choi, Kim, and Park (2018) investigate changes in income inequality using the *Korean Labor and Income Panel Study (KLIPS)* data from 1997 to 2014. Their estimates of Gini coefficient show a declining trend after the global financial crisis. However, unlike the alternative Gini coefficient obtained from the *Household Income and Expenditure Survey*, their Gini coefficient bottomed out in 2012 and increased again in 2013. They find that, while the negative impacts of real estate related incomes and financial incomes were modest, the positive impacts of transfer and social security incomes contributed to the improvement in income inequality after the global financial crisis.

Kwark (2018) investigates the relationship between income inequality and the business cycle in the ROK. Using the market and disposable income Gini coefficients, he verifies that income inequality was widening in the years before the global financial crisis but improved after. He also shows that various income inequality measures are countercyclical over the business cycle in the ROK. In other words, income inequality worsens in recessions but improves in expansions as the income share of low-income households increases in expansions. According to Kwark's estimates, both labor income and business income are procyclical, and labor income plays a more important role for low-income households.

Yoon, Rhee, and Lee (2019) explore potential determinants and macroeconomic consequences of income inequality. Using the disposable income Gini coefficient estimated from the 1990–2016 *Household Income and Expenditure Survey*, they show that rising income inequalities are significantly associated with lower private consumption and gross domestic product (GDP) growth rates in the ROK. They also conduct a cross-country panel study to identify macroeconomic determinants of income inequality. They find that per capita income is the only significant determinant in their full sample with all countries. However, in their subsample of countries with low tax progressiveness, the real housing price and unemployment rate are positively associated with the measure of income inequality. Based on this finding, they argue that the rapid rise in real estate prices in the ROK potentially contributed to deteriorating income inequality given that the tax regime is not as progressive as other Organisation for Economic Co-operation and Development (OECD) countries.

Jung and Lim (2020) estimate traditional and age-adjusted Gini coefficients using the *Household Income and Expenditure Survey* for 1990–2020. They find that the Gini coefficients obtained from market and current incomes sharply increased after the 1997 Asian crisis and continued a

moderate increasing trend since then. According to their study, aging and the education gap are important factors of increasing disparity in market incomes in the ROK.

As for the wealth inequality, Cheon (2019) investigates asset accumulation and wealth inequality in the ROK. He finds that capital gains and asset price increases have contributed more to asset accumulation than savings or inheritances. According to Cheon's estimates using various survey data in the ROK, the measures of real wealth inequality in the ROK such as Gini and the share of top 10% are not significantly higher than for other countries. For instance, the degree of net asset inequality in the ROK is significantly lower than it is in the US, Austria, and Germany, and is similar to Spain, Italy, and Australia. Net asset inequality in the ROK increased from 1998 through 2005, but has decreased since about 2005 and 2006. Cheon interpreted this shift as caused by accelerated real estate prices in the early 2000s and subsequent strengthening of prudential regulations on real estate financing such as limits on debt service-to-income (DTI) and loan-to-value (LTV) ratios.

Jeong and Cheon (2017) investigate the role of housing assets as a determinant of wealth inequality in the ROK in comparison to the US and Spain. By decomposing Gini coefficients, they find that the contribution of real estate assets in total net wealth inequality is significantly higher in the ROK. The contribution of inequality between home owner group and non-homeowner group to total net wealth inequality is also significantly higher in the ROK than in the US and Spain, while the within-group inequality is much lower in the ROK. Based on this difference, Jeong and Cheon argue that housing assets do not mitigate the wealth inequality in the ROK unlike other countries such as Spain.

Kim (2018) investigates individual wealth distribution in the ROK by utilizing the inheritance tax statistics to avoid potential under-reporting problems in household survey data. He finds wealth concentration higher than income concentration in the ROK. The wealth concentration in the ROK was lower than in the United Kingdom and the US, but was higher than for the continental European countries. According to his estimates, the share of wealth held by the top 10% was higher than those estimated from the household survey data, and the share increased modestly from 63.3% in 2000–2007 to 65.5% in 2010–2013 after the global financial crisis.

Shin (2020) investigates the relationship between income inequality and wealth inequality in the ROK using 2017 survey data by linking the *Survey of Household Finance and Living Conditions* with the administrative data on household income from the National Tax Office. He finds that wealth inequality is more severe than income inequality in the ROK, and that income and leverage are important factors in explaining wealth inequality. For instance, financial leverages of higher income groups have contributed to wealth inequality as higher income groups have obtained more loans to finance their investments in housing whose prices have increased substantially. However, this study is basically a cross-sectional analysis yielding only limited evidence on the dynamics of income and wealth inequalities.

Finally, Jeong and Cheon (2020) also investigate the relationship between income equality and wealth inequality in the ROK. They find that, while the net wealth inequality is not as high as the OECD average, the correlation between disposable income and net assets is positive, and stronger than in other OECD countries. The contribution of income to asset accumulation is also relatively high in the ROK, which suggests an important mutually reinforcing effect between income and wealth inequalities.

III. MEASURING INCOME AND WEALTH INEQUALITIES

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 Gini coefficient from 2016 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% 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 the ROK, 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 data covers 2011 through 2020, which is not sufficiently long for our time-series analysis. Hence, we use the *KLIPS* data, which spans from 1999 to 2019.

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 house price index, the Korea Composite Stock Price Index (KOSPI), 3-year treasury bill rate, GDP, and 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, and excluding government transfer payments. Total income includes transfer income. But in our empirical analysis, we use market income-based measures because since the objective of our study is to identify potential effects of monetary policy on household income distribution, it is important to use the household income distribution without fiscal transfers. 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 Government of the ROK has expanded redistributive policies.

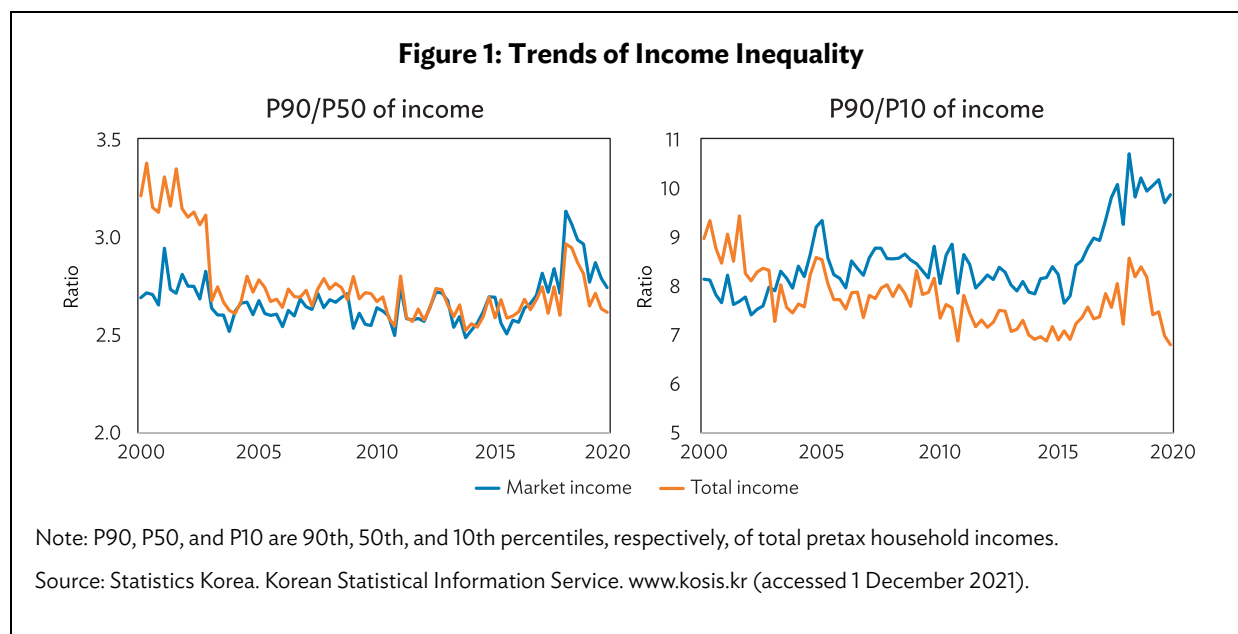
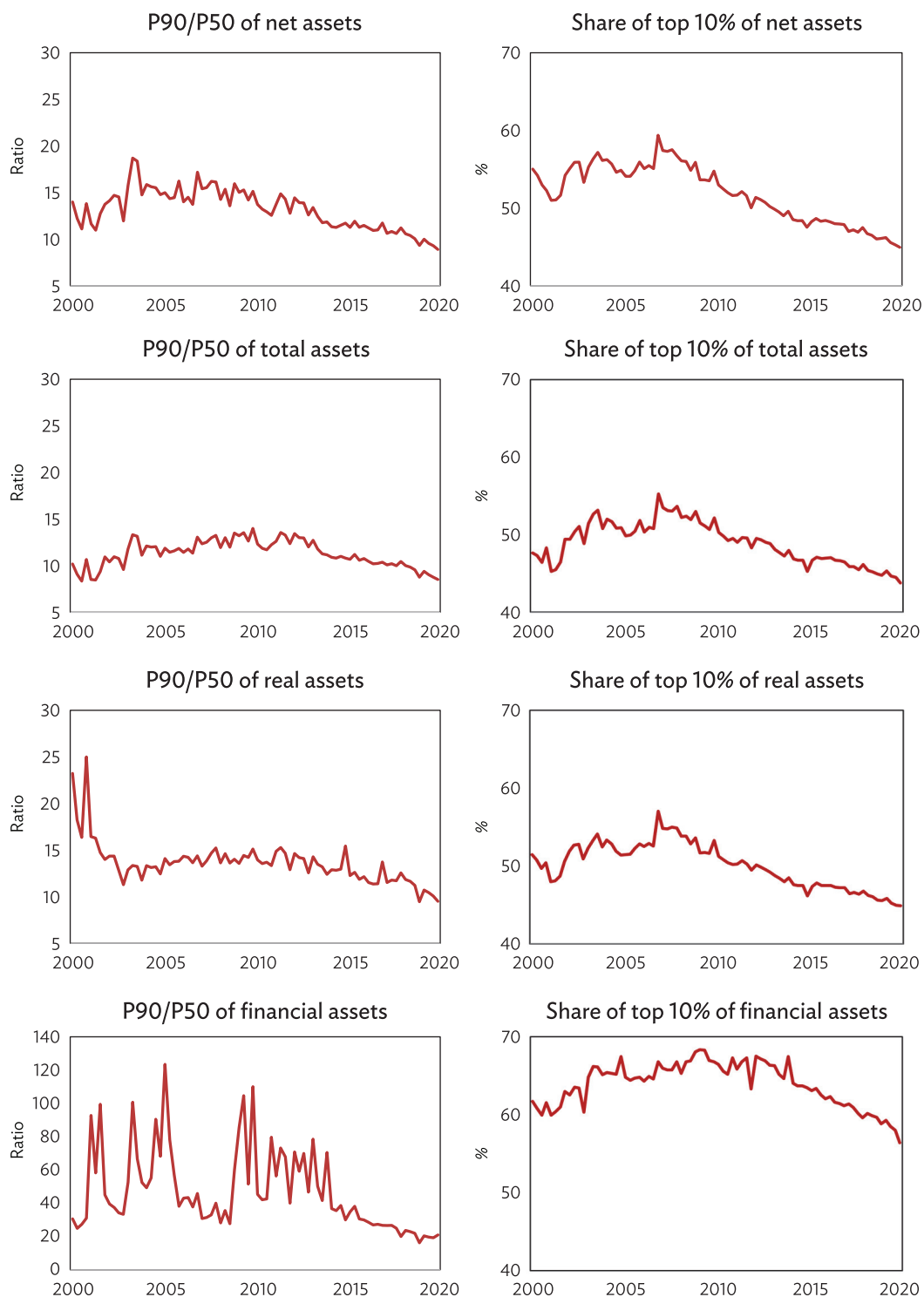


Figure 2 shows the trend of our wealth inequality measures obtained from various asset categories. Both the P90/P50 ratio and the share of top 10% show in general a decreasing trend since the global financial crisis, which is consistent with the literature review. In the case of the top 10% share, the 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 early 2000s and the 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

Note: P90, P50, and P10 are 90th, 50th, and 10th percentiles, respectively, of various household wealth measures. Share of top 10% is the ratio of sum of the 10th percentiles of the household wealth measures out of the sum of the total household ones.

Source: Korea Labor Institute. www.kli.re.kr (accessed 1 December 2021).

IV. EFFECTS OF MONETARY POLICY SHOCKS ON ECONOMIC INEQUALITIES

A. Identification of Monetary Policy Shocks and the Vector Autoregression Model

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

$$A(L)y_t = \epsilon_t, \epsilon_t \sim (0, I) \quad (1)$$

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:

$$B(L)y_t = u_t \quad (2)$$

where $B(L) = \sum_{i=0}^p B_i L^i$, $B_0 = I_n$, 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 which contradicts mainstream theory. We found that the price puzzle still exists in the standard VAR model of the ROK. Various methods are suggested to tackle the problem such as using the measure of Romer and Romer (2004) and using the factor-augmented VAR (FAVAR) of Bernanke, Boivin, and Elias (2005). Romer and Romer (2004) is hard to apply in the Korean case because the Bank of Korea’s version of the US Federal Reserve’s *Green Book* forecast is not available before 2005. FAVAR is also not relevant 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 steps are the following: (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 corresponding $\hat{A}_0^{-1}Q$ using the QR decomposition and calculate the impulse response function from the structural vector moving average form; and (4) if the resulting impulse responses satisfy the sign imposed, keep the result and drop the draw otherwise.

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

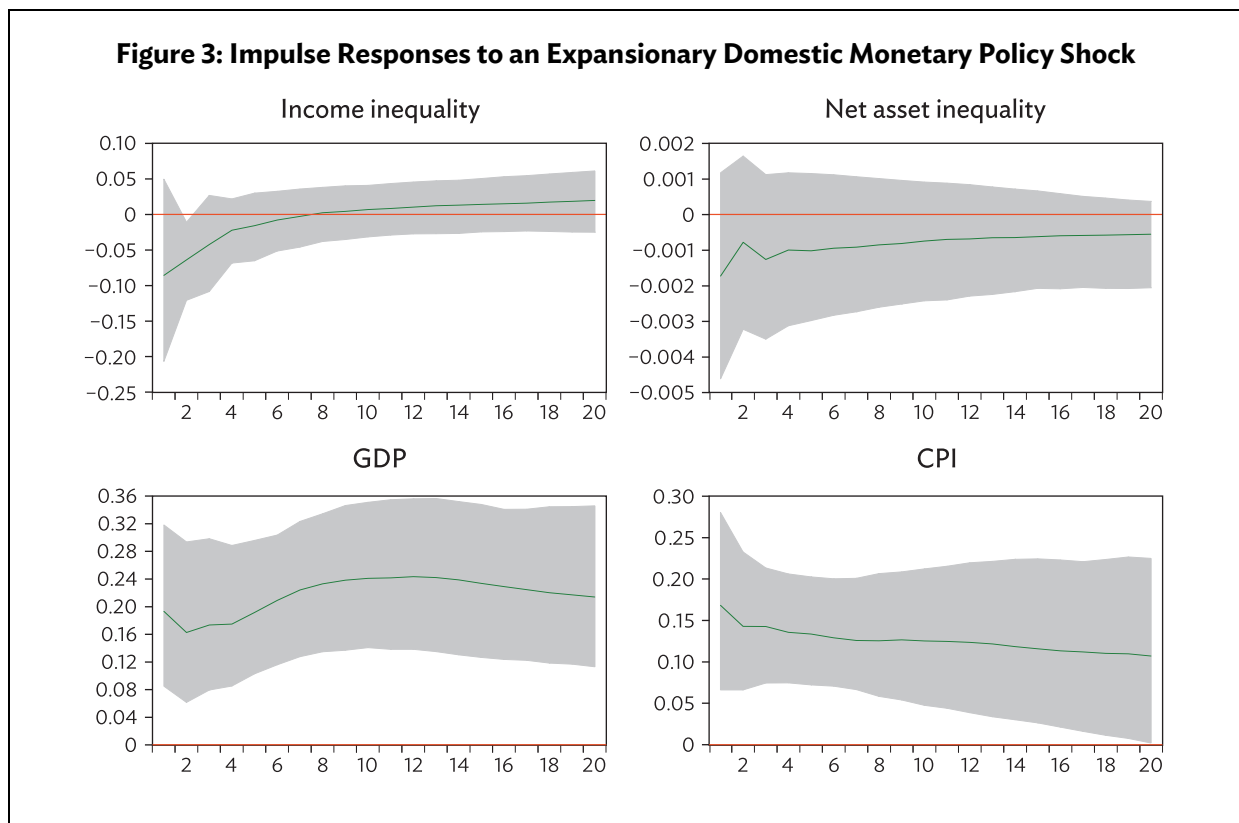
In order to identify domestic and external monetary policy shocks, we impose the restriction that an expansionary domestic monetary policy shock lowers overnight call rate and increases both GDP and CPI. As for the external monetary policy shock, we assume that an expansionary external monetary policy 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. GDP and CPI are in log and all variables besides interest rates are seasonally adjusted. We also apply the penalty function method of Arias, Rubio-Ramirez, and Waggoner (2018) as an alternative to the rejection method, and find no significant differences except 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.

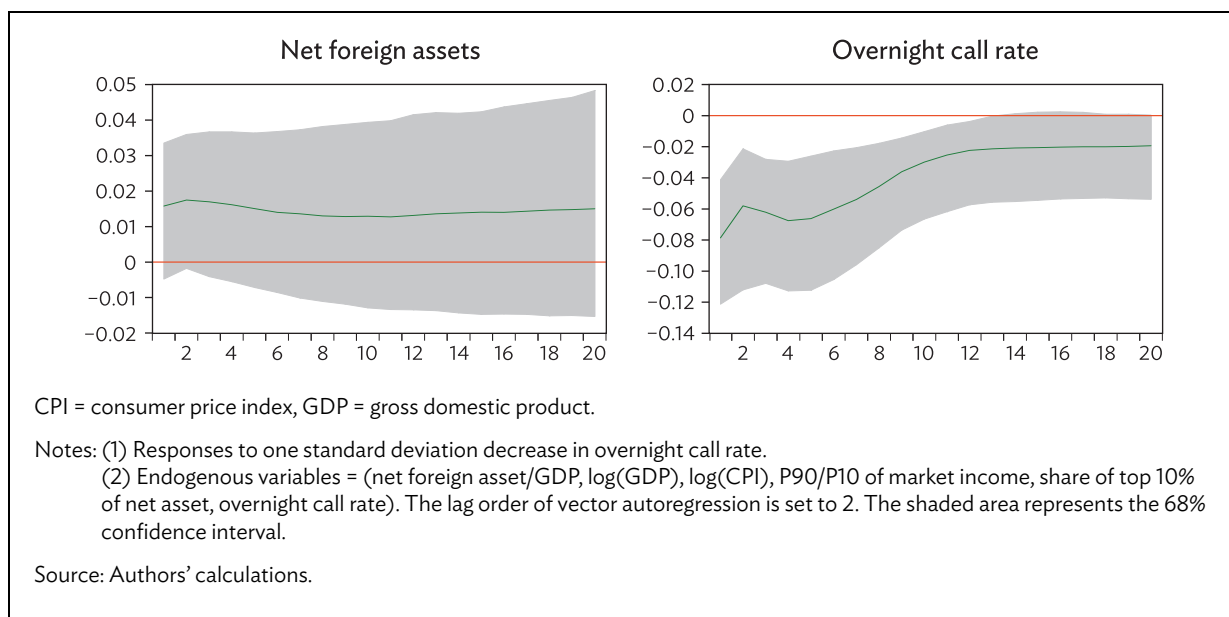
B. Empirical Findings

(1) Vector Autoregression 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 monetary policy. An expansionary domestic monetary policy initially reduces income inequality for a few quarters, after which the effect disappears. The sign of the responses coincides with findings such as 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 the ROK. However, the effect seems temporary even though the call rate remains low for longer.



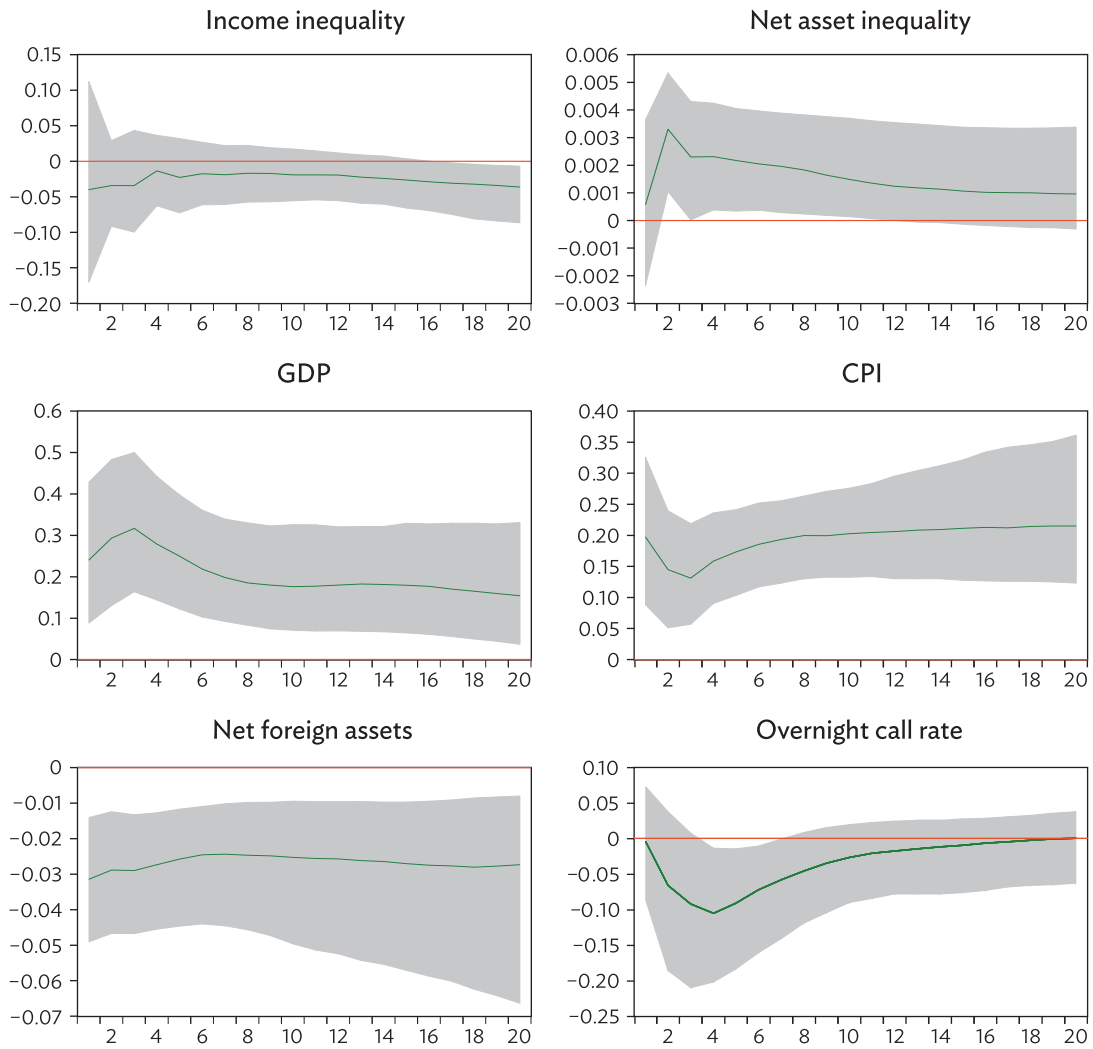
continued on next page

Figure 3 *continued*

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 lower interest rate exposure of low- and middle-class households with high leverage. However, the response of net asset inequality is not statistically significant 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, and our empirical results imply that no single channel is dominant in the ROK.

Figure 4 describes the impulse responses to an expansionary external monetary policy shock where the external policy is represented by 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 the ROK due to an expansionary external monetary policy, the net foreign asset position deteriorates. We use the P90/P10 ratio of market income as a measure of income and the share of top 10% of net assets to gauge asset inequalities.

An expansionary external monetary policy shock which increases net capital inflows to the ROK 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 lower-income households are more dependent upon labor income and unemployment rate, which are thus more significantly affected by the positive shocks to the real economy that capital inflows bring. The increase in wealth inequality after a foreign capital inflow shock can be interpreted by the observation that financial market asset prices such as stocks and bonds are highly sensitive to foreign portfolio investments. An interesting result is that an external monetary policy shock seems to have stronger and more significant effects on wealth inequality than a domestic monetary policy shock. This finding is consistent with the recent observation that the long-term interest rates in the ROK are more affected by the global financial cycle than domestic monetary policy. Indeed, the co-movements of domestic and global long-term interest rates has become stronger after the global financial crisis, which implies that the financial asset price effect of external monetary policy shocks may have increased in recent years. Note also that financial assets are much more concentrated on wealthy households as shown in Figure 1. Together, an expansionary external monetary policy shock could increase net asset inequality through the financial asset price channel.

Figure 4: Impulse Responses to an Expansionary Net Foreign Asset Shock

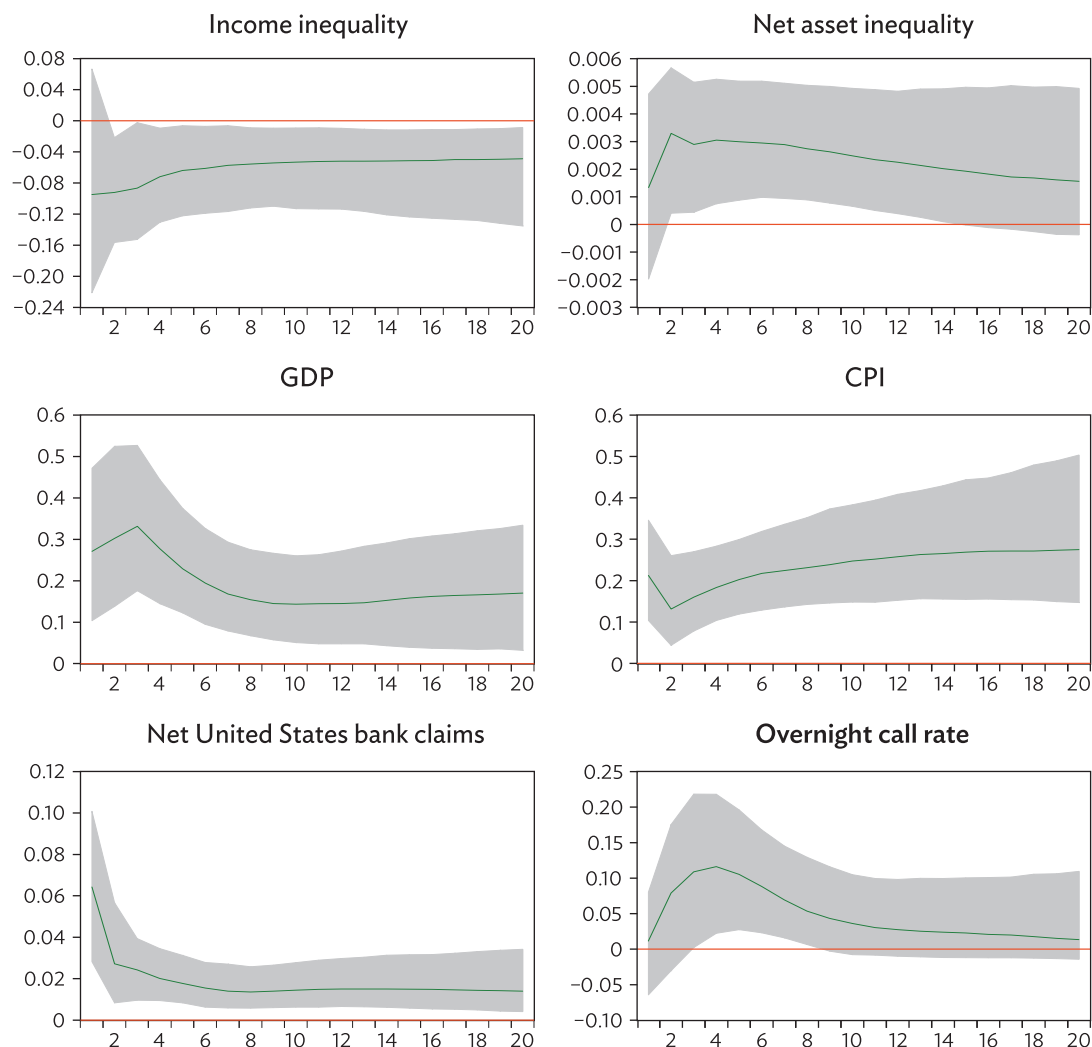
CPI = consumer price index, GDP = gross domestic product.

Notes: (1) Responses to one standard deviation decrease in net foreign assets of the Republic of Korea-to-GDP ratio.

(2) Endogenous variables = (net foreign asset/GDP, $\log(\text{GDP})$, $\log(\text{CPI})$, P90/P10 of market income, share of top 10% of net asset, overnight call rate). The lag order of vector autoregression is set to 2. The shaded area represents the 68% confidence interval.

Source: Authors' calculations.

Figure 5 shows the impulse responses of an expansionary external monetary policy shock when net US banks' claims to Korean banks are used as alternative proxy variable. We employ this proxy to focus on the effect of the US monetary policy through the international bank lending channel. Now an expansionary policy shock is identified with a positive shock to the net US banks' claim. As can be seen, 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 5: Impulse Responses to an Expansionary Net United States Bank Claims Shock

CPI = consumer price index, GDP = gross domestic product.

Notes: (1) Responses to one standard deviation decrease in net foreign assets of the Republic of Korea-to-GDP ratio.

(2) Endogenous variables = (net foreign asset/GDP, $\log(\text{GDP})$, $\log(\text{CPI})$, P90/P10 of market income, share of top 10% of net asset, overnight call rate). The lag order of vector autoregression is set to 2. The shaded area represents the 68% confidence interval.

Source: Authors' calculations.

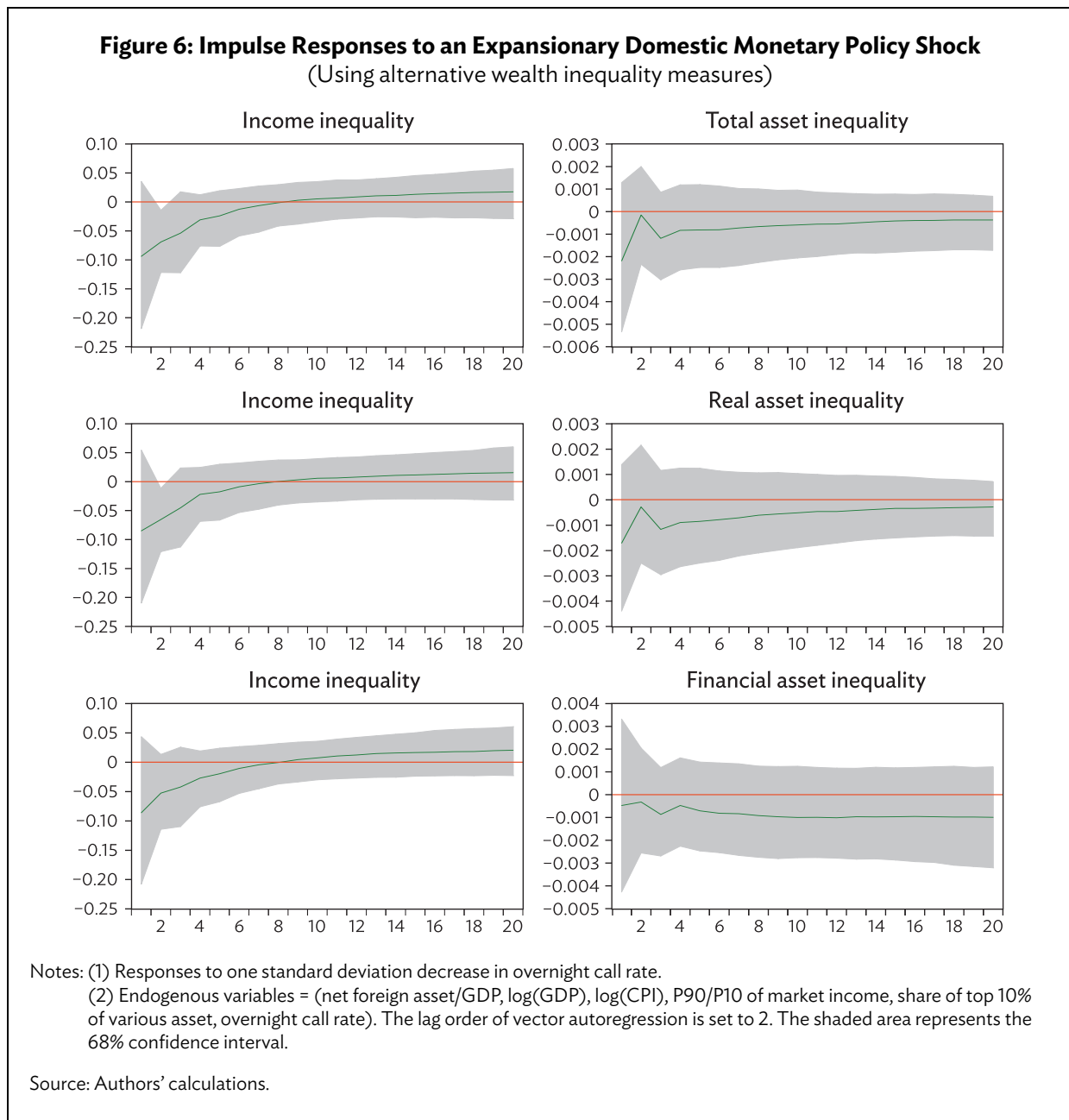
The effect on net asset inequality is opposite and also statistically significant. Unlike domestic monetary policy shock, the effect of an external policy shock on income inequality is statistically significant and longer lasting.¹ This result suggests that changes in global monetary condition via

¹ 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.

international bank lending exert significant impact on both income and wealth inequalities in open emerging economies such as the ROK.

(2) Vector Autoregression Models with Income Inequality and Other Asset Inequalities

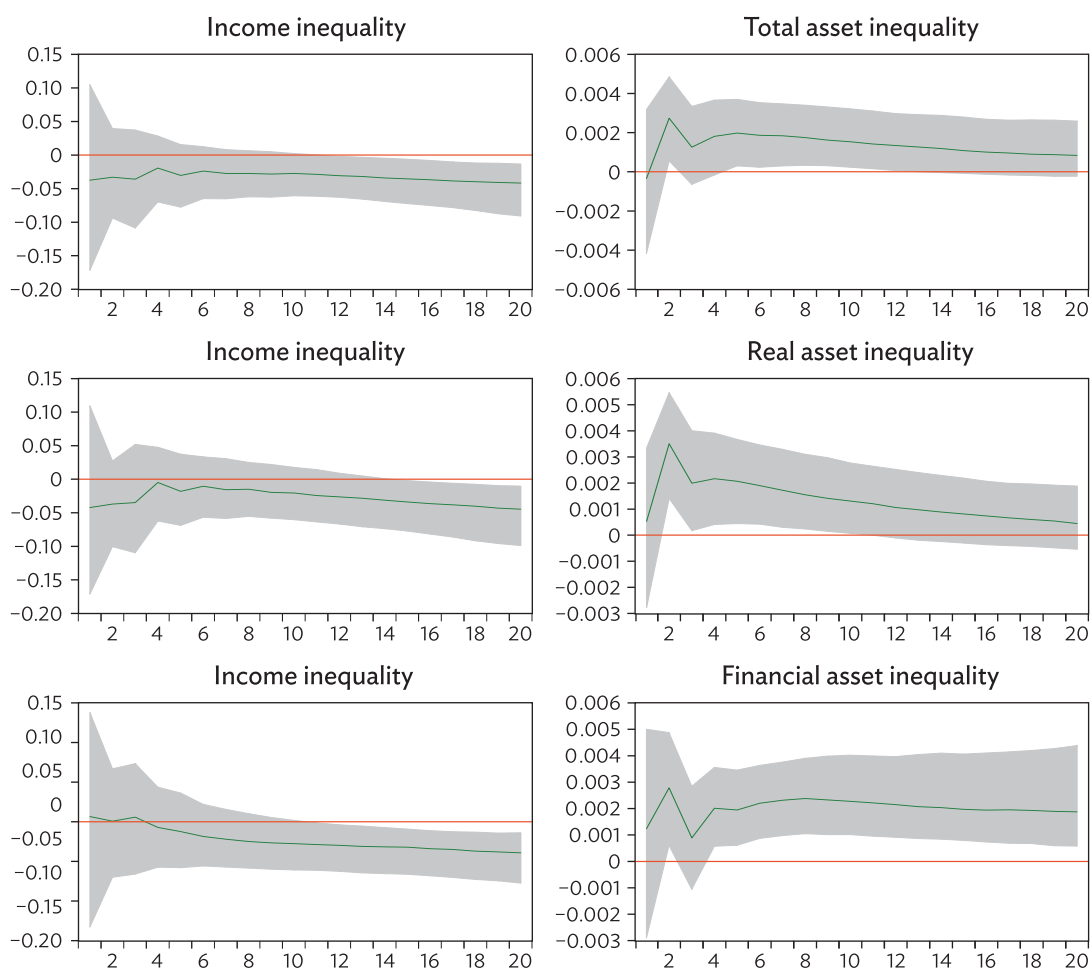
We also estimate the VAR models employing alternative measures of wealth inequality, using different asset types such as real estate and financial assets together with total assets. Figure 6 shows the impulse responses of income and wealth inequalities in different asset type to a domestic monetary policy 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 external monetary policy 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 does not have significant impact on wealth inequality measured in different asset classes. Note that we have included both domestic and external monetary policy variables in the VAR model. The domestic monetary policy shock is orthogonal to other endogenous factors in the interest rate that may be driven by other variables, including the external factor. Nevertheless, it is important to understand why the distributional effects of domestic monetary policy shocks differ between income and asset classes.

Figure 7 shows the impulse response of income and various asset inequality measures to an expansionary external monetary policy shock in VAR models where net foreign asset position is used as external policy variable. As in our benchmark model using net assets, an expansionary net foreign assets

Figure 7: Impulse Responses to an Expansionary Net Foreign Assets Shock
(Using alternative wealth inequality measures)



Notes: (1) Responses to one standard deviation decrease in net foreign asset/GDP.

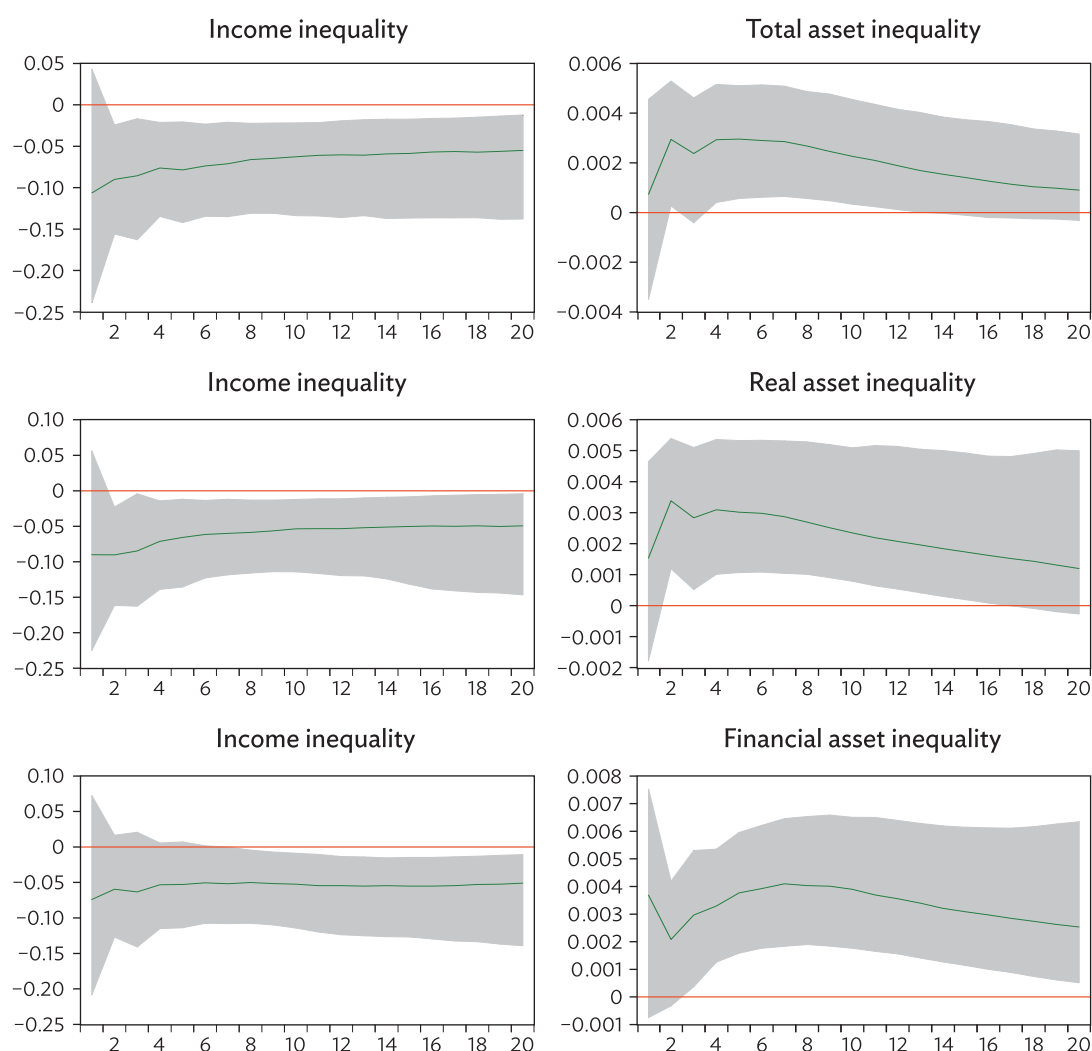
(2) Endogenous variables = (net foreign asset/GDP, log(GDP), log(CPI), P90/P10 of market income, share of top 10% of various asset, overnight call rate). The lag order of vector autoregression (VAR) is set to 2. The shaded area represents the 68% confidence interval.

Source: Authors' calculations.

shock leads to a decline in income inequality, which seems to last longer. The opposite would be also true. For example, the effect of an economic downturn following financial crises may worsen income inequality as the ROK experienced in the aftermath of the credit card crisis in 2002–2003 and the global financial crisis a few years later. An expansionary net foreign assets shock leads to an increase in wealth inequality uniformly across alternative asset classes. In other subcategories of assets, the impact is stronger for real asset inequality in the short term, but the impact seems to last longer for financial asset inequality.

Finally, the impulse responses of income and wealth inequality measures to an expansionary net US bank claims shock is reported in Figure 8. Consistent with findings in this paper, the expansionary shock leads to an improvement in income inequality but a deterioration in various measures of asset

Figure 8: Impulse Responses to an Expansionary Net United States Bank Claims Shock
(Using alternative wealth inequality measures)



Notes: (1) Responses to one standard deviation increase in net US bank claims/GDP

(2) Endogenous variables = (net US bank claims to the Republic of Korea, $\log(\text{GDP})$, $\log(\text{CPI})$, P90/P10 of market income, share of top 10% of various asset, overnight call rate). The lag order of vector autoregression is set to 2. The shaded area represents the 68% confidence interval.

Source: Authors' calculations.

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 exerted a greater impact on the Korean economy relative to other types of capital flows such as portfolio investments.

V. CONCLUSION

This paper examines the linkage between monetary policy and economic inequalities in an open economy such as the ROK. It contributes to existing studies on the distributional effects of monetary policy in two ways. First, by investigating the effects of not only domestic monetary policy but also external monetary policy, it compares how heterogeneous transmission channels of monetary policy shocks affect economic inequalities in a small open economy. For instance, the credit and bank lending channels may be more important in the transmission of domestic monetary policy shocks, while the asset price and exchange rate channels could be more important in the transmission of external policy shocks. Its second contribution is in examining the redistributive effects of domestic and external monetary policy shocks subject to country-specific income and wealth distribution over time. This helps to better understand the dynamics of the income and wealth effects of monetary policy.

Key findings and policy implications can be summarized as follows. First, an expansionary domestic monetary policy shock tends to reduce income inequality, but it has no significant effect on net wealth inequality. This effect is consistent with the findings of many existing studies on other countries in literature review.

Second, an expansionary external monetary policy shock as measured by unanticipated net capital inflows tends to reduce income inequality but worsen net asset inequality. In other words, the distributional effect of external monetary policy works on income and wealth inequalities in opposite ways. For instance, if a monetary easing during the crisis period in the US leads to net capital inflows to the ROK, this will lead to an improvement in income inequality but a worsening of wealth inequality. To our knowledge, this opposite impact of net capital flows on income and wealth inequalities has not been reported in previous studies.

Third, both domestic and external monetary policy shocks exert significant countercyclical effects on income inequality. But the wealth inequality effects of domestic and external monetary policy shocks are very different. External policy shocks proxied by fluctuations in net capital flows seem to have significant effects on net wealth inequality, while the effect of domestic monetary policy shocks is insignificant. This might be because financial assets are far more concentrated among the wealthiest households while financial asset prices tend to be more sensitive to capital flows in open emerging economies. Indeed, the empirical results show that the net assets of the top decile households are more significantly affected by the fluctuations in net capital flows.

Fourth, our findings suggest that the distributional effect of domestic monetary policy is subject to external monetary condition in a small open economy. The domestic monetary condition cannot be independently determined by the domestic monetary policy. For instance, an expansionary monetary policy during a recession might ease domestic monetary conditions and mitigate a worsening of income inequality. However, where the lower domestic interest rate causes net capital outflows, this may offset the effect of domestic monetary policy and exacerbate income inequality.

Finally, our results offer interesting policy implications for managing financial stability risks from volatile capital inflows in emerging economies. As emphasized in this paper, the global monetary policy cycle and its spillover effects via capital flows may have important redistributive impacts on income and wealth inequalities in open emerging economies. Excessive capital inflows during the expansionary phase of the global monetary policy cycle may not only undermine financial stability in emerging market economies by building up financial imbalances but also aggravate wealth inequality by inflating asset prices. If the global monetary cycle suddenly turns into a tightening phase, a reversal of capital flows may prick the asset price bubble and aggravate income inequality in emerging economies. Therefore, macroprudential policy to manage capital flow volatility can help avoid unnecessary fluctuation in income and wealth inequalities.

Many interesting findings and policy implications notwithstanding, our study has a clear limitation. The sample covers only 22 years, which may not be long enough to analyze long-term outcomes of the distributional effects of monetary policy beyond the contemporary business cycle. In principle, the effects of monetary policy on income and wealth inequalities must be temporary as the policy stance should be reversed over the business cycle. However, the redistributive effect of monetary policy could persist if monetary policy is not symmetric over the business cycle or if it induces a longer financial cycle. For instance, subdued inflation has allowed major central banks to keep interest rates very low for an extended period, leading to high leverages and risky investments in global financial markets. Asset prices have been elevated with the belief of “the central bank put,” which may have a non-trivial implication for wealth distribution. Investigating the long-term distribution effect of monetary policy on income and wealth is beyond the scope of this study given our limited data and country specific analysis. We leave this as a promising part of the future research agenda.

REFERENCES

- Adam, Klaus, and Panagiota Tzamouri. 2015. "Distributional Consequences of Asset Price Inflation in the Euro Area." Discussion Paper No. 27. Deutsche Bundesbank, Frankfurt.
- Arias, Jonas, Juan Rubio-Ramirez, and Daniel Waggoner. 2018. "Inference Based on SVARs Identified with Sign and Zero Restrictions: Theory and Application." *Econometrica* 86 (2): 685–720.
- Bernanke, Ben, Jean Boivin, and Piotr Elias. 2005. "Measuring the Effects of Monetary Policy: A Factor-Augmented Vector Autoregressive (FAVAR) Approach." *The Quarterly Journal of Economics* 120 (1): 387–422.
- Bivens, Josh. 2015. "Gauging the Impact of the Fed on Inequality During the Great Recession." Working Paper No. 12. Hutchins Centre on Monetary Policy at Brookings, Washington, DC.
- Carpenter, Seth, and William Rodgers III. 2004. "The Disparate Labor Market Impacts of Monetary Policy." *Journal of Policy Analysis and Management* 23 (4): 813–30.
- Cheon, Byung You. 2019. "Asset Accumulation and Wealth Inequality in Korea." *Health and Welfare Policy Forum* 2019-4: 43–55 (in Korean).
- Choi, Jemin, Sunghyun Kim, and Sangyeon Park. 2018. "Income Inequality in Korea in the Post Global Financial Crisis Period." *Korean Journal of Economic Studies* 66 (1): 115–42.
- Chow, Gregory, and Ah-loh Lin. 1971. "Best Linear Unbiased Interpolation, Distribution, and Extrapolation of Time Series by Related Series." *Review of Economics and Statistics* 53 (4): 372–75.
- Coibion, Olivier, Yuriy Gorodnichenko, Lorenz Kueng, and John Silvia. 2017. "Innocent Bystanders? Monetary Policy and Inequality." *Journal of Monetary Economics* 88 (C): 70–89.
- Doepke, Matthias, and Martin Schneider. 2006. "Inflation and the Redistribution of Wealth." *Journal of Political Economy* 114 (6): 1069–97.
- Domanski, Dietrich, Michela Scatigna, and Anna Zabai. 2016. "Wealth Inequality and Monetary Policy." *BIS Quarterly Review*. 9 March.
- Furceri, Davide, Prakash Loungani, and Aleksandra Zdzienicka. 2016. "The Effects of Monetary Policy Shocks on Inequality." Technical Report. International Monetary Fund, Washington, DC.
- Gagnon, Joseph, Matthew Raskin, Julie Remache, and Brian Sack. 2011. "The Financial Market Effects of the Federal Reserve's Large-Scale Asset Purchases." *International Journal of Central Banking* 7 (1): 3–43.
- Gertler, Mark, and Simon Gilchrist. 1994. "Monetary Policy, Business Cycles, and the Behavior of Small Manufacturing Firms." *Quarterly Journal of Economics*. 109 (2). 309–40
- Gornemann Nils, Keith Kuester, and Makoto Nakajima. 2012. "Monetary Policy with Heterogeneous Agents." Working Paper No. 12-21. Federal Reserve Bank of Philadelphia, Philadelphia, PA.

- Heathcote, Jonathan, Fabrizio Perri, and Giovanni Violante. 2009. "Unequal We Stand: An Empirical Analysis of Economic Inequality in the United States, 1967–2006." Research Department Staff Report No. 436. Federal Reserve Bank of Minneapolis, Minneapolis, MN.
- Jeong, Jun Ho, and Byung You Cheon. 2017. "Korea's Wealth Inequality Structure from an International Perspective—Comparing with Wealth Inequalities in Korea, USA and Spain." *The Geographical Journal of Korea* 50 (2): 149–64 (in Korean).
- . 2020. "An Analysis of the Linkage between Income and Wealth Inequalities." In *Causes of Deteriorating Income Inequality and Policy Responses 3: Focusing on the Asset Inequality*, Cooperative Research Series, 20-01-01. National Research Council for Economics, Humanities and Social Sciences, Sejong.
- Jung, Ji Un, and Byung In Lim. 2020. "A Study on an Age effect of Income Inequality and Its Trend in Korea." *Korean Journal of Economic Studies* 68 (4): 93–118 (in Korean).
- Kim, Nak Nyeon. 2018. "Wealth Inequality in Korea, 2000–2013, Evidence from Inheritance Tax Statistics." *Journal of the Korean Welfare State and Social Policy* 2 (2): 26–57 (in Korean).
- Kwark, Noh-Sun. 2018. "Business Cycle Fluctuation and Income Inequality in Korea." *Korea Review of Applied Economics* 20 (1): 139–73 (in Korean).
- Mumtaz, Haroon, and Angeliki Theophilopoulou. 2017. "The Impact of Monetary Policy on Inequality in the UK. An Empirical Analysis." *European Economic Review* 98: 410–23.
- O'Farrell, Rory, and Lukasz Rawdanowicz. 2017. "Monetary Policy and Inequality: Financial Channels." *International Finance* 20: 174–88.
- Park, Jongwook. 2021. "Monetary Policy and Income Inequity in Korea." *Journal of the Asia Pacific Economy* 26 (4): 766–93.
- Romer, Christina D., and David H. Romer. 2004. "A New Measure of Monetary Shocks: Derivation and Implications." *American Economic Review* 94 (4): 1055–84.
- Rosa, Carlo. 2012. "How 'Unconventional' Are Large-scale Asset Purchases? The Impact of Monetary Policy on Asset Prices." Staff Report 560. Federal Reserve Bank of New York, New York, NY.
- Saez, Emmanuel, and Gabriel Zucman. 2014. "Wealth Inequality in the United States since 1913: Evidence from Capitalized Income Tax Data." NBER Working Paper Series 20625. National Bureau of Economic Research, Cambridge, MA.
- Shin, Kwang-Yeong. 2020. "A New Approach to Social Inequality: Inequality of Income and Wealth in South Korea." *Journal of Chinese Sociology* 7: 17.
- Uhlig, Harald. 2005. "What Are the Effects of Monetary Policy on Output? Results from an Agnostic Identification Procedure." *Journal of Monetary Economics* 52 (2): 381–419.
- Williamson, Stephen. 2009. "Monetary Policy and Distribution." *Journal of Monetary Economics* 55: 1038–53.

- Yoon, Deok Ryong, Dong-Eun Rhee, and Jinhee Lee. 2019. "Analysis of the Effects of Asset Price Changes on Economic Inequality and External Economic Variables." Policy Analyses 19-21. Korea Institute of International Economic Policy, Sejong.

Domestic and External Monetary Policy Shocks and Economic Inequality in the Republic of Korea

The coronavirus disease (COVID-19) pandemic has raised renewed concerns about economic and social inequality. The pandemic-induced global recession has left visible economic scars with the impact falling disproportionately on the poor and disadvantaged. Using the detailed Household Income and Expenditure Survey and Korean Labor and Income Panel Study data, this paper constructs measures of income and wealth inequality in the Republic of Korea. Empirical results show that both domestic and external monetary policy shocks exert significant countercyclical effects on income inequality. However, for wealth inequality, the effects are very different.

About the Asian Development Bank

ADB is committed to achieving a prosperous, inclusive, resilient, and sustainable Asia and the Pacific, while sustaining its efforts to eradicate extreme poverty. Established in 1966, it is owned by 68 members—49 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

