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Unpacking the interconnectedness between macro economic policies and socioeconomic outcomes: A case of monetary policies and wealth inequality in the ASEAN region

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ABSTRACT

This study aims to link the interconnectedness between the dynamic of macroeconomic policies and the distribution of wealth in the Association of Southeast Asian Nations (ASEAN) context through the lens of monetary policy. Time series and panel data from the World Inequality Database (WID) for six ASEAN countries from 2000 to 2021 and the panel vector autoregression (PVAR) were used to analyze the dynamic interactions between monetary policy and wealth inequality. The results suggest that lowering the policy interest rate, increasing inflation, and economic growth lead to a significant increase in wealth inequality in the short run. The impulse response function of the top 1% and top 10% wealthiest are more noticeable than those of the middle 40% and the bottom 50%. Additionally, the study highlights an interesting temporal dynamic, suggesting that the effects of monetary policy don't manifest instantaneously. Instead, these effects evolve gradually. This time lag indicates the complexity of how monetary interventions interact with economic factors and underscores the importance of patience and careful observation when assessing the outcomes of such policy decisions. The study's implications emphasize the importance for policymakers to consider the distributional effects of monetary policy in the long run policy objective.

Contribution/Originality: The study establishes a possible link between monetary policy actions, such as lowering policy interest rates, with wealth inequality dynamics. Using robust data from the WID, it reveals that certain policies amplify wealth inequality, especially among the top 10%. The research also highlights a temporal lag in policy effects, urging policymakers to consider long-term distributional impacts.

1. INTRODUCTION

The transmission of monetary policy to wealth disparity in the ASEAN region is a complicated and nuanced problem that has received much attention in recent years (Colciago, Samarina, & De Haan, 2019; Punzi, 2020). Monetary policy, which refers to central banks' operations to regulate the money supply and interest rates, may also have a considerable influence on how wealth and income are distributed within an economy rather than stabilizing the economy (Walsh, 2017). However, fiscal policy might not be the only factor influencing income and wealth inequality. It is well known among monetarists that the primary goal of monetary policy is typically focused on price stability, economic growth, and employment, and not the allocation of income or wealth. However, its implementation can have distributional effects that significantly impact inequality (Bernanke, 2015; Coibion,

Gorodnichenko, & Kueng, 2017; Park, 2021; Punzi, 2020; Romer & Romer, 1998; Ruankham & Sethapramote, 2023). Even inequality is beyond the monetary policy objective, and a great number of studies from emerging modern economic literature claim that monetary policy can also worsen both income and wealth disparity (Albert, Peñalver, & Perez-Bernabeu, 2020; Colciago et al., 2019; Domanski, Scatigna, & Zabai, 2016; Hohberger, Priftis, & Vogel, 2020; Meh, Ríos-Rull, & Terajima, 2010).

This research aims to examine the mechanisms through which monetary policy affects wealth inequality the context of selected six countries in ASEAN (Association of Southeast Asian Nations), and to explore the potential policy implications of these findings. There are a number of reasons why examining the transmission of monetary policy to wealth disparity in the ASEAN region is critical. To begin with, emerging Asia is an area with fast increasing economies and large populations, making it a crucial engine of global economic growth. Unfortunately, this expansion has not always been inclusive, and many people in the region continue to face poverty and inequality. Geopolitics and domestic politics may build more effective measures to promote inclusive growth by understanding how monetary policy influences wealth inequality in the region. Second, linking monetary policy to wealth disparity in emerging Asia can shed light on the wider topic of monetary policy and inequality. Monetary policy is a crucial instrument for controlling economic stability and growth, but it can have distributional implications. It is important to better understand the complicated link between monetary policy and inequality by researching the setting of emerging Asia, which can then be used to support global monetary policy formulation. Finally, wealth disparity is a huge social and economic issue that may have a detrimental impact on a society's overall well-being and is a significant challenge faced by many countries and regions worldwide. It can lead to social unrest and economic instability and hinder overall development.

Therefore, researching the transmission of monetary policy to wealth disparity in emerging Asia is critical for encouraging inclusive economic growth, comprehending the larger issue of monetary policy and inequality, and boosting overall social well-being. Specifically, this research investigates the evidence from an empirical perspective, with an emphasis on the impact of interest rates, inflation, and other monetary policy tools in altering the distribution of wealth in the area. This paper is outlined as follows: The first part displays the interconnectedness of monetary policy and wealth disparity based solely on the previous empirical frameworks and the findings in the earlier days. The second part shows the research methodology, data source, econometric model and how to estimate the model. The final section highlights the key findings and some policy implications.

2. LITERATURE REVIEW

2.1. Interconnectedness between Monetary Policy and Wealth Inequality

There is a growing body of literature on this topic in the academic field of economics. Some studies have focused on specific countries or sub-regions within developing nations, while others have taken a broader regional or comparative approach (Albert et al., 2020; Benhabib, Bisin, & Luo, 2017; Colciago et al., 2019; Domanski et al., 2016). The monetary policy transmission mechanism refers to the process by which monetary policy actions (such as changes in interest rates) affect the broader economy (Walsh, 2017), and it is often used as a tool to stabilize price and output gaps in the short and middle runs.

The transmission mechanism of Mishkin (1996) works through several different channels. The interest rate channel suggests that a decrease in interest rates encourages borrowing and spending, which can lead to increased economic activity and higher inflation (Albert et al., 2020). The credit channel states that a decrease in interest rates can make it easier for households and firms to borrow, which can lead to increased spending and investment. The asset price channel shows that a decrease in interest rates can lead to higher asset prices (such as stocks and real estate), which can increase household wealth and encourage spending (Coibion et al., 2017; Gollier, 2001; Park, 2021). The exchange rate channel suggests that a decrease in interest rates can lead to currency depreciation, which can boost exports and economic activity (Aye & Harris, 2019; Jeanneney & Hua, 2001). The expectations channel

shows that a decrease in interest rates can also lead to increased expectations of future inflation, which can lead to increased spending and investment (De La Horra, Perote, & De La Fuente, 2021). The monetary policy transmission mechanism is not always immediate; it could take time to materialize, and its effectiveness can vary depending on several factors, such as the level of economic activity, the state of the banking system, and the level of consumer and business confidence.

Regarding the link between monetary policy and wealth inequality, monetary policy can have an impact on wealth inequality, but the relationship between the two is complex. Meade (1964); Domanski et al. (2016); Davies and Shorrocks (2000) and Albert et al. (2020) show that monetary policy affects wealth inequality through different channels:

(i) Interest rate channel: Low interest rate policy can stimulate borrowing and spending, which may lead to increased economic activity and higher inflation. However, low interest rates can also benefit the wealthy, who tend to hold more assets, such as stocks, bonds, and real estate, as it makes them more valuable. Additionally, the impact of low interest rates on wealth inequality is an important consideration. When interest rates are low, the value of these assets often increases, leading to capital gains and higher investment returns. This appreciation in asset values disproportionately benefits the wealthy, who have a higher ownership stake in these assets. As a result, the wealth gap between the rich and the rest of the population can widen. Moreover, low interest rates can make it easier for the wealthy to access credit for leveraging investments and expanding their business interests. They can borrow at lower costs to finance ventures and capitalize on investment opportunities, further enhancing their wealth accumulation. Conversely, low-income individuals and households may face challenges in accessing affordable credit, limiting their ability to invest and accumulate assets (Auclert, 2019; Inui, Sudo, & Yamada, 2017).

(ii) Credit channel: Low interest rates can make it easier for households and firms to borrow, which can lead to increased spending and investment. However, it can also lead to increased inequality if credit is not accessible to low-income households and small businesses. When interest rates are low, it becomes more affordable for individuals and businesses to borrow money from financial institutions. This can have both positive and negative effects on the economy. On the positive side, low interest rates can stimulate borrowing and spending. When borrowing costs are lower, households and firms are more inclined to take out loans to finance various expenditures. This increased borrowing can lead to higher consumer spending, as individuals have more access to credit for purchasing homes, cars, and other goods. Similarly, businesses may find it more attractive to invest in new projects or expand their operations when financing costs are reduced. This increased spending and investment can stimulate economic activity, job creation, and overall economic growth. However, the accessibility of credit is a crucial aspect to consider. If low-income households and small businesses face barriers in accessing affordable credit, it can lead to increased inequality. Financial institutions may be more inclined to provide loans to wealthier individuals and established businesses with higher creditworthiness, leaving marginalized groups with limited options for borrowing. This can create a divide where those who have access to credit benefit from low interest rates, while those who do not have access are unable to take advantage of the opportunities presented by low borrowing costs. The lack of credit accessibility for low-income households can hinder their ability to invest in education, housing or entrepreneurial endeavors. It restricts their capacity to improve their socioeconomic status and contribute to economic growth. Similarly, small businesses, which are often vital for local economies, may struggle to obtain the necessary financing to expand their operations or compete effectively with larger corporations (Doepke & Schneider, 2006).

(iii) Asset price channel: Easing the monetary policy's interest rate (r) boosts asset values, such as equity prices (P_e). According to $P_e = 1/r$, those holding assets, especially real estate, see gains when values increase due to falling rates. Holders of various assets, particularly homes, benefit when asset values rise in response to decreasing interest rates. Expansionary monetary measures benefit borrowers and asset-based investors due to lower interest rates, while those reliant on savings or bonds can experience setbacks (Punzi, 2020).

(iv) Exchange rate channel: Low interest rates can lead to a depreciation of currency, which can boost exports and economic activity. However, it can also lead to increased inequality if the depreciation leads to inflation, which disproportionately affects low-income households. In an environment of low interest rates, borrowing costs can be more affordable. However, access to credit is often easier for individuals and businesses with higher creditworthiness and existing wealth. This means that wealthier individuals and businesses have greater access to credit and can leverage it to pursue investment opportunities or expand their businesses. On the other hand, low-income households may face barriers to accessing affordable credit, limiting their ability to invest and accumulate wealth (Aye & Harris, 2019; Jeanneney & Hua, 2001).

In general, monetary policy can have a positive impact on the economy and on reducing poverty, but it can also have negative effects on wealth inequality if it does not address the underlying structural issues that contribute to the gap between the rich and the poor. In the ASEAN region, Punzi (2020) and Tapasanan and Ronaparp (2020) found that an expansionary monetary policy increases aggregate economic variables. Gross domestic product (GDP), the Consumer Price Index (CPI), house prices, stock prices, yields, and effective rates tend to increase income and wealth inequality. The empirical study in India and China carried out by De (2017) also suggests that the expansion of monetary policy through food prices seems to affect the poor more than the rich and hence increases inequality.

3. METHODOLOGY

The nexus between monetary policy and wealth inequality is examined by following the empirical model by Coibion et al. (2017) and Park (2021), who state that wealth disparity occurs because the expansionary monetary policy benefits the rich and the poor unevenly. Rich households with greater financial asset holding tend to benefit more from monetary shocks than poor households (Albert et al., 2020; Romer & Romer, 1998). The methodology of this study follows five steps. First, we specify a simple vector autoregressive (VAR) model as follows:

$$\boldsymbol{y_t} = \sum_{j=1}^{p} A y_{t-j} + \mu_t \quad (1)$$

$$\begin{bmatrix} y_{1,t} \\ y_{2,t} \\ y_{3,t} \end{bmatrix} = \sum \begin{bmatrix} \alpha_{1j} & \gamma_{1j} & \beta_{1j} \\ \alpha_{2j} & \gamma 2j & \beta_{2j} \\ \alpha_{3j} & \gamma_{3j} & \beta_{3j} \end{bmatrix} \begin{bmatrix} y_{1,t-1} \\ y_{2,t-1} \\ y_{3,t-1} \end{bmatrix} + \begin{bmatrix} \mu_{1,t} \\ \mu_{2,t} \\ \mu_{3,t} \end{bmatrix} \quad (2)$$

Where $\boldsymbol{y_t}$ = A vector of the dependent variables.
$y_{t,}(L)$ = Matrix of lagged variables.
A = Matrix of coefficients.
μ_t = Matrix of policy innovations (white noise errors).

In our empirical analysis, we establish a framework to examine the relationship between monetary policy and wealth inequality by considering the endogenous lag of several key variables. Specifically, we focus on the interplay between the policy interest rate (PIR), wealth Gini coefficient (WGC), GDP growth rate (GDP), Consumer Price Index (CPI), and exchange rate (EX):

$$PIR_t = \alpha_0 + \alpha_1 PIR_{t-1} + \alpha_2 WGC_{t-1} + \alpha_3 GDP_{t-1} + \alpha_4 CPI_{t-1} + \alpha_5 EX_{t-1} + \varepsilon_t \quad (3)$$

$$WGC_t = \beta_0 + \alpha_1 PIR_{t-1} + \beta_2 WGC_{t-1} + \beta_3 GDP_{t-1} + \beta_4 CPI_{t-1} + \beta_5 EX_{t-1} + \varepsilon_t \quad (4)$$

Where: PR_t = interest rate at time t; WGC_t = wealth Gini coefficient at time t; GDP_t = GDP growth rate at time t; CPI_t = inflation rate at time t; EX_t= exchange rate at time t; α0, α1, α2, α3, α4, α5, β0, β1, β2, β3, β4, β5 = parameters to be estimated; and ε_t = error term. Within this framework, we investigate how changes in these variables, taking into account their lagged effects, can contribute to our understanding of the dynamics between monetary policy and wealth inequality. Through this empirical approach, we are able to capture the potential influence of monetary policy on wealth inequality, as well as the impact of wealth inequality on macroeconomic

factors such as GDP growth, inflation, and exchange rates. By incorporating endogenous lags, we account for the time delays in the transmission of policy measures and the subsequent effects on wealth distribution.

Second, Sims (1992) suggested that endogenous variables (yt) should be stationary and that residuals are mutually uncorrelated. A stationary time series has statistical qualities that remain constant across time, such as mean, variance, and autocorrelation. Variable (yt) is *stationary* if (i) its mean $E(y_t) = \mu$; (ii) variance: $Var(y_t) = E(y_t - \mu)^2 = \sigma^2$; and (iii) covariance: $E[(y_t - \mu)(y_{t+k} - \mu)] = \gamma_k$. To ensure compliance with the stationary assumption, this study conducts the panel unit root test using the Levin–Lin–Chu (LLC), Breitung, Im–Pesaran–Shin (IPS), ADF Fisher and Hadri test methodologies.

To address potential endogeneity bias in the model, we employ a time series analysis using the PVAR model, incorporating both lagged dependent and independent variables into the regression framework. This can help control for autocorrelation and endogeneity problems (Stock & Watson, 2003). Furthermore, we account for potential exogenous shocks stemming from demographic, geopolitical, and socioeconomic aspects by incorporating these control variables into our model. We also take steps to ensure that our time series model meets specific assumptions, including variable stationarity and the absence of serial correlation in the error term.

Third, we assume the policy shock can be observed based on the arbitrary lagged economic variable, and it can reasonably be assumed to be independent of contemporaneous economic disturbance (Bernanke & Blinder, 1992). Thus, prior to the VAR estimate, it is essential to determine the optimal lag length. This study employs three primary methods for determining the optimal lag length for the VAR estimation, namely the Likelihood Ratio Test (LRT), the Akaike Information Criterion (AIC), and the Bayesian (Schwartz) Information Criterion.

Fourth, we devise an impulse response function (IRF) to examine how wealth inequality dynamically reacts to a standard deviation shock from monetary policy changes. The IRF displays the ongoing impact of this shock on inequality variables, capturing its immediate effect, persistence, and eventual realignment with long-term patterns. Analyzing the IRF offers valuable insights to policymakers and scholars regarding the ripple effects of monetary policy on inequality, aiding the formulation of responsive strategies. Nonetheless, creating an IRF demands meticulous data and modeling choices, and the outcomes are bound by certain assumptions and constraints.

Last, in this section, we interpret the distributional effects of a monetary policy shock on income and wealth inequality in selected ASEAN countries. To analyze the distributional effects, we focus on how different segments of the population are affected by monetary policy shocks. By examining the distributional effects, we can assess whether these shocks exacerbate or mitigate existing inequality. This analysis allows us to understand how different income and wealth groups respond to changes in monetary policy and whether certain groups benefit more than others. The interpretation of the distributional effects entails examining various indicators of inequality, such as the Gini coefficient wealth shares of different groups. For example, we may find that a monetary policy shock leads to an increase in wealth inequality, where higher-income groups benefit more than lower-income groups. Alternatively, the shock may result in a decrease in inequality, narrowing the gap between different socioeconomic groups.

3.1. Data

According to data from the International Monetary Fund (2020) and the World Inequality Database (2021), ASEAN countries have seen an increase in wealth inequality in recent years, as measured by the Gini coefficient. The Gini coefficient is a commonly used measure of inequality, with a value of 0 indicating perfect equality and a value of 1 indicating perfect inequality. This study employs three groups of data on six ASEAN countries (Thailand, Malaysia, Vietnam, Philippines, Indonesia, and Myanmar). First, the monetary policy proxies are policy interest rates and other monetary policy measures that are commonly used in the region, such as inflation and GDP growth. The panel data were retrieved from the International Monetary Fund from 2000–2021. Second, for wealth inequality proxies we use the personal wealth Gini coefficient. The wealth share of the top 1% represents the richest

of the rich, the wealth share of the top 10% represents the rich, the wealth share of the middle 40% represents the middle-class, and the wealth share of the bottom 50% represents the poor. These measures are commonly used to proxy inequality (World Inequality Database, 2021). Wealth inequality data from 2000–2021 was extracted from the World Inequality Database. Additional control variables included in the model, such as GDP per capita, urbanization, or literacy rate, may also affect wealth inequality in the region.

4. RESULTS

4.1. Stationary Assumptions

To satisfy the stationary assumption and to prevent price puzzle difficulties, as in Bernanke, Boivin, and Eliasz (2005), this study tests the panel unit root test by using the Levin–Lin–Chu (LLC), Breitung, Im–Pesaran–Shin (IPS), ADF Fisher and Hadri tests. The results in Table 1 show that most of the data are stationary at first difference I(1). In addition, to ensure that our PVAR model and impulse response standards error are stable and valid, this study also ensures that the time series model used is dynamically stable by plotting the inverse root of the autoregressive (AR) characteristic polynomial and that all modules are inside the accepted circle limits (Lütkepohl, 1991).

Table 1. Panel unit root test results by common and individual root.

Variable	Level	Common root		Individual root		
		Levin–Lin–Chu	Breitung	Im–Pesaran–Shin	ADF Fisher	Hadri
WGC	Level	-1.436*	-1.149	-0.359	18.667	3.486***
WGC	First diff.	-4.210***	-4.691***	-3.226***	44.301***	3.630***
WT1	Level	-0.341	-2.249**	-0.482	19.613	4.687***
WT1	First diff.	-2.824***	-5.450***	-3.795***	49.870***	4.064***
WT10	Level	-1.2427	-0.843	-0.703	13.641	3.511***
WT10	First diff.	-3.664***	-4.244***	-3.679***	35.264***	2.841**
WM40	Level	-0.520	-0.771	-0.696	13.395	3.534***
WM40	First diff.	-2.727**	-4.298***	-3.656***	35.087***	2.960***
WBT50	Level	-1.057	-1.472*	-1.211	26.132	1.662**
WBT50	First diff.	-3.235***	-4.873***	-3.129***	43.863***	0.029
CPI	Level	-2.45**	-1.651**	-1.930**	-1.661**	5.738***
CPI	First diff.	12.69***	-8.325***	-11.145***	-8.779***	12.587***
GDP	Level	-0.509	4.081	-0.402	20.207	4.119***
GDP	First diff.	-3.264***	1.310	-1.347*	28.690*	2.949***
PIR	Level	0.097	-0.037	-0.339	29.747*	5.290***
PIR	First diff.	-6.092***	-1.349*	-5.131***	65.810***	3.524***
EX	Level	-0.381	-0.152	-0.110	10.398	2.787**
EX	First diff.	-2.813***	-4.216***	-2.153**	22.698**	1.669**

Note: Displayed values are t statistics, except for Hadri's test that is Z statistics. The number in parentheses are p-values. The null hypothesis is unit root, except for Hadri's test. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. PIR = policy interest rate, WGC = wealth Gini coefficient , GDP = GDP growth rate, CPI = Consumer Price Index, EX = Exchange rate, WT1 = wealth share of the top 1%, WT10 = wealth share of the top 10%, WM40 = wealth share of the middle 40%, WBT50 = wealth share of the bottom 50%.

4.2. Lag Length Criteria and Dynamic Stability

Table 2 reports the optimal lag length selection based on the AIC, final prediction error (FPE), and Hannan–Quinn (HQ) criteria. As the model assumed, the policy shock can be observed based on the arbitrary lagged economic variable. The results represented in Table 2 suggest employing lag 6 as an optimal lag to estimate the PVAR model. In addition to the aforementioned points, the confirmation of the dynamic stability of our PVAR (6) model can be further supported by the analysis of the inverse root of the autoregressive (AR) characteristics polynomial, as illustrated in Appendix 3. This analysis provides additional evidence to substantiate the claim of stability within our model. It reveals that all the roots of the characteristic equation possess a unit circle. This observation is significant as it demonstrates the stability of our PVAR (6) model. All roots lie within the unit circle,

which indicates exponential decay rather than growth, ensuring that the system remains bounded and well-behaved over time.

Table 2. Optimal lag length criteria.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	865.435	NA	2.35e-21	-21.960	-21.688	-21.851
1	1815.867	1657.164	4.95e-31	-44.253	-41.534*	-43.164
2	1863.268	71.709	1.27e-30	-43.391	-38.224	-41.323
3	2009.742	187.787	2.92e-31	-45.070	-37.456	-42.022
4	2225.636	226.966	1.43e-32	-48.529	-38.468	-44.501
5	2433.739	170.750	1.26e-33	-51.788	-39.280	-46.780
6	2625.903	113.328*	3.35e-34*	-54.639*	-39.683	-48.651*

Note: * indicates the lag order selected by the criterion; LR = Sequential modified LR test statistic (each test at the 5% level); FPE = Final prediction error; AIC = Akaike information criterion; SC = Schwarz information criterion; HQ = Hannan–Quinn information criterion.

4.3. Impulse Response Function of PVAR (6)

Figure 1 presents the response of each variable to the dynamic changes within the model. The first column represents the accumulated response of the personal wealth Gini coefficient in response to one standard deviation shock arising from the natural logs of policy interest rate, GDP growth, inflation, and exchange rate. The controlled variables are not presented as they are regarded as exogenous shocks. The rest represent the responses of the wealth share of each class to policy innovations.

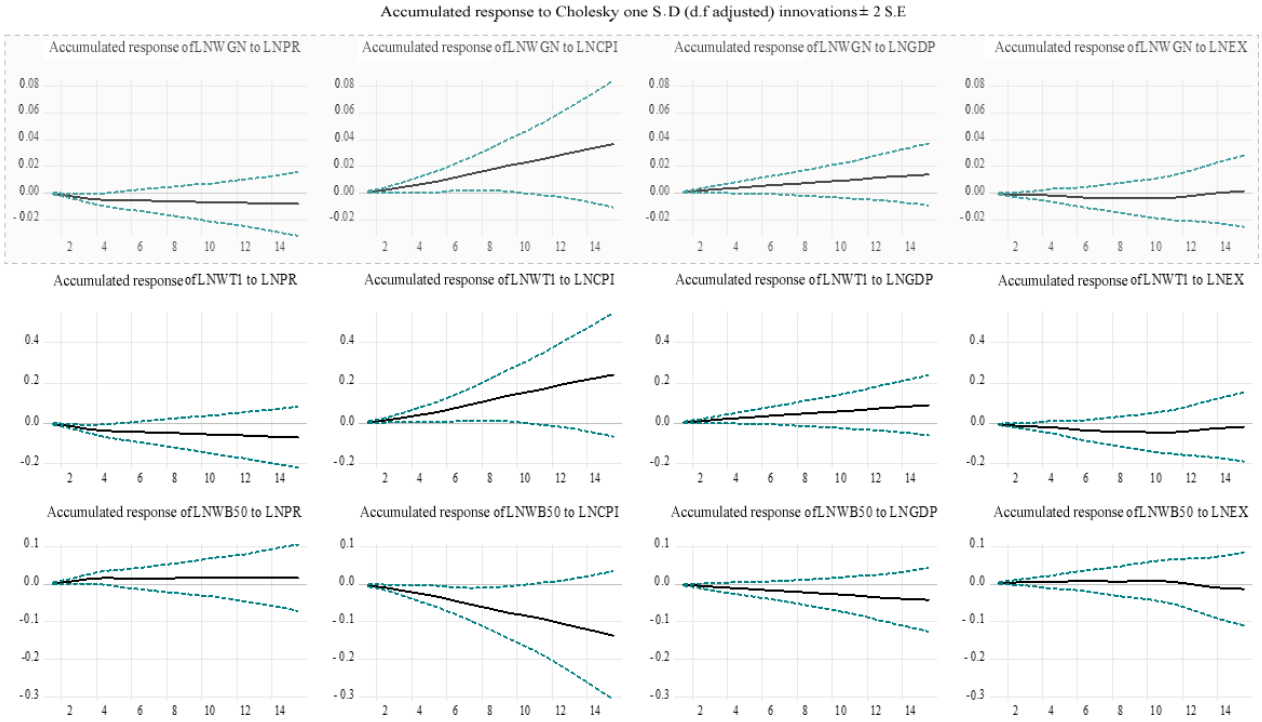

Figure 1. Cholesky impulse response function of wealth inequality to one standard deviation changes in policy interest rate and other policy innovations.

Note: LNWGN = Natural log of wealth Gini coefficient, LNPR=Natural log of policy interest rate, LNCPI=Natural log of consumer price index, LNGDP=Natural log of GDP, LNEX= Natural log of exchange rate, LNWT1 = Natural log of wealth share of the top 1%, LNWB50 = Natural log of wealth share of the bottom 50%.

As displayed in Figure 1, the wealth inequality responses to monetary policy shock are diverse. The personal wealth Gini coefficient responds negatively and significantly to the policy interest rate shock during the first 4.5 years. This means that the increase in policy interest rate (known as contractionary monetary policy shock) significantly reduces wealth inequality in the ASEAN region. In other words, decreasing the policy interest rate (known as expansionary monetary policy shock) increases wealth inequality significantly.

This linkage is also known as the *interest rate channel*. It shows that a decrease in interest rates can stimulate borrowing and spending, which can lead to increased economic activity and higher inflation. However, low interest rates can also benefit the wealthy, who tend to hold more assets, such as stocks and bonds, as it makes them more valuable. If the central bank lowers the interest rate, it can stimulate borrowing and spending and thus boost economic activity and inflation. But this may benefit the wealthy more than the poor, as the wealthy tend to have more assets that will appreciate. Our results align with the findings observed in developed countries and other regions, such as Adam and Zhu (2016); Albert and Gómez-Fernández (2022) and Albert et al. (2020).

Additionally, GDP growth and an increase in inflation were found to raise wealth inequality. As per the *asset price channel* in Coibion et al. (2017), low interest rates can lead to higher asset prices (such as stocks and real estate), which can increase household wealth and encourage spending. It also leads to increased wealth inequality as the wealthy hold a larger proportion of assets than the poor. For example, if the central bank lowers the interest rate, it can lead to a rise in stock prices, but this will mainly benefit the wealthy, who hold more stocks than the poor. The findings derived from our analysis exhibit a notable alignment with the patterns and outcomes observed in developed countries, where extensive research has been conducted on the distributional effects of monetary policy shocks. Furthermore, our results also demonstrate congruence with the findings documented in various regions, such as Albert and Gómez-Fernández (2022) and Punzi (2020).

However, our findings contradict the *exchange rate channel* of Coibion et al. (2017), who suggested that expansionary monetary policy can lead to a depreciation of currency, which can boost exports and economic activity. Nonetheless, it can lead to increased inequality if depreciation leads to inflation (as shown in Appendix 1), which disproportionately affects low-income households. For example, if the central bank lowers the interest rate, it can lead to a depreciation of the currency, and this can make exports cheaper and boost the economy, but it can also lead to higher prices of imported goods, which can disproportionately affect low-income households. Nevertheless, our results are not significant. It shows that depreciation seems to slightly lower wealth inequality and appears to benefit the poor more than the rich.

Figure 2 classifies the response of wealth share among each group to one standard deviation change in policy interest rate and other policy innovations. The left panels represent the responses of rich families (the top 1% and 10%), while the right panels represent the middle-class (middle 40%) and poor families (the bottom 50%). The responsiveness of each group to changes in monetary policy is presented in Appendix 2.

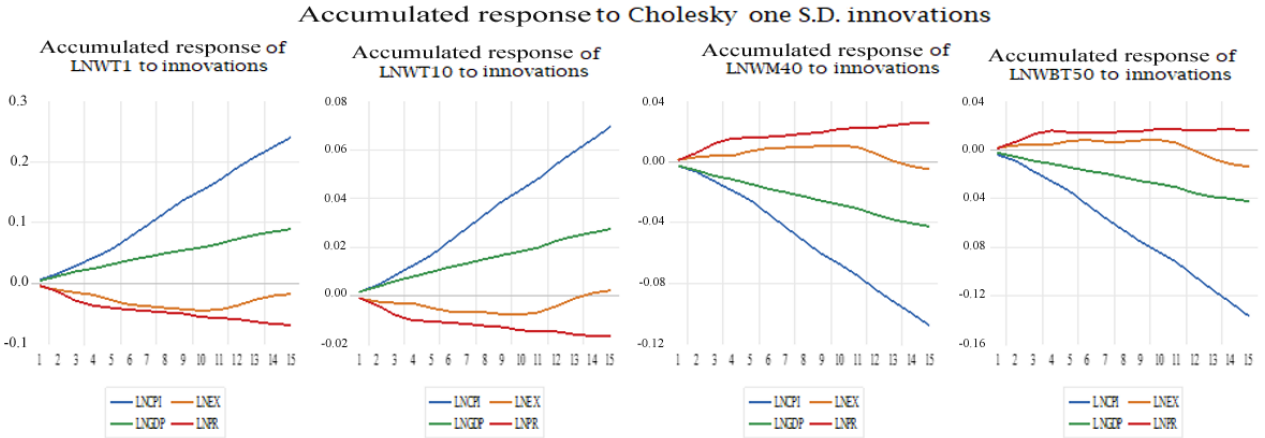

Figure 2. Cholesky impulse response function of wealth Gini to one standard deviation changes in policy interest rate and other policy innovations.

Note: LNCPI = Natural log of the consumer price index, LNEX = Natural log of exchange rate, LNGDP = Natural log of GDP, LNPR = Natural log of policy interest rate.

The response to monetary policy shocks varies between the rich and the poor. Following expansionary monetary policy measures, the wealthy tend to experience an increase in their wealth share, while the middle-class

and the bottom 50% of the population see a decline in their wealth shares with a lag of two to three periods. This highlights the unequal impact of such policy measures on wealth distribution, with the affluent benefiting more significantly. Policymakers need to address these disparities and ensure that the benefits of monetary policy are distributed more equitably among different socioeconomic groups. This observation implies that the distribution of wealth becomes increasingly skewed in favor of the rich, while the middle-class and lower-income segments face a relative reduction in their wealth shares.

The divergent responses among different socioeconomic groups emphasize the unequal impact of monetary policy shocks on wealth distribution. The privileged position of the wealthy, coupled with their higher concentration of assets, enables them to capitalize on the favorable conditions generated by expansionary monetary policies. As a result, their wealth increases more significantly compared to other segments of society. Contrarywise, the middle-class and the bottom 50% of the population face challenges in capitalizing on the opportunities presented by these policy innovations. Their wealth shares tend to experience a decline or slower growth, reflecting the limited access to financial resources and assets that could potentially generate higher returns.

These disparities in wealth accumulation and distribution underscore the importance of considering the differential impact of monetary policy on various socioeconomic groups. Policymakers need to address the potential consequences of such policies to ensure that the benefits are not disproportionately skewed towards the wealthy, exacerbating wealth inequality. Implementing measures that promote inclusive access to credit, enhance financial literacy, and support wealth-building opportunities for the middle-class and lower-income households can help mitigate these disparities and foster a more equitable distribution of wealth and resources.

5. CONCLUSION

In conclusion, the linkage between monetary policy and wealth inequality is complex. Monetary policy can have an impact on wealth inequality through different channels, such as the interest rate channel, asset price channel, and exchange rate channel. However, the direction and magnitude of the impact can vary depending on the specific context and the underlying structural factors that contribute to wealth inequality. Expansionary monetary policy refers to a situation where a central bank increases the money supply by reducing interest rates or purchasing financial assets in order to stimulate economic growth. When implemented, it can have various effects on the economy, including an impact on the distribution of wealth. In the ASEAN context, it has been found that expansionary monetary policy shocks and other policy innovations can widen the wealth gap significantly, except for the exchange rate channel. This means that the use of expansionary monetary policy can exacerbate income inequality in ASEAN countries. The reasons behind this are complex and multifaceted, but some possible explanations include the fact that expansionary monetary policy tends to benefit those who have access to credit and financial markets, which are typically the wealthy. Additionally, the increase in asset prices that may result from expansionary monetary policy can also benefit those who hold assets, such as stocks and real estate, which are again often owned by the wealthy. However, it is important to note that not all channels of expansionary monetary policy have the same impact on income inequality. As mentioned, the exchange rate channel appears to have a different effect, which may be due to the fact that changes in exchange rates can affect a broader range of economic actors, including exporters and importers, rather than just those with access to financial markets. Panel vector autoregressive (PVAR) models can be used to analyze the dynamic relationships between monetary policy and wealth inequality, but it's important to note that the PVAR model is just a simplification of reality, and it should be used with caution. Additionally, it's important to consider other factors that could affect wealth inequality, such as structural, demographic, and political factors. It's worth being aware that monetary policy alone cannot solve wealth inequality issues; it's important to have other policies in place, such as progressive taxation, social welfare programs, and labor market policies that address the underlying structural issues that contribute to the gap between the rich and the poor.

6. POLICY IMPLICATION

Based on the analysis of the linkage between monetary policy and wealth inequality, the following implications are proposed for further research and policy consideration: (i) A comprehensive approach: Monetary policy alone cannot solve wealth inequality issues. It's important to have other policies in place, such as progressive taxation, social welfare programs, and labor market policies, that address the underlying structural issues that contribute to the gap between the rich and the poor; (ii) Central banks could incorporate inequality considerations into their monetary policy decision making processes. This could involve assessing the distributional effects of monetary policy on different income groups and social classes; (iii) Develop targeted monetary policy tools: Central banks could develop targeted monetary policy tools that can help to mitigate the effects of monetary policy on wealth inequality, for example, targeted lending facilities for small and medium-sized enterprises (SMEs) and low-income households; (iv) Research and analysis: Central banks could carry out research on the linkage between monetary policy and wealth inequality and use the results to inform their policy decisions; (v) Collaborate with other policy-making bodies: Central banks could collaborate with other policy-making bodies, such as governments and international organizations, to develop and implement policies that address the underlying structural issues that contribute to wealth inequality; and (vi) Communication and transparency: Central banks could improve communication and transparency in relation to their monetary policy decisions and the distributional effects of those decisions to the public, as this could help to build public support for the central bank's policies.

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REFERENCES

Adam, K., & Zhu, J. (2016). Price-level changes and the redistribution of nominal wealth across the Euro area. *Journal of the European Economic Association, 14*(4), 871-906. https://doi.org/10.1111/jeea.12155

Albert, J.-F., & Gómez-Fernández, N. (2022). Monetary policy and the redistribution of net worth in the U.S. *Journal of Economic Policy Reform, 25*(4), 420-434. https://doi.org/10.1080/17487870.2021.1895778

Albert, J.-F., Peñalver, A., & Perez-Bernabeu, A. (2020). The effects of monetary policy on income and wealth inequality in the US exploring different channels. *Structural Change and Economic Dynamics, 55*, 88-106. https://doi.org/10.1016/j.strueco.2020.07.002

Auclert, A. (2019). Monetary policy and the redistribution channel. *American Economic Review, 109*(6), 2333-2367. https://doi.org/10.1257/aer.20160137

Aye, G. C., & Harris, L. (2019). *The effect of real exchange rate volatility on income distribution in South Africa*. WIDER Working Paper No. 2019/29, Issue.

Benhabib, J., Bisin, A., & Luo, M. (2017). Earnings inequality and other determinants of wealth inequality. *American Economic Review, 107*(5), 593-597. https://doi.org/10.1257/aer.p20171005

Bernanke, B. S. (2015). *Monetary policy and inequality*. Retrieved from https://www.brookings.edu/blog/ben-bernanke/2015/06/01/monetary-policy-and-inequality/

Bernanke, B. S., & Blinder, A. S. (1992). The federal funds rate and the channels of monetary transmission. *The American Economic Review, 81*(4), 901-921.

Bernanke, B. S., Boivin, J., & Eliasz, P. (2005). Measuring the effects of monetary policy: A factor-augmented vector autoregressive (FAVAR) approach. *The Quarterly Journal of Economics*, *120*(1), 387-422. https://doi.org/10.1162/0033553053327452

Coibion, O., Gorodnichenko, Y., & Kueng, L. (2017). *Inequality innocent bystanders? Monetary policy and inequality in the U.S.* IMF Working Paper, No. 88.

Colciago, A., Samarina, A., & De Haan, J. (2019). Central bank policies and income and wealth inequality: A survey. *Journal of Economic Surveys*, *33*(4), 1199-1231. https://doi.org/10.1111/joes.12314

Davies, J. B., & Shorrocks, A. F. (2000). The distribution of wealth. *Handbook of Income Distribution*, *1*, 605-675. https://doi.org/https://doi.org/10.1016/S1574-0056(00)80014-7

De, K. (2017). *Distributional consequences of monetary policy in emerging market economies and the role of food prices.* Doctoral Dissertation, University of Georgia.

De La Horra, L. P., Perote, J., & De La Fuente, G. (2021). Monetary policy and corporate investment: A panel-data analysis of transmission mechanisms in contexts of high uncertainty. *International Review of Economics & Finance*, *75*, 609-624. https://doi.org/10.1016/j.iref.2021.04.035

Doepke, M., & Schneider, M. (2006). Inflation and the redistribution of nominal wealth. *Journal of Political Economy*, *114*(6), 1069-1097. https://doi.org/10.1086/508379

Domanski, D., Scatigna, M., & Zabai, A. (2016). Wealth inequality and monetary policy. *BIS Quarterly Review*, 45.

Gollier, C. (2001). Wealth inequality and asset pricing. *The Review of Economic Studies*, *68*(1), 181-203. https://doi.org/10.1111/1467-937x.00165

Hohberger, S., Priftis, R., & Vogel, L. (2020). The distributional effects of conventional monetary policy and quantitative easing: Evidence from an estimated DSGE model. *Journal of Banking & Finance*, *113*, 105483. https://doi.org/10.1016/j.jbankfin.2019.01.002

International Monetary Fund. (2020). Should inequality factor into central banks' decisions? *IMF Working Paper*, *196*(20), 1-38.

Inui, M., Sudo, N., & Yamada, T. (2017). *The effects of monetary policy shocks on inequality in Japan.* BIS Working Papers No. 642. Bank for International Settlements.

Jeanneney, S. G., & Hua, P. (2001). How does real exchange rate influence income inequality between urban and rural areas in China? *Journal of Development Economics*, *64*(2), 529-545. https://doi.org/10.1016/s0304-3878(00)00149-8

Lütkepohl, H. (1991). *Stable vector autoregressive processes. In: Introduction to Multiple Time Series Analysis.* Berlin, Heidelberg: Springer.

Meade, J. E. (1964). *Efficiency, equality and the ownership of property.* Abingdon, Oxon, New York: Routledge.

Meh, C. A., Ríos-Rull, J.-V., & Terajima, Y. (2010). Aggregate and welfare effects of redistribution of wealth under inflation and price-level targeting. *Journal of Monetary Economics*, *57*(6), 637-652. https://doi.org/10.1016/j.jmoneco.2010.05.001

Mishkin, F. (1996). *The channels of monetary transmission: Lessons for monetary policy.* National Bureau of Economic Research, Inc. No. 5464.

Park, J. (2021). Monetary policy and income inequality in Korea. *Journal of the Asia Pacific Economy*, *26*(4), 766-793. https://doi.org/10.1080/13547860.2020.1870794

Punzi, M. (2020). Integrative report: The distributional impact of monetary policy in SEACEN economies. *The Distributional Impact of Monetary Policy in SEACEN Member Economies – SEACEN Research and Training Centre*, 1-34.

Romer, C., & Romer, D. (1998). *Monetary policy and well-being of the poor.* National Bureau of Economic Research, No. 6793.

Ruankham, W., & Sethapramote, Y. (2023). Distributional effects of monetary policy on income inequality: Evidence from Thailand. *Southeast Asian Journal of Economics*, *11*(1), 1-42.

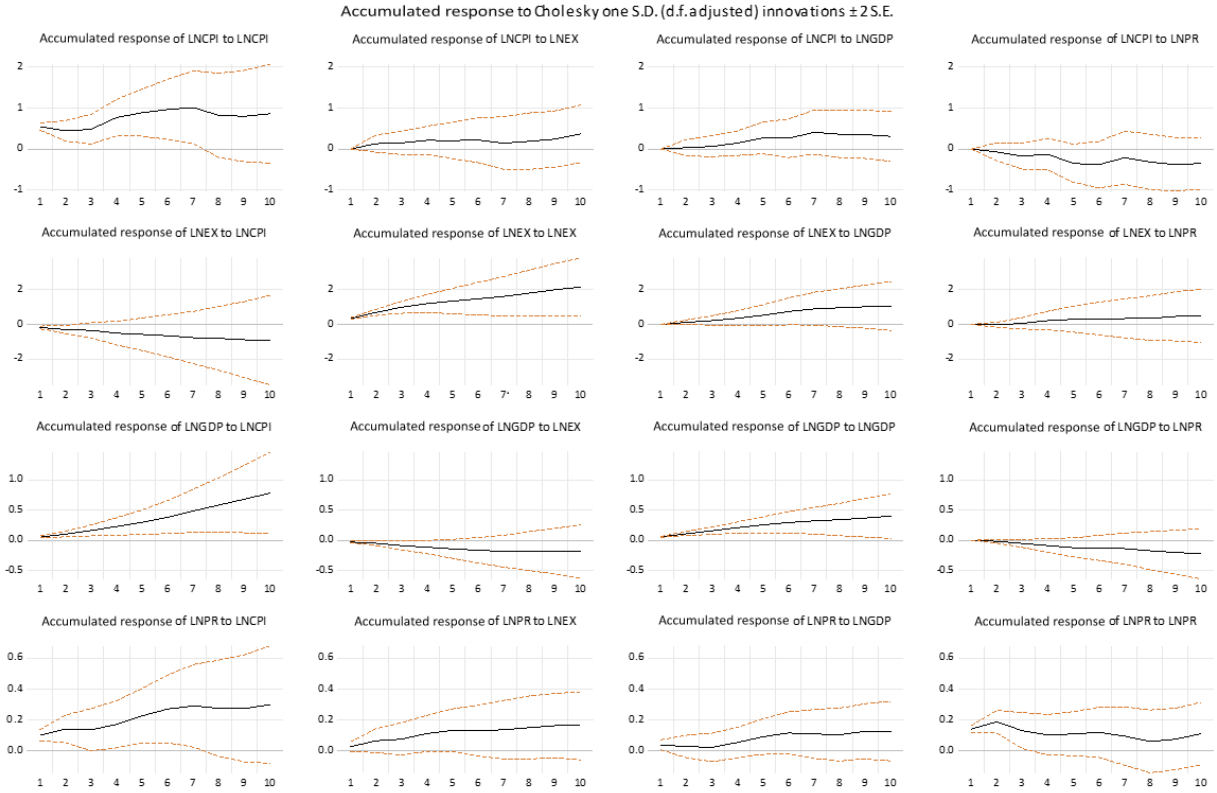
Sims, C. A. (1992). Interpreting the macroeconomic time series facts: The effects of monetary policy. *European Economic Review*, *36*(5), 975-1000. https://doi.org/10.1016/0014-2921(92)90041-t

Stock, J. H., & Watson, M. W. (2003). Forecasting output and inflation: The role of asset prices. *Journal of Economic Literature*, *41*(3), 788-829. https://doi.org/10.1257/jel.41.3.788

Tapasanan, P., & Ronaparp, P. (2020). The impact of monetary policy on income and wealth distribution: A case of Thailand. *The Distributional Impact of Monetary Policy in SEACEN Member Economies, Issue.*

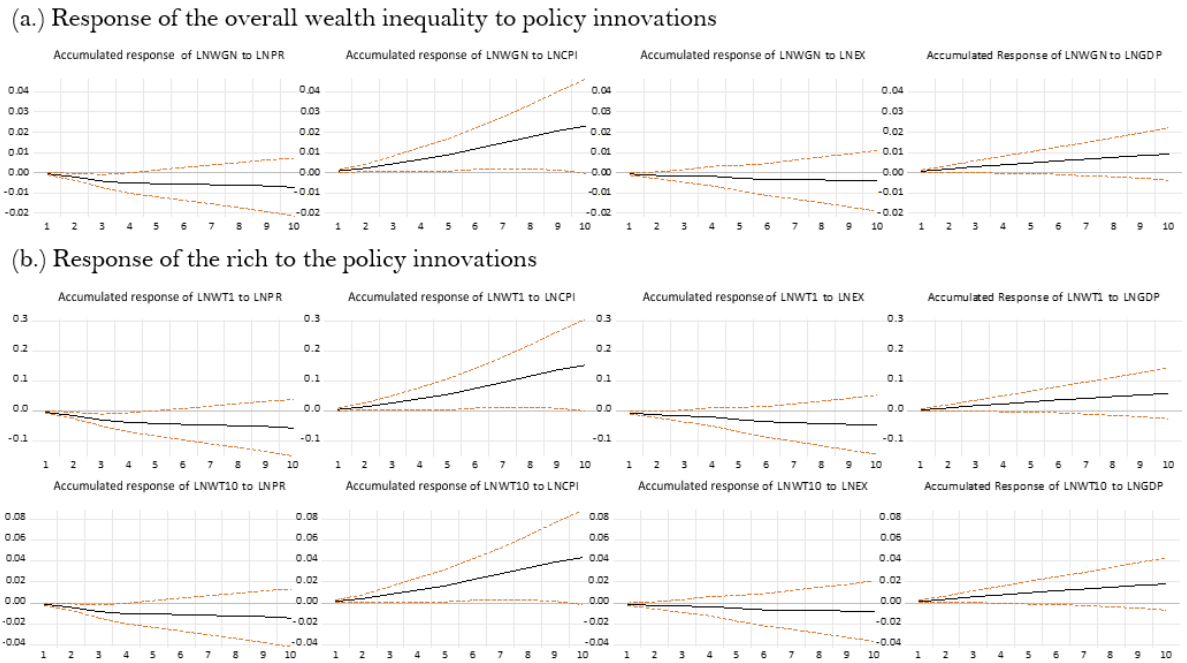
Walsh, C. E. (2017). *Monetary theory and policy* (4th ed.). Cambridge, Massachusetts London, England: The MIT Press.

World Inequality Database. (2021). *World Inequality Database.* Retrieved from https://wid.world/

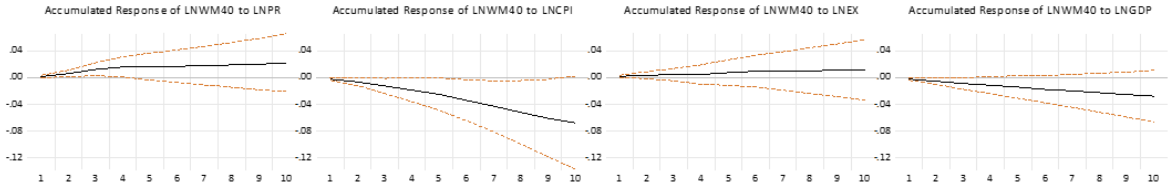


Appendix 1. Accumulated response of Cholesky one standard deviation innovations of the monetary policy to macroeconomic variables.

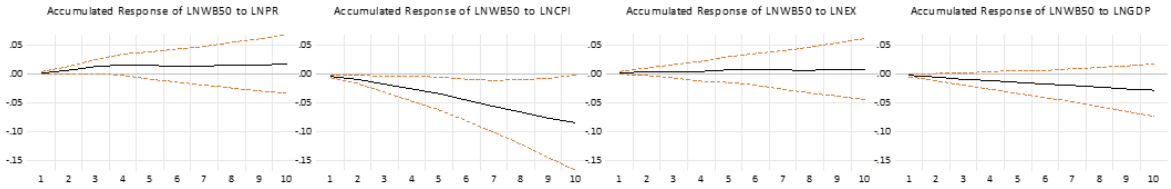
Note: LNWGN = Natural log of wealth Gini coefficient, LNPIR = Natural log of policy interest rate, LNCPI = natural log of consumer price index, LNGDP = Natural log of GDP, LNEX = Natural log of exchange rate.



(c.) Response of the middle 40% to the policy innovations

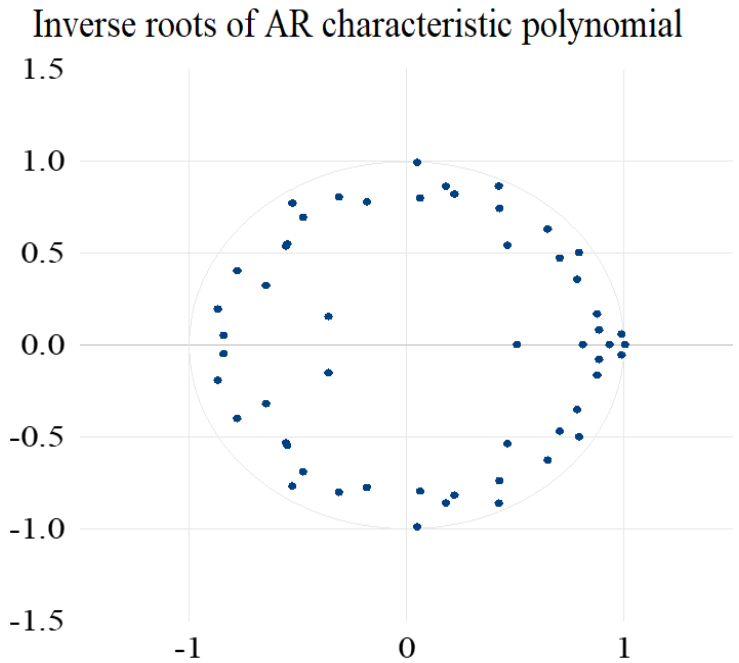


(d.) Response of the bottom 50% to policy innovations



Appendix 2. Accumulated response of wealth share to the one standard deviation monetary policy shock.

Note: LNWGN = Natural log of wealth Gini coefficient, LNPIR = Natural log of policy interest rate, LNCPI = Natural log of consumer price index, LNGDP = Natural log of GDP, LNEX = Natural log of exchange rate, LNWT1 = Natural log of wealth share of the top 1%, LNWM40 = Natural log of wealth share of the middle 40%, LNWB50 = Natural log of wealth share of the bottom 50%.



Appendix 3. Stability diagnosis: the result shows that the model is dynamically stable as all the roots are located within the unit circle.

Note: The inverse root of the AR (autoregressive) characteristic polynomial is a concept used primarily in time series analyses to determine the stability (or stationarity) of an autoregressive model.