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Distributional Impact of Monetary Policy: Evidence from The Philippines

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Abstract

With the advent of unconventional policies implemented by the central banks in advanced economies, a resurgence of interest in the role of monetary policy in driving inequality has ensued. This research mainly focused on examining how the variations in the Bangko Sentral ng Pilipinas' policy rate affect income across Filipino households, and consequently, income inequality. The study first employed a VAR model to check the general direction of how variation in output growth, inflation, and policy rates affect income inequality as measured by the GINI coefficient. The impulse response functions suggest that expansionary monetary policy could potentially reduce income inequality in the country. Moreover, a positive shock to output reduces inequality, while a positive shock to inflation drives higher inequality.

Subsequently, the paper employed quantile regressions to characterize how variation in the BSP's policy rate affects income across income groups. The regression analyses yielded a significant impact of policy rates on income at varying magnitude across household groups. While all income groups recorded a negative association between income and policy rates, the wealthier households bear the substantial negative effects. Also, the quantile regressions highlight the negative association between inflation and total income across all household groups. In particular, the poorest households are hit the hardest following an inflationary episode. This is consistent with the paper's preliminary assessment, which noted the inequality-worsening effect of a positive shock to inflation. These results suggest that the inflation channel is an essential distributional channel of monetary policy in the Philippines, and keeping inflation within target benefits the poor the most.

JEL Classification: D63, E52, E31, R20

Keywords: monetary policy, household income, income inequality, inflation, developing economies

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Nickson J. Cabote and Justin Ray Angelo J. Fernandez[2]

1. Introduction

Inequality is a long-standing issue that has attracted significant attention of both policymakers and academics across disciplines. There exists a wealth of literature that explores the drivers and implications of inequality. In general, these studies associate inequality with structural factors such as 1) the emergence of skill-biased technologies (Bound and Johnson, 1992); 2) increased global trade (Feenstra and Hanson, 1996); and 3) change in labor market institutions (Card, 2001).

However, the advent of unconventional policies by the central banks has led to a resurgence of interest in reviewing the role of monetary policy in driving inequality. In their commentary entitled "Who Captured the Fed?," Acemoglu and Johnson (2012) suggested that expansionary monetary policy primarily benefits financiers and high-income clients. At the same time, the emergence of a new paradigm in macroeconomic theory that integrates market frictions and heterogeneity among households has allowed the joint study of how monetary policy shocks affect inequality and vice versa. For instance, Heterogenous Agent New Keynesian (HANK) models have shown multiple possible channels of monetary policy's distributional impact (Kaplan, Moll, and Violante, 2018). According to these models, heterogeneity in terms of preference and income sources, among others, could potentially cause households to respond differently to a specific monetary shock. This results in monetary policy having a differentiated impact on households.

This paper contributes to the literature by examining the distributional impact of monetary policy on household income in the Philippine context. In particular, the paper attempts to assess the impact of changes in the Bangko Sentral ng Pilipinas' (BSP) Reverse Repurchase (RRP) rate, its primary policy instrument, on the income of Filipinos belonging to different income groups.

The paper employs a quantile regression analysis on individual income data derived from the Family Income and Expenditure Survey (FIES) in the Philippines. A quantile regression (Koenker and Gilbert, 1978) allows exploration of monetary policy's potential asymmetric impact at different household income distributions. Specifically, we run a quantile regression on the lower end of the income distribution (.01, .05, .10, and .25 quantiles) and the upper end

1 An earlier version of this study was published as a chapter in The South East Asian Central Banks (SEACEN) Centre's research entitled "The Distributional Impact of Monetary Policy in SEACEN Economies."

2 Mr. Nickson Cabote is Bank Officer V from the Center and Monetary and Financial Policy, and Mr. Justin Ray Angelo Fernandez is Bank Officer V from the Department of Economic Research, Bangko Sentral ng Pilipinas. The authors are grateful for the valuable comments from Dr. Maria Tereza Punzi and Dr. Ole Hummel from The SEACEN Centre, and Ms. Eloisa T. Glindro (Deputy Director, CMFP). The authors also thank Mr. Alan Chester Arcin and Mr. Justin Eloriaga, for their excellent research assistance to this report. Nonetheless, errors and omissions are the sole responsibility of the authors.

of the distribution (.75, .90, .95, .99 quantiles). This is to test whether asymmetry of the impact is more robust with more heterogeneity.

The results indicate that the changes in the BSP's monetary policy stance through the RRP adjustments could potentially generate different impacts across different income groups. Specifically, the effect of higher interest rates is negative and more substantial for higher-income quantiles. The said result suggests that the heterogeneity in income level and sources is a potential channel of the distributional impact of monetary policy in the Philippines. Nonetheless, it was noted that the magnitude of impact via this channel appears to be small. Further, regression results also show that inflation could potentially have different effects on different income groups. In particular, most of the adverse consequences of higher inflation are felt by households belonging to the lower-income quantiles. The effect is highly significant across income groups and is robust to different specifications. These observations substantiate the importance of the inflation channel of the distributional mechanism of monetary policy in the country.

This paper is organized as follows: Section 2 provides a brief background of the Philippines' monetary policy framework and household income trends. Section 3 surveys existing literature on the interaction between monetary policy and inequality. Section 4 describes the data and methods and presents a preliminary analysis using VAR. In addition, it discusses the quantile regression and its merits. Section 5 presents the main empirical finding. Lastly, section 6 concludes.

2. Literature Review

The government's traditional approach in addressing welfare concerns such as poverty and inequality is through targeted programs centered on the development of the citizenry's well-being and viewed mainly under the purview of fiscal policy. The analyses of income inequality are then ascribed mostly through the lens of public economics, where income redistribution is implemented through taxation and government spending.

However, a growing body of literature has emerged that investigates the distributional impact of monetary policy. This is connected to the primary objective of most central banks in achieving low and stable inflation. An erratic and high inflation environment in an economy is considered undesirable as it leads to heightened uncertainty and expectation of an upcoming instability of macroeconomic fundamentals. Further, high inflation can disrupt financial markets and potentially result in distortionary economic policies (Romer and Romer, 1998). Also, empirical pieces of evidence such as that of Bulir (2001) and Albanesi (2007) suggested that elevated inflation at present tends to result in higher income inequality in the succeeding periods.

Several studies were done on how monetary policy affects income and inequality with varying results. One of the recent cross-country evidence on the distributional impact of conventional monetary policy is that of Furceri et al. (2018). They found evidence that expansionary monetary policy tends to lower-income inequality in 32 advanced and emerging economies. This result mirrors the study of Guerello (2016), which reported a decline in income inequality in the euro area following an expansionary monetary policy stance from the

European Central Bank. In the same way, O'Farrell and Rawdanowicz (2016) offered evidence that expansionary monetary policy reduces income inequality in Canada and the USA, while it increases inequality in the UK. O' Farrell and Rawdanowicz (2016), however, found mixed results for euro area countries.

In the case of single-country studies, the distributional effects of conventional monetary policy are also mixed. Coibion et al. (2017) supplied evidence that contractionary monetary policy increases economic inequality in the USA. Meanwhile, Dolado et al. (2019) suggested that expansionary monetary raises labor income inequality in the USA. Villarreal (2014) found that contractionary monetary policy reduces income inequality in Mexico. For the UK, Mumtaz and Theophilopoulou (2017) find that tight monetary policy raises economic disparities. Some studies also examined the impact of unconventional monetary policies. (Bank of England (2012) and Saiki and Frost (2014)).

Also, recent literature that focused mostly on monetary policy's distributional impact is based on general equilibrium models characterized by market frictions and heterogenous agents such as the so-called HANK models.

According to standard literature, monetary policy affects households or individual agents via three main effects. First is the income effect, as monetary policy directly affects interest rates, which, in turn, have immediate partial equilibrium effects on income. Second is the wealth effect stemming from the changes in values of assets such as stocks, bonds, and real properties triggered by the change in interest rates. Third, there is also a substitution effect as changes in interest rates alter current and future prices, hence, change households' preference in the timing of consumption.

The interaction of these effects, along with heterogeneity among households, results in transmission channels of monetary policy that potentially generate different household responses from a particular monetary policy shock, which results in the distributional effects of monetary policy. The response varies depending on the degree of heterogeneity. These channels are referred to as distributional channels (Colciago et al., 2018).

2.1 Distributional Channels of Monetary Policy

The following distributional channels of monetary policy have been identified in the literature. First is the inflation channel. Higher inflation can reduce the real value of debt, which puts borrowers in a favorable situation but puts savers at a disadvantage. Doepke and Schneider (2006) also found that inflation affects households based on their assets and liabilities' maturity structure. Since wealthy households hold more of the long-term assets, they are hurt by inflation more. Conversely, Erosa and Ventura (2002) argued that increases in expected inflation disproportionately wear down households' purchasing power that depend more on cash to conduct their transactions. Lower-income households are more likely to use more cash as a percentage of their total expenditures, thus are hurt more by inflation.

In the Philippines, Mapa (2017) examined the disproportionate impact of higher consumer price inflation on the poor following the government's policy to increase excise taxes on domestic fuel. In detail, Mapa (2017) found that higher inflation affects the poor

approximately ten times more than the non-poor and noted that the uptick in inflation due to tax rate hikes could significantly increase the country's number of poor households.

Literature also finds the savings redistribution channel. Changes in interest rates affect interest payments on the debt as well as earnings on deposits. Thus, an expansionary monetary policy could potentially hurt savers by lowering the interest rates for household savings and, consequently, favoring borrowers. To the extent that affluent households have more savings, they are more adversely affected by a loose monetary policy.

Households receive their incomes from various sources, each of which may react differently to changes in monetary policy. This channel is called the income composition channel. At the lower end of the income distribution, households tend to depend more on transfer income. In contrast, households close to the median reply more on labor income, and those at the upper tail of the income distribution rely relatively more on business and capital income. Following an adjustment to the central bank's monetary policy stance, the effects on inequality coming from this channel are not noticeably clear. A fall in interest rates is viewed to stimulate economic activity. Expansionary monetary policy is viewed to weigh down inequality as higher interest rates could drive higher wages and lower unemployment in the lower end of the distribution. Concomitantly, a cut in nominal interest rates can reduce interest income (mostly increasing to wealthier households), and inequality amongst more affluent households could fall.[3]

There is also the interest rate exposure channel. According to Auclert (2016), this channel explains how redistribution is done owing to real interest rate adjustments. When in real interest rates fall, financial asset prices move up to the point that the interest rate is used to discount future dividends reductions. Nevertheless, it is essential to examine both assets and liabilities and, equally important, their respective tenures.

The earnings heterogeneity channel explains monetary policy affecting labor earnings. According to Heathcote, Perri, and Violante (2009), households whose earnings are at the top of the distribution are primarily affected by hourly wage adjustments. Meanwhile, those whose earnings are at the bottom of the distribution are influenced mainly by fluctuations in hours worked and the unemployment rate.

It should be noted that these channels are interrelated and are not mutually exclusive. Likewise, the direction and size of monetary policy's distributional impact also depend on the degree of heterogeneity. Dolado et al. (2018) argued that the same monetary policy could have had different and potentially offsetting effects. Thus, the overall distributional impact of monetary policy is ambiguous a priori.

[3] Gornemann, Kuester, and Nakajima (2012) consider the importance of the earnings and income composition channels in the context of a model in which households differ in their employment status, earnings, and wealth. They find that the redistributive effects of monetary policy are such that contractionary monetary policy shocks increase inequality. The unemployed are made worse off by monetary policy tightening, as a contractionary shock tends to prolong their unemployment spell, as firms reduce labor demand.

3. Stylized Facts: Monetary Policy and Household Income in the Philippines

3.1 Economic Growth, Household Income, and Inequality

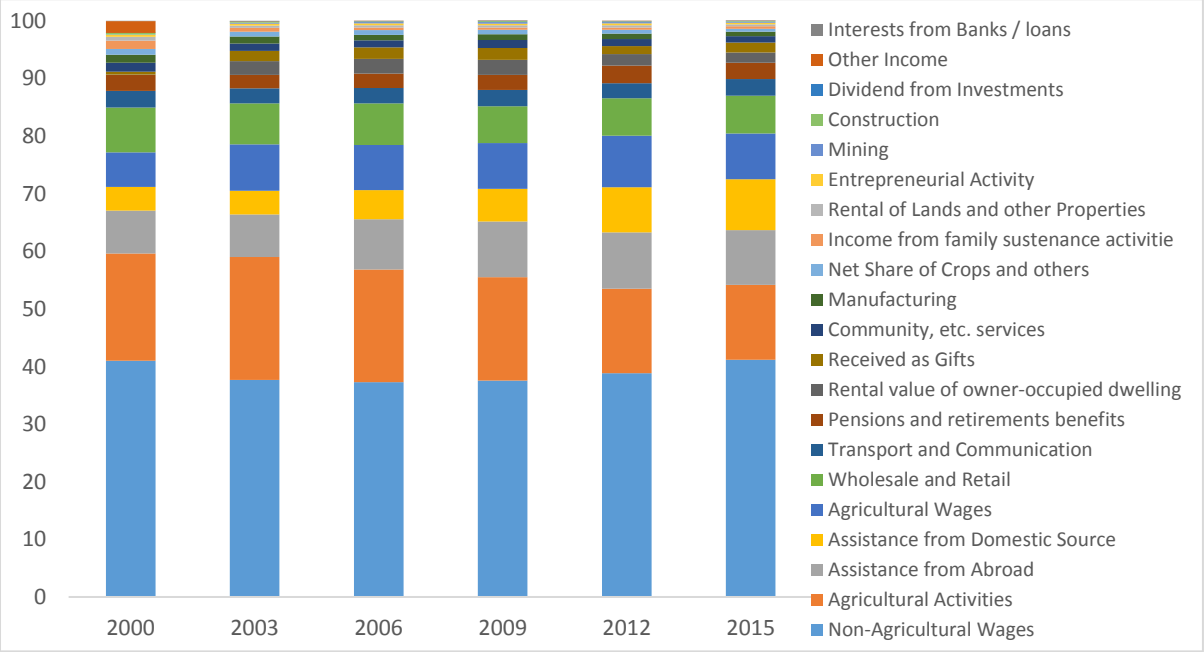
In recent years, the Philippines moved away from the perennial boom and bust growth pattern following several structural economic reforms in the 2000s. With this, growth accelerated and registered a 10-year average of 4.5 percent from 2000-2009. This continued in the most recent decade when the Philippines exhibited robust growth and became one of the fastest-growing emerging economies in the region, with average quarterly growth of 6.3 percent from 2010 2019.

In terms of income source (Figure 1), most of the Filipino households draw their income from non-agricultural salaries and wages (about 40 percent from 2000 to 2015), followed by earnings from agricultural activities (17.5 percent) such as crop farming and gardening, livestock and poultry raising, fishing, and forestry and hunting. A sizable number of Filipino households rely on remittances income from abroad (8.75 percent) and domestic sources (6 percent). These trends remained consistent from 2000 to 2015.

Looking at the source of earnings per income decile (Figure 2), salaries and wages from non-agriculture remain the highest income source across the household segments, followed by remittances received by the households from both foreign and domestic sources.

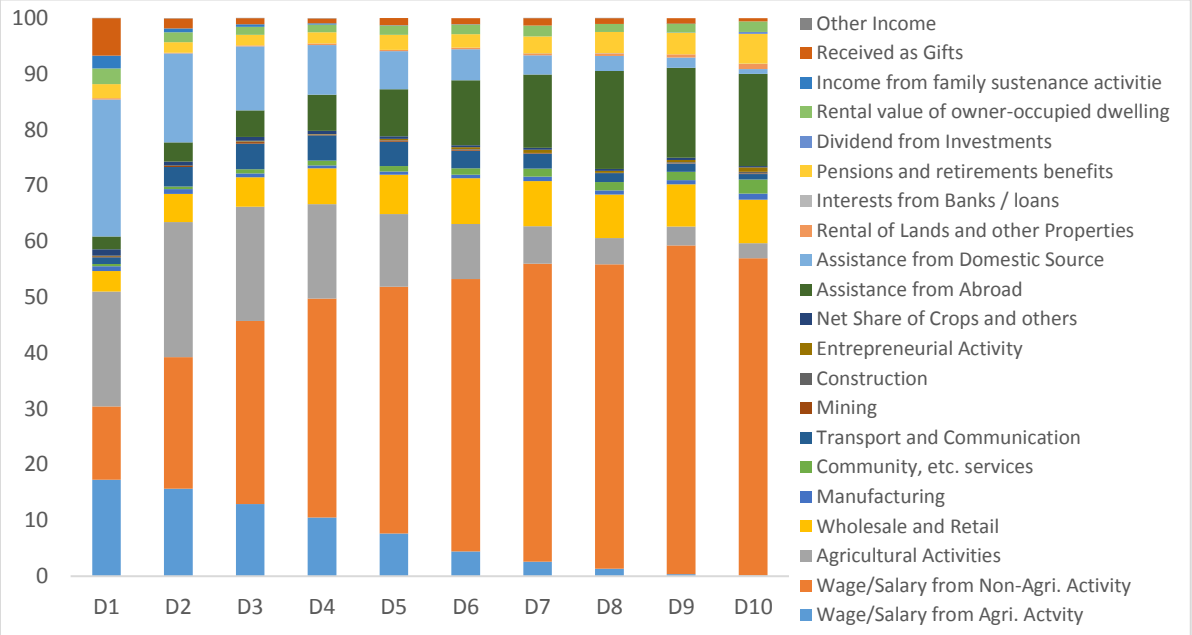
Households in the lower-income deciles draw most of their finances from agricultural activities and salaries from agriculture. However, the share of agriculture as an income source markedly decline as households move up across income groups. Meanwhile, receipts from entrepreneurial activities increase as one moves up to higher-income deciles. It is also worth noting that only families occupying the upper deciles recorded income from financial activities such as interest earnings from banks, and loans and dividends from investments.

Figure 1: Share of Income Source of Filipino Households, 2000-2015



Source: Family Income and Expenditure Survey, Philippine Statistics Authority

Figure 2: Share of Household Income Source by Income Decile, 2015



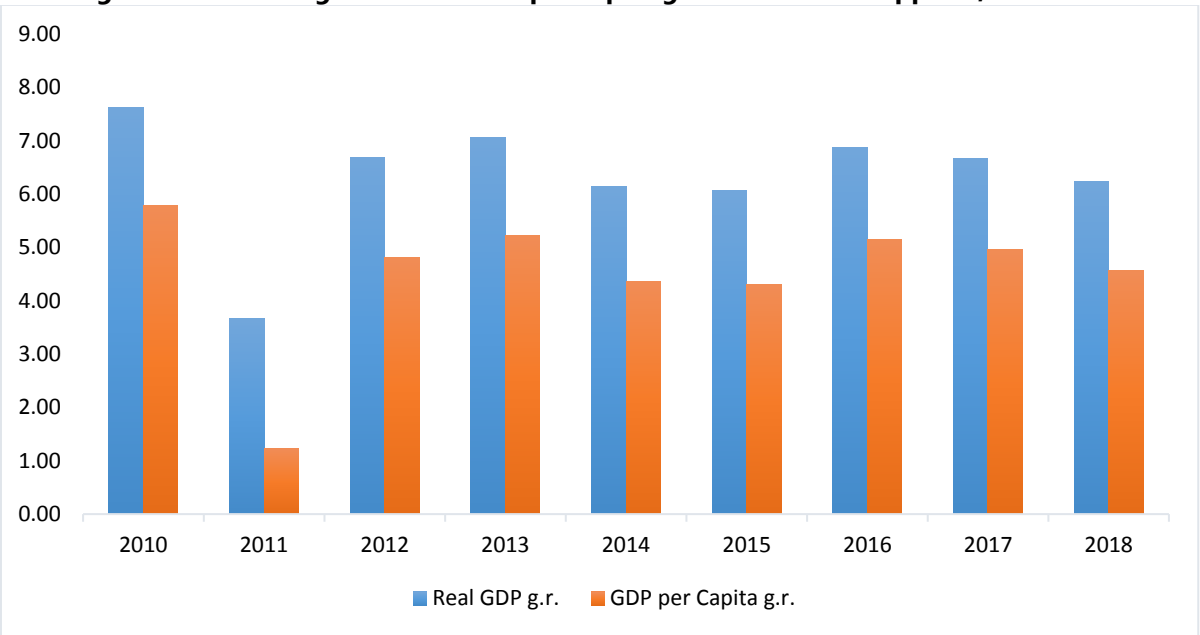
Source: Family Income and Expenditure Survey, Philippine Statistics Authority

Consequent to improving the country's overall economic output is the rising income of Filipino households. However, the economic expansion rate at the macro-level may not be as fast when viewed across regions and income groups. Figure 3 shows that the country's per capita GDP growth, albeit within the positive territory, remained slower than the growth of real economic activity.

Regional per capita GDP from 2009-2018 (current prices) shows the glaring inequality across the regions over time (Figure 4). The income disparity is apparent even between advanced regions of NCR and CALABARZON (Region IVA). In 2018, CALABARZON's per capita output amounted only to less than half (41%) of NCR's per capita output. Meanwhile, the Autonomous Region in Muslim Mindanao (ARMM) posted the lowest per capita output across the years— ARMM's per capita output is equivalent to only 5.7 percent of NCR's output in 2018.

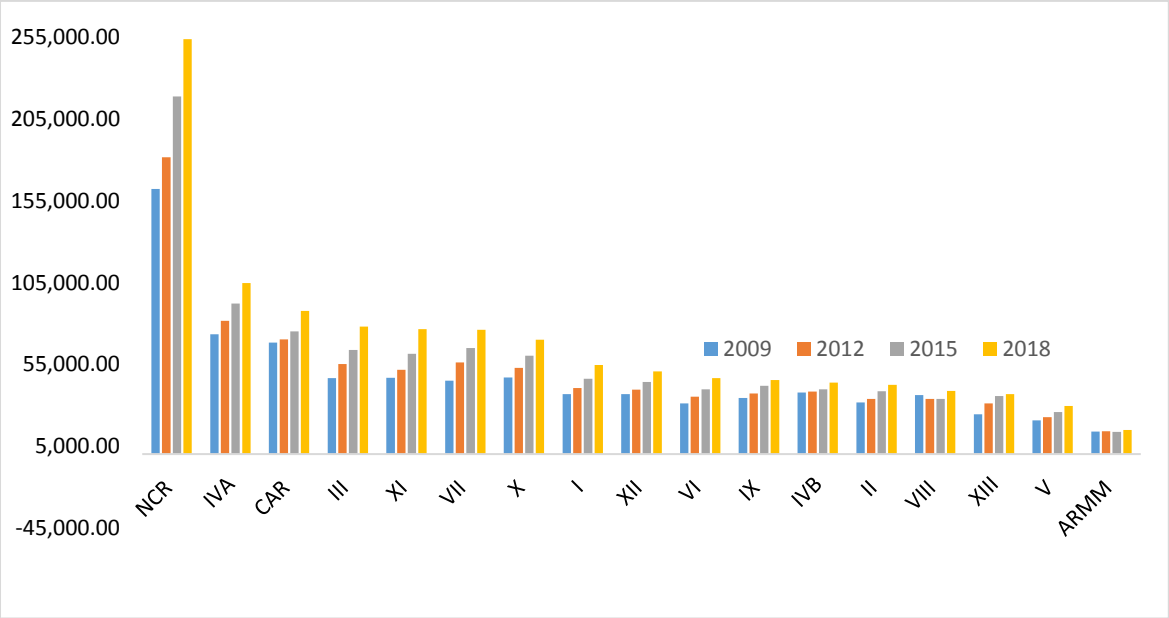
On the household level (Figure 5), the income of wealthy households represented by the first quintile tallied a faster increase than its less affluent counterparts. This indicates the absence of income convergence across households and, in turn, a persistent income gap across Filipino households.

Figure 3: Real GDP growth and GDP per capita growth in the Philippines, 2010-2018



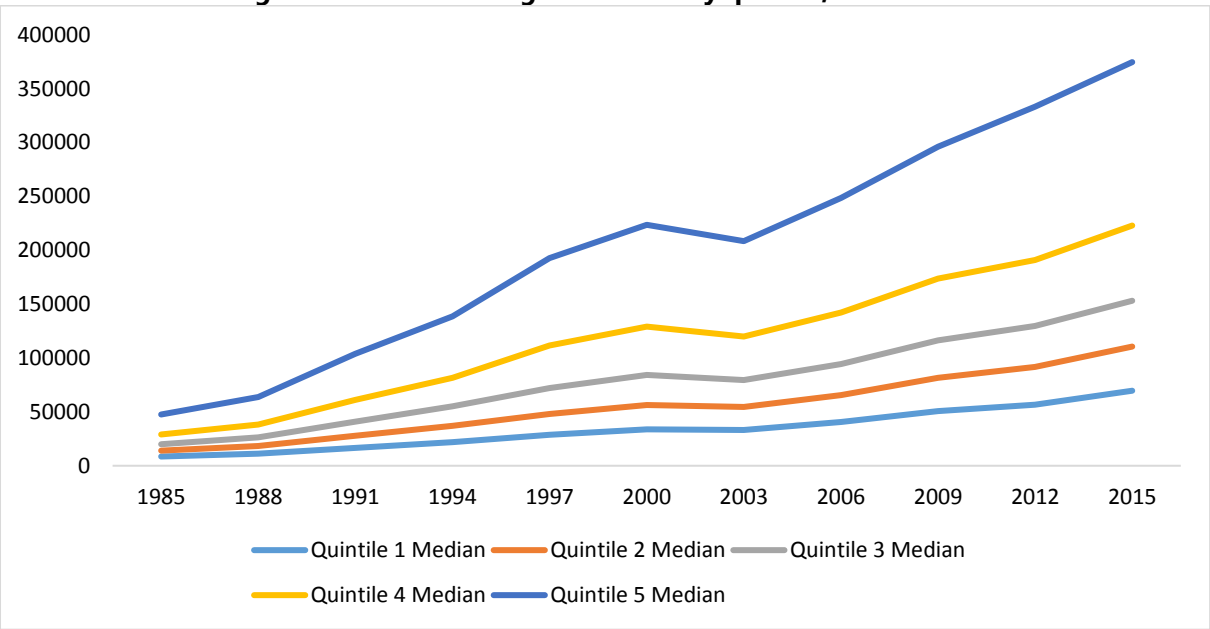
Source: National Income Accounts, Philippine Statistics Authority

Figure 4: Regional per capita Income (2009-2018)



Source: National Income Accounts, Philippine Statistics Authority

Figure 5: Total income growth rates by quintile, 1985-2015



Source: Family Income and Expenditure Survey, Philippine Statistics Authority

3.2 Views on Income Inequality and GINI Trends in the Philippines

The pervasive income disparity in the Philippines was previously described in numerous studies. Estudillo (1997) conducted a comprehensive study on inequality outcomes in the country from 1961-1991. She highlighted that the Philippines' over-all inequality during the study period remained firm and stable at elevated levels. Other studies typified inequality across space, such as the difference between urban and rural inequality (Estudillo, Otsuka, and Quisumbing, 2001). Meanwhile, Balisacan and Fuwa (2004) explored how spatial income inequality moved throughout the Philippines from 1985 to 2000 and examined the impact of macroeconomic variations on income inequality. They noted that macroeconomic outcomes have minimum effects on sub-national levels of inequality.

Understanding how inequality affects a country's development process is necessary as the literature presents an array of studies with opposing views on the role of inequality in economic growth and the welfare of the people.

Some studies maintained that higher inequality might not necessarily be bad for an economy, as higher inequality could potentially support growth (Ostry, Berg, and Tsangarides (2014) and Farole, (2013)). Nonetheless, it is conditional on investors and entrepreneurs having enough incentives to set up new businesses and facilitate innovations that will lead to higher income for the whole economy (Lazear and Rosen 1981). This view is shared by Kaldor (1957), who noted that some degree of inequality might boost economic growth as long as those who have access to capital and savings save and invest most of their income in the domestic economy. This, in turn, supports the over-all savings and investments in the economy. Also, Bourguignon and Morrison (2002) suggested that inequality could be driven by the positive relationship between the geographical concentration of economic activity and economic growth.

On the other hand, there are studies which suggested that high and persistent inequality may hurt the country's economic growth. This is because inequality affects not only the poor but the rest of the economy. First, inequality is viewed to limit the lower-income household's access to quality health services and education, which may hinder human capital development in a nation (Perroti, 1996), (Galor and Moav, 2004), (Aghion, Caroli, and Garcia-Penalosa, 1999).

High income inequality is also linked to credit bubbles and financial crises. Kumhof, Ranciere, and Winant (2015) showed that rising inequality in the United States served as a precursor to high household leverage and crises. In particular, their research provides empirical evidence that the periods 1920–1929 and 1983–2008 both exhibited a significant increase in the income share of high-income households, a substantial increase in debt leverage of low- and middle-income households, and an eventual financial and real crisis.

Persistent income inequality could also lead policymakers to overlook the situation in the peripheral and lagging areas. The nationwide indicators could shadow the real situation on the sub-national levels, i.e., regions and provinces. That is, when average inequality seems passable at a national level, this may cloud an underlying economic stagnation and ballooning poverty in the sub-national levels (Farole 2013).

Long-standing disparities are also sources of dissatisfaction towards governments, which could potentially threaten political and social cohesion. The higher demand for redistributive policies, as opposed to the productive policies, may dampen overall growth. This, however, depends on whether output inequality translates to income inequality (Aghion, Alesina, and Trebbi 2004). Should lagging regions be continuously left behind, as a result of their incapacity to make productive use of the resources and further aggravated by weak and non-inclusive institutions, then these lagging regions could fall into the "low growth trap," which could drag the over-all national growth potentials (Farole, Rodriguez-Pose, and Storper, 2011).

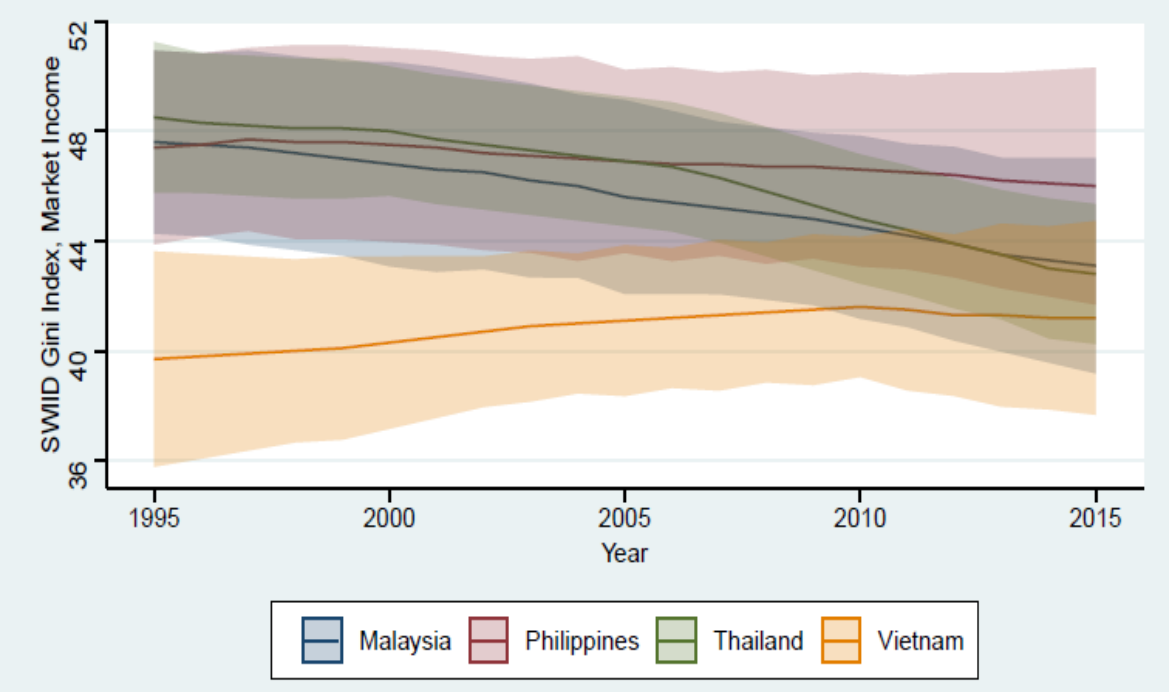
In the case of the Philippines, income inequality has gone down, albeit gradually over the years. This is reflected by the sluggish decline in the country's Gini coefficient from 48.5 in 1970 to 46 in 2015 (Table 1). The progress in reducing inequality remains slow for the Philippines, vis-à-vis its Asian counterparts (Figure 6).

Table 1: GINI Coefficient based on Market Income and Disposable Income, Philippines

Variables	1970	1980	1990	2000	2010	2011	2012	2013	2014	2015
GINI (Market Income)	43.7	42.4	42	42.5	41.6	41.5	41.4	41.3	41.2	41.1
GINI (Disposable Income)	48.5	47.2	46.8	47.5	46.6	46.5	46.4	46.2	46.1	46

Source: Standardized World Income Database v8.1 (Solt 2019)

Figure 6: GINI of Select ASEAN Economies based on Pre-Tax and Pre-Transfer Income, 1995-2015



Source: Standardized World Income Database v8.1 (Solt, 2019). Note: Solid lines indicate mean estimates; shaded regions indicate the associated 95% uncertainty intervals

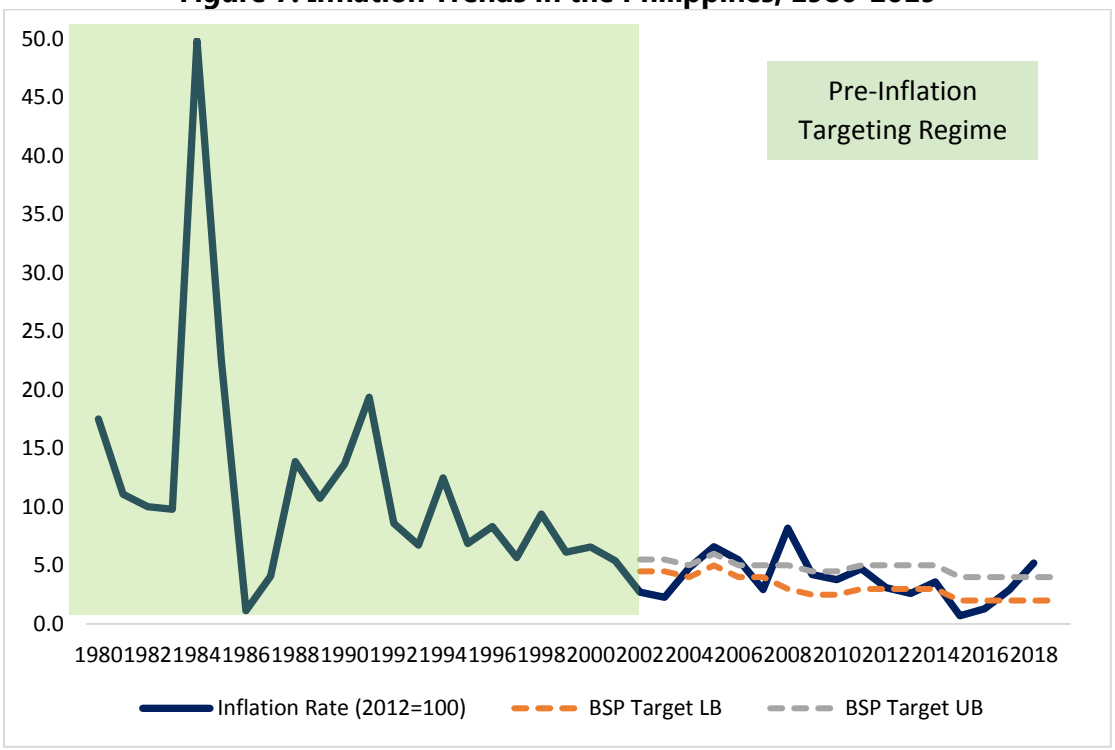
3.3 Monetary Policy and Inflation Targeting in the Philippines

Price stability was embedded early on as one of the primary goals of the Philippine monetary authority. The New Central Bank Act of 1993 in the Philippines stipulated that the newly instituted Bangko Sentral ng Pilipinas (BSP) must aim to achieve price stability. Accordingly, the BSP formally shifted to an Inflation Targeting (IT) monetary policy framework in 2002. Inflation Targeting (IT) is a framework that focuses on achieving price stability as the primary goal. Through IT, the BSP officially announces a headline inflation target, which it sets to achieve over a specified period. The inflation target is defined as the average year-on-year change in the consumer price index (CPI) over the calendar year. It is expressed as a point target with a tolerance interval, to provide flexibility in steering inflation. The achievement of the goal is measured by comparing the actual headline inflation with the officially announced inflation target. The shift followed the earlier decision made by the Monetary Board (MB), the BSP's policymaking body, to change the country's monetary policy framework to IT on 24 January 2000.

The shift to IT was meant to address the risks of increased financial globalization and liberalization of the Philippine financial markets in the late 1990s. The change in the global financial landscape led to a weaker link between money, output, and inflation and made the Philippine economy more susceptible to large monetary and real shocks.[4]

Looking back, it is during the IT regime that the BSP recorded considerable success in bringing inflation rates lower and keeping inflation expectations well anchored. From an annual average of 12.1 percent from 1980 to 2000, the BSP succeeded in taming prices as headline inflation rate decelerated to a yearly average of 3.8 percent from 2002 to 2019. This also allowed the BSP to build its credibility through greater accountability and transparency.[5]

Figure 7: Inflation Trends in the Philippines, 1980-2019



Source: Philippine Statistics Authority and Bangko Sentral ng Pilipinas

4. Data and Methodology

4.1 Data and Variables

The study sourced the information on individual income from the FIES survey.[6] The survey holds detailed information on Filipino households' income and expenditures and has been conducted by the Philippine Statistical Agency (PSA) since 1957. Over the years, the FIES changed sampling design and collection methods, among others. For instance, starting in

[4] Guinigundo, D. (2008). "Transmission mechanism of monetary policy in the Philippines," BIS Papers chapters, in: Bank for International Settlements (ed.), Transmission mechanisms for monetary policy in emerging market economies, volume 35, pages 413-425, Bank for International Settlements.

[5] Guinigundo, D. (2017), "Implementing a flexible IT in the Philippines," Philippine Central Banking: A Strategic Journey to Stability, Bangko Sentral ng Pilipinas, Manila.

[6] Note that one household in the survey could have multiple income-earning individuals. Thus, this paper uses income on an individual level for more granular analysis.

1985, the frequency was adjusted triennially from the previous five years. A modification in the use of a master sample for the surveys was then introduced in 2003. This almost coincides with the BSP's shift towards an inflation-targeting framework. Hence, the empirical analysis covers triennial data from 2003 to 2015 with 200 thousand observations.

The paper employs total individual income as the primary dependent variable. This includes primary income, receipts from other sources received by all family members, and other receipts. Primary income includes salaries and wages, commissions, and other forms of compensation and net receipts from the operation of family-owned enterprises and the practice of profession. Meanwhile, receipts from other sources, include imputed rental values of owner-occupied dwelling units, interests, rentals, among others. Lastly, other receipts include profits from sales of stocks and bonds, among others.

Table 2: Variable Description

Variable	Definition
Total income (tot_inc)	Triennial data on primary income, receipts from other sources, and other receipts. Expressed in natural logarithm.
Overnight Reverse Repurchase Rate (RRP)	The 3-year average of overnight lending rate to banks in natural logarithm.
Family Size (fsize)	Total number of individual members in a household
Educational Attainment (educ)	Total expenditure allotted for education
Inflation	3-year average expressed in natural logarithm
GDP	3-year average expressed in natural logarithm

Given that the BSP is an inflation-targeting central bank, the primary explanatory variable is the overnight reverse repurchase rate, which is the BSP's policy rate at which it lends to the banks. The variable is transformed to its 3-year average to match the frequency of the income data.

In line with existing literature, household and individual characteristics such as family size and educational attainment are included as control variables. Likewise, macroeconomic variables are included as additional controls like real GDP growth rate and inflation rate.

All variables, except family size and educational attainment, are expressed in the logarithms of their three-year average to match the frequency of the data on total income. Table 2 summarizes the variables and their definitions, and Table 3 supplies descriptive statistics.

Table 3: Variable Summary Table

Variable	Mean	Std. Dev.	Min	Max
rrp	5.1	1.6	3.5	7.5
tot_inc	267880.1	419649.8	3258.0	60200000.0
educ	6503.0	19363.2	0.0	731000.0
fsize	21.3	25.0	1.0	305.0
gdp	119895.8	34448.2	72199.0	162196.0
inflation	3.1	1.6	0.7	5.5

4.2 Preliminary Analysis

4.2.1 Impact of RRP, Inflation, and GDP on Inequality

Before exploring the quantile regressions, the authors first examined the relationship between inequality and monetary policy by specifying a basic vector autoregressive (VAR) model as follows:

$$x_t = \begin{pmatrix} dlog(GDP\ SA)_t, dlog(CPI\ SA)_t, D(Policy\ Rate)_t, \\ dlog(Compensation\_Index)_t, dlog(PSEI)_t, GINI\_MKT_t \end{pmatrix}'$$

The macroeconomic variables included in the model are the seasonally adjusted real GDP, consumer price index, the reverse repurchase rate as key policy rate of the BSP, compensation index to account for labor income, and equity prices to account for asset prices. Meanwhile, an indicator variable standing for the global financial crisis in 2008 was included as exogenous input to the model. Added details on the VAR model are described in Appendices 1A to 1B.

The usual Cholesky decomposition was used in monetary policy identification. Subsequently, the impulse response functions of inequality with the various macroeconomic variables were obtained. Based on the VAR's impulse response functions, it is suggested that an expansionary monetary policy tends to reduce income inequality in the Philippines (Figure 8). This can be attributed to the income composition channel of monetary policy. Relatedly, a positive shock on inflation results in higher inequality in the subsequent periods providing evidence on the inflation tax channel. Meanwhile, a positive shock on the GDP was seen to reduce income inequality (Figure 9). The complete IRFs resulting from the specified VAR model are reported in Appendices 1C to 1E.

Figure 8: GINI Response to an expansionary monetary shock

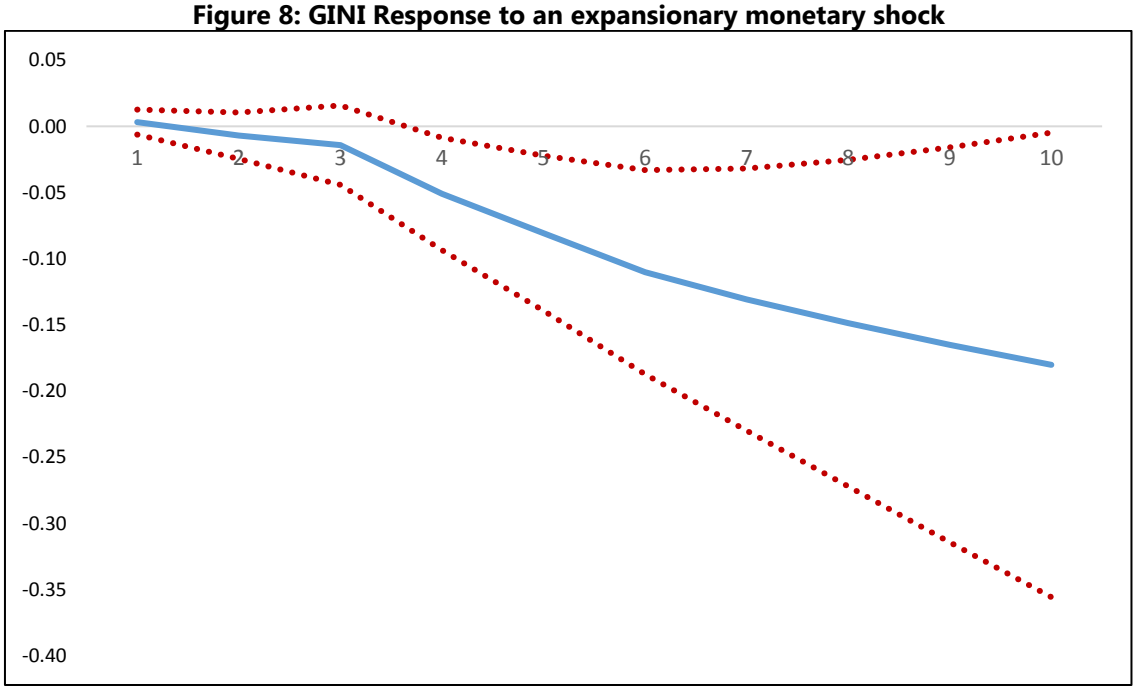
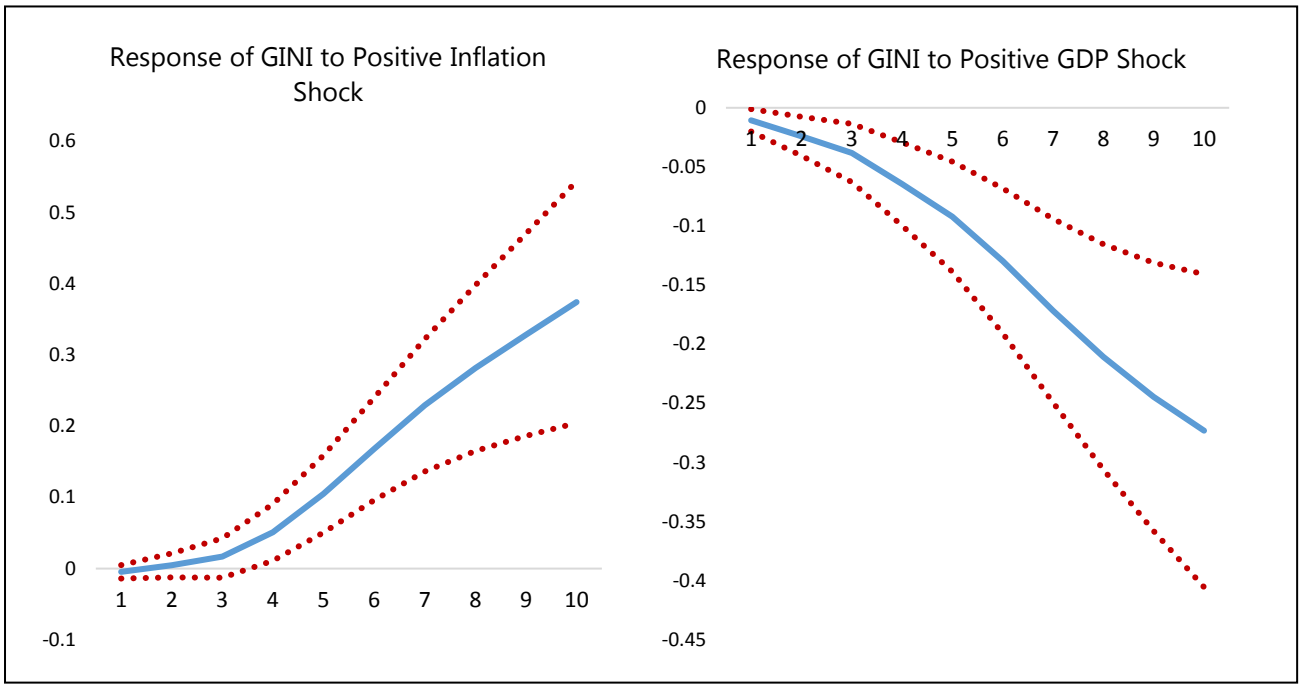


Figure 9: Impulse Response Function of GINI to Positive Shocks in Inflation and GDP



4.3 Empirical Methodology

The paper applies a quantile regression as an empirical strategy. Two reasons motivate this choice: 1) monetary policy could potentially generate distinct effects on different parts of the income distribution, and 2) the distribution of the income data is concentrated to the lower income levels and highly skewed to the left. Using conditional mean regression methods could potentially fail to capture parameter heterogeneity between monetary policy and various groups in the income distribution. Meanwhile, quantile regression can better capture the impact of the explanatory variable (RRP) on specific parts of the income distribution. The quantile regression model can be expressed as:

$$Q_\tau(Y_{i,t}|X_{i,t}) = C_\tau + \beta_\tau(MP)_{it} + \sum_j \gamma_\tau X^j_{i,t} + v_{i,t} \quad (1)$$

Here, $Q_\tau(Y_{i,t}|X_{i,t})$ is the τth quantile regression function on income. Like Fang, et. al. (2019), specific estimators are identified for each desired quantile (e.g. .01, .05, .10, .25, .50, .75, .90, .95, and .99). Meanwhile, MP is monetary policy, and X refers to the vector of control variables discussed above.

5. Results and Discussions

The quantile regression is applied to four iterations. The first iteration includes total income as the dependent variable and RRP rate as the only explanatory variable. Second, iteration includes control variables such as characteristics of households such as family size and educational attainment. Third, we also include macroeconomic variables such as GDP and inflation as additional explanatory variables. The fourth model is then specified to include both

the controls and the macroeconomic variables in the third iteration. The results are summarized in Table 4.

In the baseline model, an increase in RRP leads to a decrease in total income in all quantiles. The effect is higher in the more interest-sensitive higher-income quantiles. A one percent change in RRP leads to a 1.12 percent decrease in total income in the 99th quantile, which is higher than the corresponding change of 0.8 percent in the first quantile.

The results are similar in model 2, when family characteristics like family size and educational attainment are included as controls. The negative impact of higher RRP remains more substantial for the upper quantiles. It is also observed that education positively affects income across all groups, but the benefit is more significant for the higher income groups. Meanwhile, the effect of family size on income is observed to be negative.

In model 3, the RRP's impact becomes positive for almost all quantiles but stays negative in the 99th quantile. The negative impact, however, on the 99th quantile, is minimal at .005 percent. Meanwhile, inflation hurts all quantiles in the distribution. The magnitude is larger for lower-income quantiles. For instance, a one percent increase in inflation leads to a 0.3 percent decrease in income for those belonging to the first quantile and only a 0.2 percent decrease in income for the 99th quantile. Lastly, GDP positively affects income in all quantiles with a more substantial impact on the lower quantiles.[7]

In model 4, when macroeconomic variables and household characteristics are all included, the negative impact of RRP becomes insignificant for the 95th and 99th quantiles. However, inflation's effect remains significant in all quantiles, with the magnitude more considerable in the lower quantiles.

5.1 General Observations

The results of the impact of the BSP policy rate on the total income in all four models are presented in graphical form in Figure 10. In the following panels, the X-axis corresponds to the different quantiles in the income distribution. The Y-axis stands for the beta coefficients for each explanatory variable. The grey line corresponds to the confidence intervals for each coefficient.

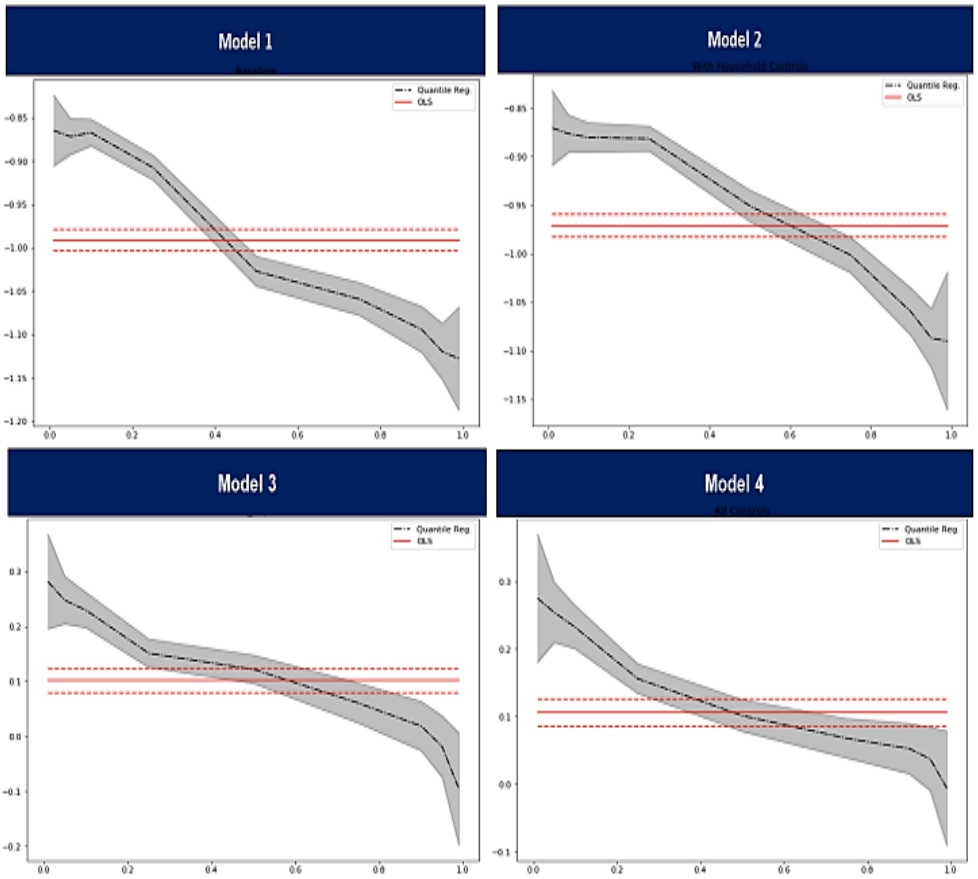
[7] The variable family size was dropped as a control variable in the third model due to suspected error in the survey data collection.

Table 4: Quantile Regression Results

Quantiles	*Iteration 1* Base Quantile Regression	*Iteration 2* Quantile Regression with Controls			*Iteration 3* Quantile Regression with Macroeconomic Variables			*Iteration 4* Quantile Regression with Macroeconomic Variables and Control			
	Natural Log of RRP	*Natural Log of RRP*	*Education*	*Family Size*	*Natural Log of RRP*	*Natural Log of Inflation*	*Natural Log of GDP*	*Natural Log of RRP*	*Natural Log of Inflation*	*Natural Log of GDP*	*Education*
1st Quantile	-0.8648***	-0.87045***	1.02e-5***	0.010181***	0.281115***	-0.3431***	1.187844***	0.2747976***	-0.3368939***	1.173004***	1.08e-5***
	(0.0207984)	(0.0195684)	(4.66e-7)	(0.0001666)	(0.0438358)	(0.0124111)	(0.0462325)	(0.0481828)	(0.0126533)	(0.0474375)	(7.55e-7)
5th Quantile	-0.87168***	-0.87635***	1.45e-5***	0.0069***	0.247456***	-0.32588***	1.173264***	0.253925***	-0.3261195***	1.160397***	1.45e-5***
	(0.0106901)	(0.0098734)	(2.58e-7)	(0.0001054)	(0.0219136)	(0.00555)	(0.0224065)	(0.0226929)	(0.005698)	(0.0225858)	(3.49e-7)
10th Quantile	-0.86709***	-0.88023***	1.67e-5***	0.005382***	0.229678***	-0.32489***	1.167738***	0.2320821***	-0.3240006***	1.137926***	1.66e-5***
	(0.0078753)	(0.0070117)	(2.79e-7)	(8.71e-0.5)	(0.0162403)	(0.004173)	(0.0168667)	(0.0163854)	(0.0041773)	(0.0172424)	(2.65e-7)
25th Quantile	-0.90746***	-0.88147***	2.02e-5***	0.00293***	0.151096***	-0.31912***	1.097151***	0.1560187***	-0.3184914***	1.036713***	1.97e-5***
	(0.0073314)	(0.0062312)	(2.47e-7)	(7.16e-0.5)	(0.0128714)	(0.0030956)	(0.0139351)	(0.0112147)	(0.002924)	(0.0120549)	(2.48e-7)
50th Quantile	-1.027125***	-0.95067***	2.24e-5***	0.000535***	0.121924***	-0.29887***	1.038141***	0.101454***	-0.3035204***	0.9364139***	2.24e-5***
	(0.008337)	(0.0078819)	(1.99e-7)	(0.0000888)	(0.0126068)	(0.0032894)	(0.0145642)	(0.0120431)	(0.0031322)	(0.0136121)	(2.15e-7)
75th Quantile	-1.05928***	-1.00128***	2.28e-5***	-0.00036***	0.060532***	-0.2737***	0.9743938***	0.060062***	-0.2837663***	0.8929487***	2.32e-5***
	(0.00966)	(0.008811)	(1.99e-7)	(9.82e-0.5)	(0.0185527)	(0.0045002)	(0.019137)	(0.0149072)	(0.0037778)	(0.0157296)	(1.97e-7)
90th Quantile	-1.094295***	-1.0599***	2.15e-5***	-0.00064***	0.018624	-0.24501***	0.952282***	0.0527755***	-0.2630054***	0.9065911***	2.18e-5***
	(0.0135947)	(0.0122611)	(2.94e-7)	(0.000132)	(0.0225569)	(0.0055207)	(0.0238889)	(0.019075)	(0.0045108)	(0.0203591)	(2.40e-7)
95th Quantile	-1.119831***	-1.0868***	2.05e-5***	-0.00081***	-0.01875	-0.22922***	0.930234***	0.0375284	-0.2457786***	0.951621***	2.08e-5***
	(0.0166054)	(0.0159667)	(3.49e-7)	(0.0001602)	(0.0278606)	(0.006994)	(0.0313031)	(0.0240188)	(0.0240188)	(0.0249042)	(3.18e-7)
99th Quantile	-1.127999***	-1.08986***	1.79e-5***	-0.000167***	-0.09599**	-0.22368***	0.790123***	-0.0058042	-0.2319125***	0.9246201***	1.76e-5***
	(0.0303593)	(0.035806)	(6.73e-7)	(0.0003686)	(0.0484306)	(0.0129785)	(0.0588548)	(0.0430607)	(0.00122542)	(0.0203591)	(5.70e-7)

*Significance at a 90% Confidence Bound, **Significance at a 95% Confidence Bound, ***Significance at a 99% Confidence Bound. The numbers in parenthesis indicate robust standard errors.

Figure 10: Impact of RRP on Total Income



Source: Authors' Computation

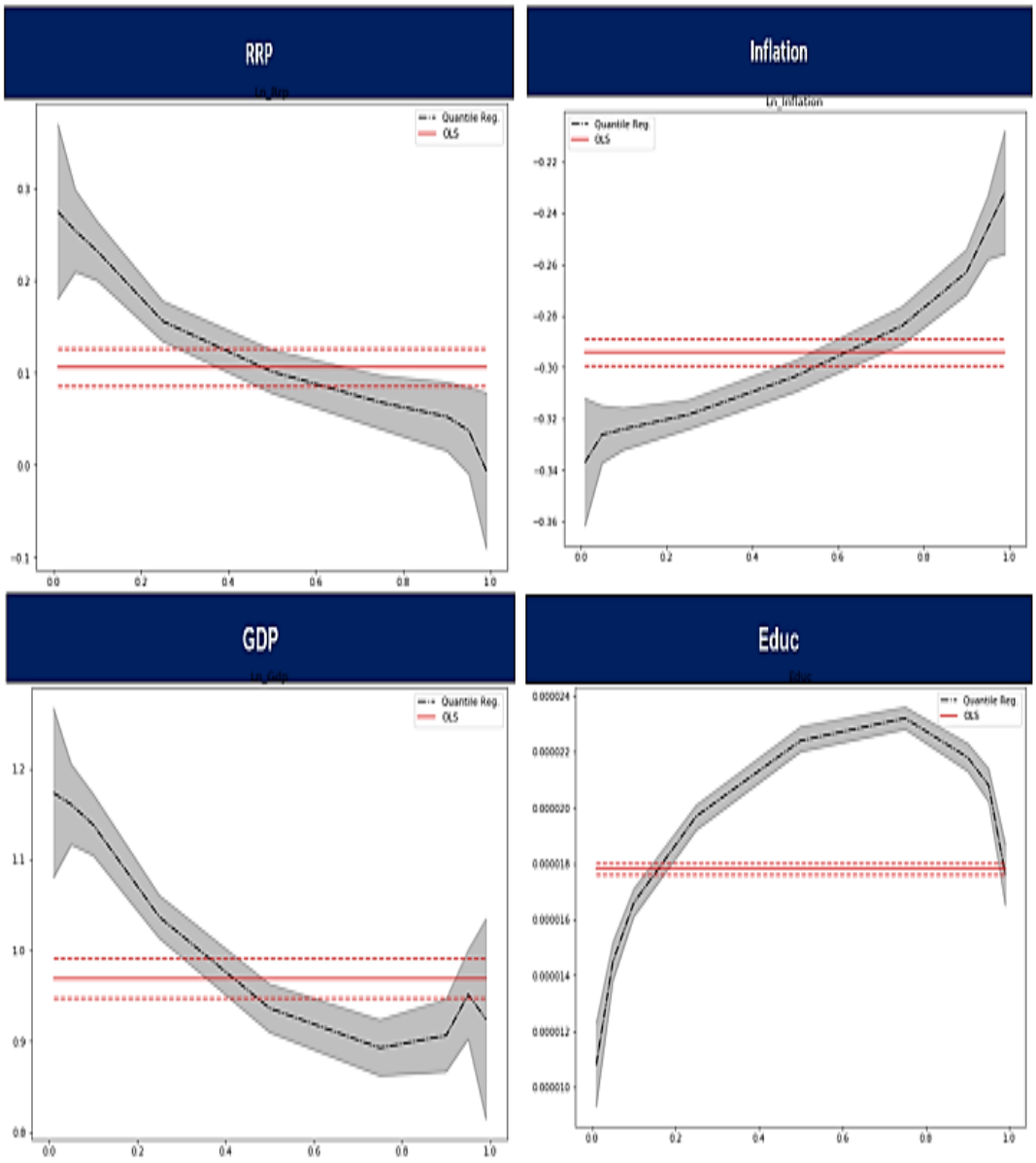
Several general observations can be made. First, in all models, monetary policy's impact via the central bank's policy rate generates effects of varying magnitude across income levels. Second, the negative impact of an increase in RRP is more pronounced in higher-income quantiles. These results appear to be consistent with HANK models' suggestions, which identify heterogeneity in income composition as a potential channel of monetary policy's asymmetric effects. Households obtain their incomes from various sources, each of which may respond differently to changes in monetary policy. At the low end of the income distribution, households tend to depend more on transfer income. Meanwhile, households that fall near the median rely mostly on labor income. On the other hand, households located in the upper tail of the income distribution depend more on business and capital income and income from financial assets such as bonds and equities.

An increase in the central bank's policy rate could lead to a higher borrowing cost, thus lowering investments and profits. Likewise, higher interest rates could lead to the adjustment of asset prices, such as bonds. This could explain the broader impact of RRP on total income in the higher quantiles. However, when macroeconomic variables are included, the negative effect on higher quantiles becomes smaller and insignificant. These results suggest that this distribution channel is relatively weak in the Philippine context. The said observation can be partly explained by the fact that income from investments such as equities and bonds, which

are more sensitive to interest rate changes, are mostly concentrated to a very small number of individuals belonging to the higher quantile of the income distribution.

Third, inflation appears to have a more substantial negative impact on the lower-income quantiles (Figure 11). Increases in inflation disproportionately affect income in two ways. First, higher inflation erodes the purchasing power of lower-income individuals to a greater extent. Second, the increase in expected inflation also disproportionately erodes individuals' purchasing power that relies more on cash to conduct their transactions. Lower-income households are expected to use more cash as a percentage of their total expenditures. Erosa and Ventura (2002) highlighted that expected inflation acts as a regressive consumption tax, increasing inequality. The study results suggest that the monetary policy's distributional impact significantly operates through the Philippines' inflation channel. Likewise, this appears to be the most critical distributional channel in the Philippines.

Figure 11: Quantile Regression Results, Model 3



Source: Authors' Computation

6. Conclusion

The study aims to present the necessary first steps in analyzing and assessing the distributional impact of monetary policy in the Philippine setting. In detail, the study focused on examining the variations in the BSP's policy rate as the primary monetary policy instrument and how it affects the total income of households across income groups.

The study first used a VAR model to check the general direction of how macroeconomic variables such as output growth, inflation, and the variation in the BSP's policy rate affect inequality as measured by the GINI coefficient. Based on the VAR model's impulse response functions, expansionary monetary policy is seen to reduce inequality in the case of the Philippines. It is also worth noting that a positive shock to output reduces inequality, while a positive shock to inflation drives inequality higher.

Following the VAR analyses, the paper employed quantile regression to characterize how variation in the BSP's main monetary policy instrument affects income across different income groups in the Philippines. The paper specified four quantile regression models to ensure the robustness of results.

The regressions yielded a significant impact of the BSP's policy rate to income at varying magnitude across income levels. In particular, the more affluent households bear a more substantial negative effect on income. These results are consistent with the findings of the HANK models, which show heterogeneity in income composition as a potential channel of monetary policy's asymmetric effects. Households obtain their incomes from diverse sources, each of which may react differently to changes in monetary policy.

More importantly, the quantile regression highlights the negative association between inflation and total income across all household groups. In particular, the poorest households are hit the hardest following an inflationary episode. This is consistent with the preliminary assessment made in the paper, which noted the inequality-worsening effect of a positive shock to inflation.

The paper's results suggest that the inflation channel appears to be an essential distributional channel of monetary policy in the Philippines. This finding has a significant policy implication – the BSP, as well as similar emerging central banks, can also tackle issues such as inequality by remaining faithful to their traditional objective of safeguarding price stability.

In an emerging and developing economy like the Philippines, keeping prices within target benefits the poor most, specifically the lowest income rungs of the population. The BSP track inflation rates for the poorest segment of Philippine society, cognizant of the difference in their basket of goods and economic behavior. The poor rely heavily on monetary policy's ability to rein in inflation, mainly because they feel a heavier brunt if the central bank misses its inflation target.

Monetary policy contributes best to desirable socio-economic objectives (e.g., lower cost of living, higher growth, among others) by promoting low and stable inflation. It helps

ensure that the real economy expands along the maximum sustainable growth path associated with price stability.

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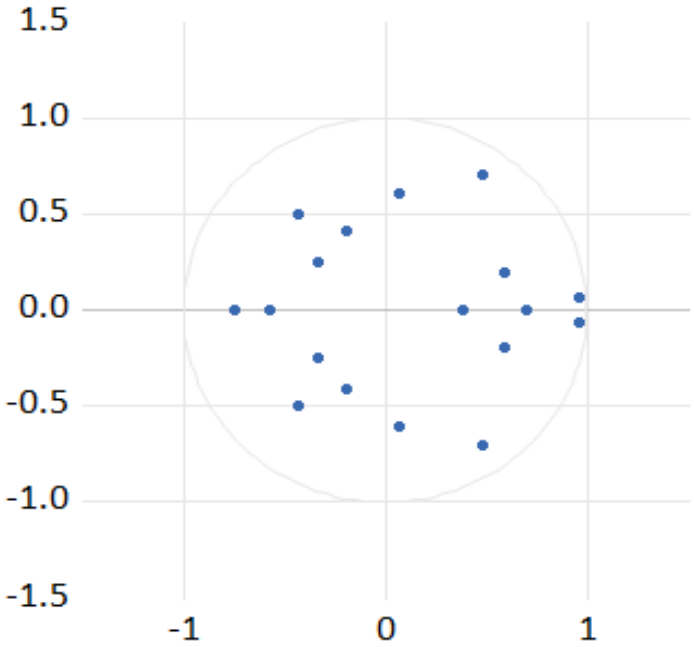
Appendix 1A – VAR Stability Test
Inverse Roots of AR Characteristics Polynomial



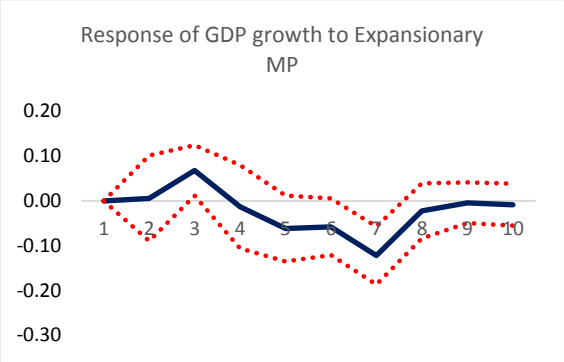
No root lies outside the unit circle; VAR satisfies the stability condition.

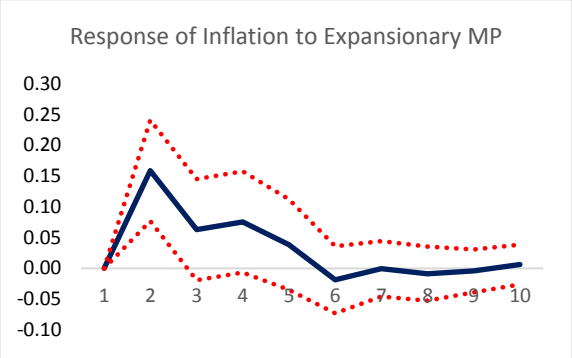
Appendix 1B – VAR Lag Order Selection Criteria

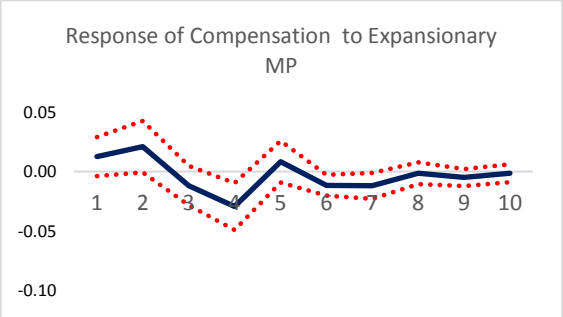
Lag	LogL	LR	FPE	AIC	SC	HQ
0	438.68	NA	0.00	-18.07	-17.87	-18.00
1	593.32	270.63	0.00	-23.47	-22.30	-23.03
2	654.66	94.56	0.00	-24.99	-22.84*	-24.18
3	694.72	53.42*	5.91e-18*	-25.61*	-22.49	-24.43*
4	715.00	22.82	0.00	-25.42	-21.32	-23.87

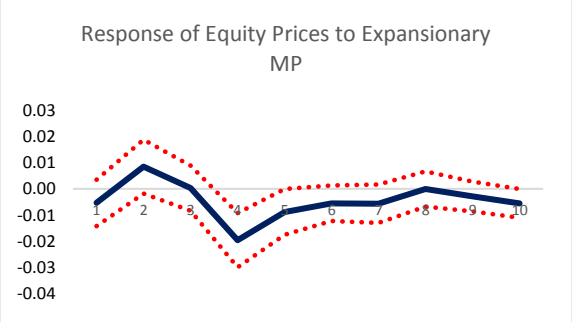
Notes:
* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

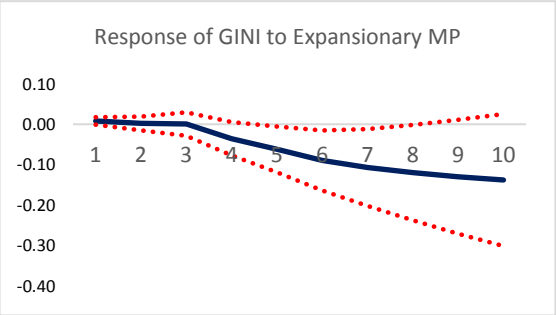
Appendix 1C –Response to Expansionary Monetary Policy



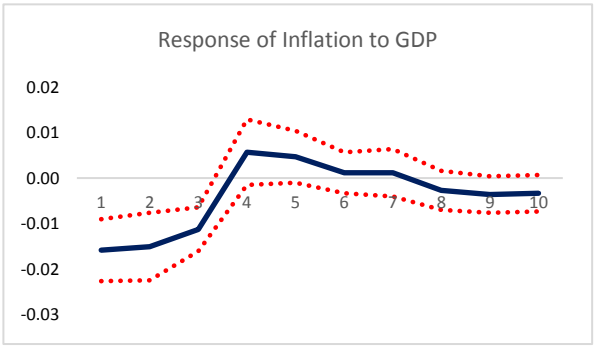


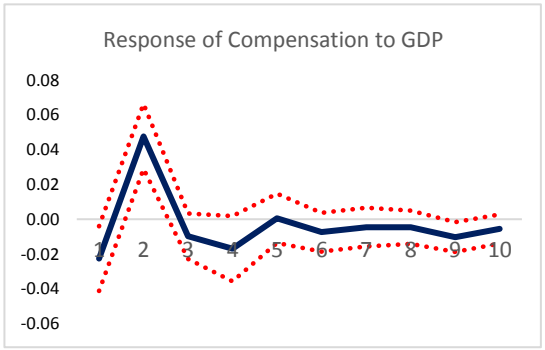


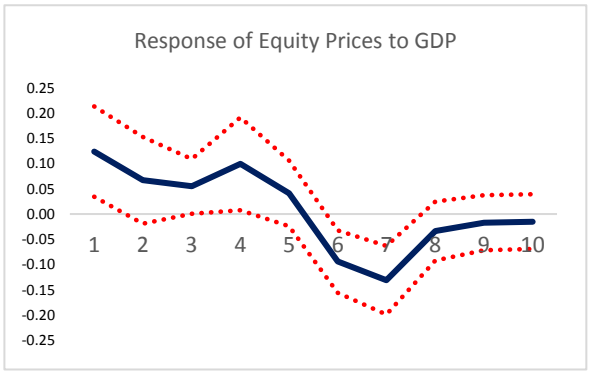


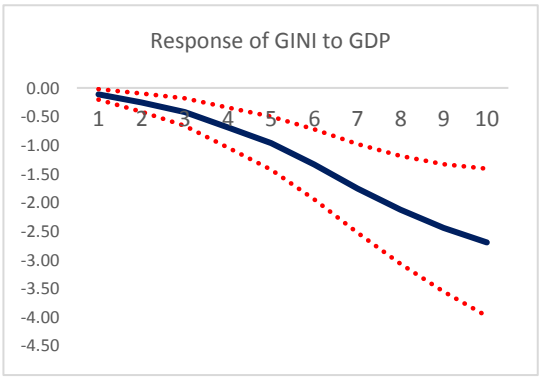


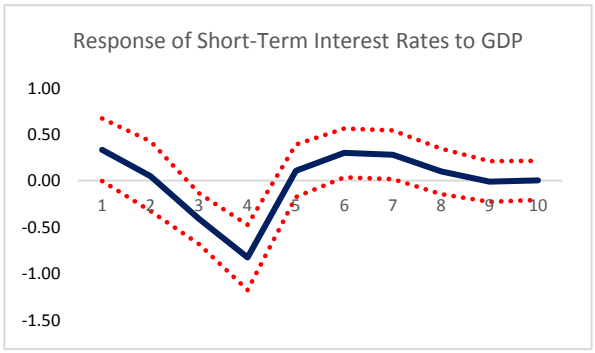
Appendix 1D –Response to 1 S.D. Innovation to GDP Growth



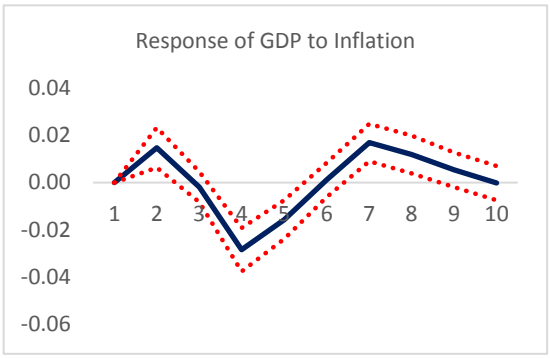


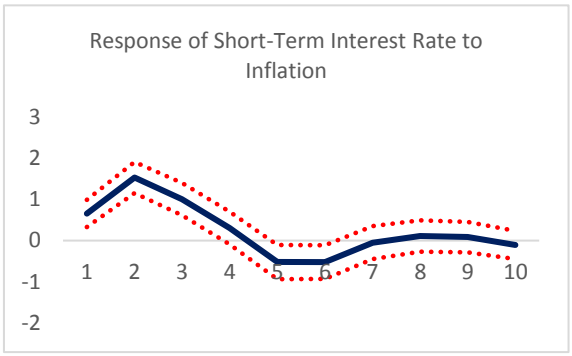


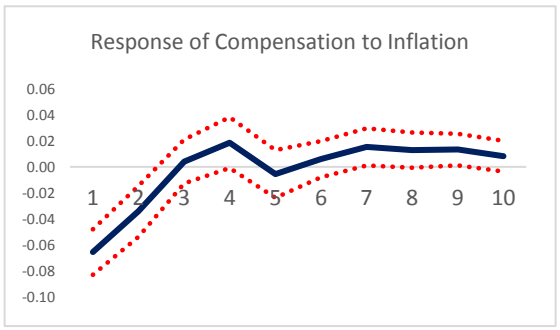


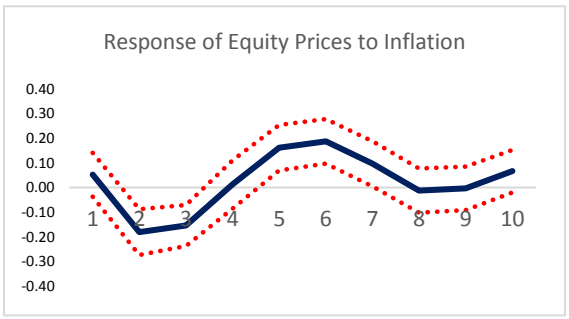


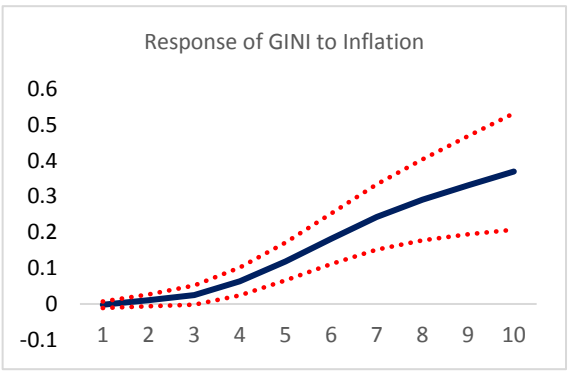
Appendix 1E –Response to 1 S.D. Innovation to Inflation











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- All graphs, tables, and footnotes must be in font Segoe UI, font size 9.
- Tables must contain only essential data and hence, must be kept to a minimum. Each figure and table must be given an Arabic numeral, followed by a heading.
- All diagrams, charts, and graphs must be referred to as figures and consecutively numbered.
- All figures and tables must be cited in the text.
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