Decoding Disparities: The Interplay of Monetary Policy and Income Inequality in the Middle East

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Abstract

This study examines the relationships between monetary policy, economic growth, unemployment, and income inequality in selected Middle Eastern countries. Using the LSDV Panel Vector Autoregression and GMM estimation models, the research reveals a positive correlation between monetary policy, specifically the M1 money supply, and income inequality. Economic growth, though traditionally seen as a remedy for economic challenges, can exacerbate income disparities if not accompanied by equitable distribution policies. Furthermore, unemployment rates are positively correlated with income inequality, emphasizing the societal implications of jobless growth. The study also found that monetary policy's impact on income distribution is significant, with money supply shocks leading to immediate unemployment repercussions. These findings are vital for policymakers, highlighting the need for balanced growth strategies and the risks of unchecked economic development.

Acknowledgements

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Contents

List of Figures

List of Tables

1 Introduction

Within the rapidly transforming global financial landscape, monetary policy plays a pivotal role in steering economies (Mishkin 2007; Blanchard and Galí 2007; Ben S Bernanke and Gertler 1995). However, an intriguing puzzle emerges when probing deeper into the Middle East. Unlike many other regions, Middle Eastern economies are often characterized by their heavy reliance on oil revenues, which can occasionally have a greater impact than traditional monetary policy tools (Elbadawi and Soto 2016). Furthermore, the intertwining of politics, religion, and finance, specifically the prevalence of Islamic banking, presents unique challenges and considerations for policymakers (M. Umer Chapra 2008; Kettell 2012). Consequently, the efficacy and impact of standard monetary policy mechanisms in the Middle East can differ significantly from those in other global contexts At a time when economic disparities are at the forefront of global discussions, understanding the link between monetary policy and income inequality is paramount. This paper delves into such an important question, attempting to unravel the complex dynamics between central banking decisions and the distribution of wealth within Middle Eastern countries.

Why is this question significant? Firstly, the Middle East, with its distinct socio-economic and political landscape, can present a culturally bounded context. Economically, the region is marked by its vast oil reserves, with countries such as Saudi Arabia, Iraq, and the United Arab Emirates contributing significantly to the global oil supply (OPEC 2021). This oil wealth coexists with areas of significant poverty, as seen in conflict-ridden zones including Yemen (Bank 2020). Politically, the region is a mosaic of monarchies, republics, and transitional governments, spread with geopolitical flashpoints such as the Israel-Palestine conflict and the Syrian civil war (Gelvin 2015). These economic and political complexities can shape the efficacy of monetary policy on income distribution. While numerous studies, such as Mishkin (2007), have delved into monetary policy's impact on economic growth, limited research has explored its ramifications on income inequality, especially within the Middle Eastern context.

Several studies, such as those by Ben S. Bernanke and Blinder (1992), Clarida, Galí, and Gertler (1999), and Woodford (2011), have grappled with the global question of monetary policy's impact on economies. However, a research gap remains in relation to income inequality in the Middle East. By employing a rigorous empirical method and a Middle East specific dataset, this research

aims to bridge this gap, offering a fresh perspective and a novel contribution to the existing body of knowledge.

My study focuses on the United Arab Emirates (UAE), Egypt, Iran, Iraq, Jordan, Lebanon, Qatar, Israel, Saudi Arabia, Syria, and Turkey, representing a majority of the Middle East. Several countries were removed from the study due to inadequate data - Palestine, Bahrain, and Kuwait.

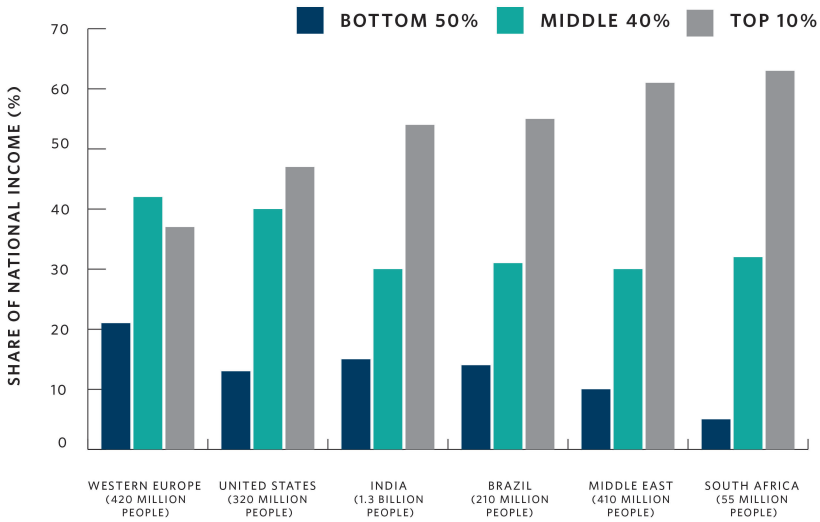
The paper is structured as follows: section 2 provides a comprehensive review of the existing literature. This is followed by a detailed account of theoretical and empirical framework in section 3. Section 4 presents the data collection and composition. Section 5 presents the results, comparing them with prior studies. Finally, the paper concludes with a discussion on the practical implications of the findings, potential policy recommendations, and avenues for future research.

2 Literature Review

Income disparity has been a focal point of economic research in recent years (Piketty and Goldhammer 2014; A B Atkinson and Morelli 2011). It refers to the uneven distribution of wealth and resources among different segments of a population. Globally, this disparity has profound implications, influencing social cohesion, economic sustainability, and even political stability. The Middle East also experiences this phenomenon. Known for its oil reserves, the region paradoxically stands as the most unequal globally. This juxtaposition of immense wealth and profound inequality renders the Middle East a unique and crucial focal point for understanding the dynamics of income distribution. Within this context, the role of monetary policy, a primary tool for economic regulation, emerges as an essential area of investigation.

2.1 Income Inequality in the Middle East

The Middle East is one of the world's most unequal regions, as highlighted in a 2019 study by Alvaredo, Assouad, and Piketty (2019). This region, characterized by its oil wealth, has seen tremendous economic growth over the decades, particularly in countries belonging to the Gulf Cooperation Council (GCC). However, alongside this economic prosperity, there has been a widening gap between the rich and the poor.



Source: Alvaredo, Assouad, and Piketty (2019)

Figure 1: Inequality Around The World

One reason for the region's pronounced inequality is the significant revenue generated from natural resources, specifically oil, which tends to be concentrated in the hands of a few. This concentration of wealth is further exacerbated by patronage systems and limited redistributive policies (Lake 2017). Moreover, state-led economic models, while ensuring stability, often curtail private sector development and can lead to jobless growth (Hanieh 2016)

The labor market in the Middle East also plays a role in deepening income disparities. With a heavy reliance on expatriate labor, particularly in the lower and middle tiers of the job market, local populations often find themselves either in high-paying public sector jobs or unemployed. This divide leads to a polarized income distribution, with expatriates earning considerably less than their local counterparts (Kapiszewski 2016).

Furthermore, the lack of progressive taxation systems and strong redistributive policies means that the benefits of growth are not evenly distributed. In many countries, public services, which are essential for leveling the playing field, such as education and healthcare, are underfunded or not universally accessible, further entrenching inequality (Cammett et al. 2018).

Gender also plays a role in the region's inequality. The Middle East has one of the world's lowest female labor force participation rates. Sociocultural

norms, coupled with policy constraints, limit women's economic opportunities, leading to a gendered dimension to the region's income disparities (Moghadam 2004).

This disparity, both within and across countries, emphasizes the need for a thorough economic investigation. Specifically, understanding how monetary policy interacts with other macroeconomic variables in Middle Eastern economies becomes crucial. This paper examines the impact of monetary policy on income inequality in the Middle East since existing context-specific research is limited.

2.2 Monetary Policy and Income Inequality

Ncube, Anyanwu, and Hausken (2014) show that in the Middle East and North African (MENA) region, income inequality diminishes economic growth and exacerbates poverty. In a study on Turkey, Arslan (2019) applied income decomposition to data from the 2000s, revealing that simultaneous reductions in borrowing and real interest, coupled with a decline in financial income, can lead to improvements in income distribution.

Turning to Nigeria, Adeleye (2021) analyzed data spanning 1980 to 2015 and uncovered an indirect link between real interest and inequality, mediated through bank credit. Guza et al. (2020) report on the pronounced inequality in Nigeria, as evidenced by the Gini coefficient. They identify growth, educational levels, and per-capita GDP as pivotal drivers of income disparity.

Asogwa et al. (2022) employed the General Method of Moment (GMM) in their study on 28 selected African economies. They found a negative association between income inequality and economic growth, rejecting the Kuznets curve hypothesis. Additionally, they discovered that wage rates, the labor force, and inflation rate all negatively influence income inequality. Education and unemployment were found to elevate inequality.

In an analysis by Oxfam, Abdo (2019) explored the ramifications of International Monetary Fund (IMF) policies on Middle East Northern Africa (MENA) countries, focusing on Egypt, Jordan, and Tunisia. The study examined aspects such as income inequality, the fallout of monetary policy decisions, gender-related impacts, and the dynamics of public debt, among others. A central point of Abdo's research is the worsening state of income inequality in these nations, particularly following the roll-out of reform agendas that were prerequisites for IMF loans. The study stated that the IMF recommended a monetary tightening stance for several nations, with Tunisia and Egypt being notable

examples. In compliance with these recommendations, both nations increased their interest rates. However, an IMF report later acknowledged the potential risks associated with such strategies. Specifically, the report suggested that a currency devaluation in Egypt or a prolonged increase in real interest rates could initiate unfavorable debt trajectories for the nation. Moreover, as these countries grappled with such monetary shifts, their public debt financing priorities underwent a significant transformation. The focus moved from subsidies towards addressing public debt. This transition had a ripple effect on income redistribution, resulting in a shift of resources from the general public - with women being disproportionately affected - towards creditors.

Furthermore, Saiki and Frost (2014) employed a Vector Autoregression (VAR) model on Japanese data, discovering that unconventional monetary policy, a relatively recent approach, exacerbated income inequality.

Mian, Straub, and Sufi (2021) found that the US, since the 1980s, has experienced downward pressure on interest rates. Using the Survey of Consumer Finances data, they attribute this trend to a surge in savings, often termed as the country's "savings glut." While inequality intensified, the affluent accumulated more wealth, leading to increased savings and potentially fostering greater inequality. This data indicates that increasing inequality tends to reinforce itself.

Coibion et al. (2017) examined the repercussions of monetary policy shocks upon income and consumption inequality from 1980 onwards. They found that contractionary monetary policy amplified disparities in labor income, overall income, consumption, and total expenditures. This study also attributed a significant fraction of historical cyclical variance in both income and consumption inequality to these monetary shocks.

Within the UK, Mumtaz and Theophilopoulou (2017) used micro-level data spanning 1969-2012, revealing that contractionary monetary shocks intensified wage, income, and consumption disparities. They further noted that households with lower income and consumption bear a disproportionately adverse impact from such policies, compared to wealthier segments.

Research on Denmark by Andersen et al. (2022) highlighted that the benefits of relaxed monetary policy increased with ex-ante income, suggesting monetary policy indirectly boosts inequality. Bielecki, Brzoza-Brzezina, and Kolasa (2022) argued that monetary easing reduces net worth inequality, though this shift benefits younger generations at the expense of senior ones.

Recent challenges such as the asymmetric effects of the COVID-19 pandemic,

interest rate hikes in advanced economies, and rising costs of essentials including food and energy, have made addressing distributional issues crucial (Osakwe and Solleder 2023). Research on advanced economies by O'Farrell and Rawdanowicz (2017) indicated that while monetary easing's impacts on income and net wealth inequality remain unclear due to the complex interplay of contributing factors, such impacts are often minimal in real-world scenarios. Amaral (2017) echoed this sentiment, suggests that traditional monetary policy's redistributive effects are overall negligible, though unconventional policies' effects on inequality remain inconclusive.

Lastly, Furceri, Loungani, and Zdzienicka (2018), analyzing data from 32 countries between 1990 and 2013, posited that an unexpected 1% hike in the policy rate increases inequality by approximately 1.25% in the short term and nearly 2.25% in the long term.

2.3 Alternative Perspectives and Contending Views

While several studies highlight the influence of monetary policy on income inequality, others present contrasting views. Dossche, Slacalek, and Wolswijk (2021) posited recent inequality trends in advanced economies, evident since the 1980s, cannot be solely attributed to their monetary policies. The authors further argue that recent accommodative monetary policies could have provided a degree of equilibrium.

Yellen (2016) has posited that while monetary policy can influence inequality, its primary purpose remains the stabilization of prices and employment. Yellen suggests that focusing on monetary policy as a primary tool to address inequality might overlook more significant structural factors.

Another viewpoint comes from Kumhof, Rancière, and Winant (2015), who emphasize the role of financial deregulation and the rise of credit supply as significant drivers of increased income and wealth inequality, suggesting that it might not be monetary policy per se, but the broader financial environment that impacts inequality.

Lastly, Anthony B. Atkinson (2017) reiterates the need to adopt a broader view of inequality, emphasizing that while monetary policy might impact income and wealth distribution, other dimensions of inequality, such as health and education, are influenced by a myriad of other factors.

2.4 Methodological Considerations

Determining the ideal model to analyze the interplay between monetary policy and income inequality presents challenges. The variables in question, relating to monetary policy and inequality, have shown both concurrent and lagged interactions. However, the Panel Vector Autoregression (PVAR) model emerges as a popular methodological choice. For instance, Liosi and Spyrou (2022) utilized PVAR with data from 2005 to 2017 for the Eurozone, concluding that monetary policy tends to exacerbate income inequality. Zungu and Greyling (2022), employing the same PVAR approach, discovered that a sudden 1% shock in unconventional monetary policy drives income inequality through various channels, including earning heterogeneity and portfolio composition.

Embarking on a different approach, Mumtaz and Theophilopoulou (2017) used the Structural Vector Autoregression (SVAR) model on UK data spanning from 1969 to 2012. Their findings echoed the sentiment that monetary policy shocks contribute to surges in income, consumption, and earnings inequality . Furceri, Loungani, and Zdzienicka (2018) employed Impulse Response Functions (IRFs) derived from local projections to reach a congruent conclusion. This paper aims to replicate their work within a Middle Eastern context. A key distinction lies in the nature of the monetary shocks explored. Contrary to their study that primarily focused on unanticipated monetary shocks, this research delves into the broader scope of monetary policies, avoiding the limitations of solely examining unanticipated variations.

PVAR is advantageous in several manners. It is efficient in utilizing both time series and cross-sectional data, and particulary beneficial when data might be limited in one of these dimensions. This model also stands out for its ability to incorporate heterogeneity across units, a significant feature when examining diverse regions or countries in order to capture specific effects that might be overlooked in standard VAR models (Canova and Ciccarelli 2013). Additionally, the ability of the PVAR to capture dynamic interactions, along with its provision for impulse response analysis, offers deeper insights into the temporal effects of policy changes or shocks (Love and Zicchino 2006). Finally, the model's design controls for endogeneity, ensuring that the identified relationships are more consistent and less biased. These distinctive capabilities of the PVAR render it a robust and versatile tool in econometric analysis, particularly in understanding complex relationships.

While the PVAR model, with its data efficiency, heterogeneity capturing,

dynamic interactions, and control for endogeneity has emerged as a widely used and trusted choice, it is not without limitations. One notable challenge is the 'curse of dimensionality'. As the number of variables in the model increases, the required data points grow exponentially, potentially leading to overfitting (Baltagi 2005). Additionally, as with all panel data models, PVAR assumes consistent relationships across cross-sectional units, which might not always hold true within diverse samples (Holtz-Eakin, Newey, and Rosen 1988). Moreover, identifying structural shocks in a PVAR context can be more challenging than in a pure time-series framework due to the added complexity of the cross-sectional dimension (Canova and Ciccarelli 2013). Consequently, while the PVAR is a robust tool, researchers must exercise caution in its application and interpretation.

2.5 Conclusion Research Gap

The established relationships between money supply, policy rate, and inequality often diverge from theoretical anticipations, such as those posited by the Kuznets Hypothesis. Overall, there is literature exploring the relationship between monetary policy and income inequality within the context of advanced economies. This paper aims to bridge the research gap by drawing insights from seminal works like that of Furceri, Loungani, and Zdzienicka (2018), adapting and applying their methodologies to the unique context of the Middle East.

3 Theoretical and Empirical Framework

3.1 Theoretical Framework

Kuznets (1955) demonstrated that there is a changing relationship between inequality of income and economic growth, with a positive relationship throughout the early stage and a negative relationship over the mature stage. Following his work, other research initiatives began to illustrate that while growth had unclear impacts on inequality, income disparity was harmful to economic growth. It has been found that policies concerning transferring payments and public expenditure can initiate income redistribution while rent seeking behavior and lobbying may discourage redistribution affecting both inequality and development (Mdingi and Ho 2021). Coibion et al. (2017) shows that there are several channels through which monetary policy can affect inequality, namely: (a) income

composition channel: if monetary policy causes a greater positive impact on profits rather than wages, income inequality will rise; (b) financial segmentation channel: frequent participants in the financial markets, if affected by changes in money supply compared to non-participatory ones, will experience greater income and consumption compared to their counterparts, consequently exacerbating inequality; (c) portfolio channel: if individuals with lower income tend to hold more currency than their higher income counterparts, central banks' inflationary actions will transfer money from the poor towards wealthy individuals enhancing inequality of the concerned economy.

These theoretical findings offer the following framework for the concept of Income Inequality 2:

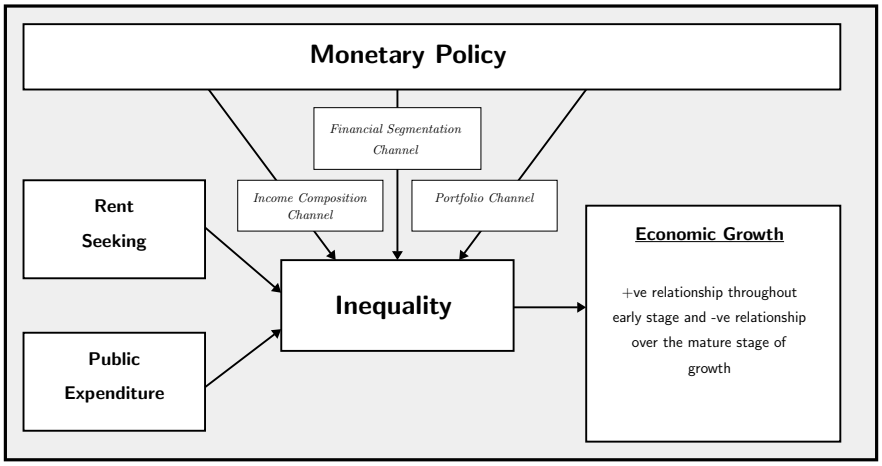


Figure 2: Theoretical Framework

These theoretical findings reveal that income inequality is eventually affected by various policy measures, including the monetary policies of an economy, requiring researchers to both consider and empirically analyze a wide range of potential factors and relationships.

Prior empirical studies on income inequality have yielded diverse results across different contexts. For instance, in a comprehensive analysis of the effects of globalization on income distribution in developing countries, Milanovic (2005) found that factors like money supply, unemployment, inflation rate, and savings can have significant implications for income inequality. Ahmad (2016) used Fixed Effect and system Generalized Method of Moments (GMM) estimations

on a sample of 117 countries for a time frame ranging between 1970-2014, to find that freedom concerning international trade, erratic inflation along with money supply as well as smaller size of governments have significant relationships with inequality. A separate study applied the fixed-effect model on economic data from ASEAN-5 countries to find that financial development positively affect inequality (Azam and Raza 2018). An empirical study on Euro-area found that a reduction in unemployment due to monetary policy intervention reduces the degree of increase in inequality (Alves and Silva 2021). An empirical study on OECD countries between 1971 and 2010 found that increase in inflation reduces inequality, as long as the rate does not reach approximately 13% and increases inequality after that threshold (Monnin 2014). Therefore, it is implied that any policy intervention (such as the monetary policy) that reduces inflation after it reaches 13%, will reduce income inequality within OECD countries. Choi (2006), focusing on 119 countries between 1993 and 2002, found that increases in per-capita GDP reduce income inequality. The same is true for real per-capita GDP growth. An inverse U-relationship between GDP (that is calculated based on per-capita basis) and income inequality (Barro 2008). However, contrary evidence were also found. Case in point, Scognamillo, Mele, and Sensini (2016) finds that no significant relationship exists between income inequality and GDP per-capita. Such evidence established the fact that monetary policy lies along a set of common variables across countries and regions, with variables such as interest rate, GDP and unemployment all affecting inequality of the concerned economies. Based on the above theoretical and empirical discussions, the following hypotheses have been developed:

Null Hypothesis, H_0: There is no relationship among money supply, interest rate, economic development, and income inequality.

Hypothesis, H_{1a}: Money Supply is positively associated with income inequality.

Hypothesis, H_{2a}: Interest rate is negatively associated with income inequality.

Hypothesis, H_{3a}: Per-capita GDP is negatively associated with income inequality.

Hypothesis, H_{4a}: Unemployment Rate is positively associated with income inequality.

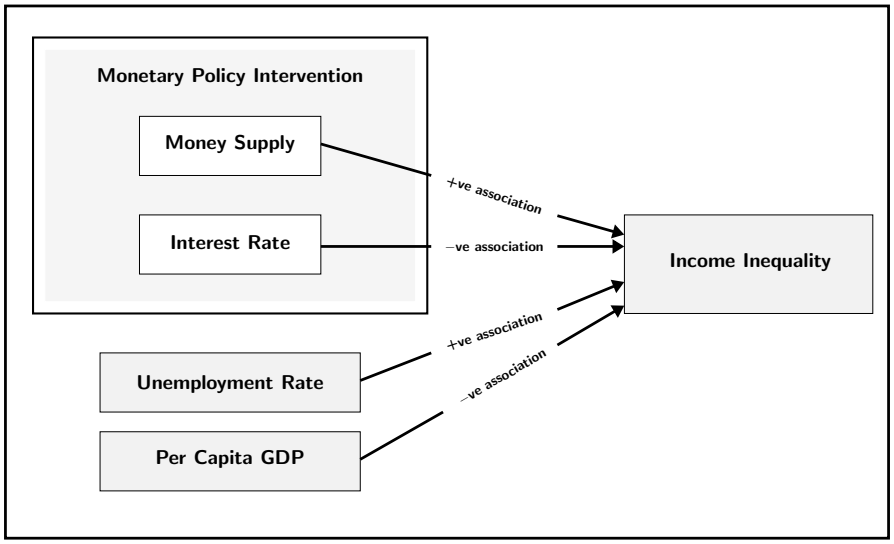


Figure 3: Conceptual Framework

3.2 Model

This study investigates the relationship between monetary policy and income inequality. To achieve this objective, I estimate a Panel Vector Autoregression (PVAR) model to explore causal relationships by observing how lagged values of the independent variables impact dependent variables. The PVAR model presents two significant econometric advantages for this purpose. Firstly, it captures dynamic interdependencies across multiple time series within a panel data framework. Secondly, it accounts for individual heterogeneities while facilitating dynamic interactions among various endogenous variables.

Holtz-Eakin, Newey, and Rosen (1988) introduced the fusion of panel data with traditional VAR models, resulting in the PVAR models. Following such research, this econometric approach gained more prominence in the literature due to two key factors: its proficiency in capturing interrelationships among time-series variables across differing nations, and its ability to account for unobserved individual-specific effects. In the case of the analysis of monetary policy, the PVAR model is an effective econometric model to estimate the impact of policy changes on economic variables.

Furthermore, the choice to test for stationarity using the Harris-Tzavalis unit-root test (Harris and Tzavalis 1999) ensures the robustness of the PVAR approach, as non-stationarity can lead to spurious results.

The following four equations represent the Least Square Dummy Variable (LSDV) VAR model:

$$y_{j,t} = \sum_{i=1}^{k} b_{1,i} y_{j,t-i} + \sum_{i=1}^{k} c_{1,i} f_{j,t-i} + \sum_{i=1}^{k} d_{1,i} r_{j,t-i} + \sum_{i=1}^{k} g_{1,i} s_{j,t-i} + \eta_{1,j} + \varphi_{1,t} + \varepsilon_{1,j,t} \tag{1}$$

$$f_{j,t} = \sum_{i=1}^{k} b_{2,i} y_{j,t-i} + \sum_{i=1}^{k} c_{2,i} f_{j,t-i} + \sum_{i=1}^{k} d_{2,i} r_{j,t-i} + \sum_{i=1}^{k} g_{2,i} s_{j,t-i} + \eta_{2,j} + \varphi_{2,t} + \varepsilon_{2,j,t} \tag{2}$$

$$r_{j,t} = \sum_{i=1}^{k} b_{3,i} y_{j,t-i} + \sum_{i=1}^{k} c_{3,i} f_{j,t-i} + \sum_{i=1}^{k} d_{3,i} r_{j,t-i} + \sum_{i=1}^{k} g_{3,i} s_{j,t-i} + \eta_{3,j} + \varphi_{3,t} + \varepsilon_{3,j,t} \tag{3}$$

$$s_{j,t} = \sum_{i=1}^{k} b_{4,i} y_{j,t-i} + \sum_{i=1}^{k} c_{4,i} f_{j,t-i} + \sum_{i=1}^{k} d_{4,i} r_{j,t-i} + \sum_{i=1}^{k} g_{4,i} s_{j,t-i} + \eta_{4,j} + \varphi_{4,t} + \varepsilon_{4,j,t} \tag{4}$$

In this context, the variables are defined as follows: $y_{j,t}$ represents income inequality, measured using the Gini Index; $f_{j,t}$ signifies the natural logarithm of narrow money (M1) and alternatively, policy rate (since two versions of each equation are used for an alternative set of monetary policy variables); rj,t$r_{j,t}$ corresponds to the unemployment rate; sj,t$s_{j,t}$ stands for the natural logarithm of GDP per-capita; η_j denotes the country-specific fixed effect; φ_t represents time fixed effects; and $\varepsilon_{j,t}$ is a random error with normal distribution. With respect to the subindex, j represents the country and t denotes the time period. Additionally, k represents the number of lags considered for each variable.

3.3 GMM Estimation

According to Hayakawa (2016), the GMM estimation of the Panel VAR model improves its asymptotic properties. Moreover, GMM estimation ensures the robustness of the findings. In this sense, I use the following equation for the GMM Models:

$$y_{it} = \alpha_0 + \sum_{k=1}^{p} \alpha_{1j} y_{it-k} + \sum_{k=1}^{p} \alpha_{2k} f_{it-k} + \sum_{k=1}^{p} \alpha_{3l} r_{it-k} + \sum_{k=1}^{p} \alpha_{4m} s_{it-k} + \eta_{1i} + \mu_{1it} \tag{5}$$

$$f_{it} = \beta_0 + \sum_{k=1}^{p} \beta_{1j} y_{it-k} + \sum_{k=1}^{p} \beta_{2k} f_{it-k} + \sum_{k=1}^{p} \beta_{3l} r_{it-k} + \sum_{k=1}^{p} \beta_{4m} s_{it-k} + \eta_{2i} + \mu_{2it} \quad (6)$$

$$r_{it} = \gamma_0 + \sum_{k=1}^{p} \gamma_{1j} y_{it-k} + \sum_{k=1}^{p} \gamma_{2k} f_{it-k} + \sum_{k=1}^{p} \gamma_{3l} r_{it-k} + \sum_{k=1}^{p} \gamma_{4m} s_{it-k} + \eta_{3i} + \mu_{3it} \quad (7)$$

$$s_{it} = \varphi_0 + \sum_{k=1}^{p} \varphi_{1j} y_{it-k} + \sum_{k=1}^{p} \varphi_{2k} f_{it-k} + \sum_{k=1}^{p} \varphi_{3l} r_{it-k} + \sum_{k=1}^{p} \varphi_{4m} s_{it-k} + \eta_{4i} + \mu_{4it} \quad (8)$$

Where, $y_{i,t}$ is the income inequality, $f_{i,t}$ is the natural logarithm of narrow money (M1) and alternatively, policy rate, $r_{i,t}$ is the unemployment rate, while $s_{i,t}$ is the natural logarithm of GDP per-capita. $\mu_{i,t}$ is a random disturbance and is approximately normal. η is the country specific effect. Error term $\mu_{i,t}$ are orthogonal to country-specific effects and the lagged values of the endogenous variables.

Within the framework of econometrics, the application of GMM estimation to the panel VAR model has the potential to enhance the properties and consistency of the results. However, certain crucial conditions must be met for this to hold true. As emphasized by Blundell and Bond (1998), especially in the case of univariate analysis, GMM estimators face challenges related to weak instruments when the variable under investigation is on the verge of exhibiting a unit root. This underscores the importance of conducting a comprehensive examination of the stationarity of the variables.

4 Data

4.1 Data Source

The primary data for this study is extracted from the Standardized World Income Inequality Database (SWIID). SWIID serves as a database of data spanning various countries over different time periods, capturing measures such as Gini Disposable Income, Gini Market Income, Relative Redistribution, and Absolute Redistribution. (Solt 2020).

All other relevant variables such as GDP per-capita, unemployment rate, M1

money supply, and the policy rate have been extracted from Economics (2023) to ensure consistency between countries by using an identical data source.

A significant obstacle in income inequality research is the availability of exhaustive datasets. Yet, SWIID offers a notable exception, providing a vast dataset spanning 153 countries since 1960. However, it's worth noting the SWIID's reliance on underlying sources that may vary in quality, potential gaps in data, and the challenges associated with standardizing and interpolating data, which might sometimes overlook specific nuances of inequality (Jenkins 2015; Niño-Zarazúa, Roope, and Tarp 2017).

4.2 Sampling Selection

The aim of this research is to examine the effects of various monetary policy approaches on income inequality within key Middle Eastern nations. For this purpose, I sourced data on income inequality, narrow money (M1), unemployment rates, and GDP per-capita from the following Middle Eastern countries: Egypt, Iran, Iraq, Jordan, Lebanon, Qatar, Israel, Saudi Arabia, Syria, Turkey, and UAE.

Countries such as Kuwait, Bahrain, and Palestine were excluded due to the absence of comprehensive data on pivotal variables. The eleven economies incorporated in this research are of notable regional significance (Statista 2023). Given their representative nature, the patterns and dynamics identified in these countries can be generalized to the wider Middle Eastern landscape.

4.3 Data Composition

This study uses data covering a 27-year period, from 1996 through 2022, for the chosen Middle Eastern countries, giving a total of 297 observations. Studies have advocated for the use of Panel VAR models when dealing with datasets that have at least 250 observations (Clements, Hurn, and S. Shi 2017).

4.4 Variables

This section outlines the variables used in this study. Table 1 details the definitions for each variable.

The Gini index is used in this study to measure income inequality. This index provides insights into income inequality from two perspectives: disposable

Relevant Study Variables	Description
Policy Rate (in %)	Central bank policy rate
M1 Money Supply	M1 Money Supply (Liquid deposits)
Unemployment Rate (%)	Unemployment rate
GDP per Capita	GDP per-capita at constant prices
Gini (Disposable Income)	Gini index using disposable income
Gini (Market Income)	Gini index using market income

Table 1: Variable Descriptions

income (after taxes and transfers) and market earnings (before taxes and transfers) (Luebker 2010). As additional variables, GDP per-capita and the unemployment rate were integrated into the analysis. Their inclusion is supported by literature supporting their association with income inequality, especially when juxtaposed with policy rates and the money supply (Silvo et al. 2022; Alves and Silva 2021; Cammeraat 2020; Gbohoui, Lam, and Lledo 2021).

Given the disparate scales inherent within the data variables, I introduced natural logarithm transformations for the money supply and GDP per-capita variables. These transformations are well-regarded for tempering heteroscedasticity, neutralizing pronounced upward trajectories, and facilitating a more congruent fit for linear models (J. M. Wooldridge 2013).

Countries such as Iraq, Lebanon, Syria, and UAE have missing data points for the Gini indices and the policy rate in the earlier years of the dataset. To address this issue, I employed the single imputation method, with a specific inclination towards the median technique. This approach is supported in the literature, for instance, Schafer and Graham (2002) acknowledge its utility in certain contexts. However, it is crucial to recognize the potential pitfalls of imputation. While imputation helps in completing the dataset, it can introduce biases if not performed correctly, potentially leading to misleading inferences. Specifically, single imputation does not account for the uncertainty inherent within imputed values, which can underestimate variances and inflate test statistics (Little and Rubin 2014). Despite its benefits, C. K. Enders (2010) caution that the results derived from imputed data should be interpreted with care, keeping in mind the potential for bias.

Variables	Observations	Mean	Std. Dev.	Min	Max
Policy Rate	297	8.17	5.88	0.1	49.14
M1 Supply	297	11.86	1.69	6.80	15.85
Unemployment	297	9.05	3.34	0.20	18.60
GDP Per Capita	297	8.90	0.91	7.33	11.20
Gini Disposable	297	38.75	2.92	29.70	47.10
Gini Market	297	42.69	4.07	31.90	53.1

Table 2: Summary Statistics

Table 2 presents summary statistics for the key variables employed in this study. The policy rate exhibits a wide range, with a minimum of 0.1 and a maximum of 49.14, indicating significant volatility in some economies. The unemployment rate, which reflects labor market conditions, has a mean of 9.05%, consistent with global averages in the studied period (ILO 2022).

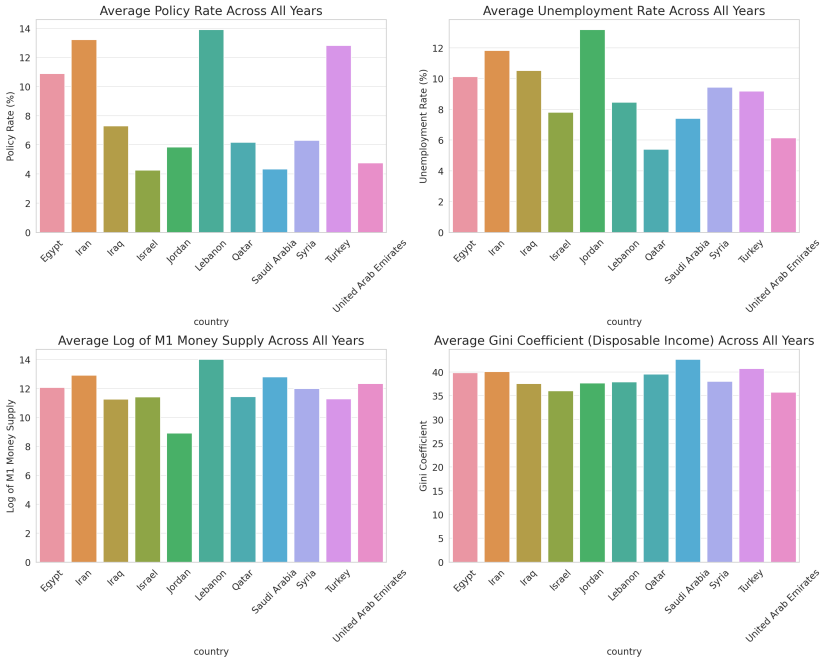


Figure 4: Average Variables for each country

Figure 5: Correlation Heatmap

Correlations that are significant at the 1% are bolded

The presented correlation heatmap presents a positive correlation between the central bank's Policy Rate and the Natural log of the M1 Supply. As central banks elevate policy rates, there appears to be a corresponding increase in the M1 money supply.

The negative correlation between the Natural log of GDP per capita and the Unemployment Rate echoes Okun's law, which theorizes an inverse association between economic output (or GDP) and unemployment rates (Okun 1962). An expanding economy, reflected by a rising GDP per capita, usually leads to a decrease in unemployment due to increased economic activity and improved job opportunities

The positive correlation in the Gini indices highlights persistent income disparities, indicating that market forces alone may not reduce inequality, emphasizing the importance of policy interventions (Anthony B. Atkinson 2017).

Furthermore, the negative correlation between the Natural log of GDP per-capita and the Gini index (disposable income) suggests that as an economy grows, disposable income inequality might decrease. This could be due to progressive tax systems and redistributive measures that aim to balance post-tax

and post-transfer incomes (Piketty and Goldhammer 2014). On the other hand, the positive relationship between the Natural log of GDP per capita and the Gini index (market income) indicates that economic growth might initially widen income gaps. This aligns with the Kuznets curve theory, which posits an inverted-U relationship between economic development and income inequality (Kuznets 1955).

5 Empirical Results

Having detailed the data sources, adjustments, and transformations in the preceding section, attention now shifts to the empirical results to examine the hypothesized relationships among the study's variables.

The Panel Vector Autoregression (PVAR) model was initially utilized in this study. This model is proficient in capturing the effects of lagged predictors on the dependent variables. This section presents results from the Least Square Dummy Variable (LSDV) Panel Vector Autoregression estimations. Robustness tests and interpretation of the Orthogonalized Impulse Response Frequency (OIRF) graphs are also reported.

Prior presenting the core empirical results, a test for data stationairty is conducted. The effective application of the PVAR model mandates data that is stationary and adheres to a strongly balanced panel structure (Aslan and Acikgoz 2021; Rousseau and Wachtel 2000). The dataset already conforms to the criteria of being a strongly balanced panel.

Table 9 in the Appendix highlights the outcomes of the stationarity tests. Results show that not all variables are stationary. Specifically, the natural logarithm of M1 money supply, the natural logarithm of GDP per-capita, Gini index based on both disposable income and market income are non-stationary. In contrast, the policy Rate and the unemployment rates are stationary.

Given these findings, it is necessary to induce stationarity in the non-stationary variables. A widely accepted method to achieve this is the first differencing of the variables (W. Enders 2014). Results from this exercise are reported in 10 in the Appendix

After implementing the first differencing on the non-stationary variables, all variables are now stationary. With this transformation, the dataset is now appropriately prepared, and the LSDV Panel Vector Autoregression model can be confidently applied to these variables at their first difference.

The next step before deploying the PVAR model is to establish the optimal lag length for the variables. Drawing insights from past research, Makhoba and Kaseeram (2022) uses the information criteria as a reliable method for lag selection. Applying the same procedure, the findings are reported in Table 3 below:

Model	**Lag**	**CD**	**J**	**J P-Val**	**MBIC**	**MAIC**	**MQIC**
Gini (Disp.), M1 Supply	1	-1.074	73.702	0.191	-271.490	-54.298	-142.005
	2	-1.080	50.391	0.379	-208.503	-45.609	-111.390
	3	-0.906	27.600	0.689	-144.996	-36.400	-80.254
	4	0.214	10.963	0.812	-75.335	-21.037	-42.964
Gini (Disp.), Policy Rate	1	-1.108	76.097	0.143	-269.096	-51.903	-139.611
	2	-1.156	50.563	0.373	-208.331	-45.437	-111.218
	3	-0.743	26.768	0.729	-145.829	-37.232	-81.086
	4	0.269	5.377	0.994	-80.921	-26.623	-48.550
Gini (Mkt.), M1 Supply	1	-0.941	77.315	0.123	-267.877	-50.685	-138.393
	2	-0.970	54.212	0.250	-204.682	-41.788	-107.569
	3	-0.791	34.292	0.358	-138.304	-29.708	-73.562
	4	0.209	12.300	0.723	-73.998	-19.700	-41.627
Gini (Mkt.), Policy Rate	1	-1.027	72.480	0.219	-272.712	-55.520	-143.228
	2	-0.983	50.289	0.383	-208.605	-45.711	-111.492
	3	-0.689	28.659	0.636	-143.937	-35.341	-79.195
	4	0.278	7.729	0.957	-78.569	-24.271	-46.198

Table 3: Lag Selection Criteria

The results in Table 3 unanimously point towards a lag order of 1 as the most fitting for all models in the study. While this selection aligns with the information criteria, it is crucial to juxtapose this finding with the broader context of the econometric literature. Nowak-Lehmann D et al. (2006) have expressed concerns about the pitfalls of a short lag length. They argue that such a selection can occasionally fail to capture dynamic relationships accurately, potentially leading to misleading results.

J. M. Wooldridge (2013) further adds to this debate by emphasizing the trade-off between capturing dynamics and preserving degrees of freedom. Specifically, he suggests that for annual data, which is the frequency of the dataset, lags between 1 and 2 are typically the most judicious choices. This range ensures that while the model captures sufficient past information, it doesn't excessively compromise the degrees of freedom, which is essential for robust statistical inference.

Balancing these considerations, a maximum lag length of 2 has been chosen

for this study. This choice not only aligns with the empirical findings but also adheres to the best practices.

Variables	Gini Disp	Gini Mkt	M1 Supply	Unemp	Policy)
L1 M1 Supply	0.278*	0.311*			
	(0.159)	(0.173)			
L1 Unemp Rate	0.144**	0.185**			
	(0.0715)	(0.0780)			
L1 GDP Per-Capita	0.853**	0.969***			
	(0.336)	(0.368)			
L2 Unemp Rate			0.058**	-0.157*	
			(0.029)	(0.088)	
L2 GDP Per-Capita			0.250*		
			(0.136)		

*, **, *** represent significance at 10%, 5%, and 1% levels, respectively.

Table 4: LSDV Panel Vector Autoregression Model (only significant associations)

The empirical results presented in Table 4 highlights the relationships between various economic variables and income inequality, as captured by the Gini indices based on both disposable and market income.

The positive relationship between the lagged natural logarithm of M1 money supply and the Gini coefficient highlights the influence of monetary policy on income distribution. A rise in the money supply in a given year exerts upward pressure on income inequality in the subsequent year. This observation resonates with research by Taghizadeh-Hesary, Yoshino, and Rasoulinezhad (2022) and Wienk, Buttrick, and Oishi (2022), suggesting that monetary policy, particularly its expansionary stance, can inadvertently exacerbate income disparities.

Moreover, the positive relationship between the natural logarithm of GDP per-capita and the Gini coefficient suggests a complex economic dynamic. Economic growth is often seen as a solution for many economic problems. However, these results show that growth alone can make income inequality worse if not distributed fairly. This insight is consistent with the notion that swift economic growth can aggravate income inequality in the absence of inclusive policies (Uchida and Oishi 2016; Wahiba and Dina 2023).

Additionally, the positive relationship between the unemployment rate and the Gini coefficient shows the social effects of unemployment. An increase in unemployment appears to coincide with with a rise in income inequality. This suggests that economic progress without corresponding employment opportuni-

ties can be harmful to income inequality. This situation, where growth doesn't create jobs, is important for policymakers to understand.

The interplay between money supply and income inequality, as shown in my findings, mirrors the insights shown by Sieron (2017). When the money supply surges, it does not disseminate evenly across all sectors of the economy. Instead, the additional liquidity typically enters the economy through asset markets, which predominantly benefit those positioned closer to these financial hubs. This influx in liquidity can stoke inflationary pressures, which, without accompanying real economic growth, can distort wealth distribution. Those holding assets, often the wealthier segments of society, see their wealth appreciate, while the lower-income strata grapple with rising costs without equivalent increases in income, exacerbating economic disparities.

Martin et al. (2020) shows that during economic downturns or shocks, the economically vulnerable suffer the most. The COVID-19 pandemic serves as a stark illustration. While businesses shuttered in the wake of the pandemic, the ensuing unemployment wave disproportionately affected the lower income segments. This uneven distribution of economic pain exacerbates income inequality, as those already economically disadvantaged find themselves further marginalized. This further explains the link between unemployment and income inequality.

Murshed (2022) delves deeper into this dynamic, highlighting the vulnerabilities of unskilled and informally employed workers during economic contractions. During downturns, groups already struggling economically face even more job uncertainties. Their roles are often more susceptible to substitution, either by technology or cheaper labor alternatives, suppressing wage growth. Moreover, their limited access to essential services, including healthcare and critical information, further marginalizes them, driving the wedge of income inequality even deeper.

The relationship between the unemployment rate and money supply, as detailed in Table 4, has been a focus of modern economic research. An increase in unemployment in one period leading to a subsequent rise in the money supply is consistent with observations by Blanchard, Dell'Ariccia, and Mauro (2010) in their discussions on monetary policy during times of economic downturn.

Historical economic events and studies provide a backdrop for these findings. For instance, in the aftermath of wars, with economies reeling and unemployment rates surging, Barro (1979) identified a positive response in the M1 money supply to lagged unemployment. This observation underscores the

reactive nature of monetary policy to exogenous shocks that affect the labor market. Building upon Barro's model, Hamburger and Zwick (1981) corroborated the influence of lagged unemployment on money supply expansion. The underlying rationale is intuitive: when faced with rising unemployment, monetary authorities might opt for an expansionary monetary stance, increasing the money supply to stimulate economic activity, spur growth, and counteract rising unemployment.

Furthermore, my findings of the relationship between money supply and GDP growth align with prior work by Sharew Denbel, Wassie Ayen, and Adugna Regasa (2016) and Gnawali (2019) that identifies a unidirectional casuality from GDP growth to money supply or a bidirectional interplay between the two. They delve into these dynamics, underscoring the relationship between an economy's output (GDP) and its liquidity conditions (money supply). Whether as a feedback mechanism where growth triggers monetary adjustments or as part of a broader strategy where monetary conditions aim to steer growth trajectories, the intertwined nature of these variables is evident.

Discrepancies such as those highlighted by Y. Shi, Paul, and Paramati (2022) suggest that the impact of financial development, gauged through parameters including bank credit and money supply, might elevate income levels for the economically disadvantaged at a more pronounced rate, when compared to their affluent counterparts. Such observations can be attributed to the distinct wealth distributions inherent to each economy. While these disparities in wealth distribution remain outside the purview of our investigation, they certainly pave the way for subsequent studies to delve deeper into such an issue. Future research could potentially unravel the complexities behind how the wealth distribution profile of an economy interacts with monetary policy decisions to influence income inequality. Moreover, the study by Wahiba and Dina (2023), presents a contrarian perspective, suggesting that income inequality can exert a dampening effect on GDP growth. This posits a potential bidirectional causality, wherein GDP influences income inequality and is, in turn, impacted by it.

Another intriguing observation from the results is the apparent non-significance of the policy rate on income inequality. This contrasts with earlier research, such as that by Furceri, Loungani, and Zdzienicka (2018), which identified notable impacts. One possible explanation for this divergence can be traced to the unique monetary policy landscape in regions like the Middle East. Espinoza and Prasad (2021) illuminate how the pegged exchange rates and open capital accounts in the GCC countries constrain their independent monetary policy.

However, despite these constraints, the influence of external factors, notably U.S. monetary policy, remains significant in the region. Moreover, the GCC monetary authorities employ a variety of tools beyond policy rates, including reserve requirements and macroprudential measures, to influence liquidity and credit conditions.

5.1 Robustness

The limitations of the LSDV Panel Vector Autoregression model encourage the importance of seeking alternative methods to ensure robustness. While the model's rigidity might render it susceptible to biases, especially in dynamic panel settings, the work of Judson and Owen (1999) offers a promising alternative. Their research emphasizes the potential biases inherent in the dynamic panel data model, even when the time dimension, T, is substantially large. This becomes particularly concerning since deviations from the model's assumptions could significantly impact its application.

Given these challenges, the Generalized Method of Moments (GMM) estimator emerges as a more pragmatic approach. The GMM estimator is particularly advantageous as it is less prone to biases that might affect the LSDV model.

Hayakawa (2016) reinforces the importance of incorporating multiple analyses to ensure the robustness and reliability of research findings. Impulse Response Analysis, Granger Causality, and the stability of Panel VAR models, when applied in conjunction, provide a comprehensive understanding of the relationships at play. This multifaceted approach not only adds depth to the analysis though also accounts for potential inconsistencies that might arise from relying on a singular method.

Moreover, to ensure the robustness of the analysis, it is commendable to consider two alternative reflections of monetary policy - the M1 money supply and policy rates. By analyzing these reflections across both LSDV and GMM models, the research ensures that findings are not merely an artifact of the chosen method but are instead representative of the underlying economic relationships.

Variables	Gini Disp.	M1 Supply	Ln GDP PC
L1. Gini Disp.	0.087**		
	(0.044)		
L1. Unemp	0.162**		
	(0.069)		
L1. Ln GDP PC	0.929*		0.084*
	(0.555)		(0.052)
L2. Ln GDP PC		0.236*	
		(0.123)	

Table 5: GMM Panel VAR estimation - Model 1

*, **, *** represent significance at 10%, 5%, and 1% levels, respectively.

Variables	Gini Disp.	Policy Rate
L1. Gini Disp.	0.079**	
	(0.040)	
L2. Gini Disp.	0.057**	
	(0.027)	
L2. Policy Rate		-0.206**
		(0.081)

Table 6: GMM Panel VAR estimation - Model 2

*, **, *** represent significance at 10%, 5%, and 1% levels, respectively.

Variables	Gini Mkt.	M1 Supply
L1. Unemp	0.203**	
	(0.083)	
L2. Unemp	0.131**	
	(0.062)	
L1. GDP PC	1.080**	
	(0.545)	
L2. GDP PC	0.378*	0.229**
	(0.228)	(0.117)
L1. M1 Supply	0.503*	
	(0.333)	

Table 7: GMM Panel VAR estimation - Model 3

*, **, *** represent significance at 10%, 5%, and 1% levels, respectively.

Variables	Gini Mkt.	Policy Rate	Unemp Rate
L1. Unemp	0.173**		
	(0.076)		
L2. Unemp.	0.111*		
	(0.060)		
L1. GDP PC	0.981*		
	(0.538)		
L2. Policy Rate		-0.205**	
		(0.081)	
L2. Gini Mkt			0.061**
			(0.023)

Table 8: GMM Panel VAR estimation - Model 4

*, **, *** represent significance at 10%, 5%, and 1% levels, respectively.

While the GMM estimation and the LSDV Panel VAR outcomes largely align, slight differences emerge, especially concerning unemployment's second lagged values and Gini Market income. Such discrepancies might be attributed to the inherent methodological variations between GMM and LSDV Panel VAR or the nature of the data used in this study. Jeffrey M Wooldridge (2002) presents that method selection can influence the interpretation of lagged relationships and the robustness of empirical findings in economic models.

Additional tests, such as stability and Granger Causality assessments as seen in figure 14, 15, 16, 17, 10, 11 12, and 13 in the Appendix, are conducted. Stability tests ensure our findings are not fleeting, and the Granger Causality tests unravel the directionality of relationships. For instance, the one-way causality from unemployment to Gini disposable income hints at the potent influence of labor market dynamics on income distribution. In contrast, the two-way causality between unemployment and Gini Market income suggests a deeper, more intertwined relationship. It is worth noting, however, that despite these intricate interplays, monetary policy variables seem to maintain a distance from income inequality dynamics.

The Orthogonalized Impulse Response Functions (OIRFs), as shown in figure 6, 8, 7, and 9 in the Appendix, provide insight into the dynamic interplay between unemployment, money supply, and GDP over differing time horizons. When interpreting OIRFs, it is crucial to remember that these visual representations capture the impact of a one-unit shock in one variable upon another variable, both immediately and over time.

The preliminary examination of unemployment shocks on GDP indicates a clear distinction between short-term and long-term effects. In the immediate aftermath of a spike in unemployment, there is a noticeable uptick in GDP. This observation is in line with the findings of Jordà, Singh, and Taylor (2022) who explored the long-term macroeconomic effects of pandemics, indicating that unemployment shocks can have multifaceted impacts on GDP. This counterintuitive reaction could be attributed to various factors. Perhaps firms, in a bid to maintain profitability following a layoff, could be increasing productivity, leading to a short-term GDP boost. Alternatively, it might be the result of fiscal or monetary stimulus aimed at counteracting the adverse effects of rising unemployment. However, as time progresses, this positive GDP effect diminishes, eventually settling at a zero effect in the long run. This indicates the transient nature of the initial GDP response, emphasizing that the resilience or adaptability of an economy can neutralize the longer-term impacts of unemployment shocks.

An initial money supply shock appears to dampen GDP in the short-term. Gertler and Karadi (2015) also highlight the nuanced effects of monetary policy shocks on economic activity. This immediate decrease could be due to factors such as inflationary pressures or interest rate hikes, which might stifle consumer spending and investments. However, in transition into the medium term, the GDP begins to rebound, potentially reflecting the stimulative effects of a more generous money supply, such as increased lending or consumer spending. Yet, this effect does not persist indefinitely. Eventually, the GDP's response fades, returning to a neutral stance.

When the money supply experiences shocks, there is a distinct reaction in unemployment during short-term. Specifically, unemployment exhibits an upward trend in the initial phase. However, the increased unemployment caused by the money supply shock starts to diminish. By the medium term, the rise in unemployment begins to slow down, and by the long run, the effects of this shock on unemployment dissipate completely. In essence, while money supply shocks might have immediate repercussions on employment, the economy seems to adjust and counterbalance these effects over an extended time period.

In contrast, shocks to inequality, as gauged by the Gini coefficient of disposable income, have a more nuanced influence on the economy. This complements the research by Furceri, Loungani, and Ostry (2019), where they analyzed the persistence of income inequality following various shocks. Initially, there's a boost in national output in the short-term following an inequality shock. How-

ever, this enhancement in GDP does not persist. Over time, the positive effects of the inequality shock on GDP taper off, and by the long run, they evaporate entirely. Concurrently, the unemployment rate also reacts to inequality shocks. The immediate aftermath witnesses a somewhat irregular decline in unemployment. However, similar to GDP's response, the initial effects of the inequality shock on unemployment do not last. The unemployment rate returns to its equilibrium, showing no lingering impacts in both the medium- and long-terms.

Policy rate shocks appear to act as a catalyst for output in the immediate term. Similar findings have been discussed by Nakamura and Steinsson (2018) in their analysis of the effects of monetary policy upon the real economy. Specifically, there is a surge in the rate of change of output shortly after such a shock. However, this surge in output is short-lived. As swiftly as the output rises, it reverts, neutralizing the effects of the shock. The unemployment landscape also reacts to these policy rate shocks, though in a converse manner. Rather than increasing, the rate of change in unemployment dips, continuing this downward trajectory until the fifth period post-shock. Subsequently, the effect plateaus, with no discernible impact on unemployment during subsequent periods.

Transitioning to the realm of inequality shocks, especially those gauged by disposable income, their repercussions on policy rates are multifaceted. Bordo and Meissner (2016) touched upon the interplay between financial crises, policy responses, and inequality. During the immediate aftermath, there is a contraction in the rate of change of the policy rate. However, this decline is not permanent. As the economy transitions to the medium-term, the rate of change of the policy rate rebounds, exhibiting an uptick. By the time the long term is reached, this influence of the inequality shock on policy rates dissipates.

Figure 6 provides insights into the relationship between market income-based inequality shocks and economic outcomes. When the economy is subjected to such shocks, the rate of change in national output displays an escalating trend, peaking at approximately the second period. Beyond this point, the effect diminishes and eventually becomes negligible. Conversely, unemployment reacts differently to these shocks. There is an immediate decline in the rate of change in unemployment, followed by a more gradual and inconsistent reduction in the medium term. As the long term approaches, this effect on unemployment fades away, echoing the transitory nature of these shocks.

The intricate relationship between monetary policy and various economic indicators resonates with the studies by Hasanov and Huseynov (2013) who explored the determinants of inflation in developing oil-based economies, a sig-

nificant portion of which are situated in the Middle East. The detailed nuances of this relationship are apparent through the behavior of different variables in response to shocks in inequality.

For instance, when faced with inequality shocks, the change in the money supply initially descends, bottoming out in the short-term prior to ascending, eventually neutralizing its effects by the third period. This response curve mirrors the shape of the letter "U", highlighting the transitory nature of the impact. Concerning the policy rate perspective, the response to inequality shocks (specifically those captured by the Gini market income) undergoes a decline in the initial period, stabilizes to a certain degree in the subsequent period, and witnesses a steeper drop by the third period. Following this, the effects quickly fade away.

This intricate relationship underscores the presence of both lagged and contemporaneous effects of monetary policy in within such Middle Eastern nations. At its core, the findings suggest that monetary policy, when manifested through alterations in the policy rate and money supply, invariably leaves its footprint on various economic dimensions. While policy rate shifts might not exert a delayed influence on income inequality, their immediate impacts are visible. In contrast, unemployment rates and national output tend to cast a shadow on income inequality, albeit with a delay. The M1 money supply, a core component of monetary policy, interestingly, does not display immediate effects on inequality due to specific monetary stances. It does, however, influence inequality with a time lag.

The results from Granger causality tests further explain the relationship dynamics. My methodological approach is similar to the empirical strategies adopted by Baumeister and Hamilton (2019) in their exploration of the structural interpretation of vector autoregressions. For instance, a clear cause-and-effect relationship is evident between unemployment rates and Gini disposable income. When examining market income, a bidirectional relationship emerges between unemployment and inequality. GDP per-capita, on its part, seems to be a driver for income inequality, influencing its trajectory. Notably, despite the numerous relationships unearthed, monetary policy variables and income inequality remain detached, with no Granger Causality binding them, regardless of the inequality metric employed.

6 Conclusion

The findings indicate a significant association between the M1 money supply and income inequality. A rise in the money supply in a given year is linked with an increase in income inequality the following year. Additionally, while economic growth can potentially enhance prosperity, it can also exacerbate income disparities if not paired with equitable distribution mechanisms. Moreover, a clear relationship between unemployment rates and income inequality underscores the importance of ensuring that economic growth translates into tangible employment opportunities.

Monetary policy's impact on income distribution is complex. An increase in the money supply doesn't lead to uniform wealth distribution. Instead, those better connected to financial centers tend to benefit more, amplifying income disparities. Additionally, the link between unemployment and income inequality highlights the added challenges faced by the economically vulnerable during downturns. However, this research is not without its limitations. The findings, while revealing, may not be universally applicable. They offer insights into the selected Middle Eastern countries, but extrapolating them to regions with differing economic and sociopolitical climates might be premature. Moreover, the study's reliance on specific datasets and models might introduce biases that could tint the outcomes.

While this study offers insights into the relationship between monetary policy and income inequality in selected Middle Eastern countries, it has its constraints. The findings, shaped by data adjustments and imputations, may not be universally applicable. Extrapolating these results to regions with divergent economic or sociopolitical landscapes warrants caution. Additionally, the choice of datasets and modeling techniques could introduce potential biases, influencing the study's conclusions. Future research might consider these limitations when building upon this work.

The findings show the need for strategic policymaking. While economic growth is beneficial, it must be balanced to ensure societal equity. The evident correlation between unemployment and income disparities emphasizes the necessity for strategies that create real employment opportunities alongside growth. Given monetary policy's pronounced impact on income distribution, policymakers must exercise caution to prevent unintended exacerbations of economic inequalities.

Future research should further explore the relationship between wealth dis-

tribution and monetary policy, examining the influence of the former on the latter. The observed lack of impact from the policy rate on income inequality in this study suggests other potential areas for investigation.

In conclusion, this study offers insights into the intricate interactions of essential economic variables, relevant to both the Middle Eastern context and the broader global perspective. While the findings establish a foundational understanding, they underscore the need for continued research in this domain.

7 References

Abdo, Nabil (Oct. 2019). *The Gendered Impact of IMF Policies in MENA: The case of Egypt, Jordan and Tunisia*. Tech. rep. DOI: 10.21201/2019.5143. URL: http://hdl.handle.net/10546/620878.

Adeleye, Bosede Ngozi (2021). "Unbundling interest rate and bank credit nexus on income inequality: structural break analysis from Nigeria". In: *Journal of Financial Regulation and Compliance* 29.1. ISSN: 17400279. DOI: 10.1108/JFRC-04-2020-0035.

Ahmad, Mahyudin (2016). "Middle income trap and income inequality: Empirical evidence on the distributional effect of economic liberalization and political regime".

Alvaredo, Facundo, Lydia Assouad, and Thomas Piketty (2019). "Measuring lnequality in the Middle East 1990–2016: The World's Most Unequal Region?" In: *Review of Income and Wealth* 65.4. ISSN: 14754991. DOI: 10.1111/roiw.12385.

Alves, José and Tomás Silva (2021). "An Empirical Assessment of Monetary Policy Channels in Income and Wealth Disparities". In: *Comparative Economic Studies* 63.3. ISSN: 14783320. DOI: 10.1057/s41294-021-00149-0.

Amaral, Pedro (2017). "Monetary Policy and Inequality". In: *Economic Commentary (Federal Reserve Bank of Cleveland)*. ISSN: 0428-1276. DOI: 10.26509/frbc-ec-201701.

Andersen, Asger Lau et al. (2022). "Monetary Policy and Inequality". In: *SSRN Electronic Journal*. DOI: 10.2139/ssrn.4197131.

Arslan, Fatma Pınar (2019). "Public Debt and Income Inequality in Turkey". In: *Journal of Research in Economics* 3.2. ISSN: 2636-8307. DOI: 10.35333/jore.2019.50.

Aslan, Çağlayan and Senay Acikgoz (2021). "Analysis of global economic policy uncertainty and export flows for emerging markets with panel VAR modeling". In: *International Journal of Emerging Markets*. ISSN: 17468817. DOI: 10.1108/IJOEM-12-2020-1570.

Asogwa, Fredrick O. et al. (2022). "Do macroeconomic indicators determine income inequality in selected African countries?" In: *Journal of Public Affairs* 22.4. ISSN: 14791854. DOI: 10.1002/pa.2560.

Atkinson, A B and Salvatore Morelli (2011). *Economic Crises and Inequality*. Tech. rep. UNDP-HDRO. URL: https://ssrn.com/abstract=2351471.

Atkinson, Anthony B. (2017). *Inequality: What can be done?* DOI: 10.17323/1726-3247-2017-2-41-79.

Azam, Muhammad and Syed Ali Raza (2018). "Financial sector development and income inequality in ASEAN-5 countries: Does financial Kuznets curve exists?" In: *Global Business and Economics Review* 20.1. ISSN: 17451329. DOI: 10.1504/GBER.2018.088482.

Baltagi, B (2005). *Econometric analysis of panel data*.

Bank, World (2020). *Yemen's Economic Outlook- April 2020*. Washington, D.C.

Barro, Robert J. (1979). "Unanticipated money growth and unemployment in the United States: Reply". In: *American Economic Review* 69.5. ISSN: 00028282.

— (2008). "Inequality and Growth Revisited". In: *Working Papers on Regional Economic Integration* 11.

Baumeister, Christiane and James D. Hamilton (2019). *Structural interpretation of vector autoregressions with incomplete identifcation: Revisiting the role of oil supply and demand shocks*. DOI: 10.1257/aer.20151569.

Bernanke, Ben S and Mark Gertler (1995). "Inside the Black Box: The Credit Channel of Monetary Policy Transmission". In: *Journal of Economic Perspectives* 9.4. ISSN: 0895-3309. DOI: 10.1257/jep.9.4.27.

Bernanke, Ben S. and Alan S. Blinder (1992). "The federal funds rate and the channels of monetary transmission". In: *American Economic Review* 82.4. ISSN: 00028282.

Bielecki, Marcin, Michał Brzoza-Brzezina, and Marcin Kolasa (2022). "Intergenerational Redistributive Effects of Monetary Policy". In: *Journal of the European Economic Association* 20.2. ISSN: 15424774. DOI: 10.1093/jeea/jvab032.

Blanchard, Olivier, Giovanni Dell'Ariccia, and Paolo Mauro (2010). "Rethinking macroeconomic policy". In: *Journal of Money, Credit and Banking* 42.SUPPL. 1. ISSN: 00222879. DOI: 10.1111/j.1538-4616.2010.00334.x.

Blanchard, Olivier and Jordi Galí (2007). "Real wage rigidities and the new Keynesian model". In: *Journal of Money, Credit and Banking*. Vol. 39. SUPPL.1. DOI: 10.1111/j.1538-4616.2007.00015.x.

Blundell, Richard and Stephen Bond (1998). "Initial conditions and moment restrictions in dynamic panel data models". In: *Journal of Econometrics* 87.1. ISSN: 03044076. DOI: 10.1016/S0304-4076(98)00009-8.

Bordo, M. D. and C. M. Meissner (2016). "Fiscal and Financial Crises". In: *Handbook of Macroeconomics*. Vol. 2. DOI: 10.1016/bs.hesmac.2016.04.001.

Cammeraat, Emile (2020). "The relationship between different social expenditure schemes and poverty, inequality and economic growth". In: *International Social Security Review* 73.2. ISSN: 1468246X. DOI: 10.1111/issr.12236.

Cammett, Melani et al. (2018). *A political economy of the middle east*. DOI: 10.4324/9780429492600.

Canova, Fabio and Matteo Ciccarelli (2013). *Panel vector autoregressive models: A survey*. DOI: 10.1108/S0731-9053(2013)0000031006.

Choi, Changkyu (2006). "Does foreign direct investment affect domestic income inequality?" In: *Applied Economics Letters* 13.12. ISSN: 13504851. DOI: 10.1080/13504850500400637.

Clarida, Richard, Jordi Galí, and Mark Gertler (1999). "The science of monetary policy: A new Keynesian perspective". In: *Journal of Economic Literature* 37.4. ISSN: 00220515. DOI: 10.1257/jel.37.4.1661.

Clements, Adam, Stan Hurn, and Shuping Shi (2017). "An empirical investigation of herding in the U.S. stock market". In: *Economic Modelling* 67. ISSN: 02649993. DOI: 10.1016/j.econmod.2016.12.015.

Coibion, Olivier et al. (2017). *Innocent Bystanders? Monetary policy and inequality*. DOI: 10.1016/j.jmoneco.2017.05.005.

Dossche, M, J Slacalek, and G Wolswijk (2021). "Monetary policy and inequality". In: *Economic Bulletin Articles* 2.

Economics, Oxford (2023). *Unlock the power of economics [Data source]*. URL: https://www.oxfordeconomics.com/.

Elbadawi, Ibrahim and Raimundo Soto (2016). "Resource rents, political institutions and economic growth". In: *Understanding and Avoiding the Oil Curse in Resource-Rich Arab Economies*. DOI: 10.1017/CBO9781316493854.008.

Enders, Craig K. (2010). *Applied missing data analysis [electronic resource]*. Tech. rep.

Enders, Walter (2014). "Applied Econometric Time Series, 4th Edition". In: *John Wiley & Sons*. ISSN: 00401706.

Espinoza, Raphael A. and Ananthakrishnan Prasad (2021). "Monetary Policy Transmission in the GCC Countries". In: *SSRN Electronic Journal*. DOI: 10.2139/ssrn.2127026.

Furceri, Davide, Prakash Loungani, and Jonathan D. Ostry (2019). "The Aggregate and Distributional Effects of Financial Globalization: Evidence from

Macro and Sectoral Data". In: *Journal of Money, Credit and Banking* 51.S1. ISSN: 15384616. DOI: 10.1111/jmcb.12668.

Furceri, Davide, Prakash Loungani, and Aleksandra Zdzienicka (2018). "The effects of monetary policy shocks on inequality". In: *Journal of International Money and Finance* 85. ISSN: 02615606. DOI: 10.1016/j.jimonfin.2017.11.004.

Gbohoui, William, W. Raphael Lam, and Victor Lledo (2021). "The Great Divide: Regional Inequality and Fiscal Policy". In: *SSRN Electronic Journal*. DOI: 10.2139/ssrn.3417725.

Gelvin, J L (2015). *The Arab uprisings: What everyone needs to know*. Oxford, UK: Oxford University Press.

Gertler, Mark and Peter Karadi (2015). "Monetary policy surprises, credit costs, and economic activity". In: *American Economic Journal: Macroeconomics* 7.1. ISSN: 19457715. DOI: 10.1257/mac.20130329.

Gnawali, Laxman (2019). "Money supply and economic growth of Nepal". In: *International Journal of Economics, Business and Management Research* 3.09. ISSN: 2456-7760.

Guza, Garba Mohammed et al. (2020). "The determinants of income inequality in nigeria: An autoregressive distributive lag approach". In: *International Journal of Innovation, Creativity and Change* 11.12. ISSN: 22011323.

Hamburger, Michael J. and Burton Zwick (1981). "Deficits, money and inflation". In: *Journal of Monetary Economics* 7.1. ISSN: 03043932. DOI: 10.1016/0304-3932(81)90057-X.

Hanieh, Adam (2016). *Capitalism and class in the Gulf Arab States*. DOI: 10.1057/9780230119604.

Harris, Richard D.F. and Elias Tzavalis (1999). "Inference for unit roots in dynamic panels where the time dimension is fixed". In: *Journal of Econometrics* 91.2. ISSN: 03044076. DOI: 10.1016/S0304-4076(98)00076-1.

Hasanov, Fakhri and Fariz Huseynov (2013). "Bank credits and non-oil economic growth: Evidence from Azerbaijan". In: *International Review of Economics and Finance* 27. ISSN: 10590560. DOI: 10.1016/j.iref.2013.02.005.

Hayakawa, Kazuhiko (2016). "Improved GMM estimation of panel VAR models". In: *Computational Statistics and Data Analysis* 100. ISSN: 01679473. DOI: 10.1016/j.csda.2015.05.004.

Holtz-Eakin, Douglas, Whitney Newey, and Harvey S. Rosen (1988). "Estimating Vector Autoregressions with Panel Data". In: *Econometrica* 56.6. ISSN: 00129682. DOI: 10.2307/1913103.

ILO (2022). *World employment and social outlook: Trends 2022*. Tech. rep.

Jenkins, Stephen P. (2015). "World income inequality databases: an assessment of WIID and SWIID". In: *Journal of Economic Inequality* 13.4. ISSN: 15738701. DOI: 10.1007/s10888-015-9305-3.

Jordà, Òscar, Sanjay R. Singh, and Alan M. Taylor (2022). "LONGER-RUN ECONOMIC CONSEQUENCES OF PANDEMICS". In: *Review of Economics and Statistics* 104.1. ISSN: 15309142. DOI: 10.1162/rest{_}a{_}01042.

Judson, Ruth A. and Ann L. Owen (1999). "Estimating dynamic panel data models: A guide for macroeconomists". In: *Economics Letters* 65.1. ISSN: 01651765. DOI: 10.1016/s0165-1765(99)00130-5.

Kapiszewski, Andrzej (2016). "Arab versus Asian migrant workers in the GCC countries". In: *South Asian Migration to Gulf Countries: History, Policies, Development*. DOI: 10.4324/9781315684338.

Kettell, Brian (2012). *Introduction to Islamic Banking and Finance*. DOI: 10.1002/9781118467299.

Kumhof, Michael, Romain Rancière, and Pablo Winant (2015). "Inequality, leverage, and crises". In: *American Economic Review* 105.3. ISSN: 19447981. DOI: 10.1257/aer.20110683.

Kuznets, Simon (1955). "Economic Growth and Income Inequality. The American Economic Review". In: *Academy of Management Review* 45(1).

Lake, David A. (2017). "From Resilience to Revolution: How Foreign Interventions Destabilize the Middle East". In: *Political Science Quarterly* 132.1. ISSN: 0032-3195. DOI: 10.1002/polq.12585.

Liosi, Konstantina and Spyros Spyrou (2022). "The impact of monetary policy on income inequality: evidence from Eurozone markets". In: *Journal of Economic Studies* 49.3. ISSN: 01443585. DOI: 10.1108/JES-07-2020-0328.

Little, Roderick J.A. and Donald B. Rubin (2014). *Statistical analysis with missing data*. DOI: 10.1002/9781119013563.

Love, Inessa and Lea Zicchino (2006). "Financial development and dynamic investment behavior: Evidence from panel VAR". In: *Quarterly Review of Economics and Finance* 46.2. ISSN: 10629769. DOI: 10.1016/j.qref.2005.11.007.

Luebker, Malte (2010). *Inequality, Income Shares and Poverty: the Practical Meaning of Gini Coefficients*. ILO.

M. Umer Chapra (2008). *The Islamic vision of development in the light of Maqasid al-Shariah.*

Makhoba, Bongumusa Prince and Irrshad Kaseeram (2022). "Fiscal policy, sovereign debt and economic growth in SADC economies: A panel vector autoregression analysis". In: *Cogent Economics and Finance* 10.1. ISSN: 23322039. DOI: 10.1080/23322039.2022.2107149.

Martin, Amory et al. (2020). "Socio-Economic Impacts of COVID-19 on Household Consumption and Poverty". In: *Economics of Disasters and Climate Change* 4.3. ISSN: 2511-1280. DOI: 10.1007/s41885-020-00070-3.

Mdingi, Kholeka and Sin Yu Ho (2021). "Literature review on income inequality and economic growth". In: *MethodsX* 8. ISSN: 22150161. DOI: 10.1016/j.mex.2021.101402.

Mian, Atif R., Ludwig Straub, and Amir Sufi (2021). "What Explains the Decline in r*? Rising Income Inequality Versus Demographic Shifts". In: *SSRN Electronic Journal*. DOI: 10.2139/ssrn.3916345.

Milanovic, Branko (2005). "Can we discern the effect of globalization on income distribution? Evidence from household surveys". In: *World Bank Economic Review* 19.1. ISSN: 02586770. DOI: 10.1093/wber/lhi003.

Mishkin, F S (2007). *Monetary policy strategy*. Cambridge, MA: MIT press.

Moghadam, Valentine M. (2004). "Patriarchy in transition: Women and the changing family in the Middle East". In: *Journal of Comparative Family Studies* 35.2. ISSN: 00472328. DOI: 10.3138/jcfs.35.2.137.

Monnin, Pierre (2014). "Inflation and Income Inequality in Developed Economies". In: *SSRN Electronic Journal*. DOI: 10.2139/ssrn.2444710.

Mumtaz, Haroon and Angeliki Theophilopoulou (2017). "The impact of monetary policy on inequality in the UK. An empirical analysis". In: *European Economic Review* 98. ISSN: 00142921. DOI: 10.1016/j.euroecorev.2017.07.008.

Murshed, Syed Mansoob (2022). "Consequences of the Covid-19 pandemic for economic inequality". In: *COVID-19 and International Development*. DOI: 10.1007/978-3-030-82339-9{_}5.

Nakamura, Emi and Jón Steinsson (2018). "High-frequency identification of monetary non-neutrality: The information effect". In: *Quarterly Journal of Economics* 133.3. ISSN: 15314650. DOI: 10.1093/QJE/QJY004.

Ncube, Mthuli, John C. Anyanwu, and Kjell Hausken (2014). "Inequality, Economic Growth and Poverty in the Middle East and North Africa (MENA)". In: *African Development Review* 26.3. ISSN: 14678268. DOI: 10.1111/1467-8268.12103.

Niño-Zarazúa, Miguel, Laurence Roope, and Finn Tarp (2017). "Global Inequality: Relatively Lower, Absolutely Higher". In: *Review of Income and Wealth* 63.4. ISSN: 14754991. DOI: 10.1111/roiw.12240.

Nowak-Lehmann D, F et al. (2006). *Problems in applying dynamic panel data models: Theoretical and empirical findings*. Tech. rep. IAI.

O'Farrell, Rory and Lukasz Rawdanowicz (2017). "Monetary policy and inequality: Financial channels". In: *International Finance* 20.2. ISSN: 14682362. DOI: 10.1111/infi.12108.

Okun, Arthur M (1962). "Potential GNP, its measurement and significance". In: *Business and Economics Statistics Section of the American Statistical Association*.

OPEC (2021). *Annual Statistical Bulletin*. Vienna, Austria: OPEC.

Osakwe, Patrick. N. and Olga Solleder (2023). "Wealth Distribution , Income Inequality and Financial Inclusion : A Panel Data Analysis". In: *United Nations Conference On Trade And Development Working Paper* 4.

Piketty, Thomas and Arthur Goldhammer (2014). *Capital in the twenty-first century [electronic resource]*.

Rousseau, P. L. and P. Wachtel (2000). "Equity markets and growth: Cross-country evidence on timing and outcomes, 1980-1995". In: *Journal of Banking and Finance* 24.12. ISSN: 03784266. DOI: 10.1016/S0378-4266(99)00123-5.

Saiki, Ayako and Jon Frost (2014). "Does unconventional monetary policy affect inequality? Evidence from Japan". In: *Applied Economics* 46.36. ISSN: 14664283. DOI: 10.1080/00036846.2014.962229.

Schafer, Josepn L. and John W. Graham (2002). "Missing data: Our view of the state of the art". In: *Psychological Methods* 7.2. ISSN: 1082989X. DOI: 10.1037/1082-989X.7.2.147.

Scognamillo, Antonio, Gianluca Mele, and Luca Sensini (2016). *Nonrenewable Resources, Income Inequality and Per Capita GDP: An Empirical Analysis*. DOI: 10.1596/1813-9450-7831.

Sharew Denbel, Fitsum, Yilkal Wassie Ayen, and Teshome Adugna Regasa (2016). "The Relationship between Inflation, Money Supply and Economic Growth in Ethiopia: Co integration and Causality Analysis". In: *International Journal of Scientific and Research Publications* 6.1. ISSN: 2250-3153.

Shi, Yongfen, Sudeshna Paul, and Sudharshan Reddy Paramati (2022). "The impact of financial deepening on income inequality: Empirical evidence from

Australia". In: *International Journal of Finance and Economics* 27.3. ISSN: 10991158. DOI: 10.1002/ijfe.2338.

Sieron, Arkadiusz (Dec. 2017). "Inflation and Income Inequality". In: *Prague Economic Papers* 26.6, pp. 633–645.

Silvo, Aino et al. (Feb. 2022). *The impact of monetary policy on income and wealth inequality*. URL: https://cepr.org/voxeu/columns/impact-monetary-policy-income-and-wealth-inequality.

Solt, Frederick (2020). "Measuring Income Inequality Across Countries and Over Time: The Standardized World Income Inequality Database". In: *Social Science Quarterly*.

Statista (2023). *MENA region—GDP by country 2022 [Data set]*. URL: https://www.statista.com/statistics/804761/gdp-of-the-mena-countries/.

Taghizadeh-Hesary, Farhad, Naoyuki Yoshino, and Ehsan Rasoulinezhad (2022). "Unconventional monetary policy and income disparity in an aging society". In: *Journal of Economic Policy Reform* 25.4. ISSN: 17487889. DOI: 10.1080/17487870.2021.1968860.

Uchida, Yukiko and Shigehiro Oishi (2016). *The Happiness of Individuals and the Collective*. DOI: 10.1111/jpr.12103.

Wahiba, Nasfi Fkili and Mahmoudi Dina (2023). "Technological Change, Growth and Income Inequality". In: *International Journal of Economics and Financial Issues* 13.1. DOI: 10.32479/ijefi.13831.

Wienk, Margaux N.A., Nicholas R. Buttrick, and Shigehiro Oishi (2022). "The social psychology of economic inequality, redistribution, and subjective well-being". In: *European Review of Social Psychology* 33.1. ISSN: 1479277X. DOI: 10.1080/10463283.2021.1955458.

Woodford, Michael (2011). *Interest and prices: Foundations of a theory of monetary policy*. DOI: 10.1111/j.0013-0427.2005.430{_}2.x.

Wooldridge, J. M. (2013). "Introductory Econometrics A Modern Approach, Fifth Edition". In: *Cengage Learning, South-Western*. ISSN: 1873-6009.

Wooldridge, Jeffrey M (2002). "Econometric Analysis of Cross Section and Panel Data". In: *Booksgooglecom* 58.2. ISSN: 09331719. DOI: 10.1515/humr.2003.021.

Yellen, Janet L. (2016). *Perspectives on inequality and opportunity from the survey of consumer finances*. DOI: 10.7758/rsf.2016.2.2.02.

Zungu, Lindokuhle Talent and Lorraine Greyling (2022). "Exploring the Dynamic Shock of Unconventional Monetary Policy Channels on Income In-

equality: A Panel VAR Approach". In: *Social Sciences* 11.8. ISSN: 20760760. DOI: 10.3390/socsci11080369.

8 Appendix

Variable	RHO Statistic	Z	p-Value
Logged M1 Supply	0.91	0.62	0.73
Unemployment Rate	0.84	-1.60	0.05
Logged GDP per Capita	0.85	-1.02	0.15
Gini Index (Disposable)	0.85	-1.30	0.097
Gini Index (Market)	0.88	-0.47	0.32
Policy Rate	-0.71	-5.57	0.00

No. of Panels = 11, No. of Periods = 27

Table 9: Harris-Tzavalis unit-root test

Variable	RHO Statistic	Z	p-Value
Diff. Logged M1 Supply	-0.03	-26.30	0.00
Diff. Unemployment Rate	-0.03	-26.30	0.00
Diff. Logged GDP per Capita	0.00	-25.47	0.00
Diff. Gini Index (Disposable)	0.01	-25.08	0.00
Diff. Gini Index (Market)	0.01	-25.31	0.00
Diff. Policy Rate	-0.05	-26.80	0.00

No. of Panels = 11, No. of Periods = 27

Table 10: Harris-Tzavalis unit-root test of Differenced Variables

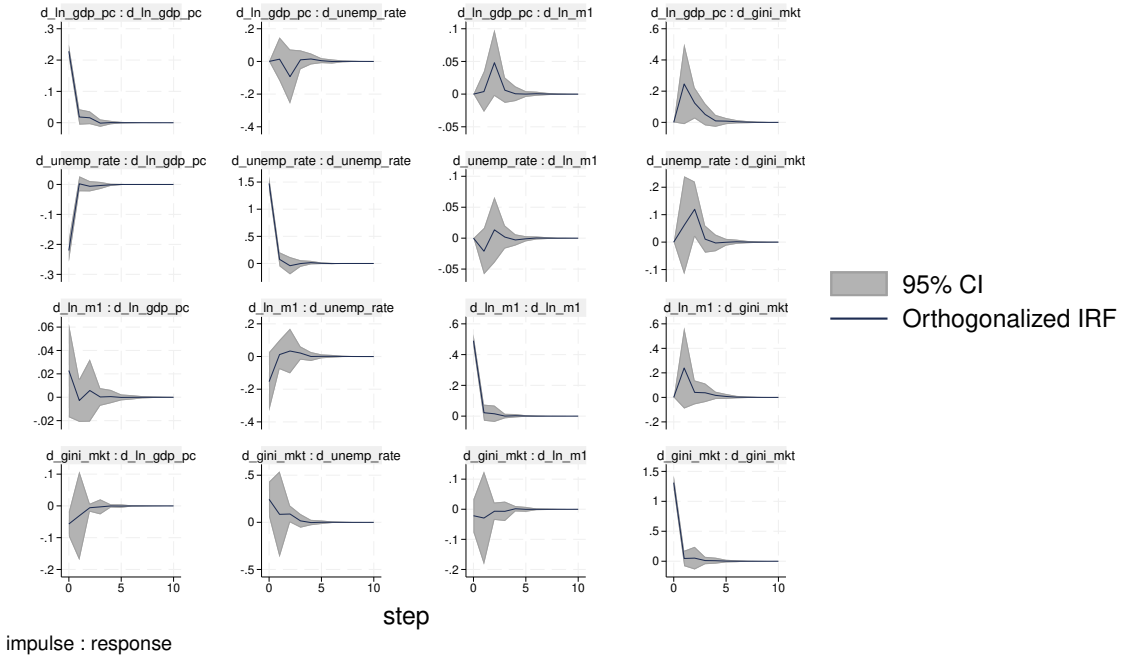


Figure 6: Orthogonalized IRFs with Gini (Market Income) and M1 Supply

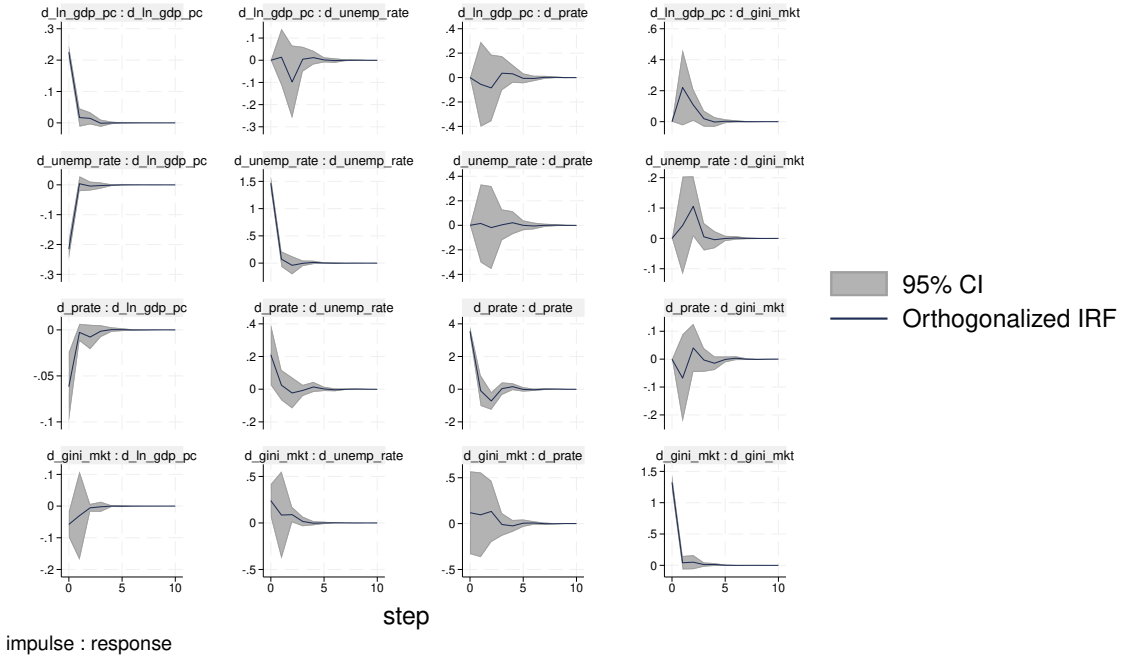


Figure 7: Orthogonalized IRFs with Gini (Market Income) and Policy Rate

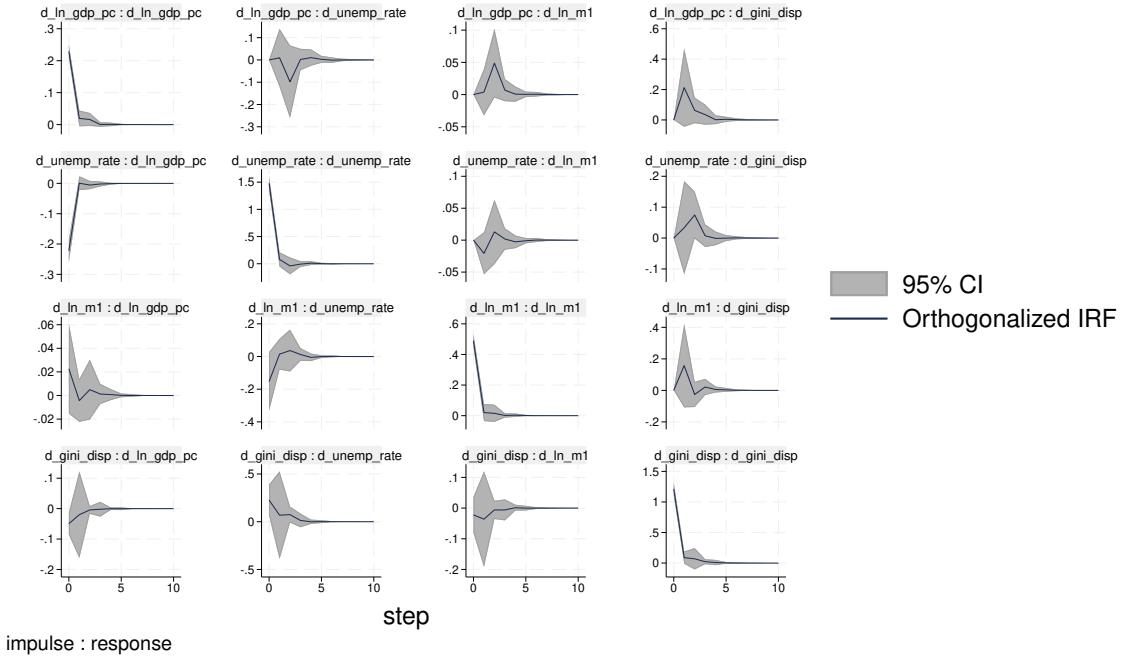


Figure 8: Orthogonalized IRFs with Gini (Dispoable Income) and M1 Supply

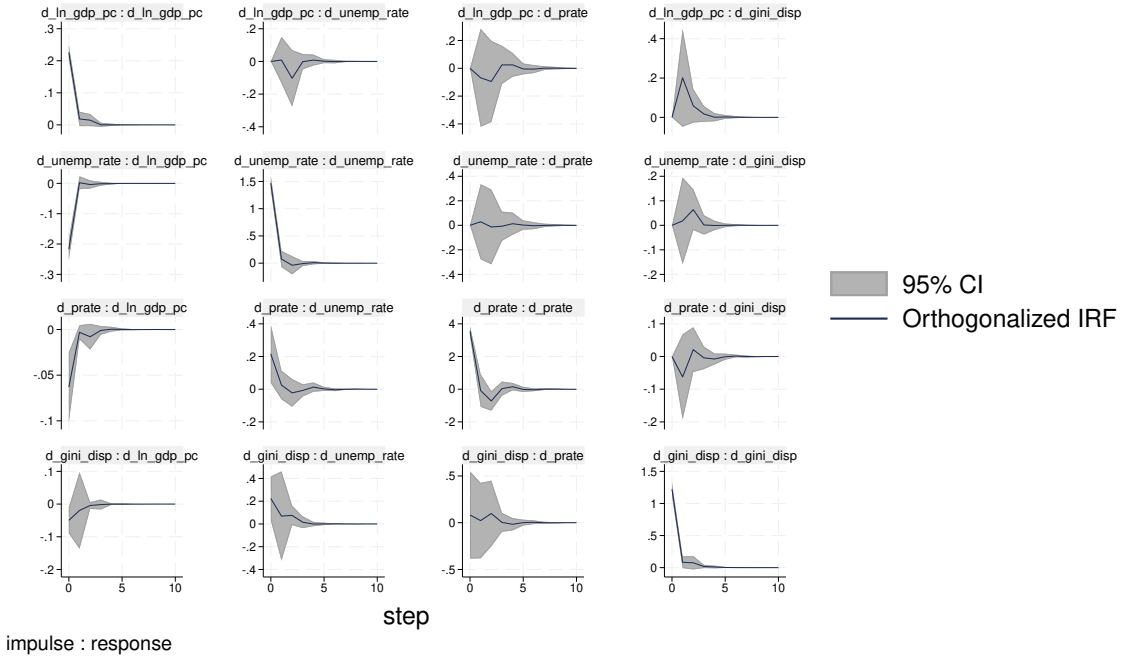


Figure 9: Orthogonalized IRFs with Gini (Disposable Income) and Policy Rate

panel VAR-Granger causality Wald test
Ho: Excluded variable does not Granger-cause Equation variableHa: Excluded variable Granger-causes Equation variable

Equation \ Excluded	chi2	df	Prob > chi2
d1_g_d			
d1 ln m1	1.542	2	0.462
d1_unemp	***4.927***	***2***	***0.085***
d1 lngdp	3.142	2	0.208
ALL	6.807	6	0.339
d1_ln_m1			
d1 g d	0.156	2	0.925
d1 unemp	3.537	2	0.171
d1 lngdp	3.802	2	0.149
ALL	9.603	6	0.142
d1_unemp			
d1 g d	3.669	2	0.160
d1 ln m1	0.318	2	0.853
d1 lngdp	1.578	2	0.454
ALL	5.894	6	0.435
d1_lngdp			
d1 g d	0.310	2	0.857
d1 ln m1	0.455	2	0.796
d1 unemp	2.107	2	0.349
ALL	3.579	6	0.733

Figure 10: VAR Granger Model 1

panel VAR-Granger causality Wald test
Ho: Excluded variable does not Granger-cause Equation variableHa: Excluded variable Granger-causes Equation variable

Equation \ Excluded	chi2	df	Prob > chi2
d1_g_d			
d1 prate	0.940	2	0.625
d1_unemp	***4.620***	***2***	***0.099***
d1 lngdp	3.153	2	0.207
ALL	7.433	6	0.283
d1_prate			
d1 g d	0.446	2	0.800
d1 unemp	0.252	2	0.882
d1 lngdp	0.607	2	0.738
ALL	1.414	6	0.965
d1_unemp			
d1 g d	3.584	2	0.167
d1 prate	0.801	2	0.670
d1 lngdp	1.802	2	0.406
ALL	6.457	6	0.374
d1_lngdp			
d1 g d	0.511	2	0.775
d1 prate	1.597	2	0.450
d1 unemp	2.292	2	0.318
ALL	5.324	6	0.503

Figure 11: VAR Granger Model 2

panel VAR-Granger causality Wald test
Ho: Excluded variable does not Granger-cause Equation variableHa: Excluded variable Granger-causes Equation variable

Equation \ Excluded	chi2	df	Prob > chi2
d1_g_m			
d1 ln m1	2.848	2	0.241
d1_unemp	***7.715***	***2***	***0.021***
d1_lngdp	***6.273***	***2***	***0.043***
ALL	9.503	6	0.147
d1_ln_m1			
d1 g m	0.088	2	0.957
d1 unemp	3.653	2	0.161
d1 lngdp	4.009	2	0.135
ALL	***10.758***	***6***	***0.096***
d1_unemp			
d1_g_m	***4.736***	***2***	***0.094***
d1 ln m1	0.308	2	0.857
d1 lngdp	1.627	2	0.443
ALL	7.041	6	0.317
d1_lngdp			
d1 g m	0.505	2	0.777
d1 ln m1	0.642	2	0.726
d1 unemp	2.401	2	0.301
ALL	3.424	6	0.754

Figure 12: VAR Granger Model 3

panel VAR-Granger causality Wald test
Ho: Excluded variable does not Granger-cause Equation variableHa: Excluded variable Granger-causes Equation variable

Equation \ Excluded	chi2	df	Prob > chi2
d1_g_m			
d1 prate	1.478	2	0.478
d1_unemp	***7.106***	***2***	***0.029***
d1_lngdp	***6.338***	***2***	***0.042***
ALL	9.554	6	0.145
d1_prate			
d1 g m	0.876	2	0.645
d1 unemp	0.283	2	0.868
d1 lngdp	0.561	2	0.756
ALL	1.896	6	0.929
d1_unemp			
d1_g_m	***4.564***	***2***	***0.102***
d1 prate	0.786	2	0.675
d1 lngdp	1.837	2	0.399
ALL	7.694	6	0.261
d1_lngdp			
d1 g m	0.747	2	0.688
d1 prate	1.909	2	0.385
d1 unemp	2.568	2	0.277
ALL	5.145	6	0.525

Figure 13: VAR Granger Model 4

Eigenvalue stability condition

Eigenvalue		
Real	Imaginary	Modulus
.3660945	0	.3660945
.0396597	.3634832	.3656404
.0396597	-.3634832	.3656404
.3065368	0	.3065368
-.2533902	.0885957	.2684321
-.2533902	-.0885957	.2684321
.1456605	0	.1456605
-.1309829	0	.1309829

All the eigenvalues lie inside the unit circle.pVAR satisfies stability condition.

Figure 14: Eigenvalue Stability Condition Model 1

Eigenvalue stability condition

Eigenvalue		
Real	Imaginary	Modulus
-.0103702	-.4664732	.4665885
-.0103702	.4664732	.4665885
.0313343	-.3039498	.3055606
.0313343	.3039498	.3055606
.3035584	0	.3035584
.2396476	0	.2396476
-.2020199	-.0475361	.2075373
-.2020199	.0475361	.2075373

All the eigenvalues lie inside the unit circle.pVAR satisfies stability condition.

Figure 15: Eigenvalue Stability Condition Model 2

Eigenvalue stability condition

Eigenvalue		Modulus
Real	Imaginary	
.0394778	-.3806107	.3826526
.0394778	.3806107	.3826526
.3533343	-.020291	.3539164
.3533343	.020291	.3539164
-.2737223	-.0736574	.2834596
-.2737223	.0736574	.2834596
-.1040071	0	.1040071
.0994336	0	.0994336

All the eigenvalues lie inside the unit circle. pVAR satisfies stability condition.

Figure 16: Eigenvalue Stability Condition Model 3

Eigenvalue stability condition

Eigenvalue		Modulus
Real	Imaginary	
-.0100082	-.4764321	.4765372
-.0100082	.4764321	.4765372
.0296987	.3211772	.3225474
.0296987	-.3211772	.3225474
.3110219	0	.3110219
.2540718	0	.2540718
-.2271561	-.0425417	.2311053
-.2271561	.0425417	.2311053

All the eigenvalues lie inside the unit circle. pVAR satisfies stability condition.

Figure 17: Eigenvalue Stability Condition Model 4