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The Impact of Uncertainty and Macroeconomic on Income Inequality in Indonesia

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Abstract: *This study explores the impact of global uncertainty and macroeconomic factors on income inequality in Indonesia from 1991 to 2023, employing the Autoregressive Distributed Lag (ARDL) and Error Correction Model (ECM) methodologies. The findings reveal that global uncertainty significantly reduces income inequality in the long term, while key macroeconomic variables like unemployment and real income have pronounced effects on inequality in both the short and long term. Unemployment is positively associated with income inequality, exacerbating the disparity as job losses primarily affect the lower-income segments. Real income increases, on the other hand, paradoxically heighten inequality due to the uneven distribution of wealth across socio-economic groups. Inflation, however, was found to have no significant effect on income inequality. The study highlights the role of economic policy uncertainty, which disproportionately affects the wealthier segments during economic downturns, leading to a relative decline in inequality. However, the persistent concentration of wealth among the top 10% underscores the need for policy interventions, including progressive taxation and social assistance programs. Policymakers are urged to address unemployment and ensure equitable income growth to mitigate inequality effectively. The research underscores the necessity of robust strategies to navigate global uncertainties and stabilize macroeconomic conditions to achieve inclusive growth in Indonesia.*

Keywords: Income inequality, global uncertainty, macroeconomics, ARDL, Indonesia

JEL: D31,E32,E60

1. INTRODUCTION

The shock of uncertainty affects the broader economy through multiple channels. During periods of heightened uncertainty, companies adapt their investment and hiring patterns, resulting in a decline in actual economic activity. Decreasing production might impact the overall demand, which then affects pricing (Fischer et al., 2021). Hence, comprehending the influence of uncertainty on the business cycle is essential for effectively managing and appropriately addressing periods of economic downturn. Empirical data indicates that positive uncertainty shocks exert a contractionary impact, resulting in substantial decreases in output, inflation, employment, and their constituent elements. The migration patterns of individuals associated with this channel are frequently regarded as a crucial factor in determining income disparity (Chikhale, 2023).

A study undertaken by Baker et al. (2015) devised an Economic Policy Uncertainty (EPU) index with the purpose of examining uncertainty shocks. The EPU index quantifies variations in economic uncertainty associated with policies, dependent on the frequency of newspaper reporting. The value of each monthly EPU index is directly proportionate to the proportion of newspaper articles in a country that address economic policy uncertainty for that specific month. Formulated by Baker, the EPU index encompasses 21 countries, representing around 71% of worldwide production when adjusted for purchasing power parity (PPP) and around 80% when adjusted for market exchange rates. Global Economic Policy Uncertainty (GEPU) index is created by combining the EPU indices of these 21 countries.

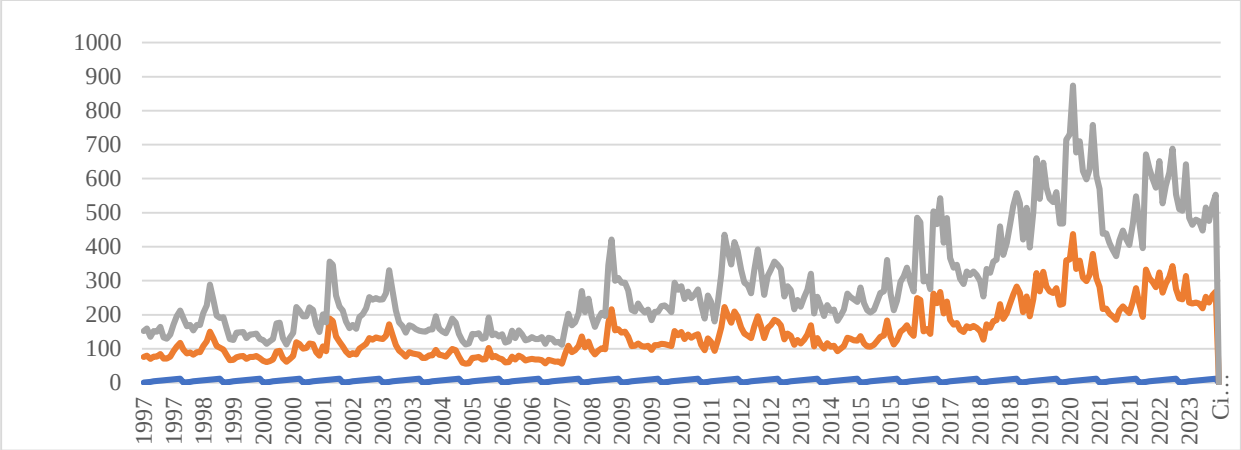

Figure 1. Global Economic Policy Uncertainty (GEPU)
Source: Policy Uncetainty, 2024

Several significant events, such as the Asian and Russian financial crises, the 9/11 attacks, the Second Gulf War, the global financial crisis, the Eurozone crisis, the US-China trade tensions, the Chinese leadership transition, the Trump election, the Brexit referendum, the European immigration crisis, and political turmoil in Brazil, France, and South Korea, contributed to the rise in the GEPU index shown in the chart above (Baker et al., 2015). The upward trend in the GEPU index among 21 countries that make a substantial contribution to global production would unavoidably affect the macroeconomic conditions of countries globally, especially emerging nations such as Indonesia.

Fischer et al. (2021) found that higher levels of uncertainty have a substantial impact on reducing inflation. This is mostly because increased uncertainty leads to less consumption, which in turn reduces the demand for goods. Consequently, firms are compelled to make pricing adjustments. This mechanism is conventionally known as the aggregate demand channel. Concurrently, there is a large decrease in GDP growth in the near term, reaching its highest point after around one quarter and then becoming negligible after one year. The recovery in actual economic activity can be ascribed to the phenomenon where enterprises, when confronted with significant levels of macroeconomic uncertainty, have a tendency to postpone their short-term investments. Nevertheless, once the ambiguity diminishes, companies recommence allocation of resources, therefore enhancing production by rising investment. Furthermore, increased uncertainty results in decreased interest rates, as central banks reduce policy rates to counterbalance the adverse impacts of uncertainty shocks on production and prices. Nationwide uncertainty shocks also impact the rates of unemployment, employment, and income.

The research undertaken by Leduc & Liu (2016) aligns with the conclusions of Fischer et al. (2021) indicating that uncertainty shocks lead to a substantial rise in unemployment that persists for almost two years, whereas inflation experiences a notable decline for around 15 months. The standard response of monetary policy is to decrease the nominal interest rate. These results corroborate the idea that in the presence of increased uncertainty, firms modify their actions by postponing the recruitment of new employees until the economic forecast becomes stable. The result is a significant decrease in total earnings, which has contributed to a less robust labor market.

A study by Theophilopoulou (2018) revealed that income inequality tends to decline during periods of economic recession, with the Gini coefficient for income decreasing by up to 0.5% over four years and consumption inequality declining more rapidly by 0.6% within two years. This decline is influenced by the overall income distribution. One reason is that shareholders are more vulnerable to adverse economic fluctuations, such as significant drops in corporate earnings and stock values. However, if the proportion

of capital income is small, inequality may increase because individuals with lower skills are more susceptible to changes in the labor market and technology.

Low-income households tend to be better protected during recessions due to countercyclical social benefits. In contrast, households with high levels of debt (*mortgagors*) are more affected than renters or homeowners without mortgages, particularly in terms of consumption. Overall, macroeconomic uncertainty shocks account for 10-15% of the variation in inequality, underscoring the importance of economic uncertainty as a determinant of inequality and the need for stronger redistributive policies in a stable economic environment.

Furthermore, a study by Fischer et al. (2021) found that income inequality is declining in most states, although there are significant variations in the dynamics of this decline. Conversely, some states, notably in the Midwest, have experienced increasing economic inequality over time. A deep understanding of the mechanisms driving fluctuations in income inequality is crucial for policymakers in government institutions and central banks (Stiglitz, 2012).

The commencement of the Reform Era signified a phase of economic revival for Indonesia following the Asian financial crisis. The nation successfully rebounded rapidly, sustaining continuously sound economic expansion from 1999 to the onset of the COVID-19 epidemic (Vujanovic, 2015;Geise & Bariyah, 2022). Nevertheless, this notable economic expansion was accompanied by a rise in wealth disparity (Basri & Hill, 2020). Data from the World Inequality Report reveals that in 2021, the poorest 50% of Indonesia's population possessed a mere 12.4% of the overall national income, which is a decrease from 17.4% twenty years ago. Concurrently, the top decile accounted for 48% of the total national income in 2021, which is a rise from 41.5% in 2001.

Considerable research has been undertaken on inequality, including investigations on Economic Policy Uncertainty (EPU) carried out by (Theophilopoulou 2018; Chikhale 2023; Fischer et al. 2021; Leduc & Liu 2016). Analysis of data in most inequality studies is conducted using the Gini ratio measure. Concurrently, the quantitative assessment of uncertainty is conducted using the Economic Policy Uncertainty (EPU) index. In order to monitor economic uncertainty associated with policy, the EPU index examines the frequency of newspaper coverage that incorporates three essential terms: economy (E), policy (P), and uncertainty (U).

The current body of empirical research on the dynamic correlation between uncertainty and income disparity is somewhat little. The present study seeks to fill this research vacuum by investigating the phenomenon of income disparity in Indonesia. Moreover, a collection of national macroeconomic indicators, including inflation, unemployment, and real income, operate as crucial determinants of the business cycle. The proposed methodology facilitates a comprehensive analysis of whether uncertainty shocks generate unequal impacts on macroeconomic indicators, therefore enabling a more profound exploration of the transmission mechanisms by which uncertainty shocks influence income inequality. The objective of this study is to investigate the impact of global uncertainty and macroeconomic activity on income inequality in Indonesia, both in the long and short term. Additionally, it aims to assess the suitable economic policies to counter income inequality in the face of global uncertainty.

2. LITERATURE REVIEW

This section specifically addresses numerous crucial matters. First, it highlights empirical literature relating to the impact of global uncertainty, macroeconomic issues, and income inequality (Leduc & Liu, 2016;Theophilopoulou, 2018;Fischer et al., 2021;Chikhale, 2023). It is anticipated that this method would help in developing policies to tackle uncertainty. Furthermore, it specifically concentrates on observations obtained from a solitary country, Indonesia, in order to mitigate any worries regarding homogeneity and disparities in data sources. Prior research on economic policy uncertainty (EPU) has mostly focused on investigating domestic uncertainty, namely the U.S. Economic Policy Uncertainty Index (EPU), as analyzed by (Theophilopoulou 2018; Fischer et al. 2021; Chikhale 2023).. The present study undertakes a comprehensive empirical investigation of the Global Economic Policy Uncertainty (GEPU), which encompasses the combined Economic Policy Uncertainty (EPU) of 21 countries. The objective is to explore

the repercussions of global uncertainty on the macroeconomic stability of Indonesia, hence influencing the overall income inequality within the country. Thirdly, this research employed the Global Economic Policy Uncertainty (GEPU) to examine the impact of global uncertainty, the Gini ratio as an indicator of inequality, the Consumer Price Index (CPI) for inflation measurement, Gross National Income (GNI) for income assessment, and the unemployment rate for unemployment measurement.

The Global Economic Policy Uncertainty (GEPU) index represents a composite measure derived from the Economic Policy Uncertainty (EPU) indices of 21 countries: Australia, Brazil, Canada, Chile, China, Colombia, France, Germany, Greece, India, Ireland, Italy, Japan, Mexico, the Netherlands, Russia, South Korea, Spain, Sweden, the United Kingdom, and the United States. This index is computed by taking a weighted average of the national EPU indices, using GDP as the weight factor. Each country's EPU index measures how frequently newspaper articles mention topics related to economics, policy, and uncertainty. To construct the GEPU, individual EPU indices are first normalized to have a mean value of 100. Missing data for some countries are addressed using regression-based estimates, resulting in a balanced monthly panel of EPU indices for all 21 countries. The GDP weights are based on data from the IMF's World Economic Outlook Database. Collectively, these countries contribute over 71% of global output when adjusted for purchasing power parity (PPP) and approximately 80% when calculated using market exchange rates.

An essential field of analysis is the theoretical examination of the effects of uncertainty, macroeconomics, and inequality. Numerous studies have demonstrated that uncertainty shocks exert an impact on macroeconomic fluctuations by influencing consumption, savings, and investment choices. A prior investigation on uncertainty conducted by Fischer et al. (2021) mainly concentrated on U.S. states, examining the interplay between national macroeconomic factors (such as inflation, GDP, and one-year treasury rates) and state-level factors associated with income distribution (such as unemployment, employment, and total real personal income per capita). The results indicate that global uncertainty has a substantial and adverse impact on inflation. In the short term, GDP growth experiences a rapid decrease, reaches its highest point after around one quarter, and then becomes negligible after one year. Furthermore, with heightened uncertainty, there is a corresponding decrease in interest rates, an increase in unemployment, and a significant decrease in overall income, resulting in less robust labor markets. Although there is evident variety in dynamic reactions, income inequality declines in most states. In contrast, other states, primarily situated in the Midwest, exhibited a progressive rise in income disparity during successive years.

Concurrently, a study carried out by Leduc and Liu (2016) indicates that uncertainty functions as a detrimental shock to aggregate demand, that leads to higher unemployment rates and lower inflation. The results were derived from conventional uncertainty metrics like the VIX and a novel measure devised from Michigan poll data. An analysis conducted by Theophilopoulou (2018) examined the impact of macroeconomic uncertainty on income, wage disparity, and consumption. The findings suggest that inequality first increases after uncertainty shocks but then decreases over the medium to long term, eventually reaching a lower level. There is a strong correlation between macroeconomic uncertainty and the fluctuations in income and consumption disparity. This work analyzes household income using precise microdata to investigate the transmission mechanisms by which uncertainty shocks affect different percentiles of the income and consumption distribution. The varied reaction appears to be significantly influenced by financial segmentation and portfolio processes.

Empirical evidence suggests that uncertainty shocks exacerbate and extend economic downturns. During an economic downturn, several dimensions of income, wages, and distribution of consumption are impacted. The earnings of low-wage workers in the United States undergo significant decreases and exhibit high levels of fluctuation, but high-income people see relatively modest wage growth during periods of economic depression (Heathcote et al., 2010); (Guvenen et al., 2014). According to Attanasio and Pistaferri (2014), an analysis of the development of consumption disparity in the United States revealed a notable reduction in consumption inequality during the Great Recession, over a period of 10 years.

Analysis conducted by Belfield et al.(2017) reveals that as of 2016, indicators of income inequality, such as the Gini Coefficient and the 90:10 ratio, had reverted to levels observed during the 1990s. The financial crisis of 2007-2008 largely curtailed the upward trajectory of these measures, mostly as a result of the decline in real income among high-income households and the augmented benefits from social security systems. Their results suggest that the personal incomes of middle- and high-income households started to increase at a sluggish pace, while the actual benefits for low-income families also experienced a deceleration. The research conducted by Giorgi and Gambetti (2015) revealed a procyclical pattern in consumption inequality in the United States, namely among right-wing consumers who are more susceptible to economic volatility. Individuals exhibiting high levels of consumption were discovered to shoulder three times the financial burden of business cycles compared to other consumers. Upon analyzing the influence of Total Factor Productivity (TFP) and Economic Policy Uncertainty (EPU) on consumption distribution, researchers found substantial effects concentrated at the higher end of the distribution. During periods of high Economic Policy Uncertainty (EPU), high-consumption percentiles significantly decreased their consumption in comparison to low EPU, resulting in a decrease in consumption inequality.

Ren et al. (2019) conducted research that demonstrates the asymmetrical character of the impact of EPU shocks on monetary and fiscal policy, which is strongly interconnected with the condition of the macroeconomy. Furthermore, Bonciani and Ricci (2020) discovered that global financial uncertainty shocks have a detrimental influence on output, trade, and unemployment. However, the impact on nominal variables varies considerably among different nations. Furthermore, the consequences are more pronounced in nations characterized by elevated levels of trade or financial openness, increased susceptibility, less robust institutions, or during periods of economic decline.

The research undertaken by Ahiadorme (2022)employed financial uncertainty as a proxy for global uncertainty. Stock market returns (measured by the Center for Research in Security Prices value-weighted stock market return index) and the real price of gold were among the external variables utilized for identifying purposes. The gold price and stock market return series were obtained from Ludvigson et al. (2019), while the uncertainty calculation can be found on Sydney Ludvigson's website at https://www.sydneyludvigson.com.

The research conducted by Canh et al. (2020) defines economic policy uncertainty (EPU) using three key dimensions: (i) the frequency of newspaper articles discussing uncertainty in economic policies, (ii) the number of federal tax code provisions scheduled to expire in the near future, and (iii) differences in predictions among economic forecasters, serving as a proxy for uncertainty levels. In their analysis, the study incorporates a comprehensive set of control variables, including real GDP growth (GDPg), inflation (Inf), gross capital formation (Cap) as a measure of infrastructure development, human capital (HC), and domestic credit provided by the financial sector (FD), which acts as a proxy for financial development. Additionally, the study examines environmental factors through CO2 emissions (CO2), resource factors using energy security (ES), the real effective exchange rate (REER), trade openness (Trade), and institutional quality (INST), which is assessed through indicators such as control of corruption, government effectiveness, regulatory quality, political stability, rule of law, and voice and accountability. The findings reveal a notable contrast: domestic EPU significantly reduces foreign direct investment (FDI) inflows, whereas higher levels of global EPU are associated with a significant increase in FDI inflows.

The study by Al-Thaqeb (2019) highlights the significant impact of policy uncertainty on both corporate financial strategies and consumer spending patterns. During periods of heightened uncertainty, businesses often adopt a more conservative stance, leading to reduced investments in production capacity and slower hiring rates. The Economic Policy Uncertainty (EPU) index serves as a broad indicator of uncertainty in economic policy, drawing from a range of sources such as news coverage, government policies, financial markets, and macroeconomic data. This index is constructed using three primary components: the frequency of newspaper articles discussing policy-related economic uncertainty, the number of expiring provisions in federal tax codes, and the extent of disagreement among economic forecasters. The degree of uncertainty is measured by analyzing the prevalence of articles containing keywords related to economic issues, uncertainty, regulations, and legislative matters.

According to the research conducted by Cerda et al. (2017) elevated levels of economic uncertainty result in a decrease in GDP, investment, and employment, especially when considering Chile's relatively small open economy. The uncertainty measurement was conducted using an index that comprehensively captures the extent of coverage on several subjects pertaining to economic uncertainty, obtained by scanning digitized newspaper archives. These archives enabled the computation of the quantity of articles that include references to both economics and uncertainty.

Zhang et al. (2018) found that although China has expanded its global influence significantly, the United States continues to dominate across international markets. The findings suggest that concerns about China's growing competitiveness with the U.S. in shaping the global order are driven more by political factors than purely economic ambitions. In their analysis, Baker et al. (2016) introduced the Economic Policy Uncertainty (EPU) indices as key tools for capturing and comparing the economic policy environments of both China and the United States.

Chikhale (2023) explores the relationship between uncertainty shocks and income inequality across various U.S. states. Economic shocks stemming from uncertainty influence the economy through several interconnected pathways. During times of heightened uncertainty, businesses tend to alter their investment and hiring strategies, leading to a reduction in overall economic activity. This downturn in production can suppress aggregate demand, subsequently affecting price levels. Variations in these economic factors are often identified as key contributors to shifts in income inequality. The study relies on data from all U.S. states, including the District of Columbia, covering unemployment rates, real income, employment figures, and measures of income inequality collected through surveys. Furthermore, it integrates national macroeconomic indicators to capture common factors influencing state-level economic cycles. The findings reveal that uncertainty shocks elicit varying responses among states, with a significant role in driving fluctuations in income inequality, particularly in specific regions and periods. Differences in income distribution and labor market dynamics are highlighted as primary factors explaining the divergent impacts observed across states in the regression analysis.

Numerous prior research have reported consistent results concerning uncertainty, which is widely seen as harmful to economic performance, particularly in the immediate term. According to research conducted by Aguiar et al. (2018), Bianchi and Corugedo (2018), and Benhabib et al. (2017), income inequality has been observed to decline during periods of economic recession. One plausible explanation is that individuals who own capital are more vulnerable to negative fluctuations in the business cycle, which are frequently accompanied by significant decreases in company earnings and stock values. However, if the proportion of capital income is really small in a certain economy, inequality may rise during a period of economic downturn. This phenomenon arises from the premise that individuals with lower levels of expertise are generally more susceptible to fluctuations in the labor market and advancements in technology. A comprehensive grasp of the processes that propel fluctuations in income inequality is of utmost importance for policymakers in governmental institutions and central banks. Several research emphasize the correlation between family income disparity and the occurrence of crises (Fernández-villaverde & Guerrón-quintana, 2020).

Several empirical studies have aimed to investigate the relationship between uncertainty and macroeconomic activity on inequality. However, only a few have analyzed the long-term impact of uncertainty and macroeconomic activity on inequality in Indonesia. Based on theoretical frameworks and literature reviews, the research framework is presented in Figure 2 . The hypothesis is that uncertainty and macroeconomic activity influence inequality in Indonesia.

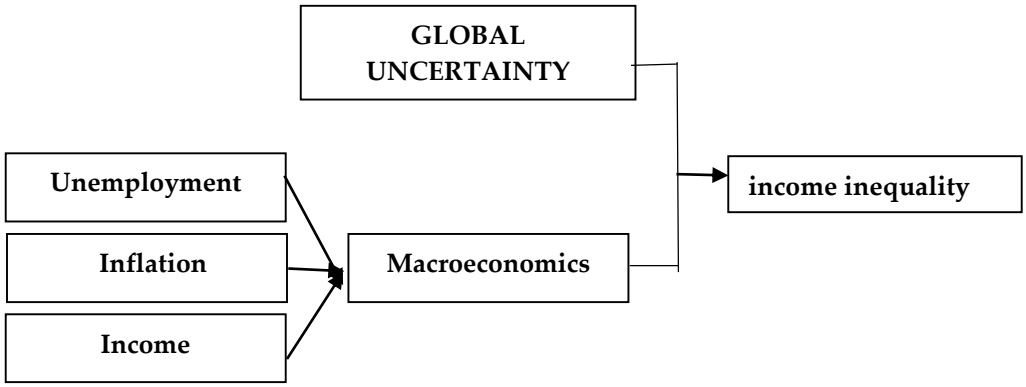

Figure 2. Research Framework
Source: (Fischer et al., 2021;Chikhale, 2023)

3. Methodology and Model Description

3.1 Data and Model Specifications

The hypothesis developed in this study posits that income inequality is influenced by global uncertainties and macroeconomic activities, as expressed in Equation (1). The model utilizes data from Indonesia covering the period 1991–2023. Data collection is sourced from the World Bank (WDI) and the Economic Policy Uncertainty index.

$$INQ_t = \alpha_0 + \alpha_1 GU_t + \alpha_2 ME_t + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

The Gini coefficient, denoted by (INQ), is used to measure income inequality, while policy uncertainty, denoted by (GU), represents global uncertainty. Macroeconomic factors are denoted by (ME), which include dimensions such as unemployment (UNM), inflation (INF), and real income (GNI). The model is estimated using the co-integration autoregressive distributed lag (ARDL) approach. Table 1 provides the definitions and sources of the variables analyzed.

Table 1. Variable definitions and sources

Variable	Notation	Size	Data source
Inequality	INQ	Gini index	WDI, Word bank
Global uncertainty	GU	*Economic policy uncertainty* (EPU)	*Policy uncertainty*
Unemployment	UM	*Unemployment rate*	WDI, World Bank
Inflation	INF	*Consumer price index* (CPI)	WDI, World Bank
Real income	GNI	GNI per capita	WDI, World Bank

Source : Processed by the author

To assess the dimensions of macroeconomic activity—namely unemployment (UNM), inflation (INF), and real income (GNI)—this study develops a model represented by Equation (2):

$$ME = f\ (UNM, INF, GNI) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

3 .2 Co-integration with ARDL

This study explores the long-term relationships and dynamic interactions between income inequality, financial development, and key control variables through an empirical analysis. The autoregressive distributed lag (ARDL) co-integration approach is employed to estimate the model. Sehrawat and Giri (2015) identify three primary reasons for utilizing this method. First, the bounds testing approach to co-integration is more straightforward compared to other multivariate techniques, such as the (Johamen & Jtiselius, 1990) framework (Mosconi, 2022). Once the optimal lag length is determined, the co-integration relationship can be assessed using the ordinary least squares (OLS) method. Second, as emphasized by (Jr

& Camba, 2021), the bounds testing approach differs from traditional methods like Engle and (Granger, 1987) because it eliminates the need for pre-testing variables for unit roots. This ensures consistency in the integration order, typically requiring variables to be integrated of the first order (I(1)). Failure to meet this condition could lead to a loss of predictive accuracy in the model.

The ARDL methodology offers flexibility, as it can be applied regardless of whether the variables in the model are stationary at level (I(0)) or integrated at first difference (I(1)). Notably, this technique demonstrates enhanced efficiency when used with smaller sample sizes, a feature highlighted in this study. Moreover, the error correction mechanism seamlessly combines short-term dynamics with long-term equilibrium relationships, ensuring that critical long-term information is retained. To evaluate both short-term and long-term relationships, the study employs the unrestricted error correction model (UECM) within the ARDL framework, as outlined in Equation (3). This approach allows for a comprehensive analysis of the interactions between variables while maintaining the integrity of the underlying equilibrium relationships.

$$\Delta LINQ_t = \delta_0 + \delta_1 T + \delta_2 GU_{t-1} + \delta_3 LUM_{t-1} + \delta_4 LINF_{t-1} + \delta_5 LGNI_{t-1} + \sum_{i=1}^{q} \alpha_i \Delta LINQ_{t-i} + \sum_{i=1}^{q} \beta_i \Delta LGU_{t-i} + \sum_{i=1}^{q} \mu_i \Delta LUM_{t-i} + \sum_{i=1}^{q} \sigma_i \Delta LINF_{t-i} + \sum_{i=1}^{q} \sigma_i \Delta LGNI_{t-i} + \varepsilon_t \quad \text{......}(3)$$

The series, as previously defined, incorporates a time trend (TTT) and employs the natural logarithmic transformation of variables (LLL). In Equation (3), the initial terms involving the variables and coefficients δ2,δ3,δ4\delta_2, \delta_3, \delta_4δ2,δ3,δ4 represent the long-term relationships, while the later terms capture the short-term dynamics. The hypothesis testing framework is designed to evaluate co-integration among the variables. The null hypothesis suggests that no co-integration exists, whereas the alternative hypothesis indicates the presence of a co-integrated relationship. This formulation allows for a robust examination of both long-term equilibrium and short-term variations within the data. $\alpha, \beta, \mu, \sigma$ $H0 = \delta_1 = \delta_2 = \delta_3 = \delta_4 = 0 H1 = \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq 0$

3.3 The ARDL Bound Test for Co-integration Procedure

The ARDL test begins by employing ordinary least squares (OLS) to estimate Equation (3) and evaluate potential long-term relationships between the variables. The F-test is applied to determine the significance of the lagged level coefficients, assessing the null hypothesis of no co-integration against the alternative hypothesis that co-integration exists. The test involves comparing the calculated F-statistic with critical values for the null (H0) and alternative (H1) hypotheses, as well as the integration order I (d). If the F-statistic falls within the critical value bounds, the conclusion regarding co-integration remains ambiguous, since the integration order ddd is constrained between 0 and 1. Following Pesaran et al. (2001), critical values for I(0) and I(1) guide this determination.

The ARDL bounds testing method incorporates a co-integration formula to estimate the number of regressions, where the parameter qqq defines the maximum number of lags considered, and the total regressions are calculated as (ρ+1)^q ρq. Once co-integration is confirmed, the next step involves estimating the long-term ARDL model. This model is based on the dependent variable LINQt and is expressed through Equation (4), facilitating the detailed analysis of long-term dynamics within the framework.

$$\Delta LINQt = \alpha_0 + \sum_{i=1}^{q} \delta_1 LINQ_{t-i} + \sum_{i=1}^{q} \delta_2 LGU_{t-i} + \sum_{i=1}^{q} \delta_3 LUM_{t-i} + \sum_{i=1}^{q} \delta_4 LINF_{t-i} + \sum_{i=1}^{q} \delta_5 LGNI_{t-i} + \varepsilon_t \quad \text{........}(4)$$

where all variables have been previously defined. This involves the selection of the ARDL order. q_1, q_2, q_3, q_4, q_5 The model uses the SIC.

The final stage involves deriving the short-term dynamic parameters through the estimation of the error correction model (ECM), which is built upon the previously obtained long-term estimates. This process is carried out using Equation (5), which captures the adjustments required to align short-term fluctuations with the established long-term equilibrium. By integrating the error correction term, the model effectively links short-term deviations to the broader equilibrium framework, ensuring a comprehensive analysis of both temporal dynamics and stability within the system.

$$\Delta LINQt = \mu + \sum_{i=1}^{q} \alpha_i \Delta LINQ_{t-i} + \sum_{i=1}^{q} \beta_i \Delta LGU_{t-i} + \sum_{i=1}^{q} \mu_i \Delta LUM_{t-i} + \sum_{i=1}^{q} \sigma_i \Delta LINF_{t-i} + \sum_{i=1}^{q} \sigma_i \Delta LGNI_{t-i} + \phi ECM_{t-1} + \varepsilon_t \quad \text{.....(5)}$$

where β represents the short-term dynamic coefficient toward equilibrium, and λ is the speed of adjustment coefficient. $\alpha, \beta, \mu, \sigma\phi$.

4. RESULTS AND DISCUSSIONS

4.1 RESULTS

Stationarity tests were conducted to meet one of the requirements for ARDL modeling. The Augmented Dickey-Fuller (ADF) test was used in this study to check for stationarity. Non-stationary data can lead to false or spurious regressions. The results of the stationarity tests for each variable, performed using STATA 15, are as follows.

Table 2. Stationarity Test

Variable	P-value
inequality	0.0000
uncertainty	0.0002
unemployment	0.0000
inflation	0.0000
income	0.0430

Source : Stata.15 (Processed)

In Table 2 above, it can be observed that the variables of inequality, uncertainty, unemployment, inflation, and income are stationary at the first difference. Therefore, further tests can be conducted.

Table 3. Regression Test

Variable	Coef	t	P > |t|
X1 (Uncertaninty)	-0.02612	-5.91	0.000
X2 (Unemployment)	0.0996656	2.23	0.035
X3 (inflation)	0.0212491	1.00	0.327
X4 (income)	0.003443	12.56	0.000

Source : Stata.15 (Processed)

In Table 3, the results of multiple regression tests show that the global uncertainty variable, unemployment rate, and real income significantly affect the income inequality variable, with a p-value of p>|t| < 0.05. However, the inflation variable does not have a significant effect on income inequality, as indicated by a p-value of p>|t| > 0.05.

Table 4. Residual Stationarity Test

Variable	P-Value
Dfuller ect	0.0007

Source : Stata.15 (Processed)

In Table 4 above, the residual stationarity test at the level degree is presented. Since the residuals are stationary, further tests can be conducted.

Table 5. ECM test

Variable	Coef	t	P >|t|
X1 (Uncertaninty)	-0.0090041	-1.69	0.104
X2 (Unemployment)	0.2419268	2.25	0.034
X3 (inflation)	0.0163724	1.18	0.249
X4 (income)	0.0043654	4.50	0.000
ect.L1	-0.6314633	-3.03	0.006

Source : Stata.15 (Processed)

In the ECM equation above, the value for ect L1 falls within the range of 0 to -1, with a value of -0.6314633, indicating that it meets the criteria for the ECT variable, and the variable is stationary. This suggests that the short-term and long-term adjustment variables are significant, with a p-value of 0.006 < 0.05, confirming co-integration between the dependent and independent variables.

Table 6. ARDL test

Variable	Coef	t	P >|t|
	Long Run		
uncertainy	-0.0312239	-4.45	0.000
unemplyoment	0.1463495	1.87	0.076
inflation	0.0418904	0.85	0.405
income	0.0037621	8.43	0.000
	Short Run		
uncertainy	-0.0103575	-1.64	0.118
unemplyoment	0.2684826	2.05	0.054
inflation	0.0240298	0.99	0.333
income	0.0046012	3.55	0.002

Source : Stata.15 (Processed)

In Table 6, it is shown that there is co-integration between the dependent and independent variables in both the long term and short term at probability levels of 5% and 10%. The global uncertainty variable has a long-term negative effect on income inequality, with a probability level of 1%. The unemployment variable has a positive effect on income inequality in both the long term and short term, with a probability level of 10%. Meanwhile, the inflation variable has no effect in either the long term or short term. Lastly, the income variable has a positive influence on income inequality in both the long term and short term, with a probability level of 1%.

Table 7. Heteroskedasticity and Autocorrelation Test

Chi2 (1)	3.46
Prob > chi2	0.0629

Source : Stata.15 (Processed)

Based on Table 7 above, it is stated that the null hypothesis (H0) assumes constant variance and no serial correlation. This indicates the presence of heteroscedasticity and autocorrelation. To assess the

model's reliability, various statistical indicators such as $\chi 2$ Normal, $\chi 2$ Series, $\chi 2$ ARCH, $\chi 2$ Hetero, and $\chi 2$ Reset were applied. These tests evaluate the normality of residuals, serial correlations, conditional autoregressive heteroscedasticity, homoscedasticity, and the overall functional form of the model. The findings reveal that the residuals follow an approximately normal distribution, the serial relationships in the model are sufficient, heteroscedasticity is not significant, and the model's functional structure is appropriate. Collectively, these statistical tests enhance the model's validity and reliability. Further supporting this, the Qusum square test results show no substantial evidence of structural shifts within the model, indicating its stability over time. This confirms that the regression parameters and the interrelationships among variables remain consistent without significant alterations throughout the study period.

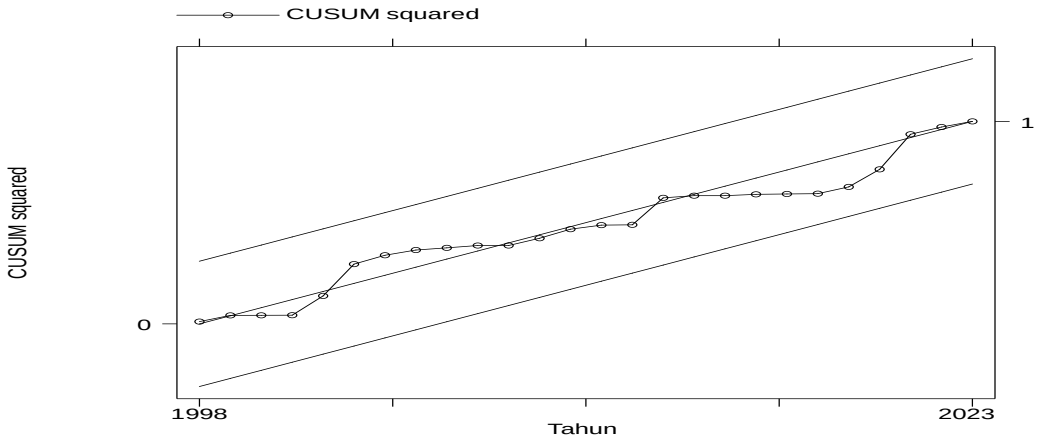

Figure 3: ARDL Model Stability and Normality Test
Source : Stata.15 (Processed)

4.2 Discussions

Previous research has shown that uncertainty affects income inequality (Theophilopoulou, 2018);(Fischer et al., 2021). Econometric analysis indicates that the global economic policy uncertainty (GEPU) variable significantly influences income inequality in Indonesia in the long run ($p < 0.05$). This suggests that an increase in global uncertainty can be a factor contributing to income inequality in Indonesia.

Based on policy uncertainty data, there was a significant increase in Global Economic Policy Uncertainty (GEPU) between 1997 and 2017. This surge can be attributed to several events including the Asian and Russian financial crises, the 9/11 attacks, the Second Gulf War, the global financial crisis, the Eurozone crisis, the trade tensions between the US and China, the change in Chinese leadership, the Trump election, the Brexit referendum, the European immigration crisis, and political disorder in Brazil, France, and South Korea. Thus, a rise in Gross Economic Product (GEPU) can have an effect on income inequality in Indonesia.

Amid times of heightened uncertainty, households often curtail their expenditure, delay the acquisition of long-lasting products, and augment their savings. Corporations may postpone investments, embracing a cautious strategy, and prioritize temporary employees over permanent personnel. The labour market is influenced by changes in employment rates, working hours, and salary adjustment. Furthermore, uncertainty has a direct effect on financial markets, resulting in significant fluctuations in returns. The credit circumstances exert increasing restrictions on both firms and people. These elements together function as causes of income disparity on the backdrop of global uncertainty.

The results of the study indicate that Global Economic Policy Uncertainty (GEPU) has a negative effect on income inequality. This means that an increase in GEPU reduces income inequality in Indonesia. This finding aligns with research by Theophilopoulou (2018), which stated that during periods of global uncertainty, economic downturns occur, and income inequality decreases depending on the composition of

income. Similarly, research by Fischer et al. (2021) found that in three out of four census areas, the Gini coefficient responded negatively to uncertainty, while in the Midwest USA, income inequality increased due to uncertainty. Historical decomposition allows for an investigation into whether and when uncertainty shocks significantly influence income inequality over the estimation period.

The decline in income inequality in Indonesia due to Global Economic Policy Uncertainty (GEPU) is influenced by the fact that capital owners, or the top 10% group, are more exposed to adverse business cycle movements, often accompanied by sharp declines in company profits and share prices. Meanwhile, for the bottom 50%, the government's efforts to stimulate the economy through looser monetary policy and social assistance programs help mitigate the impact, leading to a reduction in income inequality.

However, according to research conducted by Chikhale (2023), wealth inequality rose sharply after the financial crisis. Kasa & Lei (2018) explain that the mechanism reinforcing inequality after global uncertainty is that wealthy individuals invest a large portion of their wealth in uncertain assets, which tend to yield higher average returns. This makes the top 1% less impacted by uncertainty, while the bottom 50% struggle to recover, falling further into poverty. Therefore, effective policies are needed to address the challenges posed by global uncertainties.

Based on statistical test results, unemployment has a positive effect on income inequality in Indonesia both in the long term and short term, with P-values of 0.080 and 0.033, respectively, at a 10% probability level. This indicates that as the unemployment rate increases in Indonesia, income inequality worsens. This phenomenon is a serious concern as its impact is not only economic but also social, particularly for the lowest-income population.

In line with the research conducted by Fischer et al. (2021) and Leduc & Liu (2016), an increase in unemployment leads to greater income inequality, especially in economies where the proportion of capital income is relatively low, particularly for the bottom 50% of the population. The decline in labor demand suppresses wages and reduces people's purchasing power. Consequently, consumption, already limited among the lower-income groups, becomes even more constrained. In the context of Indonesia, this inequality becomes more pronounced as wealth is predominantly concentrated in the top 1% and 10%, while the primary source of income for the bottom 50% is labor, which is highly vulnerable to the impact of unemployment.

The Central Statistics Agency (BPS) recorded that approximately 1.7 million workers in the industrial sector were laid off due to the COVID-19 pandemic, further exacerbating this situation. Most of the affected workers belonged to the bottom 50% of the population, meaning that the surge in unemployment caused by the pandemic not only worsened income inequality but also created social and economic pressure on low-income communities.

The number of workers in Indonesia's industrial sectors in August 2019 and 2020, based on data from BPS 2021, showed a decline in several key sectors. Significant decreases were observed in the apparel manufacturing, wood and cork, non-metallic mining, metal products and equipment, other transportation equipment, as well as printing and recording sectors. Meanwhile, the textile, footwear and leather, furniture, and chemical sectors remained relatively stable. This decline reflects the direct impact of the pandemic on economic activity in industrial sectors, which indirectly contributed to rising unemployment. With this situation, it becomes evident that the impact of unemployment on income inequality is not only reflected in statistics but also in the economic realities faced by most Indonesians, particularly the most vulnerable groups.

Based on the results of statistical tests, neither the short-term nor the long-term relationship of inflation has any effect on income inequality in Indonesia, with P-values of 0.563 and 0.422, respectively. This indicates that the inflation rate does not significantly impact income inequality in Indonesia, which contrasts with the findings of Chikhale (2023) and Fischer et al. (2021). Although this study shows that inflation has no direct effect on income inequality, the government must still monitor inflation rates to achieve its broader goal of economic stability.

Based on the results of statistical tests, the income variable has a positive influence on income inequality both in the long term and short term, with P-values of 0.000 and 0.002, respectively, at a 1%

probability level. This indicates that an increase in income leads to an increase in income inequality. This finding contrasts with previous research by Fischer et al. (2021), which stated that a decrease in income would reduce income inequality.

According to world uncertainty data, a significant portion of individual wealth in Indonesia is controlled by the top group. The top 1% controls 30.2% of the total wealth of Indonesia's population, followed by the top 10%, which controls 61%. Meanwhile, the bottom 50% controls only 4.5% of the country's total wealth. In 2021, the bottom 50% held just 12.4% of total national income, a decrease from 17.4% in 2001. In contrast, the top 10% controlled 48% of total national income in 2021, up from 41.5% in 2001 (katadata.co.id). This suggests that when the top 10% experiences income growth, income inequality in Indonesia increases if the bottom 50% cannot keep pace. Even if the bottom 50% experiences income growth, it would have little impact on reducing inequality due to the significant income gap between the top 10% and the bottom 50%. Thus, any increase in income tends to exacerbate income inequality in Indonesia. The following figure illustrates the distribution of individual wealth and income between the top 10% and bottom 50% from 2001 to 2021.

5. CONCLUSIONS AND POLICY IMPLICATIONS

CONCLUSIONS

This study investigates the presence of both long-term and short-term relationships among global uncertainty, macroeconomic performance, and income inequality in Indonesia over the period from 1991 to 2023. Utilizing the ARDL and ECM co-integration bounds testing approaches, the analysis reveals a significant long-term inverse relationship between global uncertainty and income inequality. Moreover, the findings highlight that rising unemployment contributes to increasing income inequality in both the long and short term. Lastly, income levels are shown to exert a substantial impact on income inequality across both time horizons, emphasizing their critical role in shaping inequality dynamics in Indonesia.

IMPLICATIONS

Based on the research results, it is evident that global uncertainty and macroeconomic activity influence income inequality in Indonesia. Therefore, it is crucial for policymakers, both in government institutions and central banks, to address these global uncertainties and macroeconomic factors when formulating policies to mitigate their impact on income inequality.

The study findings suggest a persistent inverse correlation between global uncertainty and income disparity. Higher levels of Global Economic Policy Uncertainty (GEPU) result in greater vulnerability of the top 1% to negative fluctuations in the business cycle. This vulnerability leads to significant decreases in company profits and share prices, ultimately lowering their earnings. In the case of the lowest 50%, global uncertainty diminishes the demand for labor, resulting in a decrease in income. Thus, this group tends to curtail expenditure, albeit to a comparatively lesser extent.

To stabilize the economy amid global uncertainty, the government should implement pro-growth policies, ensuring that banks have the capacity to continue lending and facilitating ease of investment. Maintaining the stability of the banking sector is crucial for sustaining economic growth. For the bottom 50% of the population, the government should provide effective social protection programs, ensuring that income inequality continues to decrease after periods of global uncertainty. According to research by Chikhale (2023), income inequality tends to rise sharply following global uncertainties.

The results of the study indicate that an increase in unemployment can lead to higher income inequality. Therefore, the best government policy is to create more job opportunities, ensuring that these jobs are of high quality, formal in nature, and offer decent wages and benefits. This should be supported by free education, access to credit for Micro, Small, and Medium Enterprises (MSMEs), and infrastructure investment. Additionally, the government should expand social assistance programs that guarantee income and provide basic services for vulnerable and poor communities.

Based on world inequality data, the bottom 50% controlled only 4.5% of the total wealth in Indonesia in 2021, while the top 1% and 10% controlled 30.2% and 61%, respectively. An increase in

income for the top 1% and 10% can exacerbate income inequality compared to the bottom 50%. Therefore, an effective policy would be to implement a highly progressive income tax, prioritizing public interests over private gains. Without such a tax or similar policies, there is a serious risk that the wealth share of the top percentile will continue to grow indefinitely, leading to ever-increasing inequality.

Numerous government initiatives have been introduced to reduce income inequality between the wealthiest groups, such as the top 1% and 10%, and the bottom 50%. However, the poor implementation of these programs has hindered their success. A key factor critical to the effectiveness of these initiatives is the elimination of corruption. Despite the government's efforts to design policies aimed at narrowing the income gap in Indonesia, the pervasive influence of corrupt practices by certain individuals undermines their execution, preventing these programs from delivering the desired outcomes.

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