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Income Inequality in the United Kingdom: Long-Run Equilibrium and Nonlinear Distributional Dynamics

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Abstract

Income inequality remains a persistent structural challenge in advanced economies, with important consequences for economic stability, social cohesion, and the effectiveness of public policy. This study investigates the determinants of income inequality in the United Kingdom over the period 1980–2021 by combining ARDL, FMOLS, and NARDL approaches to assess long-run equilibrium relationships and potential nonlinear distributional effects. The ARDL bounds test confirms the presence of a stable long-run cointegrating relationship between the Gini index and its socioeconomic determinants, indicating that fiscal conditions, labour market dynamics, economic development, and income structure move together over time. The FMOLS estimates show that GDP per capita and unemployment are positively associated with inequality, whereas public social spending, government expenditure on education, tax revenue, and the income share of the fourth quintile are negatively related to the Gini index in the long run. These results underline the importance of redistribution, human capital investment, and labour market stability in moderating income disparities. The NARDL estimates suggest directionally different responses to positive and negative changes in the upper-middle-income share. Positive changes are associated with lower inequality (−0.931), while negative changes are associated with higher inequality (0.232); however, neither effect is statistically significant. The Wald test likewise fails to reject long-run symmetry ($\chi^2(1) = 0.212$, $p = 0.646$). Overall, the findings support a stable long-run inequality framework while indicating only limited evidence of asymmetric distributional adjustment in the United Kingdom.

Keywords: income inequality; income distribution dynamics; society; cointegration; public policy; fiscal redistribution; United Kingdom

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1. Introduction

1.1. Research Background and Significance

The achievement of economic prosperity increasingly depends not only on the expansion of aggregate wealth but also on the equitable and sustainable distribution of economic resources. Within this context, income inequality has emerged as one of the most pressing socio-economic challenges confronting contemporary economies. Income inequality refers to the uneven distribution of income among individuals or households and represents a

fundamental dimension of economic development and social welfare [1]. Since the 1980s, inequality has risen in many countries, driven by structural transformations associated with globalization, financial liberalization, technological change, and the increasing prominence of market-oriented economic policies [2].

The implications of income inequality extend beyond distributive concerns and encompass broader economic outcomes. Excessive disparities in income distribution may constrain human capital accumulation by limiting access to education and reducing opportunities for upward social mobility [3]. Moreover, the concentration of income among higher-income groups can weaken aggregate demand by reducing the consumption capacity of lower-income households, thereby adversely affecting economic growth and macroeconomic stability [4]. Recent contributions further suggest that inequality influences innovation, investment, and productivity dynamics, ultimately shaping the long-run trajectory of economic development [5,6].

Consequently, income inequality should be viewed not merely as an outcome of economic processes but also as a factor that influences broader socio-economic performance. Understanding the determinants of inequality and the mechanisms through which it evolves therefore remains a central concern for both academic research and economic policymaking.

1.2. Public Policy Relevance

Promoting sustainable economic growth while ensuring a fair distribution of income constitutes one of the primary objectives of public policy. Fiscal policy has traditionally been recognized as a key instrument through which governments influence both economic performance and distributive outcomes [7]. Nevertheless, the relationship between redistribution and economic efficiency has remained a subject of considerable debate. Okun (1975) [8] illustrated this potential trade-off through the "leaky bucket" hypothesis, arguing that redistributive interventions may generate efficiency losses that reduce overall economic welfare.

Subsequent theoretical and empirical studies have challenged the notion that redistribution necessarily impedes growth. Alesina and Rodrik (1994) [9] argued that highly unequal societies tend to generate stronger political demand for redistributive taxation, potentially affecting investment incentives and capital accumulation. Similarly, Persson and Tabellini (1994) [10] emphasized that unequal income distributions may contribute to political instability and institutional uncertainty, thereby discouraging investment and weakening long-term economic growth. These perspectives suggest that the relationship between inequality, redistribution, and economic performance is multidimensional and cannot be adequately explained through a simple equity-efficiency trade-off.

Among the various policy instruments available to governments, social expenditures and transfer programs represent the most direct mechanisms for influencing income distribution. Empirical evidence indicates that social transfers are often more effective than taxation alone in reducing income inequality [11]. Through welfare-state institutions, governments seek to mitigate socio-economic risks associated with unemployment, poverty, illness, and old age while promoting social cohesion and inclusive growth. However, because these programs are largely financed through tax revenues, concerns persist regarding the potential effects of taxation on entrepreneurship, investment, and economic incentives [8].

Since the late twentieth century, many developed economies have implemented fiscal consolidation measures, privatization initiatives, and market-oriented reforms that have altered the scale and composition of public expenditure. These transformations have reshaped the redistributive role of the state and influenced the effectiveness of social protection systems in addressing inequality. Consequently, evaluating the long-run

effects of fiscal policy instruments—particularly social spending, taxation, and education expenditure—on income inequality remains a critical issue for both economic research and evidence-based policymaking.

1.3. Research Objectives and Research Questions

The primary objective of this study is to empirically investigate the determinants of income inequality in the United Kingdom over the period 1980–2021. Specifically, the analysis examines the long-run and short-run relationships between the Gini coefficient and a set of socio-economic factors, including public social spending, tax revenue, government expenditure on education, unemployment, economic growth, and income distribution across population groups. By integrating fiscal, labor market, and macroeconomic dimensions within a unified framework, the study seeks to identify the principal mechanisms through which income inequality evolves over time.

The United Kingdom provides a particularly relevant case for such an investigation. Since the 1980s, the country has experienced substantial market-oriented reforms, financial sector expansion, labor market liberalization, and sustained economic growth. Despite possessing a high level of economic development, well-established social institutions, and considerable fiscal capacity, the United Kingdom continues to exhibit one of the highest levels of income inequality among advanced European economies. The persistence of inequality alongside economic prosperity presents an important policy paradox: why has rising economic development not translated into a more equitable distribution of income? Addressing this question requires a comprehensive assessment of the fiscal, social, and macroeconomic factors that shape income distribution dynamics [12–14].

Accordingly, the study pursues five interrelated research objectives. First, it evaluates the long-term evolution of income inequality and its relationship with structural economic changes in the United Kingdom over the period under investigation. Second, it examines the role of fiscal redistribution mechanisms, particularly public social spending, tax revenue, and government expenditure on education, in shaping income inequality. Third, it assesses the influence of labour market conditions, with particular emphasis on unemployment and its long-run distributional implications. Fourth, it investigates the relationship between economic development and income inequality to determine whether increases in GDP per capita are associated with a more equitable distribution of income or with widening disparities. Fifth, it examines the role of the fourth-quintile income share as a distributional-composition measure and evaluates whether positive and negative changes in this income share are associated with different long-run responses in aggregate inequality.

To address these objectives, the following research questions are formulated:

1. How has income inequality evolved in the United Kingdom over the period 1980–2021, and how is this evolution related to broader structural economic changes?
2. What are the long-run and short-run relationships between public social spending, tax revenue, government expenditure on education, and income inequality?
3. To what extent are unemployment and labour market conditions associated with income inequality?
4. Is economic development, measured by GDP per capita, associated with lower or higher income inequality in the long run?
5. Are positive and negative changes in the income share of the fourth quintile associated with different long-run responses in aggregate income inequality?

The principal contribution of this study lies in its comprehensive examination of the fiscal, social, and macroeconomic determinants of income inequality within a long-term empirical framework. Unlike much of the existing literature, which typically focuses on a limited set of explanatory variables or shorter time horizons, this analysis adopts an

integrated approach that simultaneously considers redistribution mechanisms, human capital formation, labor market conditions, and economic growth. Consequently, the study provides a broader understanding of the institutional and structural drivers of income inequality and offers evidence-based insights for the design of effective redistribution policies in advanced economies.

2. Literature Review

2.1. The Relationship Between Income Inequality and Economic Growth

The nexus between income inequality and economic growth has been extensively examined in the economic literature, yet empirical findings remain largely inconclusive and context-dependent. The classical foundation of this debate originates from Kuznets (1955) [15], who proposed an inverted U-shaped relationship between development and inequality, suggesting that inequality initially rises during early stages of development and subsequently declines as economies mature. However, later empirical evidence has indicated that this relationship is considerably more complex and cannot be generalized across countries and time periods.

Early empirical contributions by Alesina and Rodrik (1994) [9] demonstrate that higher income inequality is associated with lower economic growth. The authors argue that in unequal societies, political preferences tend to favor higher redistributive taxation, which in turn reduces incentives for capital accumulation and investment. Similarly, Persson and Tabellini (1994) [10] emphasize that inequality may generate political instability and institutional fragility, thereby weakening the investment climate and adversely affecting long-run growth performance.

More recent empirical evidence continues to support the adverse impact of inequality on growth. Berg et al. (2018) [16], using panel data analysis, find that lower inequality is associated with faster and more sustainable economic growth. Their results further indicate that redistributive policies do not necessarily hinder economic performance, challenging the traditional efficiency-equity trade-off perspective.

Conversely, some studies report more nuanced or country-specific outcomes. Risso et al. (2013) [17], in a time-series analysis for Mexico, identify a long-run negative relationship between economic growth and income inequality. In contrast, Demirci et al. (2026) [18] reject the classical Kuznets hypothesis in their panel analysis of high- and middle-income economies and argue that the Human Development Index (HDI) plays a more significant role in explaining inequality dynamics. Overall, the literature suggests that the relationship between income inequality and economic growth is non-linear and highly sensitive to institutional, structural, and development-related factors.

2.2. Social Spending, Tax Policy and Redistribution

Fiscal policy instruments constitute a central mechanism for addressing income inequality, with social expenditures widely recognized as a key redistributive tool. Empirical evidence generally suggests that increases in social spending contribute to improved income distribution. For instance, Eroğlu et al. (2017) [19] demonstrate that social assistance expenditures reduce inequality in OECD countries. Similarly, Bozkurt and Altıner (2024) [20] find that the inequality-reducing effect of social spending is particularly strong in economies characterized by high initial levels of income disparity.

However, the effectiveness of social expenditure is contingent upon its composition and targeting. Zhemelko and Šubová (2026) [21] show that unemployment benefits and family-related transfers are effective in reducing inequality, whereas old-age-related expenditures do not exhibit a significant equalizing effect. In addition, Dibo (2022) [22] provides

evidence of nonlinear effects, suggesting that beyond a certain threshold, social spending may generate diminishing or even counterproductive outcomes.

The empirical literature on taxation reveals more heterogeneous findings. Yalçın et al. (2024) [23] report that income and wealth taxation reduce income inequality, whereas consumption taxes tend to exacerbate distributive disparities. In contrast, Ouedraogo et al. (2025) [24] find that taxation may increase inequality in the context of sub-Saharan African economies, highlighting the importance of institutional and structural heterogeneity across countries. Taken together, these findings indicate that the impact of fiscal policy on income inequality is not uniform and depends critically on institutional quality, fiscal structure, and the composition of both taxation and public expenditure systems.

2.3. Education, Human Capital and Inequality

Education and human capital are widely recognized in the literature as fundamental structural determinants of income inequality. The prevailing theoretical perspective suggests that investment in human capital contributes to a more equitable income distribution by enhancing individual productivity and expanding economic opportunities. However, this effect is neither direct nor strictly linear, as it depends on the equality of access to education and the broader institutional context in which human capital is accumulated.

Empirical evidence generally supports the inequality-reducing role of education. Turnip and Sari (2026) [25] find that increases in average years of schooling exert a negative and statistically significant effect on the Gini coefficient in their panel analysis of ASEAN countries. Similar findings are reported by Li et al. (2026) [26], who employ an ARDL–ECM framework for China and demonstrate that human capital reduces income inequality in the long run, although short-run effects may differ in magnitude and direction.

In addition, a growing body of literature emphasizes the bidirectional relationship between educational disparities and income inequality. Aydin (2026) [27], using panel causality analysis for BRICS-T countries, identifies a unidirectional causality running from education inequality to income inequality, suggesting that structural disparities in educational access translate into persistent income distribution inequalities. Furthermore, comparative studies indicate that broader human development indicators may outperform traditional income measures in explaining inequality dynamics. Demirci et al. (2026) [18] show that the Human Development Index (HDI) is a more powerful determinant of income inequality than GDP in their panel analysis of high- and middle-income countries.

Overall, the literature indicates that although human capital accumulation plays a central role in reducing inequality, the magnitude and effectiveness of this relationship depend critically on the inclusiveness, accessibility, and institutional quality of the education system.

2.4. Unemployment, Labor Market and Inequality

Labor market conditions, particularly unemployment and employment structure, are widely regarded as key channels through which income inequality is generated and transmitted. The dominant conclusion in the literature is that rising unemployment increases income inequality by disproportionately reducing the earnings of low-income households and weakening their labor market attachment.

Bozkurt and Altıner (2024) [20] find that higher unemployment significantly increases income inequality in their panel analysis of OECD countries. Consistent with this evidence, Eroğlu et al. (2017) [19] show that unemployment reduces the income share of the lowest income groups, thereby widening overall inequality. Similarly, Dibo (2022) [22] reports that increases in unemployment lead to a decline in the income share of the poorest 20%, which aligns with standard theoretical expectations. Conversely, higher employment

levels are generally associated with lower inequality. Aktaş (2021) [28], using a panel Tobit model for 60 countries, demonstrates that rising employment significantly reduces income inequality, indicating that broader labor market participation fosters more inclusive income distribution.

In addition to aggregate employment conditions, structural characteristics of labor markets also play an important role. Atabey and Karakuş (2025) [29] analyze the sectoral effects of female employment and find that increased female labor force participation generally improves income distribution, although the magnitude of this effect varies across sectors. Nevertheless, the empirical evidence is not entirely consistent. Turnip and Sari (2026) [25] report that although unemployment has a positive effect on inequality, this relationship is statistically insignificant in their specification, suggesting that the impact of labor market variables may depend on country-specific conditions and model design.

Overall, the literature indicates that unemployment is generally associated with higher inequality, although the strength and statistical significance of this relationship are influenced by institutional structures, labor market flexibility, and methodological differences across studies.

2.5. UK-Specific Studies

Empirical studies focusing on the United Kingdom have extensively analyzed the determinants of income inequality within both long-term structural and macroeconomic frameworks. Atkinson and Jenkins (2020) [30] document that income inequality in the UK has remained persistently high over time, reaching levels in certain periods comparable to, or even exceeding, those observed prior to World War II. This evidence highlights the long-standing and structural nature of inequality in the UK economy.

In terms of income dynamics, Dutta et al. (2001) [31] employ a "mover–stayer" framework to analyze income distribution, demonstrating that labor market mobility and income transitions play a crucial role in shaping inequality patterns. Their findings underscore that inequality should not be interpreted solely through static distributional measures, but also through dynamic processes of income mobility over time. Macroeconomic determinants of inequality have also received substantial attention in the UK context. Nolan (1988) [32] shows that increases in unemployment adversely affect income distribution; however, this effect is not confined to lower-income groups but is instead distributed across the entire income distribution. The study further emphasizes that macroeconomic conditions have been a key driver of the rising inequality observed in the United Kingdom since the 1970s.

Monetary policy effects are examined by Mumtaz and Theophilopoulou (2017) [33], who find that contractionary monetary policy shocks increase both income and consumption inequality in the UK, with stronger effects observed among lower-income households. This highlights the distributional consequences of monetary policy transmission mechanisms. At the same time, the literature emphasizes that the effects of macroeconomic variables on inequality are not straightforward. Jäntti and Jenkins (2010) [34] demonstrate that the impacts of unemployment and inflation on income inequality are complex and sensitive to model specification and additional covariates, suggesting that no universal conclusion can be drawn regarding their relative effects on low-income groups.

The present study contributes to the literature by conceptualizing UK inequality as the outcome of interacting fiscal, labour-market, growth, and distributional-composition mechanisms and by integrating long-run cointegration and FMOLS estimation with a formally tested NARDL framework that distinguishes directional responses from statistically established asymmetry. Its contribution therefore lies primarily in providing an integrated, UK-specific assessment over four decades, including the fourth-quintile income share as

a cautiously interpreted distributional-composition indicator rather than an independent causal determinant.

Overall, the UK-focused literature indicates that income inequality is shaped by the interaction of multiple forces, including labor market dynamics, macroeconomic conditions, and monetary policy interventions. These studies collectively suggest that inequality dynamics in the United Kingdom are structurally embedded and influenced by a combination of economic and institutional factors. In summary, the existing literature suggests that income inequality is determined by the interaction of economic, fiscal, social, and labor market forces, while the direction and magnitude of these relationships remain context-dependent and often nonlinear. Although empirical studies indicate that inequality may hinder growth in some cases, and that social spending and education reduce inequality while unemployment increases it, the evidence remains heterogeneous and highly sensitive to methodological approaches and country-specific conditions.

Against this background, the present study contributes to the literature by examining the determinants of income inequality within a unified empirical framework using long-term UK data (1980–2021). The application of the ARDL methodology allows for the simultaneous estimation of short-run and long-run effects, as well as the identification of potential asymmetric and nonlinear relationships. This approach enables a more comprehensive and country-specific analysis by integrating variables that are often examined separately in existing studies.

2.6. Research Gaps and Positioning of the Present Study

Despite extensive research on income inequality, the UK literature remains relatively fragmented, with fiscal redistribution, labour-market conditions, economic growth, human-capital expenditure, and distributional changes often examined separately rather than within an integrated long-run framework. The present study addresses this theoretical gap by conceptualizing inequality as the outcome of interconnected socioeconomic mechanisms and, methodologically, combines ARDL and FMOLS long-run estimation with NARDL to investigate potentially asymmetric distributional adjustments. Importantly, asymmetry is not inferred solely from differences in coefficient signs or magnitudes but is formally assessed through a Wald test of long-run symmetry. Empirically, the study further incorporates the fourth-quintile income share (INC20) as a distributional-composition indicator, interpreted cautiously because of its mechanical relationship with the Gini index, to examine whether upward and downward movements within this segment of the income distribution are associated with different inequality dynamics.

3. Material and Methods

3.1. Data and Variable Construction

This study utilizes annual time-series data for the United Kingdom covering the period 1980–2021. The empirical framework is constructed to examine the determinants of income inequality, with the Gini index (GINI) serving as the dependent variable. The explanatory variables include the logarithm of GDP per capita (LGDPPC, constant 2015 US$), public social spending (PSS, % of GDP), income share of the fourth quintile (INC20), total tax revenue (TAXR, % of GDP), unemployment rate (UNEMP, %), and government expenditure on education (GEE, % of GDP). These variables are selected to capture macroeconomic performance, fiscal redistribution, labor market conditions, and income distribution structure. The income share of the fourth quintile (INC20) is included not as an independent structural determinant of inequality, but as a distributional-composition variable capturing changes in the relative position of households immediately below the highest-income quintile. Accordingly, its relationship with the Gini index is interpreted as an association

between changes in the internal composition of the income distribution and aggregate inequality, with the NARDL framework further examining whether upward and downward movements in INC20 generate different adjustment patterns.

All variables are obtained from internationally recognized and widely used databases to ensure data reliability, comparability, and methodological consistency (Table 1). Macroeconomic indicators such as GDP per capita, unemployment rate, and tax revenue are sourced from the World Bank's World Development Indicators [35]. Fiscal variables, particularly social spending and public expenditure series, are compiled from OECD long-run social expenditure databases and cross-validated using Our World in Data [36]. Additional verification and complementarity for public expenditure components are ensured through the International Monetary Fund's Government Finance Statistics and Statista datasets, particularly for government spending patterns over time [37,38].

Table 1. Variables, definitions, and data sources.

Variable	Definition	Unit	Data Source
GINI	Gini index (income inequality)	Index	World Bank
LGDPPC	Log of GDP per capita (constant 2015 US$)	Natural log	World Bank, IMF
PSS	Public social spending	% of GDP	Our World in Data
INC20	Income share of fourth quintile	%	World Bank, IMF
TAXR	Tax revenue	% of GDP	World Bank
UNEMP	Unemployment rate	%	World Bank, IMF
GEE	Government education expenditure	% of GDP	Statista

To ensure consistency across the dataset, all variables are transformed into annual frequency and aligned over the full sample period (1980–2021). Where appropriate, variables expressed in absolute values are converted into ratios or percentage shares (e.g., % of GDP) to improve comparability across time. Furthermore, logarithmic transformation is applied to GDP per capita (LGDPPC) to stabilize variance and allow elasticity-based interpretation within the econometric models. This harmonization process ensures that all variables are suitable for time-series econometric analysis and reduces potential scale-related biases.

The plotted series in Figure 1 exhibit heterogeneous long-run dynamics across the main macroeconomic and fiscal variables, indicating that each variable follows a distinct temporal path over the sample period rather than a common deterministic trend. Several variables display pronounced cyclical fluctuations and potential structural shifts, suggesting sensitivity to macroeconomic shocks and policy regime changes over time. Overall, the visual evidence supports the presence of non-uniform evolution in the underlying determinants of income inequality, reinforcing the need for a multivariate econometric framework capable of capturing dynamic and potentially non-linear relationships.

Table 2 presents the descriptive statistics, indicating moderate variability across the variables, as reflected by relatively low standard deviations in relation to their mean values. Skewness coefficients reveal mild asymmetry in most series, with a general tendency toward negative skewness for the majority of variables, while PSS, UNEMP, and GEE exhibit positive skewness. Kurtosis values are largely below 3, suggesting platykurtic distributions for most variables; however, INC20 departs from this pattern by exhibiting leptokurtic behavior and a statistically significant Jarque–Bera statistic, confirming non-normality, whereas the remaining variables do not significantly reject the normality assumption.

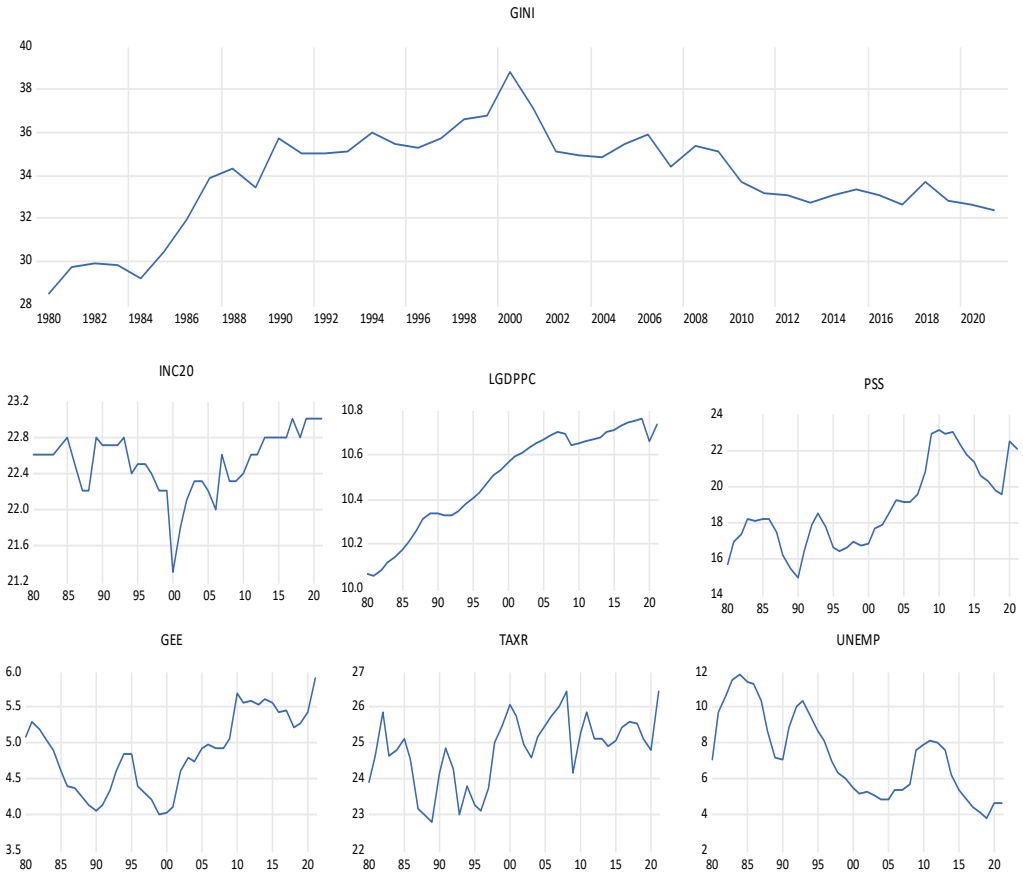


Figure 1. Temporal Dynamics and Evolution of Key Macroeconomic and Fiscal Variables in the United Kingdom (1980–2021).

Table 2. Descriptive Statistics of Variables.

Variable	Mean	Median	Std. Dev.	Skewness	Kurtosis	Jarque–Bera
GINI	33.83	34.10	2.276	−0.5077	2.977	1.805
LGDPPC	10.49	10.58	0.2226	−0.5704	1.979	4.102
PSS	18.81	18.19	2.331	0.4313	2.086	2.763
INC20	22.51	22.60	0.3466	−1.0978	4.945	15.06 ***
TAXR	24.80	24.99	0.9769	−0.4923	2.450	2.225
UNEMP	7.28	7.10	2.351	0.4071	1.958	3.057
GEE	4.86	4.90	0.5433	0.0062	1.850	2.312

Note: *** indicates rejection of the Jarque–Bera null hypothesis of normality at the 1% significance level ($p < 0.01$).

3.2. Methodology

3.2.1. Econometric Framework

This study employs a comprehensive time-series econometric strategy to examine both the long-run equilibrium relationship and short-run dynamics between income inequality and its macroeconomic determinants. The empirical strategy integrates the Autoregressive Distributed Lag (ARDL) bounds testing approach, Fully Modified Ordinary Least Squares (FMOLS), and the Nonlinear ARDL (NARDL) framework. This combination provides a complementary framework for assessing long-run relationships, short-run dynamics, and potential nonlinear adjustment patterns while enhancing the robustness of the empirical findings.

3.2.2. ARDL Bounds Testing Approach

The ARDL bounds testing approach developed by Pesaran and Shin (1999) [39] and extended by Pesaran, Shin, and Smith (2001) [40] is applied to test for cointegration among variables regardless of whether regressors are I(0) or I(1), provided none are I(2). This method has become widely adopted due to its flexibility in small samples and mixed integration orders.

The long-run relationship is specified as:

$$GINI_t = \alpha_0 + \alpha_1 LGDPPC_t + \alpha_2 PSS_t + \alpha_3 INC20_t + \alpha_4 TAXR_t + \alpha_5 UNEMP_t + \alpha_6 GEE_t + \varepsilon_t \quad (1)$$

The corresponding unrestricted error correction representation is:

$$\Delta GINI_t = \beta_0 + \sum_{\{i=1\}}^{\{p\}\beta}{}_{\{1i\}\Delta GINI_{\{t-i\}}} + \sum_{\{j=0\}}^{\{q\}\beta}{}_{\{2j\}\Delta X_{\{t-j\}}} + \lambda_1 GINI_{\{t-1\}} + \lambda_2 X_{\{t-1\}} + u_t \quad (2)$$

where X_t represents the vector of explanatory variables.

The joint significance of lagged level variables is tested using the F-statistic:

$$H_0 : \lambda_1 = \lambda_2 = 0 \ (no\ cointegration) \quad (3)$$

against:

$$H_1 : \lambda_1 \neq 0,\ \lambda_2 \neq 0 \ (cointegration\ exists) \quad (4)$$

The computed F-statistic is compared with the critical bounds provided by Pesaran et al. (2001) [40], where rejection of the null hypothesis confirms the existence of a long-run relationship.

3.2.3. FMOLS Long-Run Estimation

Following confirmation of cointegration, the long-run coefficients are estimated using the Fully Modified Ordinary Least Squares (FMOLS) estimator developed by Phillips and Hansen (1990) [41]. This method corrects for endogeneity and serial correlation in the cointegrating regression by incorporating semi-parametric corrections.

The FMOLS model is expressed as:

$$GINI_t = \gamma_0 + \gamma_1 LGDPPC_t + \gamma_2 PSS_t + \gamma_3 INC20_t + \gamma_4 TAXR_t + \gamma_5 UNEMP_t + \gamma_6 GEE_t + \mu_t \quad (5)$$

Unlike conventional OLS, FMOLS provides asymptotically unbiased and efficient estimates in the presence of cointegrated regressors, making it particularly suitable for long-run equilibrium analysis in macroeconomic systems.

3.2.4. NARDL Asymmetric Cointegration Model

To capture potential nonlinearities in the relationship between income distribution and inequality, the nonlinear ARDL (NARDL) model proposed by Shin, Yu, and Greenwood-Nimmo (2014) [42] is employed. This framework decomposes explanatory variables into partial sum processes of positive and negative changes.

The decomposition of INC20 is defined as:

$$INC20_t = INC20_0 + INC20_t^{\{+\}} + INC20_t^{\{-\}} \quad (6)$$

where

$$INC20_t^{+} = \sum_{j=1}^{t} \max(\Delta INC20_j, 0),\ INC20_t^{-} = \sum_{j=1}^{t} \min(\Delta INC20_j, 0) \quad (7)$$

The nonlinear long-run relationship is specified as:

$$GINI_t = \theta_0 + \theta_1 INC20_t^{\{+\}} + \theta_2 INC20_t^{\{-\}} + \sum_{\{k=1\}_k^{\{n\}\theta} Z_{\{k,t\}}} + \varepsilon_t \quad (8)$$

Asymmetry is tested using the Wald restriction:

$$H^0 : \theta^1 = \theta^2 \quad (9)$$

Rejection of the null hypothesis indicates asymmetric long-run effects of income distribution changes on inequality dynamics. The asymmetric long-run coefficients are derived from the estimated NARDL error-correction representation as $LR^+ = -\theta^+/\rho$ and $LR^- = -\theta^-/\rho$, where ρ denotes the coefficient on the lagged dependent variable and θ^+ and θ^- represent the coefficients on the lagged positive and negative partial-sum components, respectively. Because the long-run parameters are nonlinear functions of the estimated coefficients, their standard errors are calculated using the delta method. Long-run asymmetry is formally evaluated using a Wald test of the null hypothesis H_0: $LR^+ = LR^-$. Rejection of this restriction indicates statistically significant asymmetric long-run responses, whereas failure to reject it implies that differences between the positive and negative point estimates cannot be interpreted as statistically established asymmetry.

Model robustness is ensured through a set of diagnostic tests including the Breusch–Godfrey serial correlation test, Breusch–Pagan–Godfrey heteroskedasticity test, and stability diagnostics based on CUSUM and CUSUMSQ statistics. These tests confirm that the estimated models satisfy classical regression assumptions and remain structurally stable over the sample period.

4. Results

4.1. Unit Root Test

Table 3 reports the results of the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) unit root tests for all variables included in the model. The findings indicate that all series are non-stationary in levels but become stationary after first differencing and are therefore integrated of order one, I(1). Importantly, none of the variables is integrated of order two, I(2), satisfying the integration-order requirement for the subsequent ARDL bounds analysis.

Table 3. Unit Root Test Results.

Variable	Level/1st Diff.	ADF Statistic	PP Statistic	Stationarity
GINI	Level/1st Diff.	−1.953/−6.774 ***	−1.850/−7.521 ***	I(0)/I(1)
LGDPPC	Level/1st Diff.	−1.001/−6.759 ***	−0.921/−6.759 ***	I(0)/I(1)
PSS	Level/1st Diff.	−2.785/−4.574 ***	−1.878/−4.393 ***	I(0)/I(1)
INC20	Level/1st Diff.	−2.435/−7.832 ***	−2.329/−12.804 ***	I(0)/I(1)
TAXR	Level/1st Diff.	−3.260/−6.270 ***	−3.322/−7.715 ***	I(0)/I(1)
UNEMP	Level/1st Diff.	−3.363/−4.053 **	−3.079/−4.033 **	I(0)/I(1)
GEE	Level/1st Diff.	−2.853/−4.489 ***	−1.964/−4.471 ***	I(0)/I(1)

Note: *** and ** denote rejection of the unit-root null hypothesis at the 1% and 5% significance levels, respectively.

4.2. Correlation Matrix Analysis

The correlation matrix in Figure 2 reveals several notable relationships among the explanatory variables. In particular, public social spending (PSS) and government expenditure on education (GEE) exhibit a strong positive association, reflecting the close co-movement of these components of public expenditure within the UK fiscal framework. GDP per capita (LGDPPC) is strongly and inversely associated with unemployment (UNEMP), consistent

with the cyclical responsiveness of labour market conditions to economic activity. The remaining correlations are generally moderate, suggesting that severe multicollinearity is unlikely to characterize the explanatory-variable set. Nevertheless, the relatively stronger interdependence observed among selected fiscal variables, particularly PSS, TAXR, and GEE, warrants consideration in the subsequent econometric estimations.

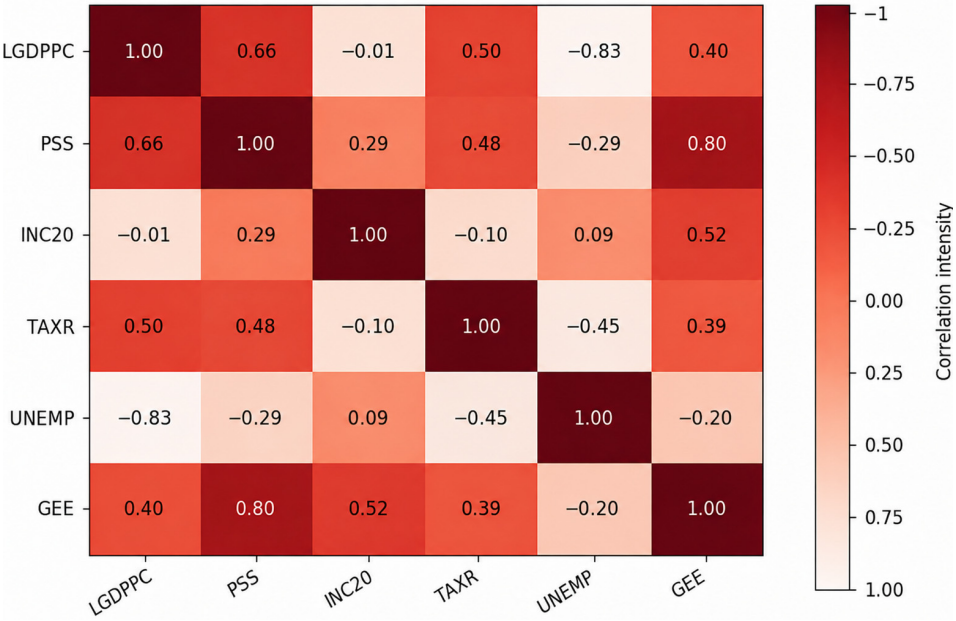


Figure 2. Correlation Matrix of Macroeconomic Determinants of Income Inequality.

4.3. ARDL F-Bound Test

Table 4 presents the results of the ARDL Bounds Test for cointegration. The estimated F-statistic of 6.0324 exceeds the upper critical bound value at the 1% significance level, providing strong evidence against the null hypothesis of no long-run relationship. Therefore, the findings confirm the existence of a stable long-run equilibrium relationship between income inequality and its socioeconomic determinants in the United Kingdom over the period 1980–2021.

Table 4. ARDL Bounds Test Results.

Test Statistic	**Value**	
F-statistic	6.032	
Number of Regressors (k)	6	
Significance Level	Lower Bound I(0)	Upper Bound I(1)
10%	2.218	3.314
5%	2.618	3.863
1%	3.505	5.121

4.4. ARDL Short-Run Analysis

In the short run (Table 5), changes in the income share held by the fourth income quintile (ΔINC20) exert a substantial and statistically significant negative effect on the Gini index ($\beta = -2.590893$, $p < 0.01$), suggesting that increases in the income of upper-middle-income households contribute to a reduction in overall income inequality in the United Kingdom. In contrast, changes in tax revenue (ΔTAXR) do not have a statistically significant short-run effect on income inequality, indicating that variations in tax collection are unlikely to produce immediate distributive outcomes. Furthermore, the error correction

term (ECT(−1)) is negative and highly significant ($\alpha = -0.364276$, $p < 0.01$), confirming the presence of a stable long-run equilibrium relationship and indicating that approximately 36.43% of short-run disequilibria are corrected within one year as the system converges toward its long-run equilibrium path.

Table 5. ARDL Short-Run Dynamics.

Parameter/Variable	Coefficient	t-Statistic	*p*-Value
ΔINC20	−2.590	−10.423	0.000 ***
ΔTAXR	−0.058	−0.720	0.476
CointEq(−1)	−0.364	−7.691	0.000 ***

Note: Diagnostic metrics indicate a high model fit, with an adjusted R^2 = 0.832 and a Durbin–Watson statistic of 2.368, suggesting no evidence of positive first-order autocorrelation. Δ denotes the first-difference operator. *** indicates statistical significance at the 1% level.

4.5. Model Diagnostics and Stability Tests

The Breusch–Godfrey Serial Correlation LM test in Table 6 produces an Obs × R^2 value of 0.2758, indicating that the null hypothesis of no serial correlation cannot be rejected. This result suggests that the model residuals are free from higher-order autocorrelation up to two lags. Similarly, the Breusch–Pagan–Godfrey test yields a Chi-square probability value of 0.660, implying that the null hypothesis of homoskedasticity cannot be rejected. Accordingly, the error terms exhibit constant variance over the sample period. Taken together, the diagnostic tests reported in Table 6 provide evidence that the estimated model satisfies the classical linear regression assumptions. As a result, the estimated coefficients can be considered efficient and statistically reliable for inference and policy interpretation.

Table 6. Diagnostic and Residual Framework.

Diagnostic Test	Statistical Criterion	Value	*p*-Value	Diagnostic Results
Breusch-Godfrey LM	Obs × R^2 (X^2)	2.576245	0.2758	No serial correlation at up to 2 lags
(*Serial Correlation*)	F-statistic	0.972199	0.3902	Confirming residual independence
Breusch-Pagan-Godfrey	Obs × R^2 (X^2)	6.777938	0.6602	Residuals are homoskedastic
(*Heteroskedasticity*)	F-statistic	0.682198	0.7190	Equal variance condition satisfied

Note: All diagnostic evaluations are conducted under a standard 5% significance threshold ($p > 0.05$).

The CUSUM and CUSUM of Squares (CUSUMsq) statistics in Figure 3 indicate that the recursive residuals (depicted by the blue line) remain consistently within the 5% critical bounds over the full sample period 1980–2021. This provides strong evidence of parameter stability in both the short-run and long-run specifications, suggesting that no significant structural breaks are present in the underlying relationship governing income inequality dynamics in the United Kingdom.

4.6. FMOLS Test

Table 7 presents the FMOLS estimates of the long-run relationship between income inequality and its socioeconomic determinants. Because the explanatory variables are expressed in different units, the coefficients are interpreted according to their respective measurement scales. A one-percentage-point increase in the unemployment rate (UNEMP) is associated with a 0.598-point increase in the Gini index, holding other factors constant. In contrast, a one-percentage-point increase in public social spending (PSS) as a share of GDP is associated with a 0.452-point reduction in the Gini index. Since GDP per capita enters the model in natural logarithmic form, its coefficient requires a semi-elasticity interpretation: a 1% increase in GDP per capita is associated with an approximately 0.155-point increase in the Gini index (15.526 × 0.01). Furthermore, a one-percentage-point increase in the

income share of the fourth quintile (INC20) is associated with a 1.683-point decline in the Gini index, while a one-percentage-point increase in tax revenue (TAXR) as a share of GDP corresponds to a 0.395-point reduction. Government expenditure on education (GEE) exhibits a comparatively large equalizing association, with a one-percentage-point increase in its GDP share associated with a 1.969-point decrease in the Gini index. All reported long-run coefficients are statistically significant at the 5% level or better, although their magnitudes should be interpreted in accordance with the measurement scale of each explanatory variable.

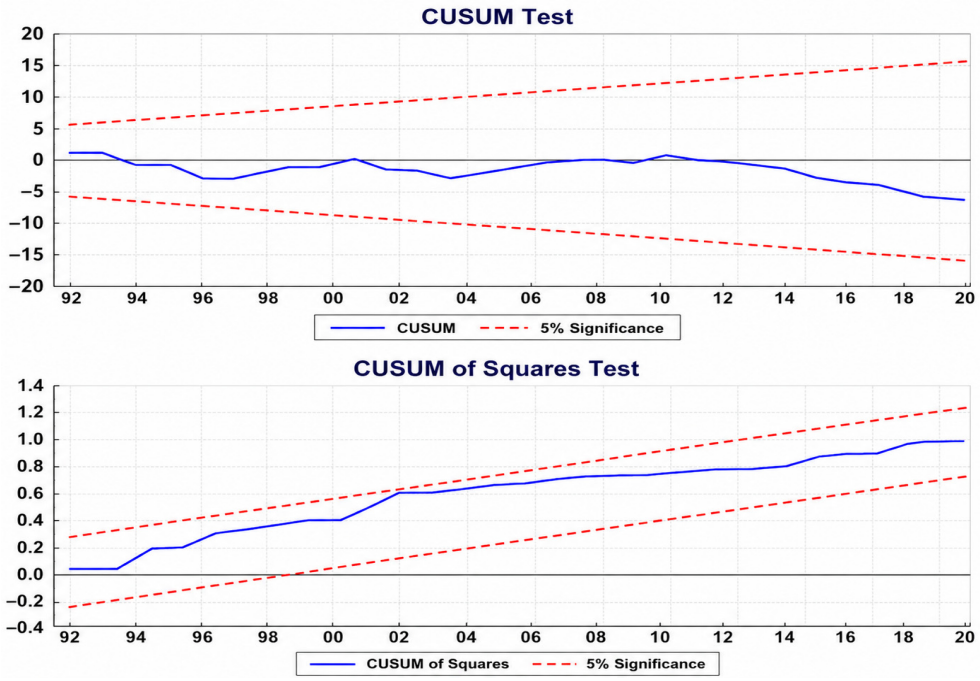


Figure 3. Stability Diagnostics Based on CUSUM and CUSUM of Squares (CUSUMsq) Tests.

Table 7. Long-Run Estimation Results (FMOLS).

Variable	Coefficient	Std. Error	t-Statistic	*p*-Value
UNEMP	0.598	0.192	3.107	0.003
PSS	−0.452	0.191	−2.367	0.023
LGDPPC	15.526	2.635	5.890	0.000
INC20	−1.683	0.524	−3.209	0.002
TAXR	−0.395	0.191	−2.061	0.046
GEE	−1.969	0.579	−3.397	0.001
C	−67.610	32.345	−2.090	0.044

Note: The model exhibits strong explanatory power, with R^2 = 0.844 and an adjusted R^2 = 0.816 indicating that a substantial proportion of the variation in the dependent variable is explained even after adjusting for model complexity.

4.7. NARDL Long-Run Distributional Effects and Asymmetry Test

Table 8 reports the long-run NARDL estimates for positive and negative changes in the income share of the fourth quintile (INC20), together with the inferential statistics required to assess their statistical reliability. Following the partial-sum decomposition proposed by Shin et al. (2014) [42], increases and decreases in INC20 are modeled separately in order to examine whether income-distribution shocks generate directionally different long-run responses in the Gini index.

Table 8. NARDL Long-Run Effects and Wald Test for Asymmetry.

Variable/Test	Coefficient/Statistic	Std. Error	t-Statistic	*p*-Value
$INC20^{+}$	−0.9307	1.1350	−0.8200	0.420
$INC20^{-}$	0.2324	2.4771	0.0938	0.926
Wald test of long-run symmetry	$\chi^2(1) = 0.2116$	—	—	0.6455

Note: $INC20^{+}$ and $INC20^{-}$ represent the cumulative positive and negative partial sums of changes in the income share of the fourth quintile. Long-run coefficients are calculated as $LR^{+} = -\theta^{+}/\rho$ and $LR^{-} = -\theta^{-}/\rho$, where $\rho = -0.3812$, $\theta^{+} = -0.3548$, and $\theta^{-} = 0.0886$. Standard errors of the derived long-run coefficients are calculated using the delta method. The Wald test evaluates H_0: $LR^{+} = LR^{-}$. Failure to reject the null indicates no statistically significant long-run asymmetry.

The estimated coefficient on the lagged dependent variable is $\rho = -0.3812$, while the corresponding level coefficients for the positive and negative partial sums of INC20 are $\theta^{+} = -0.3548$ and $\theta^{-} = 0.0886$, respectively. The implied long-run coefficients, calculated as $LR^{+} = -\theta^{+}/\rho$ and $LR^{-} = -\theta^{-}/\rho$, are −0.9307 and 0.2324, respectively.

The signs of the coefficients indicate directionally different distributional responses. A positive cumulative change in the fourth-quintile income share is associated with a lower Gini index, whereas a negative cumulative change is associated with a higher Gini index. Nevertheless, neither long-run coefficient is statistically significant. The positive-shock coefficient has a standard error of 1.1350, a *t*-statistic of −0.8200, and a *p*-value of 0.420. The negative-shock coefficient has a standard error of 2.4771, a *t*-statistic of 0.0938, and a *p*-value of 0.926.

More importantly, the formal Wald test does not support statistically significant long-run asymmetry. The null hypothesis that the positive and negative long-run coefficients are equal, H_0: $LR^{+} = LR^{-}$, cannot be rejected ($\chi^2(1) = 0.2116$, $p = 0.6455$). Accordingly, although the point estimates exhibit opposite signs, the empirical evidence does not establish that positive and negative changes in INC20 have statistically different long-run effects on income inequality.

The revised coefficient magnitudes are also economically more plausible relative to the observed variation in the Gini index and INC20 over the sample period. For example, a 0.1-percentage-point positive cumulative change in INC20 corresponds mechanically to an estimated change of approximately −0.093 Gini points, while an equivalent negative component corresponds to approximately 0.023 Gini points. These estimates should nevertheless be interpreted cautiously because their associated standard errors are relatively large and both individual effects are statistically insignificant.

Overall, the NARDL results provide evidence of directional differences in the estimated responses of inequality to positive and negative income-share changes, but they do not provide statistical support for long-run asymmetry. The nonlinear findings should therefore be regarded as complementary rather than as evidence of a distinct asymmetric long-run mechanism.

Figure 4 presents the cumulative positive and negative partial-sum decompositions of changes in INC20 used in the NARDL specification. The two components follow distinct temporal paths, confirming that positive and negative changes in the fourth-quintile income share can be modeled separately rather than being constrained to enter the model symmetrically. However, graphical divergence between the partial sums should not itself be interpreted as statistical evidence of asymmetric effects on income inequality. The formal Wald test reported in Table 8 fails to reject long-run symmetry, indicating that the estimated responses of GINI to the two components are not statistically distinguishable.

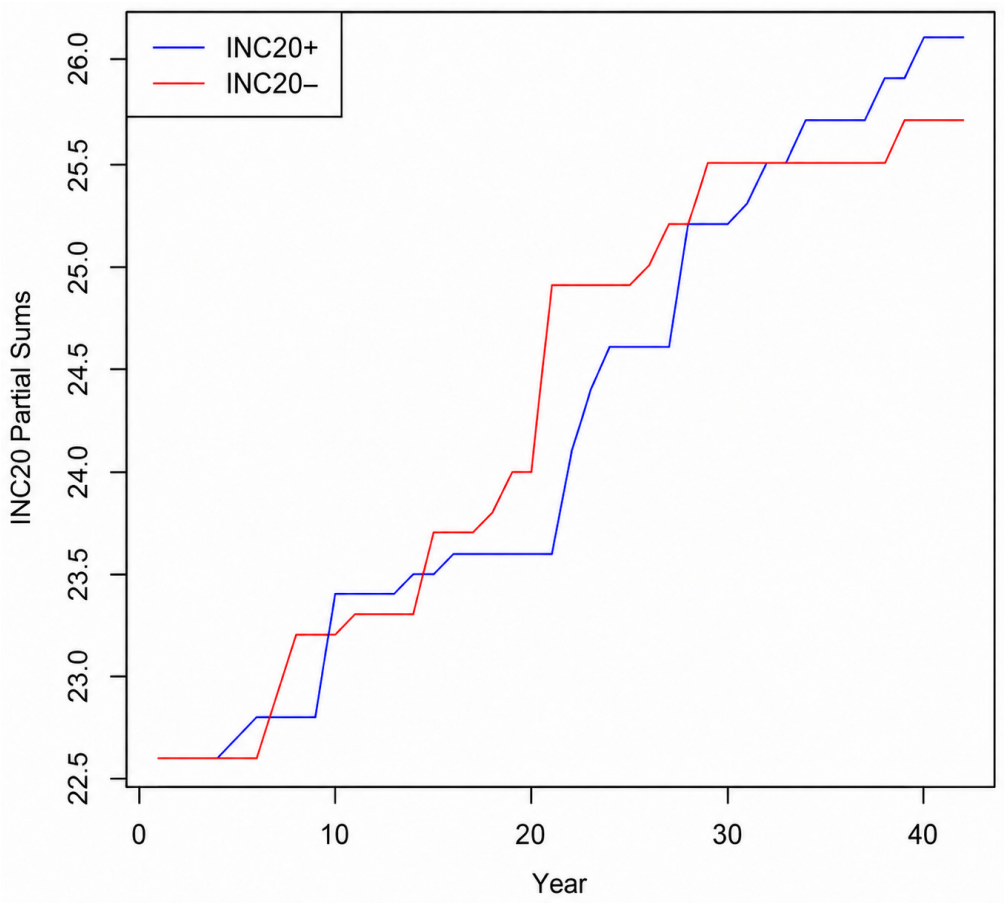


Figure 4. Positive and Negative Partial-Sum Decomposition of Fourth-Quintile Income Share (INC20).

Accordingly, the partial-sum decomposition remains useful for identifying potentially different directional responses, but the empirical evidence does not support policy conclusions based specifically on asymmetric INC20 effects. Policy implications are therefore drawn primarily from the statistically significant ARDL and FMOLS results rather than from the nonlinear decomposition.

4.8. Discussion

The findings of this study complemented and extended the existing literature on income inequality in advanced economies by providing a more comprehensive account of its structural and institutional determinants in the United Kingdom. In a recent contribution, Hasanov et al. (2026) [43] examined the relationship between income inequality and economic growth in the United Kingdom and the United States using ARDL techniques and Gini index data. Their results revealed divergent distributional outcomes, indicating that economic growth was associated with an increase in income inequality in the United States, whereas a negative relationship was observed in the United Kingdom. However, that study primarily focused on the direct growth–inequality nexus and did not explore the broader socioeconomic transmission channels shaping inequality dynamics in the UK context. The present study addressed this limitation by incorporating fiscal redistribution, labor market conditions, education expenditure, taxation, and income distribution structure within a unified econometric framework. The empirical results suggested that income inequality dynamics in the United Kingdom could not be sufficiently explained by economic growth alone, but were instead determined by the interaction of multiple institutional and macroeconomic forces. In particular, fiscal policy instruments, labor market performance, and human capital investment were found to play a central role in mediating the distributional

consequences of economic development. The NARDL estimates produced opposite-signed responses to positive and negative changes in the fourth-quintile income share; however, the Wald test did not identify a statistically significant difference between these effects. The nonlinear analysis therefore suggests potential directional heterogeneity rather than statistically established long-run asymmetry.

The estimated relationships should be interpreted within the broader institutional and political-economic transformation of the United Kingdom since the 1980s, particularly changes in labour-market institutions, deindustrialization, the expansion of finance and high-skill services, and successive reforms of taxation and welfare provision. Within this context, the positive long-run relationship between unemployment and inequality is consistent with the greater vulnerability of lower-income households to employment and earnings losses, while the negative associations of social spending, tax revenue, and education expenditure highlight the redistributive and opportunity-enhancing roles of fiscal and human-capital policies. These statistical relationships can be interpreted in light of the evolving interaction between labour-market institutions, structural economic change, and welfare-state arrangements in the United Kingdom, while recognizing that these institutional mechanisms are not directly identified by the econometric specification.

The positive long-run association between unemployment and inequality should be viewed within the broader transformation of the UK labour market since the 1980s. Deindustrialisation contributed to declining male employment and greater earnings dispersion, while subsequent shifts in employment structures, working hours, household labour supply, and the composition of jobs changed the way labour-market pressures were transmitted to household incomes [44]. Against this institutional background, higher unemployment is likely to have coincided with greater income inequality because employment losses and reductions in labour earnings were not evenly distributed across households. Lower-income households, in particular, tend to be more exposed to adverse labour-market conditions because of their greater dependence on employment income and the extent of protection provided by the tax-benefit system. The positive FMOLS coefficient on unemployment is therefore consistent with these features of the UK labour market and its institutional evolution. Nevertheless, the estimated relationship should be regarded as a long-run conditional association, rather than evidence that the econometric model identifies a specific institutional or causal mechanism.

The negative long-run associations of public social spending and tax revenue with inequality are also consistent with changes in the redistributive role of the UK tax-benefit system. The expansion of transfers during the late 1990s and 2000s strengthened income support for lower-income households, while later reductions in working-age benefits weakened this protective role [45]. The negative PSS and TAXR coefficients therefore reflect the broader capacity of fiscal policy to moderate market-income disparities, although they represent conditional long-run associations rather than the effects of specific fiscal reforms. The negative association of education expenditure and the positive association of GDP per capita with inequality suggest that the UK's transition toward a more skill-intensive, service-based economy broadened opportunities through education while distributing the gains from economic growth unevenly across skills, sectors, and households.

The present findings were also consistent with and reinforced several strands of recent empirical research emphasizing heterogeneity and asymmetry in distributional processes. Uche et al. (2024) [46] demonstrated that different dimensions of globalization produced heterogeneous effects on income distribution in the United States and the United Kingdom, with relatively more nuanced distributional responses observed in the UK. This evidence aligned with the present results, which indicated that inequality dynamics in the United Kingdom were driven not only by aggregate growth but also by the structure

and effectiveness of redistribution mechanisms. Similarly, Ahrens (2022) [47] provided evidence that changes in income and unemployment generated asymmetric responses in redistribution preferences, suggesting that behavioral reactions to economic conditions were not fully symmetric. This finding was consistent with the directionally different nonlinear responses observed in the current analysis, where variations in the upper-middle-income share produced directionally unequal effects on income inequality.

Furthermore, Drossidis (2025) [48] showed that macroeconomic shocks, including monetary policy and oil price disturbances, affected income distribution through heterogeneous channels such as capital income concentration and income composition effects, disproportionately benefiting higher-income groups. In a related contribution, Evgenidis and Fasianos (2021) [49] found that unconventional monetary policy interventions in the United Kingdom increased wealth inequality through portfolio rebalancing and housing price channels, outweighing offsetting redistribution mechanisms. These studies collectively underscored that inequality dynamics were highly sensitive to macro-financial conditions and transmission channels that operate asymmetrically across income groups.

Overall, the empirical evidence indicates that income inequality in the United Kingdom is shaped primarily by persistent long-run fiscal, macroeconomic, and labor-market relationships. Although the NARDL specification allows positive and negative income-share changes to generate different responses, the formal asymmetry test does not show that these differences are statistically significant. Accordingly, the principal empirical contribution of the study lies in the identified long-run equilibrium relationships, while the nonlinear results provide complementary evidence on possible directional heterogeneity.

4.9. Limitations

Several limitations should be considered when interpreting the findings, particularly the relatively small annual sample for 1980–2021, which restricts model complexity and may reduce the precision of nonlinear NARDL estimates. Although FMOLS and ARDL address important time-series properties, the estimated relationships should be interpreted primarily as conditional long-run associations rather than definitive causal effects, given the potential influence of unobserved institutional, demographic, technological, and policy changes. Moreover, because INC20 and the Gini index originate from the same underlying income distribution, the estimated INC20 effects may partly reflect a mechanical distributional relationship and should not be interpreted as an independent causal mechanism. The use of aggregate national indicators also limits the ability to capture heterogeneity across UK regions, household groups, income sources, and dimensions such as wealth and housing inequality. Future research could address these limitations by combining regional or household-level data with richer institutional and distributional measures to identify more precisely the channels through which labour-market conditions, fiscal policy, and economic growth shape inequality.

5. Conclusions

Income inequality remains one of the most important socioeconomic challenges confronting advanced economies, particularly in contexts where sustained economic growth has not been accompanied by proportional improvements in income distribution. By examining the United Kingdom over the period 1980–2021, this study provides a comprehensive assessment of the fiscal, labor market, and distributional factors that shape inequality dynamics in both linear and nonlinear settings.

The empirical findings indicate that income inequality is influenced by a combination of macroeconomic performance, labor market conditions, public redistribution mechanisms, and changes in income distribution across population groups. While economic expansion

contributes to rising income disparities, fiscal interventions through social spending, education expenditure, and taxation play an important role in moderating these distributional pressures. The results further demonstrate that unemployment remains a significant source of inequality, reinforcing the importance of inclusive labor market outcomes for achieving equitable economic development. The nonlinear analysis further indicates that positive and negative changes in the upper-middle-income share are associated with opposite-signed inequality responses; however, neither effect is statistically significant and the Wald test does not reject long-run symmetry. Consequently, the evidence does not support the conclusion that declines in the fourth-quintile income share generate systematically stronger inequality effects than comparable increases.

These findings carry several policy implications. First, Redistribution policies should continue to consider the position of middle-income households alongside lower-income groups, although the present nonlinear estimates do not establish statistically asymmetric effects associated with changes in the fourth-quintile income share. Second, public investment in education should be regarded as a long-term equality-enhancing instrument capable of improving opportunities and reducing structural disparities. Third, labor market policies aimed at reducing unemployment and strengthening workforce participation can contribute directly to a more balanced distribution of income. Finally, the design of tax and transfer systems should prioritize efficiency and inclusiveness, ensuring that economic growth translates into broadly shared prosperity rather than increased concentration of income. Future research may extend this analysis by incorporating wealth inequality, regional disparities, and institutional variables to provide a more comprehensive understanding of distributional dynamics in advanced economies.

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References

1. Atkinson, A.B. *Inequality: What Can Be Done?* Harvard University Press: Cambridge, MA, USA, 2015. Available online: https://www.cambridge.org/core/journals/economics-and-philosophy/article/abs/inequality-what-can-be-doneanthony-b-atkinson-harvard-university-press-2015-ix-384-pages/CCA81233696E54E50EFDABD1BA277E14 (accessed on 17 August 2026).
2. Milanovic, B. *Global Inequality: A New Approach for the Age of Globalization*; Harvard University Press: Cambridge, MA, USA, 2016. Available online: https://www.piie.com/sites/default/files/documents/milanovic20160509ppt.pdf (accessed on 17 August 2026).
3. Galor, O.; Zeira, J. Income distribution and macroeconomics. *Rev. Econ. Stud.* **1993**, *60*, 35–52. [CrossRef]
4. Carvalho, L.; Rezai, A. Personal income inequality and aggregate demand. *Camb. J. Econ.* **2016**, *40*, 491–505. [CrossRef]
5. Piketty, T. *Capital in the Twenty-First Century*; Harvard University Press: Cambridge, MA, USA, 2014. Available online: https://www.hup.harvard.edu/books/9780674430006 (accessed on 17 August 2026).
6. Stiglitz, J.E. *The Price of Inequality*; W.W. Norton: New York, NY, USA, 2014. Available online: https://wwnorton.com/books/the-price-of-inequality/ (accessed on 17 August 2026).
7. Musgrave, R.A. *The Theory of Public Finance: A Study in Public Economy*; McGraw-Hill: New York, NY, USA, 1959.
8. Okun, A.M. *Equality and Efficiency: The Big Tradeoff*; Brookings Institution: Washington, DC, USA, 1975.
9. Alesina, A.; Rodrik, D. Distributive politics and economic growth. *Q. J. Econ.* **1994**, *109*, 465–490. [CrossRef]
10. Persson, T.; Tabellini, G. Is inequality harmful for growth? *Am. Econ. Rev.* **1994**, *84*, 600–621.
11. Wang, C.; Caminada, K. *Disentangling Income Inequality and the Redistributive Effect of Social Transfers and Taxes in 36 LIS Countries*; SSRN Electronic Journal; Leiden University: Leiden, The Netherlands, 2011; pp. 1–53.
12. André, C.; Garcia, C.; Giupponi, G.; Pareliussen, J. *Labour Market, Welfare Reform and Inequality in the United Kingdom*; OECD Economics Department Working Papers; OECD Publishing: Paris, France, 2013; p. 1034. [CrossRef]
13. Giupponi, G.; Machin, S. Labour market inequality. *Oxf. Open Econ.* **2024**, *3*, i884–i905. [CrossRef]
14. Bourquin, P.; Brewer, M.; Wernham, T. Trends in income and wealth inequalities. *Oxf. Open Econ.* **2024**, *3*, i103–i146. [CrossRef]
15. Kuznets, S. Economic growth and income inequality. *Am. Econ. Rev.* **1955**, *45*, 1–28.
16. Berg, A.; Ostry, J.D.; Tsangarides, C.G.; Yakhshilikov, Y. Redistribution, inequality, and growth: New evidence. *J. Econ. Growth* **2018**, *23*, 259–305. [CrossRef]
17. Risso, W.A.; Punzo, L.F.; Sánchez Carrera, E.J. Economic growth and income distribution in Mexico: A cointegration exercise. *Econ. Model.* **2013**, *35*, 708–714. [CrossRef]
18. Demirci, D.G.; Kandemir, O.; Tütüncü, A. Revisiting the Kuznets hypothesis: The role of HDI and GDP in high and upper-middle income countries (1990–2018) using panel data. *Sosyoekonomi* **2026**, *34*, 403–426. [CrossRef]
19. Eroğlu, N.; Altaş, D.; Ün, T.; Ulu, M.İ. OECD ülkelerinde sosyal yardım harcamalarının gelir dağılımına etkisi: Panel veri analizi. *Uluslar. Ekon. Araştırmalar Derg.* **2017**, *3*, 335–354.
20. Bozkurt, E.; Altıner, A. OECD ülkelerinde kamu sosyal harcamalarının gelir eşitsizliğine etkisi: Panel kantil regresyon analizi. *Ekon. Sos. Araştırmalar Derg.* **2024**, *20*, 95–111.
21. Zhemelko, K.; Šubová, N. Importance of government social expenditures for income inequality in EU countries. *Polit. Ekon.* **2026**, *74*, 33–65. [CrossRef]
22. Dibo, M. Kamu sosyal harcamaları ve gelir eşitsizliği: OECD ülkeleri kapsamında bir analiz. *J. Emerg. Econ. Policy* **2022**, *7*, 1–16.
23. Yalçın, E.; Güneş, S.; Hotunluoğlu, H. Gelir dağılımı ve vergi gelirleri arasındaki ilişki: Panel veri analizi. *J. Account. Tax. Stud.* **2024**, *17*, 35–50. [CrossRef]
24. Ouedraogo, I.; Dianda, I.; Ouedraogo, P.P.R.; Ouedraogo, T.R.; Konfe, B. The effects of taxation on income inequality in sub-Saharan Africa. *Comp. Econ. Stud.* **2025**, *67*, 84–149. [CrossRef]
25. Turnip, G.N.; Sari, R.L. The effect of poverty, education, and unemployment on income disparity in ASEAN. *Talent. Conf. Ser. Local Wisdom Soc. Arts* **2026**, *9*, 318–322. [CrossRef]
26. Li, J.; Ridzuan, A.R.; Abd Rahman, N.H.; Abd Samad, K. Human capital and income inequality in China: An ARDL analysis. *e-J. Media Soc.* **2026**, *9*, 121–136. [CrossRef]
27. Aydın, B. Eğitim eşitsizliği, gelir eşitsizliği ve ekonomik büyüme nedensellik sarmalı. *Bull. Econ. Theory Anal.* **2026**, *11*, 67–98. [CrossRef]
28. Aktaş, E.E. Gelir dağılımı adaletsizliği ve istihdam ilişkisi: Seçili ülkeler için panel Tobit analizi. *Hacet. Üniversitesi İktisadi İdari Bilim. Fakültesi Derg.* **2022**, *40*, 1–24. [CrossRef]
29. Atabey, A.Ö.; Karakuş, M. The relationship between the sectoral structure of female employment and economic growth and income distribution in Türkiye: Empirical evidence from Fourier-based cointegration and causality analyses. *Ekon. Polit. Finans. Araştırmaları Derg.* **2025**, *10*, 677–708. [CrossRef]
30. Atkinson, A.B.; Jenkins, S.P. A different perspective on the evolution of UK income inequality. *Rev. Income Wealth* **2020**, *66*, 253–266. [CrossRef]
31. Dutta, J.; Sefton, J.A.; Weale, M.R. Income distribution and income dynamics in the United Kingdom. *J. Appl. Econom.* **2001**, *16*, 599–617. [CrossRef]

32. Nolan, B. Macroeconomic conditions and the size distribution of income: Evidence from the United Kingdom. *J. Post Keynes. Econ.* **1988**, *11*, 196–221. [CrossRef]
33. Mumtaz, H.; Theophilopoulou, A. The impact of monetary policy on inequality in the UK: An empirical analysis. *Eur. Econ. Rev.* **2017**, *98*, 410–423. [CrossRef]
34. Jäntti, M.; Jenkins, S.P. The impact of macroeconomic conditions on income inequality. *J. Econ. Inequal.* **2010**, *8*, 221–240. [CrossRef]
35. World Bank. *World Development Indicators: United Kingdom Data*; World Bank: Washington, DC, USA, 2024. Available online: https://data.worldbank.org/country/united-kingdom (accessed on 17 August 2026).
36. OECD. Social Spending (Long-Run Series), 2024. Available online: https://ourworldindata.org/grapher/social-spending-oecd-longrun?focus= GBR (accessed on 17 August 2026).
37. International Monetary Fund. *Government Finance Statistics: Primary Expenditure*; International Monetary Fund: Washington, DC, USA, 2024. Available online: https://www.imf.org/external/datamapper/prim_exp@FPP/AZE/GBR (accessed on 17 August 2026).
38. Statista. *Public Sector Expenditure as a Share of GDP in the United Kingdom*; Statista: Hamburg, Germany, 2024. Available online: https://www.statista.com/statistics/298478/public-sector-expenditure-as-share-of-gdp-united-kingdom-uk/ (accessed on 17 August 2026).
39. Pesaran, M.H.; Shin, Y. An autoregressive distributed lag modelling approach to cointegration analysis. In *Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium*; Strøm, S., Ed.; Cambridge University Press: Cambridge, UK, 1999; pp. 371–413. Available online: https://pure.york.ac.uk/portal/en/publications/an-autoregressive-distributed-lag-modelling-approach-to-cointegra/ (accessed on 17 August 2026).
40. Pesaran, M.H.; Shin, Y.; Smith, R.J. Bounds testing approaches to the analysis of level relationships. *J. Appl. Econom.* **2001**, *16*, 289–326. [CrossRef]
41. Phillips, P.C.B.; Hansen, B.E. Statistical inference in instrumental variables regression with I(1) processes. *Rev. Econ. Stud.* **1990**, *57*, 99–125. [CrossRef]
42. Shin, Y.; Yu, B.; Greenwood-Nimmo, M. Modelling asymmetric cointegration and dynamic multipliers in a nonlinear ARDL framework. In *Festschrift in Honor of Peter Schmidt: Econometric Methods and Applications*; Sickles, R.C., Horrace, W.C., Eds.; Springer: New York, NY, USA, 2014; pp. 281–314. [CrossRef]
43. Hasanov, R.I.; Vasa, L.; Mahmudova, I.; Mursalov, M.; Hajiyev, J. Relationship between economic growth and income inequality: A comparative analysis of the United States and the United Kingdom. *Reg. Stat.* **2026**, *16*, 301–325. Available online: https://www.ksh.hu/statszemle_archive/regstat/2026/2026_02/rs160204.pdf (accessed on 17 August 2026).
44. Cribb, J. Labour market and income inequalities in the United Kingdom, 1968–2021. *Fisc. Stud.* **2024**, *45*, 131–142. [CrossRef]
45. Blundell, R.; Cribb, J.; Wernham, T.; Xu, X. *Inequality in the UK: 1968–2021*; Institute for Fiscal Studies: London, UK, 2023. Available online: https://ifs.org.uk/sites/default/files/2023-12/Inequality-in-the-UK.pdf (accessed on 17 August 2026).
46. Uche, E.; Koyama, T.C.B.; Ngepah, N. Globalization—Inequality nexus in the US and UK: A multi-dimensional perspective. *Ann. Financ. Econ.* **2024**, *19*, 2450001. [CrossRef]
47. Ahrens, L. The (a)symmetric effects of income and unemployment on popular demand for redistribution. *West Eur. Politics* **2022**, *45*, 1407–1432. [CrossRef]
48. Drossidis, T. Macroeconomic Shocks and Income Inequality: An Empirical Investigation on the Distributional Channels of Monetary Policy and Oil Price News Shocks. Ph.D. Thesis, Brunel University London, London, UK, 2025. Available online: http://bura.brunel.ac.uk/handle/2438/31487 (accessed on 17 August 2026).
49. Evgenidis, A.; Fasianos, A. Unconventional monetary policy and wealth inequalities in Great Britain. *Oxf. Bull. Econ. Stat.* **2021**, *83*, 115–175. [CrossRef]

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