

## Asymmetric Effects of Redistributive Instruments on the Economic Well-Being of Moroccan Households: Evidence from a NARDL Approach.

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## Résumé

Dans les économies capitalistes, la distribution primaire du revenu, fondée sur la rémunération du travail et du capital, tend à générer des disparités croissantes de richesse. Si cette dynamique peut stimuler la croissance économique, elle accentue parallèlement les inégalités sociales et économiques. Cet article analyse les effets asymétriques des instruments redistributifs, en particulier les cotisations sociales, l'impôt sur le revenu, les prestations sociales et les autres transferts nets, sur le bien-être économique des ménages marocains entre 1998 et 2023.

En mobilisant le modèle à retards échelonnés autorégressif non linéaire (NARDL), l'étude distingue les variations positives et négatives des variables explicatives, permettant ainsi de saisir les asymétries dans les mécanismes de transmission des politiques fiscales et sociales. Les résultats empiriques révèlent des faiblesses structurelles au sein du dispositif redistributif marocain, notamment la faible cohérence entre contributions, prestations sociales et répartition équitable des ressources publiques.

À l'inverse, les autres transferts nets se présentent comme des instruments stabilisateurs efficaces, soulignant leur potentiel à renforcer les effets de la redistribution interne et à réduire la vulnérabilité économique. Ces résultats plaident pour une stratégie redistributive plus cohérente, articulant fiscalité, protection sociale et apports financiers externes, afin de promouvoir un bien-être inclusif et durable.

**Mots clés :** Redistribution, Modèle NARDL, Politique fiscale, Protection sociale, Bien-être économique.

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## Abstract

In capitalist economies, the primary distribution of income, driven by the remuneration of labor and capital, tends to generate increasing disparities in wealth. While this process can foster economic growth, it simultaneously amplifies social and economic inequalities. This article examines the asymmetric effects of redistributive instruments, namely social contributions, income tax, social benefits, and other net transfers, on the economic well-being of Moroccan households over the period 1998 to 2023.

Using a Nonlinear Autoregressive Distributed Lag (NARDL) model, the study distinguishes between the positive and negative variations of the explanatory variables, thereby capturing the asymmetric transmission mechanisms of fiscal and social policies. The empirical findings reveal structural weaknesses in Morocco's redistributive framework, particularly in the weak alignment between contributions, social benefits, and the equitable allocation of public resources.

Conversely, other net transfers emerge as significant stabilizing factors, demonstrating their capacity to complement domestic redistribution efforts. Overall, the study highlights the need for a more coherent redistributive strategy that strengthens the synergy between fiscal policy, social protection, and external financial inflows to promote inclusive and sustainable well-being.

**Keywords:** Redistribution, NARDL model, Fiscal policy, Social protection, Economic well-being.

## Introduction

In capitalist economies, the primary distribution of income by the market—based on the remuneration of labor and capital—tends to generate increasingly pronounced wealth disparities. While this dynamic can stimulate economic growth, it simultaneously exacerbates economic and social inequalities. As Thomas Piketty (2014) argues, the persistent accumulation of capital within a small segment of the population poses a serious threat to democratic stability (Gagnon, 2014). Similarly, Saez and Zucman (2019) demonstrate that this concentration of wealth is a structural feature of advanced economies and contend that existing tax systems are insufficient to curb it (Saez & Zucman, 2019).

In Morocco, empirical research on the interactions between taxation, social protection, and redistribution remains limited, despite the country's recent efforts to establish a more equitable and inclusive development model. This gap in the literature is particularly significant given the persistent structural challenges facing the Moroccan economy, including social and territorial inequalities, the prevalence of informality, the vulnerability of specific social groups, and the fragmentation of the social protection system.

Against this backdrop, an in-depth examination of the interplay between fiscal instruments and social protection mechanisms is crucial to better understand the effectiveness of public policy choices. Such an approach allows for the identification of the most effective redistribution levers and the detection of potential synergies between resource mobilization and social justice. The research question of this study is : **To what extent do redistributive instruments exert an asymmetric effect on the economic well-being of Moroccan households?**

The objective of this study is to analyze the asymmetric effects of redistributive instruments—namely social contributions, income tax, social benefits, and other net transfers—on the economic well-being of Moroccan households over the period 1998–2023. To achieve this, the study employs a NARDL model, which distinguishes between positive and negative variations in the explanatory variables in order to capture potential asymmetries in the transmission mechanisms of fiscal and social policies.

This paper is structured into six sections. The first reviews the theoretical and empirical literature on redistribution policy. The second outlines key stylized facts about the Moroccan redistribution system. The third presents the data and variables used in the analysis, followed by the fourth section detailing the methodological approach. The fifth discusses the main empirical findings, and the final section concludes with policy implications and directions for future research.

## 1. Literature Review

### 1.1. Theoretical Literature Review

Theories of distributive justice explore the fundamental principles that determine how goods, income, and opportunities are allocated within society. They offer distinct yet complementary perspectives on achieving equity and social fairness, each grounded in the philosophical reflections of influential thinkers who have shaped modern conceptions of justice.

The first group of theories centers on the equitable allocation of resources and identifies three core distributional criteria: need, merit, and equality. The principle of need emphasizes redistribution toward individuals whose basic living conditions or capabilities are insufficient. The principle of merit rewards effort, productivity, or contribution to collective welfare. Finally, strict equality advocates for an identical distribution of resources among all individuals, regardless of differences in circumstance. Yet, as Paul De Bruyne (1975) and others suggest, none of these principles alone can satisfy all dimensions of social justice; achieving fairness requires a balanced combination of these criteria adapted to the socio-economic context (Bruyne et al., 1974).

The utilitarian tradition, stemming from Jeremy Bentham and John Stuart Mill, takes a consequentialist view, arguing that justice derives from the maximization of collective well-being. Bentham's principle of utility sought to quantify happiness as the ultimate goal of social organization, while Mill nuanced this perspective by integrating moral and qualitative dimensions. However, critics have noted that this approach may justify inequalities if they increase aggregate welfare.

In contrast, resource-based and contractarian theories, inspired by John Rawls and Ronald Dworkin, shift attention to the fairness of institutional arrangements rather than outcomes alone. Rawls formulates the difference principle, asserting that social and economic inequalities are acceptable only if they benefit the least advantaged members of society (Rawls, 2003). Dworkin complements this view by emphasizing equality of resources, proposing that fairness lies in compensating individuals for circumstances beyond their control while recognizing personal responsibility for choices (Ronald Dworkin, 1981). Together, these theories highlight the delicate tension between freedom and equality that characterizes modern liberal democracies. Another important strand, the theory of social damage (Jacques, 1966), addresses the negative externalities of economic activity, such as poverty, exclusion, or environmental degradation. It advocates for institutional social responsibility and preventive policies to mitigate these "primary evils" that threaten social cohesion and human welfare.

Finally, social choice theories, developed notably by Amartya Sen (1999), extend the discussion of justice to the realm of collective decision-making (Ballet & Mahieu, 2009). These approaches examine how societies can reconcile individual preferences with collective goals through democratic and participatory mechanisms. They highlight the interplay between individual freedoms, institutional frameworks, and collective welfare, linking the ethics of distribution with the practical functioning of social institutions.

Taken together, these theoretical perspectives provide a rich conceptual foundation for analyzing redistributive mechanisms. They underscore that achieving social justice requires not only equitable distribution but also institutional arrangements that promote inclusiveness, transparency, and efficiency.

In light of these theoretical insights, the next section turns to empirical studies that examine how fiscal and social policies translate these normative principles into practice. Particular attention is given to the redistributive effects of taxation and social transfers, as well as to the asymmetric dynamics that may characterize their impact on household well-being.

## **1.2. Empirical Literature Review**

Redistribution, as both a normative and economic function of the State, seeks to correct market imbalances and promote social justice. Its role extends beyond merely compensating for inequalities—it serves as a central mechanism for macroeconomic stabilization and the reinforcement of social cohesion, particularly for the most vulnerable groups. Over the past decades, empirical research has yielded valuable insights into the tangible effects of redistributive policies on household well-being and inequality reduction.

The pioneering work of Reynolds and Smolensky (1977) laid the foundation for measuring the redistributive impact of tax and transfer systems by quantifying their influence on income distribution. Their research demonstrated that the structure of taxation and social transfers largely determines a state's ability to mitigate income disparities (Reynolds & Smolensky, 1977). Building upon these insights, Korpi and Palme (1998) and Bradley et al. (2003) further argued that welfare states characterized by generous and universal transfer systems tend to achieve superior outcomes in terms of equality and collective well-being, compared with selective or contributory welfare models (Bradley et al., 2003; Korpi & Palme, 1998).

In the field of social policy, Immervoll and Richardson (2011) emphasized that well-targeted transfers, when supported by adequate financing, not only alleviate poverty but also strengthen household resilience to economic shocks (Immervoll & Richardson, 2011). These findings have been corroborated by more recent studies, notably those of Bilan et al. (2020), Bakker and Van Vliet (2022), Zagel and Van Lancker (2022), and Hemerijck, Ronchi, and Plavgo (2023), who

underline that the most effective redistributive policies are those capable of reconciling social equity, economic incentives, and fiscal sustainability (Bakker & Van Vliet, 2022; Bilan et al., 2020; Hemerijck et al., 2023; Zagel & Van Lancker, 2022). Such perspectives highlight that redistribution should not be perceived merely as a fiscal burden but as a social investment that contributes to economic stability and inclusive growth.

However, in advanced economies, the growing concentration of capital increasingly challenges the effectiveness of redistributive systems. Saez and Zucman (2019) demonstrate that, despite higher tax rates and increasingly sophisticated redistribution mechanisms, capital accumulation among a small elite persists—revealing the structural limits of current fiscal systems (Saez & Zucman, 2019). Their work advocates for a more progressive and globally coordinated tax framework capable of countering wealth concentration and ensuring long-term distributive justice.

Beyond theoretical reflection, international experiences provide valuable empirical lessons. In France, Loubet and Fredon (2017) examined the effects of the Active Solidarity Income (RSA), housing allowances, and family benefits on living standards and employment (Antoine Loubet & Simon Fredon, 2017). Their findings reveal that while these programs significantly improve the living conditions of low-income households, particularly those with children and active labor market participation, they remain less effective at lifting inactive households out of poverty. This highlights the persistent challenge of aligning income support mechanisms with labor market activation to promote social mobility and inclusive participation.

Beyond these international experiences, the Moroccan context offers a particularly relevant framework for analyzing the scope and limitations of redistributive policies. Recent reforms—such as those concerning tax fairness, the generalization of compulsory health insurance (AMO), and the implementation of the Unified Social Registry (RSU)—reflect a strong political commitment to constructing a more equitable and inclusive model of development. Nevertheless, reports by the Economic, Social, and Environmental Council (Conseil Economique, Social et Environnemental, 2012, 2019) and the study by Hanine (2024) point to persistent challenges, including territorial disparities, labor market informality, and fragmentation of the social protection system (HANINE Sanae & BERRAHMA Nezha, 2024). These structural constraints underscore the need for a rigorous empirical assessment of the actual effectiveness of redistributive instruments on household economic well-being.

Taken together, the empirical literature converges toward a central conclusion: while redistribution remains a fundamental lever of social justice, its effectiveness varies substantially across institutional and economic contexts. In Morocco—where major fiscal and social reforms

are underway—it becomes essential to examine not only the magnitude of redistributive effects but also their asymmetric nature, in order to understand how positive and negative variations in fiscal and social instruments differentially affect household well-being.

## **2. Stylized Facts on Social Protection in Morocco**

The social security system in Morocco is built on a complex and diverse institutional framework designed to protect citizens against social and economic risks. It includes seven basic pension schemes and three supplementary schemes, while health coverage is provided through several arrangements, including Compulsory Health Insurance (AMO). These reforms reflect Morocco's commitment to expanding social protection, reducing vulnerability, and promoting social justice, while aligning national policies with constitutional guarantees and international standards, such as ILO conventions and the Sustainable Development Goals. The reform is based on the principles of solidarity, non-discrimination, anticipation, and participation, ensuring equitable access, resource pooling, proactive policy adjustment, and inclusive governance. Framework laws, notably Laws No. 09-21 and No. 06-22, provide the legal and institutional basis for implementing universal social protection and high-quality health coverage. Nevertheless, challenges remain, particularly in rural areas where infrastructure deficits and territorial disparities limit the effectiveness of these reforms.

Alongside this institutional architecture, the financial situation of social security schemes reveals significant vulnerabilities. The main pension schemes, including the CMR, RCAR, and CNSS, recorded cumulative technical deficits amounting to nearly 69% of GDP in 2022, highlighting issues related to financing, pension caps, and reserve management. Coverage is also limited: less than half of employees have access to a pension plan, and only 23.4% of eligible individuals are effectively covered. This institutional fragmentation, combined with methodological constraints such as the lack of reliable national mortality tables, complicates the planning and implementation of reforms. Measures aimed at restoring financial balance also have sensitive redistributive effects, requiring inclusive social dialogue to ensure their acceptability.

Finally, Moroccan social protection is organized around a tripartite approach combining social insurance, social assistance, and social action. Social insurance encompasses pension schemes and AMO, covering employees, self-employed workers, and vulnerable populations, while social assistance aims to reduce poverty and ensure access to essential services through the Unified Social Registry (RSU) and the Compensation Fund. These mechanisms face budgetary constraints, prompting reforms in the subsidy system to better channel resources toward direct assistance. Social action complements this framework by supporting vulnerable groups,

including abandoned children, women in difficulty, and the elderly, though it remains limited by fragmented programs and opaque eligibility criteria. Taken together, these factors underscore the need for an integrated and coordinated approach to enhance the effectiveness, sustainability, and equity of social protection in Morocco.

### 3. Data and variables

Our empirical approach aims to examine the hypothesis that the redistributive effects of fiscal and social policy instruments exhibit asymmetric behavior over time, meaning that their influence on household well-being may differ depending on whether these instruments expand or contract. To operationalize this hypothesis, we construct a set of five key economic indicators, expressed either as a share of gross domestic product (GDP) or as annual variations, and selected for their relevance in capturing both the structural and cyclical dimensions of public redistribution in Morocco.

The first indicator, income taxes (% of GDP), reflects the share of national output devoted to revenues from direct taxation of individual and household income. As a proxy for the progressivity of the tax system, it provides insight into the direct redistributive role of fiscal policy, particularly regarding higher-income groups. The second variable, social contributions (% of GDP), measures the total mandatory contributions paid by employers and employees relative to GDP. This indicator captures the system's capacity to mobilize internal resources for social protection schemes, including pensions, health insurance, and unemployment benefits.

The third variable, social benefits (% of GDP), represents the proportion of public expenditure allocated to social transfers such as pensions, allowances, and other income-support mechanisms. As the core component of redistributive action, its trajectory reveals the extent to which public policy aligns with social equity objectives and responds to macroeconomic fluctuations or structural reforms. A fourth indicator, other net transfers (% of GDP), captures the difference between transfers received and paid by households, including subsidies and targeted assistance outside conventional social benefits. This aggregate encompasses less formal but often counter-cyclical mechanisms of redistribution, such as consumption subsidies or temporary exemptions.

Finally, gross disposable income per capita (annual variation) serves as a direct measure of household economic well-being. By capturing the inflation-adjusted growth of disposable income per inhabitant, it informs on the capacity of households to sustain consumption, savings, and investment decisions. Its evolution thus constitutes a key performance metric for assessing the overall effectiveness of redistributive policies.

To empirically assess these relationships, the study relies on a comprehensive longitudinal dataset covering the period 1998–2023. This extended temporal horizon allows for the identification of both long-term structural patterns and short-term cyclical adjustments in redistributive mechanisms. The data are sourced from reputable national and international institutions known for their methodological rigor. In particular, figures on tax revenues, social contributions, and social benefits are drawn from the National Accounts published by the High Commission for Planning (HCP), Morocco’s principal statistical body.

Table 1 provides a systematic summary of all variables included in the empirical model, detailing their definitions, sources, and analytical roles. This structured presentation enhances transparency, facilitates replicability, and strengthens the robustness of the subsequent econometric analysis, particularly in assessing potential asymmetries in the redistributive impact of fiscal and social policy instruments.

**Table N°1:** Definition of Variables and Data Sources.

Variables	Label	Type	Data Source
RNBD_M	Gross Disposable Income per Capita (Evolution)	Dependent	National Accounts, High Commission for Planning (HCP), Morocco
IR_M	Income taxes (% of GDP)	Explanatory	
CS_M	Social contributions (% of GDP)	Explanatory	
(PS_M	Social benefits (% of GDP)	Explanatory	
ATN_M	Other net transfers (% of GDP)	Explanatory	

**Source :** Author’s elaboration

#### 4. Methodology

This study aims to assess the redistributive effects of socio-fiscal instruments on socio-economic and health-related well-being in Morocco over the period 1998–2023. To this end, we adopt the Nonlinear Autoregressive Distributed Lag (NARDL) model, which is particularly effective for capturing asymmetric responses and nonlinear dynamics often overlooked by conventional linear approaches.

Introduced by Shin, Yu, and Greenwood-Nimmo (2013), the NARDL framework enables the identification of both long-term cointegration imbalances and short-term adjustments, making it especially suitable for evaluating redistributive policies. Its capacity to reveal complex behavioral responses provides deeper insights into the effects of fiscal and social instruments on household outcomes (Shin et al., 2013).

The model specification considers the rate of change in gross disposable income per capita ( $\Delta RBD_t$ ) as the dependent variable and is expressed as follows:

$$\begin{aligned} \Delta RNBD\_M_t = & \alpha + \sum_{i=1}^p \beta_i \Delta RNBD\_M_{t-i} \\ & + \sum_{j=0}^q (\delta_j^+ \Delta IR_{t-j}^+ + \delta_j^- \Delta IR_{t-j}^-) \\ & + \sum_{k=0}^r (\theta_k^+ \Delta CS_{t-k}^+ + \theta_k^- \Delta CS_{t-k}^-) \\ & + \sum_{l=0}^s (\gamma_l^+ \Delta PS_{t-l}^+ + \gamma_l^- \Delta PS_{t-l}^-) \\ & + \sum_{m=0}^u (\phi_m^+ \Delta TR_{t-m}^+ + \phi_m^- \Delta TR_{t-m}^-) + \omega_1 RBD_{t-1} + \omega_2 IR_{t-1}^+ + \omega_3 IR_{t-1}^- \\ & + \omega_4 CS_{t-1}^+ + \omega_5 CS_{t-1}^- + \omega_6 PS_{t-1}^+ + \omega_7 PS_{t-1}^- + \omega_8 TR_{t-1}^+ + \omega_9 TR_{t-1}^- + \varepsilon_t \end{aligned}$$

Avec :

- $\Delta RNBD\_M_t$ : Dependent variable: rate of change in per capita gross disposable income
- $IR_t^+, IR_t^-$ : Positive and negative changes in income tax (% of GDP)
- $CS_t^+, CS_t^-$ : Positive and negative changes in social contributions
- $PS_t^+, PS_t^-$ : Positive and negative changes in social benefits
- $TR_t^+, TR_t^-$ : Positive and negative changes in other net transfers

This model specification allows for a clear separation of the short- and long-term positive and negative effects of each explanatory variable.

## 5. Resultats and discussion

This section applies the nonlinear ARDL (NARDL) model to examine the redistributive mechanisms in greater depth. This advanced econometric approach captures the asymmetric short- and long-run effects of social benefits on household welfare, revealing potential nonlinearities in the redistribution–welfare nexus. In the Moroccan context, it offers an innovative analytical perspective supported by rigorous specification, validity, and stability tests, ensuring the robustness of findings. The goal is to deliver a nuanced and context-specific assessment of social policy impacts and identify the most effective levers for enhancing welfare outcomes.



### 5.1. Preliminary test

This stage is crucial as it examines the dynamics of key fiscal and social aggregates relative to GDP and the evolution of per capita disposable income over the study period. By analyzing measures of central tendency, dispersion, and distribution, it provides an overview of the data and tests essential properties—such as normality and homogeneity—necessary to ensure the reliability of the NARDL model estimates.

**Table N°2 :** Descriptive characteristics of the variables used in the NARDL model.

	<b>IR_M</b>	<b>CS_M</b>	<b>PS_M</b>	<b>ATN_M</b>	<b>RNBD_M</b>
<b>Mean</b>	4.7230	9.8500	9.3923	11.792	4.792
<b>Median</b>	4.5500	10.050	9.3500	11.550	4.500
<b>Maximum</b>	6.3000	11.400	12.500	15.500	10.800
<b>Minimum</b>	3.5000	6.9000	6.5000	9.4000	-4.700
<b>Std. Dev.</b>	0.7038	1.3005	1.6706	1.9053	3.464
<b>Skewness</b>	0.3305	-0.7059	0.2262	0.4099	-0.353
<b>Kurtosis</b>	2,727 5	2,418 1	2,442 1	1,967 9	3 519
<b>Jarque-Bera</b>	0,553 9	2,526 2	0,558 9	1,882 2	0,835
<b>Probability</b>	0.7580	0.2827	0.7561	0.3901	0.658

**Source:** Author (our calculations using EViews 12)

Table 2 summarizes the key descriptive statistics of the variables used in the NARDL model. The results show that net transfers other than direct social benefits (ATN\_M) represent the largest share of GDP, while social security contributions (CS\_M) and social benefits (PS\_M) display similar averages, and income taxes (IR\_M) remain relatively modest. Gross national disposable income per capita (RNBD\_M) records an average annual growth of 4.79%, reflecting moderate gains in purchasing power.

Dispersion analysis indicates that RNBD\_M is the most volatile variable, whereas income taxes are the most stable. Skewness and kurtosis values suggest near-normal distributions, supported by Jarque–Bera test results that do not reject normality. Overall, the variables exhibit balanced distributions and moderate variability, providing suitable conditions for econometric modeling. However, descriptive analysis alone does not confirm the stochastic properties of the data. Therefore, before applying the NARDL model, it is necessary to test the stationarity and integration order of each variable—verified here using the Augmented Dickey–Fuller (ADF) test—to ensure valid and robust estimation.

**Table N°3:** Stationarity test of the variables in the NARDL model

<b>Test Results at 5% Threshold</b>			
<b>Variables</b>	<b>Augmented Dickey—Filler (ADF)</b>		<b>Stationarity</b>
	<b>Critical Value</b>	<b>t-Statistic</b>	
<b>Income taxes (DLIR_M)</b>	-1,955 681	-4,763 998	I (1)
<b>Social contributions (DLCS_M)</b>	-1,955 681	-4,419 567	I (1)
<b>Social benefits (DLPS_M)</b>	-1,955 681	-4,825 728	I (1)
<b>Other net transfers (DLATN_M)</b>	-1,955 681	-4,730 107	I (1)
<b>Gross Disposable Income per Capita (Evolution) (DLRNBD_M)</b>	-1,955 681	-10,274 43	I (1)

**Source:** Author (our calculations using EViews 12)

Table 3 presents the results of the Augmented Dickey–Fuller (ADF) stationarity tests for the five variables. All series become stationary after first differencing, with t-statistics below the 5% critical value, indicating integration of order one, I(1). This finding satisfies the NARDL model requirements, which allow for a mix of I(0) and I(1) variables but exclude higher-order integration. Consequently, the analysis proceeds with model specification and estimation.

## 5.2. Presentation and estimation of the nonlinear ARDL (NARDL) model

This analysis investigates the relationship between the dependent variable (LRNDB\_M) and a set of economic explanatory variables, emphasizing potential asymmetric responses to positive and negative shocks. Recognizing that economic agents may react differently to gains and losses, the study decomposes each variable into positive (POS) and negative (NEG) components. The objective is twofold: to assess the empirical validity of the model and to identify the differentiated effects of economic shocks within a framework reflecting bounded rationality and gradual adjustment dynamics.

**Table N°4:** Estimation of the NARDL model

<b>Variable</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>t-Statistic</b>	<b>Prob.*</b>
LRNDB(-1)	-0.87166	0.207978	-2.342389	0.0662
LCS_POS	-2.973167	7.792029	-0.381565	0.7185
LCS_POS(-1)	16.14402	7.829847	2.061857	0.0942
LCS_NEG	-22.76873	6.631624	-3.433357	0.0186
LCS_NEG(-1)	-9.438407	10.14499	-0.930352	0.3949
LIR_POS	8.459516	5.342370	1.583476	0.1742

LIR_POS(-1)	-12.70010	6.208657	-2.045547	0.0962
LIR_NEG	-6.632913	4.446572	-1.491691	0.1960
LIR_NEG(-1)	2.641527	1.178902	2.240666	0.0752
LPS_POS	9.202985	14.40789	0.638746	0.5511
LPS_POS(-1)	-19.51094	10.02474	-1.946278	0.1092
LPS_NEG	-50.83354	22.81445	-2.227252	0.0764
LPS_NEG(-1)	46.81314	28.81445	1.624641	0.1652
LATN_POS	-5.198441	4.371849	-1.189072	0.2878
LATN_POS(-1)	11.11040	3.397763	3.269915	0.0222
LATN_NEG	15.044088	8.055707	1.902179	0.1155
C	-0.044088	0.776777	-0.056757	0.9569
R-squared	0.9468	Durbin-Watson stat		3.042468
Prob(F-statistic) 0.033				

**Source:** Author (our calculations using EViews 12)

The estimation results of the NARDL model (Table 4) reveal a negative and significant lagged coefficient of the dependent variable ( $-0.487$ ;  $p = 0.0662$ ), indicating that approximately 49% of past disequilibria are corrected each period, confirming gradual convergence toward long-run equilibrium (Pesaran et al., 2001). The nonlinear specification (Shin et al., 2013) highlights significant asymmetric effects: a decline in social security contributions ( $LCS\_M^-$ ) has a strong negative impact on  $LRNDB\_M$  ( $p = 0.0186$ ), while increases ( $LCS\_M^+$ ) exert a weaker and delayed influence. Similar temporal asymmetries are observed for income tax and transfer variables, suggesting that negative shocks tend to generate faster and more intense responses than positive ones—consistent with asymmetric adjustment theories (Del Negro et al., 2015). The positive lag of other net transfers ( $LATN\_M(t-1)^+$ ) shows a significant delayed effect ( $p = 0.0222$ ), while other coefficients are mostly insignificant. The model exhibits strong explanatory power ( $R^2 = 0.94$ ) and overall significance ( $F = 5.567$ ;  $p = 0.033$ ), confirming its empirical validity. However, the Durbin–Watson statistic (3.04) suggests potential negative autocorrelation, warranting further diagnostic testing (Breusch–Godfrey or Ljung–Box tests) to ensure model stability.

### 5.3. Analysis of the Cointegrating Equation and Long-Term Effects

The cointegrating equation captures the long-term equilibrium relationship between  $LRNDB\_M$  and its explanatory variables in the NARDL model. Coefficient signs, magnitudes,

and statistical significance (p-values) indicate each variable's contribution to maintaining this equilibrium, despite short-term fluctuations.

**Table N°4:** Cointegrating Equation of the NARDL Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LCS_POS	8.856344	3.255606	2.720336	0.0418
LCS_NEG	21.65671	8.649604	2.503781	0.0542
LIR_POS	2.851452	1.314355	2.169468	0.0822
LIR_NEG	2.683887	3.210680	0.835925	0.4413
LPS_POS	6.931271	4.600120	1.506759	0.1922
LPS_NEG	2.695998	11.53360	0.233752	0.8244
LATN_POS	3.975315	1.048827	3.790249	0.0128
LATN_NEG	10.30376	6.379725	1.615078	0.1672
C	0.029645	0.524055	0.056569	0.9571

**Source:** Author (our calculations using EViews 12)

The estimated cointegrating equation is as follows:

$$EC = LRNDB - (8.8563 * LCS\_POS - 21.6567 * LCS\_NEG - 2.8515 * LIR\_POS - 2.6839 * LIR\_NEG - 6.9313 * LPS\_POS - 2.6960 * LPS\_NEG + 3.9753 * LATN\_POS + 10.3038 * LATN\_NEG - 0.0296)$$

The cointegration results indicate significant asymmetric effects of social security contributions and other net transfers on gross disposable income (LRNDB\_M). Increases in social security contributions (LCS\_POS) reduce income (coefficient = 8.856, p = 0.041), while decreases (LCS\_NEG) have a larger, though less robust, negative effect (coefficient = -21.656, p = 0.054), reflecting the rigidity of the Moroccan contributory system and consistent with Immervoll and Richardson (2011). Income taxes (LIR\_POS and LIR\_NEG) and social benefits (LPS\_POS and LPS\_NEG) show weak or insignificant effects, highlighting low progressivity, limited coverage, and inefficiencies in redistribution. By contrast, positive shocks in other net transfers (LATN\_POS) significantly enhance disposable income (coefficient = 3.975, p = 0.0128), while negative shocks (LATN\_NEG) are not statistically significant, suggesting short-term household resilience. The constant is insignificant (C = -0.0296, p = 0.9571), indicating that the explanatory variables capture most long-term variation. Overall, the results confirm a stable long-term relationship with pronounced asymmetries, validating the NARDL framework for analyzing redistribution dynamics in Morocco.

#### 5.4. Econometric Validation of the Model

To ensure the robustness of the NARDL model, a series of econometric tests were conducted to verify its underlying assumptions. These include the F-Bounds test for long-term relationships, the Breusch–Pagan test for homoscedasticity, the Ljung–Box test for autocorrelation, and the Jarque–Bera test for normality of residuals. Satisfying these criteria is essential for reliable and efficient parameter estimation.

##### 5.4.1. Specification Tests and Residual Diagnostics

##### 5.4.1.1. Presence of a Long-Term Relationship Between Variables (F-Bounds Test)

The F-Bounds test, developed by Pesaran, Shin, and Smith (2001) within the ARDL framework, assesses the existence of a long-term relationship between variables of mixed integration orders (I(0) or I(1)), provided no variable is integrated of order two (I(2)) (Pesaran et al., 2001).

**Table N°5:** F-Bounds Test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
<b>Asymptotic: n=1000</b>				
F-statistic	12.82404	10%	1.85	2.85
K	8	5%	2.11	3.15
		2.5%	2.33	3.42
		1%	2.62	3.77

**Source:** Author (our calculations using EViews 12)

The F-statistic (12.824) exceeds the 1% upper critical value (3.77), allowing rejection of the null hypothesis of no long-term relationship. This confirms the presence of cointegration, indicating a stable long-term equilibrium between LRNDB and its explanatory variables, including their positive and negative components.

##### 5.4.1.2. Heteroskedasticity of Residuals (Breusch–Pagan Test)

The Breusch–Pagan test (1979) is a standard method for detecting heteroscedasticity in regression residuals. Heteroscedasticity arises when error variances are non-constant, potentially biasing statistical inference, including confidence intervals, p-values, and prediction accuracy.

**Table N°6:** Heteroscedasticity Test

Test Statistique	Valeur p-value	Conclusion
<b>Breusch-Pagan</b>	<b>1,042 1</b>	<b>0,529 1</b>

**Source:** Author (our calculations using EViews 12)

The p-value (0.5291) exceeds conventional significance levels, so the null hypothesis of constant residual variance cannot be rejected. This indicates no evidence of heteroscedasticity, supporting the robustness of the model.

#### 5.4.1.3. Absence of Autocorrelation (Ljung–Box Test)

The Ljung–Box test (1978) is used to detect autocorrelation in regression residuals, assessing whether errors are independent and validating key assumptions in time series analysis.

**Table N°7:** Autocorrelation Test

Lag (Retard)	Q-Statistique	Valeur p-value	Conclusion
1	0,709 1	0,709 1	No evidence of autocorrelation
2	1,504 3	<b>0,471</b>	

**Source:** Author (our calculations using EViews 12)

The Ljung–Box test p-values for the first two lags (0.400 and 0.471) exceed the 5% threshold, indicating no significant autocorrelation. This confirms that the model residuals are random, supporting the validity of statistical inferences in a dynamic context.

#### 5.4.1.4. Normality Test of Residuals (Jarque–Bera)

The Jarque–Bera (JB) test assesses whether regression residuals follow a normal distribution by examining skewness (symmetry) and kurtosis (tailedness).

**Table N°8:** Residuals Normality Test

Test Statistique	Valeur p-value	Conclusion
<b>0,07</b>	0,964	Residuals are normally distributed

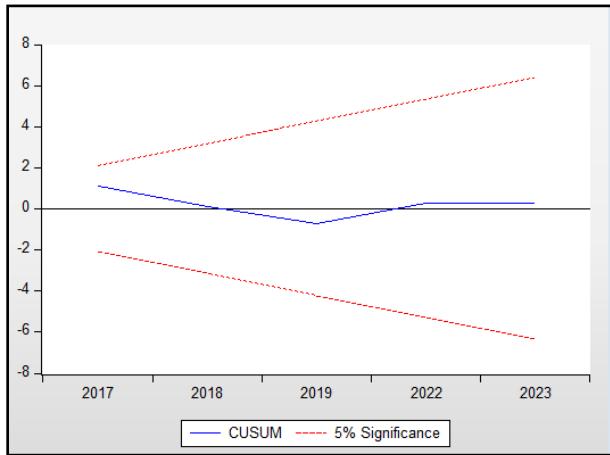
**Source:** Author (our calculations using EViews 12)

The Jarque–Bera test (JB = 0.07, p = 0.964) indicates that residuals are normally distributed, as the null hypothesis cannot be rejected. Along with the absence of heteroscedasticity and autocorrelation, this confirms that the model satisfies key classical assumptions, supporting robust and reliable estimation.

#### 5.4.2. Structural Stability Analysis (CUSUM Test)

Assessing a robust econometric model requires stable coefficients over time. The CUSUM test (Brown, Durbin, and Evans, 1975) evaluates structural stability by examining cumulative changes in standardized residuals. If the CUSUM curve remains within the 5% confidence bounds, the model parameters are considered stable, supporting the validity of the identified long-term relationships.

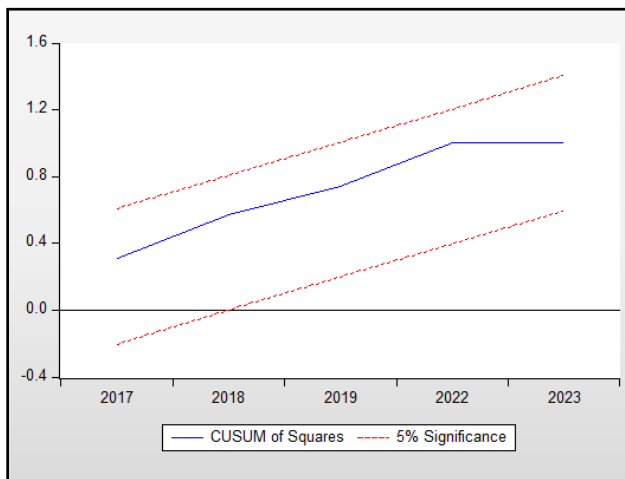
**Figure N°1:** NARDL Model CUSUM Stability Test



**Source:** Author (our calculations using EViews 12)

The CUSUM curve from 2017–2023 remains within the 5% confidence bounds, indicating that NARDL model coefficients are stable and the relationships between LRNDB and its explanatory variables are structurally consistent. This confirms that the captured asymmetric effects are robust over time. Additionally, verifying variance constancy through the CUSUM of Squares test is essential to ensure the absence of structural breaks affecting residual dispersion.

**Figure N°2:** NARDL Model CUSUM Stability Test



**Source:** Author (our calculations using EViews 12)

The CUSUM of Squares plot for 2017–2023 remains within confidence bounds, indicating constant residual variance and confirming homoscedasticity. Combined with the CUSUM test, this demonstrates coefficient stability and structural consistency, validating the robustness of the NARDL model. These diagnostics ensure reliable inference on cointegration and the asymmetric effects of fiscal and social instruments on disposable income.

### **5.5. Analysis of NARDL Model Results: Theoretical, Empirical, and Contextual Discussion**

The NARDL model reveals significant asymmetries in the effects of fiscal and social policies on Moroccan households' disposable income. Social security contributions exert a strong, lasting negative impact when increased, whereas decreases produce weaker and temporary effects. This reflects the structural limitations of Morocco's contributory system, where higher contributions are not matched by proportional benefits, particularly for low-income or partially covered groups (Immervoll & Richardson, 2011; Reynolds & Smolensky, 1977). The expansion of coverage through AMO-TNS and pension reforms has raised contributions without effectively improving household income, highlighting low redistributive efficiency and potential disincentives for formal sector inclusion.

Income tax shows no significant effect on disposable income, due to a narrow tax base, low progressivity, loopholes, and the predominance of indirect taxes, which dilute the observable impact of direct taxation (Saez & Zucman, 2019). Households also perceive little psychological gain from tax reductions, reinforcing the limited responsiveness of income to fiscal adjustments. Similarly, social benefits fail to significantly enhance disposable income, primarily due to institutional fragmentation, incomplete coverage, low benefit levels, poor targeting, and weak integration with the tax system (Antoine Loubet & Simon Fredon, 2017; Korpi & Palme, 1998; Musgrave et al., 1974). These inefficiencies perpetuate inequality rather than mitigate it.

In contrast, other net transfers, particularly remittances, have a measurable and stabilizing effect on household income, owing to their immediacy, unconditional nature, and direct targeting of vulnerable populations (de Haas, 2007; IBRD. Development Prospects Group, 2011).

Overall, the NARDL model highlights nonlinear and asymmetric responses in Moroccan household income, underscoring the limitations of current social protection and fiscal policies. These findings call for structural reforms, including a broadened and more progressive tax base, an equitable and efficient contributory system, universalization of social rights, and strategic integration of external transfers to strengthen redistributive effectiveness.

This concise analysis demonstrates the empirical relevance of asymmetric modeling in capturing the complex dynamics of Moroccan income distribution and the necessity for coherent policy design.

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## Conclusion

This study provides a comprehensive analysis of the asymmetric effects of redistributive instruments on Moroccan households' disposable income over the period 1998–2023, using a Nonlinear Autoregressive Distributed Lag (NARDL) framework. The findings reveal pronounced asymmetries in the transmission of social and fiscal policies, with social security contributions exerting a strong and persistent negative effect when increased, while reductions produce only weak and temporary benefits. Income tax and social benefits, by contrast, display limited or statistically insignificant impacts, reflecting structural inefficiencies in the tax system, fragmented social protection, and insufficient targeting mechanisms.

The empirical evidence underscores the structural limitations of Morocco's redistributive architecture, where the alignment between contributions, benefits, and equitable resource allocation remains weak. In contrast, other net transfers, particularly remittances, emerge as effective stabilizing instruments, highlighting the potential role of external inflows in complementing domestic redistribution.

These results have important policy implications. To enhance the redistributive capacity of public policies, Morocco needs to broaden and strengthen the progressivity of its tax base, improve the efficiency and fairness of the contributory system, expand social protection coverage, and better integrate social benefits with fiscal instruments. Moreover, leveraging external transfers within a coherent strategy could reinforce household resilience and reduce inequality.

By employing an asymmetric and nonlinear modeling approach, this study demonstrates the necessity of accounting for differentiated responses to policy changes, rather than relying on linear assumptions. Ultimately, the analysis contributes to a deeper understanding of the structural and institutional constraints that shape redistribution in Morocco and provides evidence-based guidance for designing more effective and socially inclusive fiscal and social policies.

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