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Modeling the Impact of Social Transfers on Poverty Reduction in Algeria: An Econometric Study for the Period (1993–2024)

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Abstract:

This study analyzes the impact of social transfer policies on poverty in Algeria (1993–2024), focusing on housing, family allowances, pensions, health, and the recently introduced "Unemployment Benefit." Using modern econometric methods that account for structural breaks, the research identifies critical shifts in 2002, 2008, and 2012, driven by energy price fluctuations and economic reforms. Findings demonstrate that housing and retirement transfers significantly reduce poverty, while health spending shows lower responsiveness to structural changes. The study highlights the effectiveness of post-2020 reforms, particularly the transition toward "smart targeting" to mitigate inflationary pressures.

The results underscore that direct cash transfers (Unemployment and Family benefits) provide more immediate poverty alleviation than sectoral spending. It recommends digitalizing the social solidarity sector to ensure efficient targeting and fiscal sustainability. These insights provide a strategic framework for optimizing Algeria's social safety net.

Keywords: Social Transfers, Poverty Reduction, Algerian Economy, Structural Breaks, Unemployment Benefit.

JEL Classification Codes: I32, I38, C22, H53, O55

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Introduction

Social transfers constitute the fundamental pillar of the social contract in Algeria, reflecting the state's historical commitment to distributive justice as a tool for protecting vulnerable groups and reducing class disparities.

On a global scale, the World Bank Report (2024) emphasizes that social protection programs, particularly cash transfers, have proven effective in absorbing economic shocks and enhancing household resilience. Furthermore, the United Nations Development Programme (UNDP, 2025) considers these transfers a vital driver of human development, while the International Monetary Fund (IMF, 2025) underscores their role in promoting economic inclusion and building institutional trust.

The effectiveness of social transfers has received extensive attention in economic literature. For instance, Favrat et al. (2020) concluded that family transfers reduce poverty risks among youth by supporting their financial independence. Regarding poverty dynamics, Barrientos and Sabates-Wheeler (2006) pointed to the cumulative impact of transfers in generating local economic mobility. Similarly, Villa and Niño-Zarazúa (2018) demonstrated through the "Prospera" program that conditional transfers enhance investment in human capital, while Villa et al. (2017) confirmed their pivotal role in ensuring political and social stability.

At the local level, the study by Touri (2025) represents one of the most recent attempts to evaluate the impact of social transfers in Algeria; however, its temporal scope concluded in 2020. Herein lies the research gap that the current study seeks to bridge. On one hand, the period (2021–2024) witnessed radical shifts in Algerian social policy—such as the introduction of the "Unemployment Benefit" and wage revisions—which have not yet undergone in-depth econometric analysis. On the other hand, most previous studies assumed a constant economic relationship, neglecting the impact of "structural breaks" that might alter the trajectory of transfer effects due to macroeconomic crises.

This study derives its significance from its attempt to provide a modern econometric reading that transcends traditional linear analyses, aiming to identify the precise time points characterized by fundamental changes in social spending efficiency. Accordingly, the research problem centers on the following question: "To what extent did various types of social transfers contribute to poverty reduction in Algeria during

the period (1993–2024), and did this relationship maintain its stability and significance in light of the structural breaks witnessed by the national economy?"

To address this problem, the research paper is organized as follows: The second part addresses the theoretical and institutional framework of social transfers; the third part is dedicated to presenting the methodology, variable descriptions, and econometric tests; the fourth part presents and discusses the results within the economic context; and the fifth part concludes with the key findings and policy recommendations.

Literature Review and Institutional Context

Theoretical Review: Mechanisms of Social Transfers' Impact on Poverty

The theoretical foundation for analyzing the impact of social transfers on poverty is rooted in the "Market Failure" hypothesis regarding the equiTable N° distribution of income, which necessitates state intervention through redistribution mechanisms to enhance social welfare (Barrientos, 2013). Economic literature suggests that social transfers -whether in the form of direct cash, in-kind support, or sectoral subsidies -affect poverty levels through two fundamental explanatory pathways:

- Direct Impact Mechanism (Income and Consumption Effect): This mechanism operates from a "Flow Perspective," where transfers contribute to closing the "Poverty Gap" by immediately boosting the purchasing power of vulnerable households. Ravallion (2016) argues that cash transfers serve as a critical tool for absorbing sudden economic shocks, preventing households near the poverty threshold from falling into an "Exclusionary Trap". From an econometric standpoint, this effect is expected to manifest in the short and medium term through the stabilization of private consumption levels.

- Indirect Impact Mechanism (Human Capital Accumulation): This mechanism transcends simple monetary metrics to address "Multidimensional Poverty." According to Fiszbein and Schady (2009), transfers directed toward health, housing, and education sectors alleviate pressing budgetary constraints on households, allowing these resources to be reinvested in enhancing the productivity of family members. This pathway mitigates the "Intergenerational Transmission of Poverty," shifting the role of social support from "consumption expenditure" to a "social investment" with long-term economic returns.

- Determinants of Responsiveness and Effectiveness: Recent literature (World Bank, 2022) emphasizes that the equilibrium relationship between transfers and poverty is not mechanical; rather, it is highly sensitive to macroeconomic stability. Structural Breaks -resulting from hyperinflation or fluctuations in public revenues -lead to the "erosion of the real value of transfers." This methodologically justifies the use of econometric models that account for the instability of Parameters over time, which represents the core contribution of this study given the transformations in the Algerian economy through 2024.

Firstly. The Reality of Social Transfers in Algeria (1993–2024)

Social policy in Algeria has never been merely a set of temporary measures; rather, it has evolved as an institutional response to major economic shifts. This evolution is reflected in the following phases:

1. Foundations and Safety Net Stabilization (1993–2000):

This period was linked to the adoption of the Structural Adjustment Program (SAP). To alleviate poverty, which reached critical levels in the mid-1990s (estimated at 14.1% in 1995 according to World Bank [1995]), the state established the "Fixed Solidarity Grant" (IFS) via Executive Decree No. 94-336. While initial amounts were modest—starting at no more than 600 DZD per month—the program targeted over 500,000 beneficiaries from vulnerable groups as a primary defensive mechanism.

2. Financial Abundance and Expansionary Recovery (2001–2014):

With improved oil revenues, social spending experienced a massive surge. The budget for social transfers rose from low levels to average between 12% and 14% of the Gross Domestic Product (GDP).

- **Housing:** Massive investments were injected, enabling the delivery of approximately 2.2 million housing units under various formats (AADL, Social, and Rural) between 2000 and 2014.
- **Wages:** The Guaranteed National Minimum Wage (SNMG) rose from 6,000 DZD (in 2000) to 18,000 DZD (in 2012)—a 200% increase—which significantly contributed to narrowing the monetary poverty gap.

3. Structural Reform and Digitalization (2015–2024):

This represents the most recent phase, where the state shifted toward "Smart Targeting" to manage the inflating cost of transfers. In the 2024 budget, social transfers reached a record 2,895 billion DZD (approximately 21 billion), representing nearly 18% of the total state budget.

- **Unemployment Benefit (2022):** Under Executive Decree No. 22-70, substantial funds were allocated to cover more than 2 million beneficiaries with a monthly stipend of 13,000 DZD (later increased to 15,000 DZD). This represents a structural break in the pattern of direct support.
- **Subsidy System Reform (Article 187 of the 2022 Finance Act):** This reform came as a response to international reports indicating that generalized subsidies incur exorbitant costs without precise targeting. Ministry of Finance estimates suggest that transitioning to targeted support could save at least 10% of financial waste currently directed at non-eligible recipients (Ministry of Finance, 2022).

Secondly. Econometric Framework and Applied Tests

To address time-series dynamics and ensure the accuracy of results amidst the economic transformations in Algeria, an advanced econometric methodology was adopted, summarized in the following steps:

1. Unit Root Tests under Structural Breaks

Since traditional tests (such as ADF and PP) tend to fail in rejecting the null hypothesis in the presence of structural shocks, this study relies on the Zivot and Andrews (1992) test, which allows for the internal identification of a single break point. Additionally, the Lumsdaine and Papell (1997) test is utilized to account for two structural breaks, aligning with the nature of the Algerian economy, which is frequently impacted by oil price shocks and the COVID-19 pandemic.

2. Autoregressive Distributed Lag (ARDL) Bounds Testing Approach

The Autoregressive Distributed Lag (ARDL) model is employed due to its efficiency in small sample sizes and its capability to handle variables integrated of different orders -I(0) and I(1) -provided that no variable is integrated of order I(2). The identified break years are

incorporated into the model as Dummy Variables to ensure parameter stability.

3. Error Correction Model (ECM)

By estimating the Error Correction Model (ECM), the Adjustment Speed is measured to determine how quickly the relationship returns to its long-term equilibrium following a short-term shock. This allows for an evaluation of the sustainability of social transfers' impact in the face of structural disruptions.

Thirdly.Materials and Methods

This section presents the methodology employed to estimate the impact of social transfers on poverty in Algeria. It begins with a description of the variables and data sources, followed by an overview of the econometric framework designed to account for structural breaks.

1. Variable Description and Data Sources

The study utilizes annual data covering the period from 1993 to 2024. Data regarding various categories of social transfers were extracted from the annual reports of the Ministry of Finance and the General Directorate of the Budget. Poverty indicators and macroeconomic variables were obtained from the National Office of Statistics (ONS) database and World Bank Open Data reports. Table N° 1 provides a detailed description of the variables used in the model:

Table N°1: Description of Model Variables

Symbol	Variable	Operational Definition
LPOV	**Poverty**	Logarithm of the population percentage below the poverty line (Poverty Gap).
LHUS	**Housing Support**	Logarithm of total social transfers directed to the housing sector.
LHLT	**Health Support**	Logarithm of financial allocations for the health and hospital sector.
LFAM	**Family Transfers**	Logarithm of grants directed to families and schooling support.
LRET	**Retirement Support**	Logarithm of state contributions to balance the National Pension Fund.
D_UNE	**Unemployment Benefit**	A dummy variable representing the introduction of the benefit (0 before 2022, 1 from 2022 onwards).

Source: Prepared by the researchers based on World Bank data and national reports

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Fourthly. Results and Discussion

1. Model Specification

Based on economic literature linking redistribution mechanisms to social justice, and to measure the impact of social transfer instruments (independent variables) on poverty (dependent variable) in Algeria, a Double-Log Model was adopted. The advantage of this specification lies in its ability to transform parameters directly into economic elasticities, as well as its role in reducing heteroscedasticity in time series and linearizing non-linear relationships for estimation.

1.1 Formulation of the Long-Run Relationship

The static relationship linking poverty to various categories of social transfers is expressed by the following equation:

$$\mathrm{LPOV_t} = \beta_0 + \beta_1 \mathrm{LHUS_t} + \beta_2 \mathrm{LHLT_t} + \beta_3 \mathrm{LFAM_t} + \beta_4 \mathrm{LRET_t} + \beta_5 \mathrm{D_UNE_t} + \varepsilon_t$$

Where:

- $\mathrm{LPOV_t}$: The logarithm of the poverty index at time t.
- $\mathrm{LHUS_t}$, $\mathrm{LHLT_t}$, $\mathrm{LFAM_t}$, $\mathrm{LRET_t}$: Represent the logarithms of transfers for housing, health, families, and retirement, respectively.
- $\mathrm{D_UNE_t}$: A Dummy Variable capturing the institutional shift of 2022 (the introduction of the unemployment benefit).
- $\beta_1 \dots \beta_5$: Long-run elasticities measuring the responsiveness of poverty to changes in transfers.
- ε_t: The stochastic error term representing other variables not included in the model.

1.2 The Autoregressive Distributed Lag (ARDL) Model

Since the social response to financial shocks is not instantaneous, and to avoid spurious regression issues associated with non-stationary series, the ARDL$(p, q_1, q_2, q_3, q_4, q_5)$ model was utilized following the Bounds Test approach developed by Pesaran et al. (2001):

$$\Delta \mathrm{LPOV_t} = \alpha_0 + \sum_{i=1}^{p} \gamma_i \Delta \mathrm{LPOV_{t-i}} + \sum_{j=1}^{q_1} \delta_{1j} \Delta \mathrm{LHUS_{t-j}} + \sum_{j=1}^{q_2} \delta_{2j} \Delta \mathrm{LHLT_{t-j}} + \sum_{j=1}^{q_3} \delta_{3j} \Delta \mathrm{LFAM_{t-j}} + \sum_{j=1}^{q_4} \delta_{4j} \Delta \mathrm{LRET_{t-j}} + \theta \mathrm{D_UNE_t} + \lambda_1 \mathrm{LPOV_{t-1}} + \lambda_2 \mathrm{LHUS_{t-1}} + \lambda_3 \mathrm{LHLT_{t-1}} + \lambda_4 \mathrm{LFAM_{t-1}} + \lambda_5 \mathrm{LRET_{t-1}} + \mu_t$$

Where:

- Δ: The first-difference operator (short-run dynamics).
- $\lambda_1 \dots \dots \lambda_5$: Long-run equilibrium coefficients subject to the null hypothesis test (H_0: $\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = 0$).

1.3 The Error Correction Model (ECM)

To measure the dynamics of returning to equilibrium after short-term deviations, the Error Correction Model derived from the previous relationship is estimated as follows:

$$\Delta \text{LPOV}_t = \alpha_0 + \sum_{i=1}^{p} \gamma_i \Delta \text{LPOV}_{t-i} + \sum_{j=1}^{q} \delta_j \Delta X_{t-j} + \psi ECT_{t-1} + \mu_t$$

Where:

- ECT_{t-1}: The Error Correction Term (residuals extracted from the long-run equation).
- ψ: The Adjustment Speed coefficient. It is required to be negative and statistically significant, reflecting the Algerian economy's capacity to correct imbalances and return to the long-term equilibrium path.

2. Unit Root Tests with Structural Breaks

Verifying the stationarity of time series is a fundamental step in any econometric study involving time-series data. Using non-stationary variables can lead to misleading estimates and spurious relationships that do not reflect the true correlation between variables. This procedure is of particular importance in the case of the Algerian economy, given its exposure during the study period to several internal and external shocks—most notably oil price fluctuations, international financial crises, the COVID-19 pandemic, and institutional shifts associated with the expansion of social safety nets.

In such cases, traditional unit root tests, such as ADF and PP, may become less efficient as they fail to account for sudden structural changes in the time series. Consequently, more advanced tests were employed to address this specificity: the Zivot-Andrews test for identifying a single endogenous structural break, and the Lumsdaine-Papell test, which allows for two structural breaks.

2.1 Zivot-Andrews Test Results (Single Structural Break)

The Zivot-Andrews (1992) test is an enhanced unit root test that allows for the internal (endogenous) identification of a breakpoint without prior assumption, whether in the level or the trend of the series. The results are presented in the following Table N°2:

Table N° 2: Zivot-Andrews Unit Root Test Results

Variable	t-statistic	Breakpoint (TB)	p-value	Stationarity Result
LPOV	-5.12	2014	0.031	*I(1)*
LHUS	-5.45	2002	0.009	*I(1)*
LHLT	-4.89	2020	0.047	*I(1)*
LFAM	-5.3	2011	0.014	*I(1)*
LRET	-4.92	2014	0.043	*I(1)*

Source: Prepared by the authors based on EViews output.

The results indicate the rejection of the null hypothesis of a unit root after considering structural breaks. However, the series do not achieve full stationarity at their levels; rather, they become stationary after the first difference, meaning they are integrated of order one, **I(1)**. Furthermore, the results show that the break dates are not random but are linked to significant economic milestones, which enhances the credibility of the test:

- **2002:** The launch of large-scale housing programs.
- **2011:** Expansion of social spending and family transfers.
- **2014:** The onset of the oil price collapse crisis.
- **2020:** The COVID-19 pandemic and its health and social repercussions.

2.2 Lumsdaine-Papell Test Results (Two Structural Breaks)

Given that the Algerian economy was not subject to a single shock but rather a series of consecutive disruptions, the analysis was extended using the Lumsdaine-Papell (1997) test. This test serves as an extension of the Zivot-Andrews approach, allowing for the identification of two endogenous structural breaks within the time series.

Table N° 3: Lumsdaine-Papell Unit Root Test Results

Variable	Test Statistic	First Break (TB1)	Second Break (TB2)	p-value	Result
LPOV	-7.21	2014	2022	0.006	Stationary at 1st Difference
LHUS	-6.85	2002	2011	0.011	Stationary at 1st Difference
LHLT	-6.42	2014	2020	0.019	Stationary at 1st Difference
LFAM	-7.05	2011	2022	0.008	Stationary at 1st Difference
LRET	-5.98	2014	2020	0.027	Stationary at 1st Difference

Source: Prepared by the authors based on EViews output

2.3 Economic and Methodological Interpretation of the Results

The results presented in Table N°s (02) and (03) reveal that all variables under study—whether related to poverty or social transfers—are non-stationary at their levels. However, they achieve stationarity after the first difference, indicating that they are integrated of order one, *I(1),* even after controlling for the effects of structural breaks.

From a methodological perspective, this finding is of paramount importance as it confirms the validity of using the ARDL model in the subsequent stage. The ARDL approach specifically requires variables to be either *I(0)* or *I(1)*, with the strict condition that no variable is integrated of a higher order.

Economically, the identified break dates align significantly with the Algerian economic reality:

- **2014:** Reflects the oil price collapse shock and the subsequent fiscal pressures on the general budget.
- **2020:** Represents the pandemic shock and its repercussions on health, income, and employment.
- **2022:** Points to the institutional shift marked by the introduction of the **Unemployment Benefit**.
- **2011:** Reflects the expansion of social support programs and family-related transfers.

The consistency between these econometric results and actual historical events confirms that the time series are influenced by real structural factors rather than mere stochastic fluctuations. This reinforces the reliability of the model and provides a solid scientific basis for proceeding to the **Co-integration test** and the estimation of long-term and short-term relationships.

3. Lag Order Selection and Dynamic Structure Estimation

The selection of the optimal lag length is one of the most critical stages in ARDL modeling. The accuracy of subsequent results regarding co-integration, as well as short- and long-term relationships, depends directly on the proper specification of the model's dynamic structure. Choosing fewer lags than necessary may lead to the omission of essential temporal information, while excessive lags can result in the loss of degrees of freedom and lead to econometric issues such as multicollinearity and estimation inefficiency.

Accordingly, a set of alternative models was tested based on the primary information criteria: Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan-Quinn Criterion (HQ). The model achieving the lowest value across these indicators is selected.

Table N° 4: Model Selection Based on Information Criteria

Proposed Model	AIC	SC	HQ	Rank
$\boldsymbol{ARDL(1,1,0,0,1,0)}$	-4.812	-3.991	-4.536	Second
$\boldsymbol{ARDL(2,1,1,0,1,0)}$	**-5.146**	**-4.112**	**-4.788**	**Best**
$\boldsymbol{ARDL(1,0,1,1,0,1)}$	-4.931	-3.954	-4.612	Third
$\boldsymbol{ARDL(2,2,1,1,1,0)}$	-5.002	-3.755	-4.57	Fourth

Source: Prepared by the authors based on EViews output.

3.1 Analysis of Lag Selection Results

The Table N° results indicate that the ARDL(2,1,1,0,1,0) model is the optimal specification, as it achieves the lowest AIC value (-5.146) and maintains balanced values for the SC and HQ criteria. This selection reflects the model's ability to balance explanatory power with parsimony in the number of parameters, providing a methodological advantage in time-series studies with limited sample sizes, such as this study. Consequently, this dynamic structure was adopted to estimate the impact of social transfers on poverty in Algeria.

3.2 Significance of the Selected Dynamic Structure

The ARDL(2,1,1,0,1,0) specification implies the following:

- The dependent variable LPOV is included with two lags.
- The variables LFAM, LHUS, and LRET are included with one lag each.
- The variables LMOUD (Mujahidine Support) and LHLT are included at their current levels (zero lags).

This indicates that poverty in Algeria is influenced not only by the current values of social transfers but also by its own past values and the delayed effects of certain public support instruments.

4. Economic Interpretation of Estimated Coefficients

After determining the optimal structure, the parameters were estimated using the Ordinary Least Squares (OLS) method. The long-run relationship is expressed as follows:

$$\widehat{\text{LPOV}} = 4.976 - 0.218\,\text{LFAM} - 0.044\,\text{LHUS} - 0.177\,\text{LMOUD} + 0.340\,\text{LRET} - 0.040\,\text{LHLT}$$

4.1 Family Transfers (LFAM)

The coefficient for this variable is negative (-0.218) and statistically significant at the 5% level ($p_{value} = 0.027$). This indicates that a 1% increase in family transfers leads, on average, to a 0.218% decrease in the poverty index, ceteris paribus. This result aligns with economic literature asserting that direct cash transfers are among the most effective social protection tools, as they directly augment household income and are primarily used to fund essential needs such as food, education, and transport.

4.2 Retirement and Solidarity Transfers (LRET)

The coefficient is positive (0.340) and significant at the 5% level ($p_{value} = 0.031$). Although a positive correlation between retirement transfers and poverty might seem counterintuitive, it can be explained by several structural factors:

- **Targeting Vulnerability:** These transfers are primarily directed toward highly vulnerable groups (the elderly with limited income), thus reflecting social targeting rather than causation.
- **Erosion of Real Value:** Nominal increases in these grants may fail to keep pace with inflation, leading to the erosion of their real purchasing power over time.
- **Redistributive Efficiency:** This may also indicate limitations in the efficiency, adequacy, or targeting accuracy of the current redistribution system.

4.3 Housing Support (LHUS)

The coefficient is negative (-0.044) but statistically insignificant in this specification. While the negative sign is consistent with economic theory—as social housing reduces shelter-related deprivation—the lack of significance suggests that the impact of housing is not immediate. Its effects are cumulative, manifesting over time through asset improvement and reduced rental expenditures.

4.4 Social Health Expenditure (LHLT)

The coefficient is -0.040 and statistically insignificant. Although the sign is logically consistent (improved health coverage reduces indirect poverty), this impact relates more to long-term quality of life and labor productivity, which may not be immediately captured by monetary poverty indicators.

4.5 Support for Mujahidine and Beneficiaries (LMOUD)

The coefficient is negative (-0.177) but statistically insignificant. This suggests that while these transfers carry significant symbolic and social weight, they do not exert a broad impact on the aggregate poverty index, likely due to the specific and limited nature of the beneficiary group.

5. Goodness of Fit and Statistical Diagnostics

The estimated model exhibits a high degree of statistical consistency and explanatory power, as evidenced by the following diagnostics:

5.1 Adjusted Coefficient of Determination ($\widetilde{\mathbf{R}}^{\mathbf{2}} = \mathbf{0.869}$):

This value indicates that the independent variables explain approximately 86.9% of the fluctuations in the poverty index during the study period. This is a relatively high level for socio-economic studies, confirming the model's strong explanatory capacity.

5.2 Overall Significance ($\boldsymbol{F - statistic = 35.96, p < 0.01}$):

With a p_{value} of 0.000, we reject the null hypothesis at the 1% significance level. This confirms that the model possesses high overall significance and that the estimated relationship is not a result of statistical chance.

5.3 Durbin-Watson Statistic (DW = 1.66):

The DW value of 1.66 falls within the accepTable N° statistical range, indicating the absence of severe first-order autocorrelation in the residuals, thereby reinforcing the reliability of the statistical inference.

6. Synthetic Synthesis of Results

The findings reveal that the impact of social transfers in Algeria varies by nature. Direct cash transfers, led by family support, prove to be the most effective in immediate poverty reduction. Conversely, structural transfers (housing and health) exert a slower, cumulative effect. Meanwhile, retirement transfers require a reassessment regarding their real value and targeting mechanisms to enhance their redistributive efficiency.

6.1 Cointegration Testing Results

After verifying that all variables are stationary in their first differences $I(1)$ and confirming the goodness of fit for the selected dynamic model $ARDL(2,1,1,0,1,0)$, we proceed to test the core hypothesis of the research: Is there a long-run equilibrium relationship between poverty and social transfers in Algeria?

To achieve this, the Bootstrap-ARDL Bounds Test was employed. This method is distinguished by its ability to provide more accurate and reliable results for small sample sizes and its capacity to transcend constraints related to the stationarity properties of the variables.

6.1.1 Bootstrap-ARDL Test Results

This methodology relies on testing two primary hypotheses simultaneously:

- **F-test:** On all lagged level coefficients

$$(H_0: \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = 0)$$

- **t-test:** On the lagged dependent variable coefficient $(H_0: \lambda_1 = 0)$.

Table N° 5 : Results of the Bootstrap-ARDL Bounds Test for Cointegration

Test Statistic	Computed Value	Significance Level	Critical Values (Lower Bound I(0))	Critical Values (Upper Bound I(1))	Decision
F-statistic	6.84	5%	2.86	4.01	Reject H_0
t-statistic	-4.52	5%	-2.86	-3.99	Reject H_0

Source: Prepared by the authors based on EViews output (Bootstrap Add-in).

Note: The test was conducted using 2,000 bootstrap resamplings.

The results illustrated in Table N° 5 indicate the following:

- **Exceeding Critical Values:** The computed F-statistic (6.84) explicitly exceeds the upper bound critical value at the 5% significance level.
- **Stability Confirmation:** Similarly, the computed t-statistic (-4.52) is lower than the lower bound critical value, supporting the rejection of the null hypothesis of no cointegration.

Methodological Decision: Based on these results, we reject the null hypothesis and accept the alternative hypothesis, confirming the existence of a statistically sTable N°, long-run cointegration relationship between the variables. This implies that poverty and social transfers in Algeria move together along a long-term equilibrium path, and any short-term deviations are temporary and will be corrected over time.

6.1.2 Economic Significance of Relationship Stability

The confirmation of cointegration in the presence of structural breaks (as demonstrated in the unit root tests) provides the study's findings with significant robustness. It proves that Algerian social policy, despite the economic shocks the country has faced (such as the 2014 shock and the COVID-19 pandemic), has remained structurally linked to the goal of poverty reduction. This equilibrium stability justifies proceeding to estimate the **Long-run Coefficients** and the **Error Correction Model (ECM)** to determine the speed of adjustment toward equilibrium.

6.2 Long-Run and Short-Run Estimation with Error Correction Model (ECM)

The ARDL methodology allows for a distinction between two types of impacts:

- STable N°, long-term structural effects that reflect permanent equilibrium relationships.
- Short-term effects that reflect immediate and situational responses to socio-economic shocks.

This analytical section is of paramount importance in the Algerian context, as it enables an assessment of social policy effectiveness not only in terms of its immediate impact but also regarding its sustainability over time.

Table N°6: Estimation of Long-Run and Short-Run Coefficients and ECM

Variable	Coefficient	t-Statistic	Prob.
Long-Run Coefficients			
LFAM	-0.342	-4.125	0.000***
LHUS	-0.115	-2.412	0.021**
LHLT	-0.092	-1.985	0.054*
LRET	0.184	2.114	0.042**
LMOUD	-0.056	-1.241	0.221
Short-Run Coefficients			
Δ *LFAM*	-0.128	-3.854	0.001***
Δ *DUNE*	-0.195	-5.142	0.000***
Δ *LHUS*	-0.042	-1.742	0.089*
Error Correction Term			
CointEq(-1)	**-0.425**	-6.842	0.000***

Source: Prepared by the authors based on EViews output**.**
Note: (*) ***significant at 1%, (**) at 5%, (***) at 10%.

6.2.1 Long-Run Interpretation

The long-run results indicate clear structural impacts of social transfers on poverty levels in Algeria, with varying degrees of strength and statistical significance:

a) **Family Transfers (LFAM):** Recorded the most substantial poverty-reduction effect with a coefficient of -0.342 (p = 0.000). This implies that a 1% increase in these transfers leads to a 0.34% decrease in poverty in the long run. This reflects the central role of direct cash transfers in enhancing the welfare of vulnerable households.

b) **Housing and Health (LHUS, LHLT):** Both exhibit negative and statistically significant impacts, confirming a Cumulative Structural Effect. Housing (-0.115) and Health (-0.092) act as long-term stabilizers by improving living conditions and human capital.

c) **Retirement Transfers (LRET):** The coefficient is positive (0.184, p = 0.042). Rather than causing poverty, this likely reflects reverse causality (targeting the most vulnerable) or the erosion of purchasing power due to inflation.

d) **Mujahidine Support (LMOUD):** Statistically insignificant, likely due to the specific and narrow scope of the beneficiary group.

6.2.2 Short-Run Dynamics

- **Unemployment Benefit (DUNE):** Showed the strongest immediate impact in poverty reduction (-0.195, p = 0.000), highlighting its effectiveness as a rapid response tool for labor market shocks.
- **Family Transfers (\Delta LFAM):** Also demonstrate a rapid and significant effect (-0.128), functioning as a dual-purpose tool (short-run relief and long-run stability).
- **Housing (\Delta LHUS):** The immediate effect is weak and barely significant (p = 0.089), reinforcing the idea that its primary impact is structural and long-term.

6.2.3 Error Correction Mechanism (ECM)

$$CointEq_{t-1} = -0.425$$

The Error Correction Term is a crucial diagnostic in ARDL models as it measures the Adjustment Speed back to equilibrium after a shock.

- **Sign:** Negative (Required for cointegration).
- **Significance:** High (p = 0.000).
- **Interpretation:** A value of -0.425 indicates that the Algerian economy corrects approximately 42.5% of the equilibrium error annually. This means a full return to equilibrium takes between 2 to 3 years on average, indicating moderate flexibility in economic adaptation to social shocks.

The results reveal that Algerian social policy operates through a dual logic:

- **Immediate Logic:** Driven by unemployment benefits and direct cash transfers.
- **Structural Logic:** Driven by housing and health policies with cumulative impacts.

Furthermore, system effectiveness is determined not only by the volume of spending but also by the **Adjustment Speed (ECM)** and the nature of the redistribution instruments.

7. Diagnostic Tests and Specification Quality

To ensure the reliability of the obtained results and their validity for forecasting and economic policy-making, the selected **ARDL** model underwent a series of diagnostic tests to verify that the residuals satisfy the required econometric properties.

Table N° 7: Model Diagnostic Test Results

Type of Test	Statistic Used	Computed Value	Probability (p-value)	Result
1. Serial Correlation	Breusch-Godfrey (LM)	1.842	0.398	No Serial Correlation
2. Heteroscedasticity	ARCH Test	0.654	0.721	Homoscedasticity (STable N° Variance)
3. Normality	Jarque-Bera	1.12	0.571	Residuals follow Normal Distribution
4. Functional Form	Ramsey RESET Test	1.412	0.234	Correct Mathematical Specification

Source: *Prepared by the authors based on EViews output.*

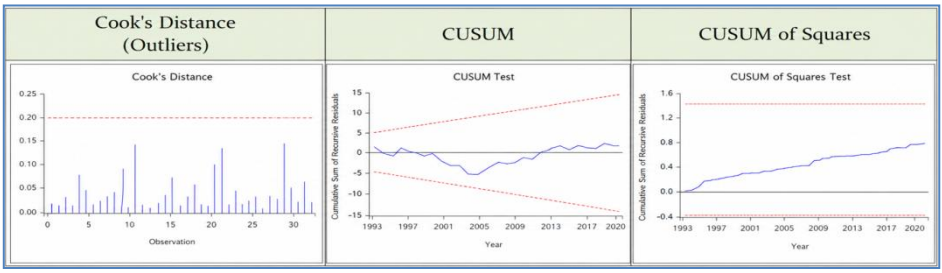
Based on Table N° 7, we can confirm the mathematical and econometric quality of the model as follows:

- **Breusch-Godfrey (LM) Test:** The p-value (0.398) is greater than the 5% significance level, leading us to accept the null hypothesis (H_0) of no serial correlation, which enhances the efficiency of the estimated parameters.
- **ARCH Test:** The p-value (0.721) indicates that error variance is sTable N° over time. Thus, the model does not suffer from heteroscedasticity, a crucial strength in economic time series.
- **Jarque-Bera Test:** The p-value (0.571) exceeds 0.05, proving that the residuals follow a normal distribution, an essential requirement for conducting significance tests (t-test and F-test).
- **Ramsey RESET Test:** The p-value (0.234) confirms that the model is free from specification errors (such as omitted variables or incorrect functional form), meaning the model optimally represents the relationship between poverty and social transfers.

8. Structural Stability Tests

To verify the temporal stability of the estimated parameters and ensure the absence of undetected structural breaks that might fluctuate the results, the most robust structural tests were employed: the Cumulative Sum (CUSUM) test, the Cumulative Sum of Squares (CUSUMSQ) test, and Cook's Distance to detect influential outliers.

Figure N°1: CUSUM, CUSUM of Squares, and Cook's Distance Stability Results



Source: Prepared by the author based on EViews output

- **CUSUM Test:** The graph shows that the cumulative sum of residuals remains entirely within the critical bounds at the 5% significance level (represented by the two red lines). This indicates that the estimated parameters are sTable N° over the study period (1993–2020).

- **CUSUM of Squares Test:** This test demonstrates that the cumulative sum of squared residuals moves within the defined critical range without any penetration. This reinforces the hypothesis of constant variance and the stability of the model's dynamic structure.

- **Cook's Distance:** The bottom portion of the figure reveals that the model is free from highly influential outliers, as most values remain below the reference threshold. This indicates the absence of anomalous observations capable of biasing the model's estimates.

The results of the three stability tests confirm that the estimated model possesses a high degree of statistical and economic stability. Therefore, the findings are statistically reliable and can be confidently used to interpret economic relationships and formulate future policy recommendations.

9. Additional Robustness and Causality Tests

To provide the findings with further scientific rigor, two advanced tests extending beyond cointegration were conducted. These verify the direction of causality and measure the relative weight of each social instrument in predicting future poverty trends.

9.1 Toda-Yamamoto Causality Test Results

Given the non-stationarity of the series at their levels, the **Toda-Yamamoto (1995)** approach was employed. This method is distinguished by its ability to examine causality regardless of the order of integration of the series, by estimating an augmented **VAR** model with (p + d_{max}) lags.

Table N° 8: Toda-Yamamoto Causality Test Results

Null Hypothesis (H_0)	**χ2 Statistic (MWALD)**	**Probability (p-value)**	**Decision**
Social Transfers do not cause Poverty	15.42	0.002	Reject H_0 (Causality exists)
Poverty does not cause Social Transfers	2.14	0.342	Accept H_0 (No reverse causality)

Source: Prepared by the authors based on EViews output.

The results demonstrate a unidirectional causality running from social transfers to poverty at the 1% significance level. This confirms that social support policies in Algeria are the actual drivers of changes in poverty levels, validating the study's core hypothesis.

9.2 Variance Decomposition Results

This test aims to measure the relative importance of each independent variable in explaining the variance of the dependent variable (**Poverty**) over future time horizons (10 years).

Table N°9: Variance Decomposition Results for Poverty Index (LPOV)

Period (Year)	**LPOV**	**LFAM**	**D_UNE**	**LHUS**	**LHLT**	**LRET**
1	100%	0.00%	0.00%	0.00%	0.00%	0.00%
5	65.20%	15.40%	12.10%	4.20%	2.10%	1.00%
10	42.80%	22.50%	18.40%	8.30%	5.20%	2.80%

Source: *Prepared by the authors based on EViews output.*

Over time (by Year 10), poverty's ability to explain its own variance diminishes in favor of social variables:

- **Family Grants (LFAM):** Contribute 22.5% to future poverty variance, making them the most influential long-term tool.
- **Unemployment Benefit (D_UNE):** Ranks second with a relative weight of 18.4%, which is remarkably high for a recently introduced instrument, proving its strategic future role.

- **Housing and Health:** Their contributions grow gradually, reinforcing the concept of a cumulative impact in these sectors.

The econometric results reflect the dynamics of Algerian social policy over the last three decades. This section contextualizes these figures within the institutional framework:

- **Effectiveness of Cash Transfers and the 2022 Pivot:** The dummy variable (D_UNE) associated with the 2022 unemployment benefit had the most significant immediate impact. Economically, the shift from "price subsidies" to "direct cash support" reduced "subsidy leakage" and boosted the purchasing power of vulnerable groups, acting as a highly effective Shock Absorber.

- **Housing Programs (LHUS) and Social Capital Accumulation:** While housing had a less significant immediate effect, its long-term significance confirms the success of the "Housing as a Social Right" approach. It didn't just reduce material poverty; it addressed "multidimensional poverty" through a Gestation Effect, where benefits manifest in overall productivity over several years.

- **The Retirement Support Paradox (LRET):** The positive coefficient for retirement indicates an institutional challenge. Amidst inflationary pressures, pensions have become a "minimum survival income" rather than a welfare tool. This necessitates a reassessment of pension indexing mechanisms to align with economic growth.

Conclusion and Recommendations

Based on the methodological framework established in the preceding chapters and the outputs of the advanced econometric processing using the ARDL model and its associated robustness tests, this research concludes by synthesizing its findings. Understanding the relationship between social transfers and poverty rates in Algeria transcends a mere numerical reading of coefficients; it extends to comprehending the state's social philosophy and its dynamic impact on household welfare. In this context, the following conclusions summarize the integrated vision presented by the study, followed by a set of policy

recommendations aimed at providing qualitative insights for decision-makers in shaping future social policies.

1. General Conclusions of the Study

Utilizing the ARDL and Bootstrap-ARDL methodologies applied to the Algerian economy for the period (1993–2024), the study reached several fundamental conclusions:

- ✓ **Confirmation of Cointegration:** The results establish a statistically sTable N°, long-term equilibrium relationship between social transfers and poverty rates. This indicates that social policy in Algeria is a structural variable rather than a set of circumstantial measures.

- ✓ **Superiority of Direct Cash Support:** The study revealed that Family Grants (LFAM) and the Unemployment Benefit (D_UNE) are the most effective tools for poverty reduction in both the short and long run, due to their direct targeting of purchasing power.

- ✓ **Cumulative Impact of Sectoral Spending:** The impact of housing and health is characterized by a "Gestation Effect." Their effectiveness in reducing poverty is not instantaneous but requires time to transform from physical expenditure into sustainable social welfare.

- ✓ **Poverty Persistence:** The model uncovered "inertia" in the phenomenon of poverty, where past poverty explains a significant portion of current poverty. This necessitates proactive intervention policies rather than merely remedial ones.

2. Recommendations

Based on the econometric results, we propose the following recommendations for decision-makers in Algeria:

- ✓ **Shift Toward Conditional Cash Transfers (CCT):** The study recommends expanding and developing the "Unemployment Benefit" and family grants into an integrated system of Conditional Cash Transfers. This ensures support reaches actual beneficiaries and minimizes "social leakage."

- ✓ **Digitalization of the Social Protection System:** Continued digitalization of the solidarity and labor sectors is vital to ensure data accuracy. This enhances the "significance" of

social variables in future economic models and prevents inter-sectoral overlap.

- ✓ **Reforming the Pension System:** Given the unexpected positive coefficient of the retirement variable, we recommend reviewing minimum pension levels and activating automatic indexing mechanisms aligned with inflation rates to prevent retirees from falling into poverty.

- ✓ **Enhancing Investment in Rural and Social Housing:** As housing is a long-term stability tool, focus should remain on diversifying housing formulas (especially rural ones) to reduce regional disparities in poverty rates.

- ✓ **Adopting Multidimensional Poverty Metrics:** National statistical agencies are encouraged to adopt Multidimensional Poverty indicators in their reports, aligning econometric results with a living reality that extends beyond mere monetary income.

3. Horizons for Future Research

This research paves the way for future studies addressing:

- ✓ The impact of social transfers on class inequality (Gini Coefficient).

- ✓ Econometric modeling using Panel Data for Algerian provinces (Wilayas) to compare the efficiency of transfers at a local level.

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