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The Impact of Economic Growth on Poverty and Regional Inequalities in Tunisia: An Econometric Panel Data Approach

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Abstract

This paper examines the impact of economic growth on poverty and regional income inequality in Tunisia using a dynamic panel data approach covering the country's main regions over the period 1990–2025. The analysis is framed within the growth–inequality–poverty triangle to explore the interdependencies among these three dimensions of development. Following a descriptive analysis of regional dynamics, including summary statistics and correlations, the study estimates a set of interrelated dynamic equations using fixed-effects models to account for temporal persistence and unobserved regional heterogeneity.

The results indicate that economic growth in Tunisia has not consistently been pro-poor and has had limited impact on poverty reduction due to weak job creation and uneven distribution of growth benefits across regions. The relationship between growth and inequality is only partially consistent with the Kuznets hypothesis, and persistent regional disparities highlight that growth remains concentrated in coastal and wealthier regions, whereas inland areas continue to lag. Institutional and socio-economic factors emerge as key determinants of inequality and poverty outcomes. From a policy perspective, the findings underscore the importance of designing targeted regional development strategies, promoting inclusive governance, and ensuring equitable allocation of public investment to transform economic growth into an effective instrument for reducing poverty and regional disparities in Tunisia.

Keywords: Economic growth; Poverty; Income inequality; Regional disparities; Tunisia; Fixed-effects panel models.
Jel codes: O47, I32, R11

1. Introduction

Over the past decade, regional economic disparities have emerged as a major challenge to inclusive and sustainable development in Tunisia. Despite episodes of positive economic growth, substantial gaps persist between coastal and inland regions in terms of income levels, employment opportunities, access to education, public infrastructure, and basic social services. These persistent spatial disparities have contributed to entrenched poverty and rising regional inequalities, raising concerns about the effectiveness of past development strategies and their capacity to foster territorial convergence.

In response to these challenges, Tunisian development policies have increasingly emphasized the promotion of inclusive growth, particularly in disadvantaged regions. Decentralization reforms, territorial governance initiatives, and regional development programs have been introduced with the objective of reducing spatial inequalities and improving living standards in marginalized areas. At the academic and policy levels, recent debates have similarly shifted away from a narrow focus on aggregate economic growth toward broader approaches that explicitly integrate poverty reduction and inequality mitigation as central development objectives. Within this framework, the concept of pro-poor growth has gained prominence, as it assesses whether economic growth disproportionately benefits the poor and contributes to a more equitable income distribution.

A growing body of empirical literature has examined the relationship between economic growth, poverty, and inequality, both in developing economies and in the MENA region. However, existing studies provide mixed and sometimes contradictory evidence regarding the capacity of economic growth to reduce poverty and inequality, particularly at the regional level. Many contributions rely on national-level data, thereby overlooking substantial intra-country disparities, while others focus exclusively on either poverty or inequality without jointly analyzing their dynamic interaction with growth. Moreover, empirical evidence for Tunisia remains relatively scarce, fragmented, and often based on outdated data or limited time horizons, despite the profound structural and institutional changes experienced since the 2011 revolution.

This study aims to address these gaps by examining the joint dynamics of economic growth, poverty, and regional inequality in Tunisia using a regional panel data framework covering the period 1990–2025. By adopting a regional perspective, the analysis captures spatial heterogeneity in development outcomes and provides a more nuanced assessment of whether economic growth has been inclusive and pro-poor at the regional level. The study further contributes to the literature by employing dynamic panel estimation techniques that account for endogeneity and unobserved heterogeneity, thereby providing more robust empirical evidence on the growth–inequality–poverty nexus in a regional context.

The main objective of this article is to assess whether economic growth in Tunisia has been inclusive at the regional level. More specifically, the study addresses the following research questions: (i) Does economic growth contribute to poverty reduction across Tunisian regions? (ii) What is the relationship between economic growth and regional income inequality? (iii) To what extent has growth promoted regional convergence or, alternatively, reinforced existing spatial disparities?

The findings of this study provide relevant insights for policymakers by identifying the conditions under which economic growth can serve as an effective tool for reducing poverty and inequality across regions. The remainder of the article is organized as follows. Section 2 reviews the literature on the relationship between economic growth, poverty, and inequality. Section 3 presents the research methodology, including data sources and econometric models. Section 4 discusses the empirical results. Finally, Section 5 concludes and outlines policy implications, research limitations, and directions for future research.

2. Economic Growth, Poverty and Inequality: A Review of the Literature

The relationship between economic growth, poverty, and inequality has long occupied a central position in development economics. While early theoretical approaches considered economic growth as a sufficient condition for poverty reduction, subsequent research has emphasized the conditional and multidimensional nature of this relationship. Both theoretical and empirical studies highlight that the impact of growth on poverty and inequality critically depends on income distribution, institutional quality, labor market dynamics, and regional disparities.

2.1. Economic Growth and Poverty

Traditional neoclassical theory posits that economic growth reduces poverty through income expansion and employment creation, often referred to as the “trickle-down” mechanism. This view was empirically supported by Dollar and Kraay (2000), who argue that growth tends to benefit all income groups proportionally. However, subsequent studies have challenged this optimistic conclusion by demonstrating that economic growth does not automatically translate into poverty reduction, particularly in contexts characterized by high inequality, labor market rigidities, and weak institutions.

More recent empirical evidence emphasizes the conditional nature of the growth–poverty relationship. Fosu (2017) and Ravallion (2012) show that the elasticity of poverty reduction with respect to growth declines as initial inequality increases. Ferreira (2021) further demonstrates that growth episodes accompanied by redistributive policies and investments in human capital are markedly more effective in reducing poverty than growth driven primarily by capital-intensive or enclave sectors.

In response to these findings, the concept of pro-poor growth has gained prominence, shifting the focus from the rate of growth to its distributional pattern. Kakwani and Pernia (2000) distinguish between absolute and relative pro-poor growth, while Ravallion and Chen (2003) propose empirical frameworks to assess whether growth disproportionately benefits the poor. Recent contributions extend this approach by incorporating multidimensional poverty and spatial inequality. Dang and Lanjouw (2021) and the World Bank (2022, 2023) show that regional disparities and unequal access to public services substantially weaken the poverty-reducing impact of growth in developing countries.

Furthermore, Ngo and Lee (2025) highlight that policy-driven growth components, such as trade liberalization, can significantly influence the relationship between income distribution and poverty dynamics. These findings suggest that structural economic changes and institutional quality play a critical role in determining how growth translates into meaningful poverty reduction.

In the MENA region, recent studies show that economic growth has often failed to generate substantial poverty reduction due to persistent regional imbalances, limited job creation, and insufficient social protection coverage (Assaad et al., 2020; World Bank, 2023). These observations underscore the importance of regionally targeted and institutionally grounded growth strategies to achieve meaningful and inclusive poverty reduction.

2.2 Economic Growth and Inequality

The relationship between economic growth and income inequality has generated equally intense debate. Kuznets (1955) proposed the inverted U-shaped hypothesis, suggesting that inequality initially increases during early stages of development before declining as economies mature. However, empirical evidence has increasingly questioned the universality of this pattern, particularly in developing and middle-income countries.

Early empirical studies by Alesina and Rodrik (1994) and Persson and Tabellini (1994) emphasize that high inequality can undermine economic growth by generating political instability and limiting investment in human capital. More recent research refines this perspective by highlighting non-linear and context-specific effects. Halter, Oechslin, and Zweimüller (2014) show that inequality may stimulate growth in the short run but hampers it in the long run by restricting social mobility and access to economic opportunities.

Contemporary literature increasingly focuses on the spatial dimension of inequality. Alvaredo et al. (2018) and Rodríguez-Pose and Ezcurra (2020) demonstrate that regional disparities in income, infrastructure, and human capital reinforce national inequality and constrain inclusive growth. Moreover, rising inequality has been shown to weaken the poverty-reducing impact of growth by concentrating income gains among higher-income groups (Bourguignon, 2004; Lakner et al., 2022).

Recent empirical studies using panel data and dynamic econometric models confirm that inequality is both a cause and a consequence of uneven growth processes. Reports by the IMF (2021) and the OECD (2023) indicate that countries exhibiting more inclusive growth patterns tend to achieve more stable and sustainable long-term growth. These findings are consistent with Sen's (1999) capability approach, which argues that development should be assessed not only through income growth but also through the expansion of individual freedoms and access to opportunities.

Moreover, panel evidence by Ambassa, Mondjeli Mwa Ndjokou, and Tsopmo (2024) shows that foreign aid can reduce income inequality in Sub-Saharan Africa, although its effectiveness is significantly weakened in contexts of conflict, highlighting how institutional and political conditions shape the growth–inequality nexus—a factor likely relevant for understanding regional disparities in developing countries, including the MENA region.

Taken together, the existing literature highlights that the relationships between economic growth, poverty, and inequality are complex, context-dependent, and strongly shaped by institutional and spatial factors. While economic growth can contribute to poverty reduction, its effectiveness critically depends on the initial level of inequality, the distributional pattern of growth, and regional heterogeneity in development outcomes. These insights underscore the need for empirical analyses that jointly examine growth, poverty, and inequality within an integrated framework, particularly at the regional level and over extended time horizons.

3. Research Methodology

The central question of this study is whether economic growth benefits all social groups equitably, especially the most disadvantaged. According to pro-poor growth theory, reducing income inequality constitutes a critical mechanism for sustainably lowering poverty. This section presents the methodology adopted to empirically analyze the relationships between economic growth, income inequality, and poverty in Tunisia.

The objectives are twofold: (1) to assess the impact of growth on income inequality and test for causal relationships, and (2) to examine the effects of growth on poverty using socio-economic welfare indicators.

Growth is considered pro-poor if it simultaneously reduces inequality and poverty, and exclusionary if it increases regional disparities despite positive aggregate performance.

3.1 Data Description: Sources and Limitations

The empirical analysis is based on a regional panel covering seven Tunisian regions — Greater Tunis, Northeast, Northwest, Center-East, Center-West, Southeast, and Southwest — over the period 1990–2025, at five-year intervals, corresponding to a balanced panel suitable for panel data estimations with fixed and random effects.

The data are drawn from multiple official sources, including the National Institute of Statistics (NIS), household budget and living standards surveys, the General Population and Housing Census, and the Statistical Yearbook of Tunisia. Information on public investment at the regional level is obtained from the Ministry of Development, Investment, and International Cooperation.

However, despite the richness of the available sources, several limitations persist, notably the limited availability of long and fully disaggregated regional time series, potential measurement inconsistencies across statistical sources, and challenges related to data harmonization over extended periods. These constraints justify the use of panel estimators that account for unobserved region-specific effects and help mitigate potential estimation biases.

3.2 Selection of Indicators

Both dependent and explanatory variables were selected based on literature recommendations and the availability of regional-level data.

Dependent variables include regional GDP per capita (GDP), the Gini index (GINI), and the poverty rate (POV). Explanatory variables include labor and employment indicators (unemployment rate, UNEMP; female labor force participation, FAR), health and demography indicators (life expectancy at birth, LEB; regional stillbirth rate, SBR), education (secondary school enrollment rate, SECR), and public investment (regional government expenditure, INV).

This multidimensional framework captures the structural factors shaping regional disparities and isolates the net effects of growth on inequality and poverty.

Table 1. *Description of Variables*

Main Category	**Indicator**	**Abbreviation**
Growth	Gross Domestic Product (GDP) per capita (%)	GDP
Inequality	Gini Index	GINI
Poverty	Poverty rate (%)	POV
Labor Force and Employment	• Unemployment rate (%) • female labor force participation rate	UNEMP FAR
Health & demography	• Life expectancy at birth (years) • Regional incidence of stillbirths (per 1,000 births)	LEB SBR
Education	Secondary school enrollment (ages 12–18) (%)	SECR
Investment	Regional public investment (thousand dinars)	INV

Source : Compiled by the author

3.3 Basic Models

This section addresses the central research question of the study, namely the impact of economic growth on income inequality and poverty across Tunisian regions. To analyze these relationships, we adopt a dynamic panel data framework that allows for capturing both temporal persistence and unobserved regional heterogeneity. Rather than relying on a system of simultaneous equations, the analysis is based on a set of interrelated dynamic equations estimated separately but interpreted within a coherent analytical framework.

The empirical specification is organized around three core equations corresponding to the main dimensions of interest:

- Growth Equation

$$GDP_{i,t} = \alpha_0 + \alpha_1 GDP_{i,t-1} + \alpha_2 GINI_{i,t} + \alpha_3 POV_{i,t} + \alpha_4 UNEMP_{i,t} + \alpha_5 FAR_{i,t} + \alpha_6 LEB_{i,t} + \alpha_7 SBR_{i,t} + \alpha_8 SECR_{i,t} + \alpha_9 INV_{i,t} + \varepsilon_{it}$$

- Income Inequality Equation

$$GINI_{i,t} = \beta_0 + \beta_1 GINI_{i,t-1} + \beta_2 GDP_{i,t} + \beta_3 POV_{i,t} + \beta_4 UNEMP_{i,t} + \beta_5 FAR_{i,t} + \beta_6 LEB_{i,t} + \beta_7 SBR_{i,t} + \beta_8 SECR_{i,t} + \beta_9 INV_{i,t} + U_{it}$$

- Poverty Equation

$$POV_{i,t} = \gamma_0 + \gamma_1 POV_{i,t-1} + \gamma_2 GDP_{i,t} + \gamma_3 GINI_{i,t} + \gamma_4 UNEMP_{i,t} + \gamma_5 FAR_{i,t} + \gamma_6 LEB_{i,t} + \gamma_7 SBR_{i,t} + \gamma_8 SECR_{i,t} + \gamma_9 INV_{i,t} + V_{it}$$

These equations are designed to reflect the sequential transmission mechanisms linking economic growth, inequality, and poverty. Economic growth is first examined as a determinant of income inequality, while both growth and inequality are subsequently included as key explanatory variables in the poverty equation.

In all specifications, « ***i*** » denotes the region (***i = 1, 2, …, 7***) and « ***t*** » represents the time period (***T = 8***).

($GDP)_t$ is GDP per capita at the beginning of the reference period, while $(GDP)_{t-1}$ denotes lagged GDP per capita. $(GINI)_t$ is the Gini index in the reference period, and $(GINI)_{t-1}$ is its lagged value. ($POV)_t$ represents the poverty rate at the beginning of the reference period, while $(POV)_{t-1}$ corresponds to the lagged poverty rate.

$(UNEMP)_{i,t}$, ($FAR)_{i,t}$, $(LEB)_{i,t}$, $(SBR)_{i,t}$, $(SECR)_{i,t}$, and $(INV)_{i,t}$ respectively denote the unemployment rate, the female labor force participation rate, life expectancy at birth, the regional stillbirth rate, the secondary school enrollment rate (ages 12–18), and public investment in region « ***i*** » at time « ***t*** ». GDP per capita and investment are expressed in natural logarithms to reduce scale effects and heteroskedasticity, while the other variables are measured in levels or percentages.

The coefficients **(α, β, γ)** represent the parameters to be estimated.

$\mathcal{E}$, ***U***, and ***V*** denote stochastic error terms, each comprising region-specific effects and random disturbances.

The first equation is grounded in endogenous growth theory (Barro, 2000). The coefficient α_1, associated with initial income, is expected to be negative, reflecting the hypothesis of conditional convergence, whereby poorer regions tend to experience faster growth than richer ones (Barro & Sala-i-Martin, 2003). The parameter α_2 captures the impact of income inequality on economic growth and represents the redistributive–growth trade-off: a negative α_2 indicates that a reduction in inequality stimulates growth, whereas a positive α_2 suggests that redistributive efforts may hinder growth dynamics.

The second equation describes the dynamics of income inequality, following the frameworks proposed by Deininger and Squire (1998) and Forbes (2000). The coefficient β_1 reflects the persistence of inequality over time, while β_2 measures the marginal effect of economic growth on income inequality. A positive β_2 indicates

that economic expansion is associated with rising inequality, suggesting a non-inclusive growth process, whereas a negative β_2 implies that growth contributes to a more equitable distribution of income, reflecting inclusive growth dynamics.

The third equation analyzes regional poverty dynamics, based on the pro-poor growth literature (Dollar & Kraay, 2000; Fosu, 2009; Ravallion, 2001). The coefficient γ_1 captures the persistence of poverty over time, while γ_2 measures the marginal effect of economic growth on poverty. A negative γ_2 indicates that growth contributes to poverty reduction, reflecting pro-poor outcomes. Within this framework, growth is considered inclusive when accompanied by declining inequality $(\alpha_2 < 0 \text{ and } \beta_2 < 0)$, and explicitly pro-poor when $\gamma_2 < 0$.

Estimation Method: Fixed Effects Models

The three equations are estimated using panel data models with both fixed and random effects. Given the potential correlation between unobserved regional characteristics and the explanatory variables, the fixed-effects estimator is retained as the main specification. This choice is particularly appropriate for the panel structure (N = 7 regions; T = 8 periods) and the inclusion of lagged dependent variables.

To ensure robust inference, standard errors are clustered at the regional level, accounting for heteroskedasticity and intra-regional correlation. This approach prevents the use of conventional Hausman tests; nevertheless, both econometric and substantive considerations justify the fixed-effects specification, especially for the inequality and poverty equations. For the growth equation, fixed effects are also preferred as they better capture intra-regional variations.

It should be noted that in dynamic panels with a small time dimension, the coefficient of the lagged dependent variable may be slightly downward biased (Nickell bias). Given the limited number of regions, we rely on the standard fixed-effects estimator while explicitly acknowledging this limitation and interpreting the lagged coefficients with caution. Estimated coefficients are interpreted as marginal effects, and their statistical significance is assessed using cluster-robust standard errors.

4. Results and Interpretations

4.1 Descriptive Data Analysis

We present three sets of descriptive statistics to provide a comprehensive overview of the data used in our econometric analysis. **Table 2** reports summary statistics for all model variables, **Figure 1** illustrates their distribution over the five-year intervals of the study period, and **Table 3** highlights regional variations across the seven Tunisian regions.

Table 2. *Descriptive Statistics of the Model Variables*

Variables	Observations	Mean	Standard Deviation	Min	Max
GDP	56	3475.04	2199.95	701	7998.5
GINI	56	0.352	0.028	0.295	0.441
POV	56	19.70	8.53	5.30	42.60
UNEMP	56	16.85	4.02	9.70	24.90
FAR	56	24.05	6.10	15	39.20
LEB	56	72.09	5.35	61	80.10
SBR	56	269.80	188.81	75	733
SECR	56	71.99	8.49	60.30	90.50
INV	56	309.22	140.65	85.90	655.40

Source: Author's elaboration

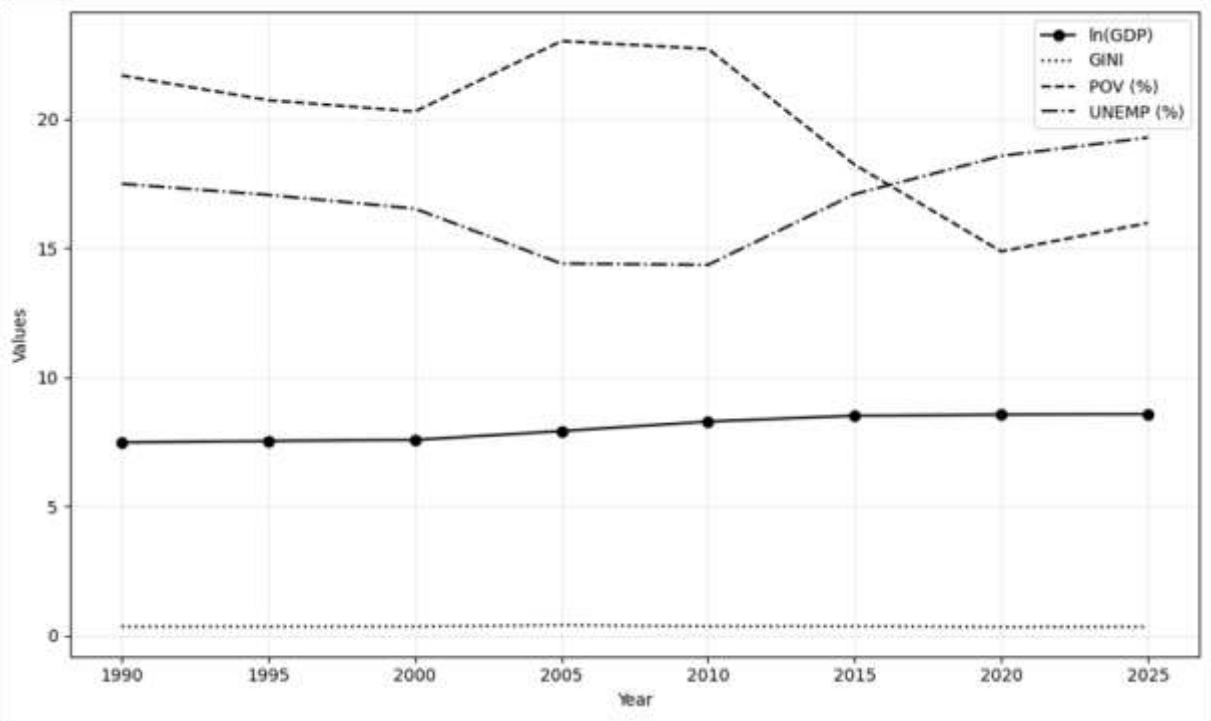

Figure 1. *Evolution of Key Economic Variables in Tunisia (1990–2025)*

Table 3. *Descriptive Statistics of the Variables by Regions*

Regions / Variables	Greater Tunis	North-East	North-West	Center-East	Center-West	South-East	South-West
GDP	4647.10	4648.97	1553.72	5617.36	1350.77	3534.77	2972.56
GINI	0.370	0.330	0.340	0.343	0.372	0.358	0.350
POV	8.09	17.84	24.20	13.10	31.85	22.27	20.56
UNEMP	16.34	13.35	20.29	12.21	17.69	18.47	19.60
FAR	30.47	29.9	20.39	27.77	19.16	17.76	22.89
LEB	75.96	74.9	66.84	77.27	73.74	72.61	63.32
SBR	449	194.62	102.5	519	317.87	141.25	164.37
SECR	79.34	71.27	68.24	79.69	64.48	71.64	69.29
INV	451.51	276.05	306.04	359.1	335.1	284.54	152.19

Source: Author's elaboration

The descriptive statistics provide a clear overview of the main economic and social variables and highlight significant heterogeneity across Tunisian regions from 1990 to 2025. According to estimates from major international organizations, average annual economic growth reached approximately 2.5% over the last decade. This growth was accompanied by improvements in several social indicators: the poverty rate declined from

21.7% in the early 1990s to around 16% in 2025, while the Gini index slightly decreased from 0.343 to 0.337 across the seven regions. Over the same period, GDP per capita increased steadily from 1,776 dinars in 1990 to 5,303 dinars in 2025 (Figure 1).

However, the evolution of these variables reveals a clear dissociation between economic growth and inclusive development outcomes. While GDP per capita exhibits a strong upward trend, reductions in poverty and inequality remain modest and uneven over time. The persistence of relatively high inequality levels suggests that the benefits of growth have not been evenly distributed across regions, limiting its poverty-reducing potential.

The labor market exhibits similarly mixed dynamics. The unemployment rate declined from 17.5% in 1990 to 14.4% in 2010, before rising again to 19.3% in 2025, highlighting the limited capacity of economic growth to generate sufficient employment opportunities. In contrast, female labor force participation increased substantially, from 19.5% in the early 1990s to nearly 28% in 2025, reflecting gradual progress in women's economic inclusion. Public investment also more than doubled over the period, indicating sustained government efforts to support economic and social development.

Despite these overall improvements, pronounced interregional disparities persist. As shown in Table 3, the wealthiest region records a GDP per capita of 5,617.36 dinars, well above the national average (Table 2) and more than four times higher than that of the poorest region (1,350.77 dinars). These disparities largely reflect the spatial concentration of population, industrial activity, and entrepreneurship in coastal areas.

Income inequality is more pronounced in the most developed regions—Greater Tunis (0.370) and Centre-East (0.343)—due to the concentration of high-income households and economic activities. Conversely, relatively poorer regions such as the Northwest (0.340) and Northeast (0.330) exhibit lower Gini coefficients. In line with the Kuznets hypothesis, these differences may reflect variations in stages of regional economic development.

Poverty remains a major concern, with 19.7% of the population still living below the poverty line (Table 2). The incidence of poverty is particularly high in the Centre-West (31.85%) and Northwest (24.2%), compared to only 8.09% in Greater Tunis. These disparities underscore the limited inclusiveness of growth across regions.

Regional unemployment gaps are substantial, ranging from 12.21% in the Centre-East to 20.29% in the Northwest, thereby constraining prospects for balanced regional development. Gender inequalities also remain pronounced: female labor force participation does not exceed 20% in inland regions, compared with approximately 30% in coastal areas. These disparities are closely linked to differences in human capital accumulation: secondary school enrollment among individuals aged 16–18 reaches nearly 80% in the Centre-East (79.69%) and Greater Tunis (79.34%), compared with only 64.48% in the Centre-West.

Health indicators further reveal persistent territorial inequalities. Life expectancy at birth is lower in regions with intermediate or low income, which also account for a disproportionate share of neonatal mortality. In contrast, women in more developed regions benefit from broader access to healthcare services and social protection, resulting in significantly lower neonatal mortality risks.

Finally, although Tunisia has made substantial public investments in health, education, and infrastructure—averaging 309 thousand dinars (Table 2)—these resources remain unevenly distributed. The most developed regions receive up to four times more public investment than inland regions. Employer firms are heavily concentrated in Greater Tunis and the Centre-East, whereas inland regions predominantly host non-employer firms, reinforcing regional economic imbalances.

4.2 Correlation Analysis

Table 4. *Correlation Between Variables*

	Ln GDP	***GINI***	***POV***	***UNEMP***	***FAR***	***LEB***	***SBR***	***SECR***	***Ln INV***
Ln GDP	1.0000								
GINI	-0.1809	1.0000							
POV	-0.7022	0.2044	1.0000						
UNEMP	-0.2922	-0.0719	0.1311	1.0000					
FAR	0.7938	-0.1477	-0.6491	-0.3786	1.0000				
LEB	0.5794	0.0429	-0.3829	-0.4858	0.5809	1.0000			
SBR	0.4866	0.1074	-0.4031	-0.3486	0.6133	0.6551	1.0000		
SECR	**0.8560**	-0.1660	-0.6399	-0.2211	0.7606	0.5955	0.6211	1.0000	
Ln INV	0.5566	-0.0290	-0.4209	-0.0440	0.5409	0.7434	0.5688	0.6630	1.0000

Source: Author's estimation

The table above presents the correlation matrix of the model's variables. The analysis indicates that the highest correlation coefficient is observed between secondary school enrollment and GDP per capita (0.8560). This result suggests that improvements in human capital through education are generally associated with higher levels of income per capita, thereby supporting the hypothesis of a positive relationship between education and economic growth.

Moreover, most of the other correlation coefficients remain relatively low (well below 1 in absolute value), indicating that the risk of multicollinearity among the explanatory variables is limited in the chosen specification.

4.3 Econometric Estimation Results

The econometric model assesses the impact of economic growth on inequality and poverty by estimating the interactions within the growth–inequality–poverty triangle. This section presents the estimation results for the three equations: economic growth (Column 1), income inequality (Column 2), and poverty (Column 3), as summarized in Table 5.

Table 5. *Estimation Results of the Growth–Inequality–Poverty Triangle Using System GMM*

Variables	**Growth Equation** **(1)**	**Income Inequality Equation** **(2)**	**Poverty Equation** **(3)**
$Ln\,GDP_{t-1}$	0,8128416 *** (0,001)	-----	-----
$GINI_{t-1}$	-----	-0,1724265 (0,380)	-----
POV_{t-1}	-----	-----	0,4127973*** (0,006)
Ln GDP	-----	0,0408513 (0,263)	-4,432631 (0,314)
GINI	3,098217*** (0,006)	-----	13,69396 (0,594)
POV	0,0011956 (0,833)	0,0014587 (0,186)	-----
UNEMP	-0,0116812 (0,175)	-0,0019331 (0,255)	-0,494271** (0,042)
FAR	0,0369939** (0,041)	0,001059 (0,778)	0,7676006 (0,153)
LEB	-0,027327 (0,159)	-0,0001243 (0,975)	-0,3787144 (0,521)
SBR	-0,0005256** (0,022)	-0,0000079 (0,987)	0,001414 (0,844)
SECR	0,0027393 (0,712)	-0,0029602** (0,046)	-0,1728075 (0,401)
Ln INV	0,1802655 (0,231)	-0,0152735 (0,597)	0,6074221 (0,880)
Constante	0,7013934 (0,638)	0,376747 (0,169)	67,34108* (0,090)
Nombre d'observations	49	49	49
R^2 within	0,948	0,288	0,585
F-statistique	66,13*** (0,0000)	1,49 (0,1939)	5,16*** (0,0002)

Source: Author's estimation

Note: *Estimates are obtained using fixed-effects panel models with region-clustered robust standard errors. Lagged variables capture intertemporal adjustment dynamics. (*), (**), and (***) denote statistical significance at the 10%, 5%, and 1% levels, respectively. Critical probabilities (p-values) are reported in parentheses. Standard errors are adjusted for regional clustering. The Wald chi-square statistic is not reported because clustering renders the conventional test infeasible.*

Robustness of the Results

The results of the three estimated models appear generally robust. The *within* R-squared coefficients indicate particularly strong explanatory power for the economic growth model, highlighting the significant role of the selected variables in accounting for intra-regional variations in GDP per capita. The income inequality model shows a more moderate explanatory capacity, reflecting the complexity and multifaceted nature of the factors driving inequality. The poverty model demonstrates a satisfactory level of explanation, suggesting that the included variables capture a substantial portion of the variation in regional poverty levels.

Overall Fisher significance tests further support the robustness of the results. The explanatory variables are jointly relevant for the growth and poverty models, whereas their collective impact on income inequality is less pronounced, indicating that additional factors may influence income distribution across regions.

Equation 1: Economic Growth

The first equation shows that lagged GDP per capita is a significant determinant of economic growth. The positive coefficient suggests the absence of relative convergence, implying that Tunisian regions follow divergent growth paths. This finding aligns with theories of development traps and multiple equilibria (Baumol, 1986; Nurkse, 1953; Rosenstein-Rodan, 1943; Young, 1928), later formalized as poverty traps (Kraay & Radatz, 2005). Poor regions can escape low-income equilibria only if policies effectively shift their initial conditions.

Income inequality positively affects regional growth, indicating that redistributive policies have not achieved an optimal allocation of resources (Cling et al., 2003). Poverty, measured in absolute terms, positively impacts growth through two channels: changes in average income (the growth effect) and changes in income distribution (the distribution effect). This highlights a paradox in poverty measurement: poverty may rise even as living conditions improve.

Female labor force participation significantly boosts GDP per capita growth (Matsui, 2005), reflecting women's contributions to skills and productivity, particularly in agriculture, small-scale manufacturing, and services. Neonatal mortality negatively affects growth, illustrating how poor health limits human capital and productivity, consistent with capital market imperfections theory. Secondary education positively affects GDP per capita, reinforcing human capital accumulation and productivity growth (Barro & Sala-i-Martin, 1995; Nelson & Phelps, 1966).

Equation 2: Income Inequality

The second equation examines income inequality, measured by the Gini index. Results indicate that GDP per capita positively affects the Gini index, suggesting that economic growth in Tunisia has not been redistributive. This finding aligns with the results of the growth equation, highlighting that increases in income have tended to exacerbate inequality rather than reduce it.

The evolution of growth and inequality in Tunisia follows the Kuznets curve (Kuznets, 1955), which is illustrated in Figure 2. According to the curve, three phases can be distinguished: a transitional phase during which both growth and inequality increase simultaneously; a stabilization phase, corresponding to the curve's peak, where inequality reaches its maximum; and a redistribution phase, during which inequality gradually declines as average income rises.

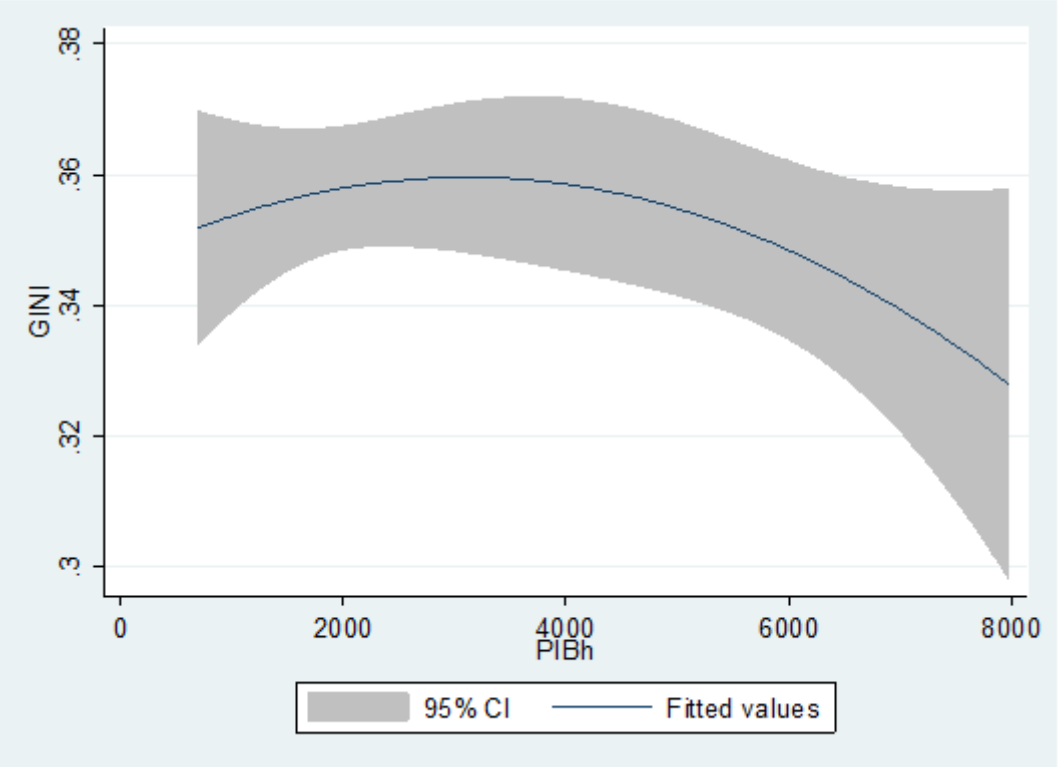

Figure 2. *Growth–Inequality Relationship (Kuznets Curve)*

Beyond the general pattern depicted in Figure 2, the regression results highlight several socio-economic factors that significantly influence income inequality. Secondary school enrollment emerges as a key determinant, with higher enrollment rates contributing to lower inequality, thus demonstrating the crucial role of education in promoting social inclusion. Other factors, including poverty, neonatal mortality, and public investment, are positively associated with disparities. In particular, the distribution of public investment has historically exacerbated regional inequalities, disproportionately favoring the capital, Tunis, and other coastal areas.

Equation 3: Poverty

The third equation focuses on poverty. Inequality is not a statistically significant determinant, whereas GDP per capita growth has a direct, positive, and significant effect at the 5% level. Economic growth in Tunisia has not reduced poverty due to limited job creation and uneven distribution of growth benefits across regions. Most poor households reside in rural and inland areas, highlighting the need for pro-poor growth policies that target disadvantaged regions.

Neonatal mortality, unemployment, and female labor force participation significantly affect poverty, with negative coefficients. The negative effect of unemployment reflects the labor market structure: many poor individuals are outside the labor force, whereas unemployment primarily affects urban populations. Higher female labor force participation reduces poverty by diversifying household income and enhancing resilience against economic shocks.

Summary

Overall, Tunisian economic growth has been neither absolutely nor relatively pro-poor, largely due to the unequal distribution of growth benefits favoring wealthier households. Poverty variations depend on both sustained growth and improvements in income distribution. These results corroborate previous literature: Ravallion and Chen (2003) show that growth is not automatically pro-poor, Dollar and Kraay (2000) stress the need for effective transmission channels, and Bourguignon (2004) highlights the importance of combining growth with inequality reduction for sustainable poverty alleviation. More recent studies confirm these findings: Fosu (2021) emphasizes that high initial inequality limits the poverty-reducing impact of growth, Dutta and Fosu (2021) show that inclusive growth requires both structural transformation and redistributive policies, and Ferreira et al. (2021) demonstrate that combining growth with investments in human capital and social protection is significantly more effective in reducing poverty.

5.Conclusion

This paper investigates the complex relationships between economic growth, poverty, and income inequality in Tunisia, with particular emphasis on regional disparities. Using a dynamic panel data framework covering five-year periods from 1990 to 2025 and employing fixed-effects models, the study evaluates whether economic growth has been inclusive and pro-poor across Tunisian regions.

The empirical findings show that economic growth has been unevenly distributed, with coastal and relatively wealthier regions benefiting disproportionately, while inland and poorer regions remain persistently disadvantaged. Income inequality continues to constrain regional economic performance and limits the potential of growth to reduce poverty. Despite periods of sustained economic expansion, growth alone has been insufficient to significantly alleviate poverty or narrow regional disparities.

The analysis also highlights that the relationship between growth, inequality, and poverty varies across regions, underscoring the importance of accounting for spatial heterogeneity in development outcomes. Human capital, particularly education, emerges as a crucial channel through which growth can become more inclusive and contribute to reducing regional inequalities.

Overall, the results confirm that Tunisia's development trajectory has been marked by structural and persistent regional imbalances. Without complementary policies aimed at reducing inequality, enhancing human capital, and promoting equitable regional development, economic growth is unlikely to translate into meaningful poverty reduction or territorial convergence.

6. Policy Implications

The findings of this study carry significant policy implications for promoting inclusive and pro-poor growth in Tunisia. First, economic policies should go beyond a sole focus on aggregate growth and explicitly integrate objectives related to equity and regional cohesion. Targeted public investments in lagging regions—particularly in education, healthcare, and basic infrastructure—are essential to reduce territorial disparities and strengthen local development potential.

Second, human capital development should be a cornerstone of Tunisia's growth strategy. Expanding access to quality education and vocational training in disadvantaged regions can enhance employability, reduce income inequality, and support long-term economic resilience. Policies promoting women's economic participation are particularly important, as increased female labor force participation, support for women's entrepreneurship, and the removal of gender-based labor market barriers contribute to income diversification and poverty reduction.

Third, the results highlight the necessity of well-designed social protection systems. Targeted cash transfers and conditional social assistance programs can provide immediate support to vulnerable households while fostering long-term human capital accumulation, ensuring that the benefits of economic growth reach the poorest segments of the population.

Finally, strengthening governance and institutional capacity is critical to the effectiveness of development policies. Enhancing transparency, accountability, and monitoring of regional socio-economic indicators ensures efficient allocation of public resources. Encouraging private sector engagement in underdeveloped regions—through investment incentives, infrastructure support, and public–private partnerships—can further stimulate job creation and balanced regional development.

7.Research Limitations and Future Directions

Despite its contributions, this study has some limitations. Data constraints at the regional level may affect the precision of certain estimates, and the analysis primarily focuses on economic variables, without fully incorporating institutional or environmental factors.

Future research could expand this framework by integrating governance indicators, employing spatial econometric methods, or using micro-level data to better understand the mechanisms linking growth, poverty, and inequality. Comparative analyses with other MENA countries could also provide broader insights into regional dynamics of inclusive growth and inform more effective policy design.

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