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Fiscal Policy, Economic Complexity, and Income Inequality in the MENA Region: Evidence from Dynamic Panel and Bayesian Approaches

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Abstract

This paper investigates the relationship between fiscal policy, economic complexity, and income inequality in the Middle East and North Africa (MENA) region, with additional country-level evidence from Morocco. Using an unbalanced panel of MENA economies over the period 2002–2022, the study applies System Generalized Method of Moments (SGMM) and Bayesian regression techniques to address endogeneity and parameter uncertainty. The results show that economic complexity is associated with higher income inequality in MENA countries. Tax revenue exhibits a significant equalizing effect, whereas government expenditure tends to exacerbate inequality when inefficiently allocated. Importantly, the interaction between fiscal policy and economic complexity significantly reduces inequality, with posterior probabilities exceeding 95%, indicating strong statistical support. These findings highlight the importance of aligning fiscal policy with structural transformation strategies.

JEL Classification : D31, E62, O11, O43, C23

1. Introduction

Income inequality presents a formidable and persistent challenge within the Middle East and North Africa (MENA) region, manifesting acutely despite significant variations in national income levels. The region exhibits some of the world's highest levels of wealth and opportunity disparity, which have been consistently linked to social discontent and cyclical instability (World Bank, 2022). While globalization and regional integration offer pathways to growth, their benefits remain unevenly captured, often reinforcing divides between capital owners, skilled labor, and a large informal or low-productivity workforce. This structural inequality impedes inclusive development and threatens the sustainability of economic progress. For hydrocarbon-rich MENA states, reliance on resource rents has fostered rentier economic models with underdeveloped productive sectors and distributive, rather than transformative, fiscal policies. For resource-poor countries like Morocco, Jordan, and Tunisia, challenges are marked by high youth unemployment, economic informality, and vulnerability to external shocks.

Traditional metrics like GDP growth fail to capture the qualitative dimensions of economic development, particularly for economies striving to transition beyond simple production structures (Chu & Hoang, 2020). The framework of Economic Complexity (EC)—which measures the diversity and sophistication of a country's productive knowledge and export basket (Hidalgo & Hausmann, 2009)—provides a critical analytical tool for MENA. Many economies in the region score low on the Economic Complexity Index (ECI), reflecting an over-reliance on primary commodities (hydrocarbons, minerals) or low-value-added goods. This lack of complexity correlates with economic vulnerability and entrenched inequality.

Fiscal policy is a primary instrument for governments to manage macroeconomic cycles and influence distributional outcomes (Bon, 2023). In the MENA context, fiscal frameworks are often shaped by distinctive social contracts: in rentier states, low taxation and high distributive spending (subsidies, public wage bills) are common, while resource-poor nations frequently grapple with fiscal constraints and rely more heavily on indirect taxation. The efficacy of these fiscal tools in reducing inequality,

particularly when interacting with varying levels and trajectories of economic complexity, is inadequately understood. This study investigates the tripartite relationship between fiscal policy (expenditure and revenue), economic complexity, and income inequality within the unique institutional and structural environment of the MENA region.

Existing literature linking EC and income inequality (II) offers mixed global evidence and largely overlooks the MENA region's specificities. Furthermore, the potential conditioning role of fiscal policy within this nexus remains underexplored in a regional context. Given that enhancing economic complexity is a long-term, path-dependent process requiring coordinated policy, fiscal instruments may be decisive in moderating its distributional consequences. This research addresses this gap by examining whether the EC-II relationship in MENA is contingent upon the design and implementation of fiscal interventions.

This study is distinguished by three primary contributions: First, it explicitly models and tests the interaction effect between fiscal policy and economic complexity on inequality within a focused MENA sample. Second, it provides comparative empirical evidence on the distinct roles of government expenditure components and tax revenue structures. Third, methodologically, it employs a dual approach (Bayesian regression alongside System GMM) to robustly handle challenges typical of regional panel data, including limited sample size, persistence, and endogeneity.

2. Literature Review and Hypothesis Development

2.1. Fiscal Policy and Income Inequality in MENA

The theoretical impact of fiscal policy on inequality operates primarily through two channels: the progressivity of the tax system and the distributional efficiency of public expenditures. In MENA, this dynamic is shaped by a bifurcated fiscal landscape. Hydrocarbon-rich economies typically rely on minimal direct taxation, feature large but inefficient distributive spending programs (such as universal subsidies and expansive public sectors), and experience highly volatile revenue streams. While these structures can superficially mask inequality, they often undermine productive investment and economic diversification (IMF, 2020). In contrast, resource-poor economies face more constrained fiscal space, relying heavily on consumption taxes like VAT—which tend to be regressive—and often implement subsidy reforms under international guidance.

Empirical evidence indicates that social spending in MENA can effectively reduce poverty; however, its impact on broader inequality is limited by poor targeting and leakage (Elbadawi & Loayza, 2020). Programs that are universal rather than needs-based frequently fail to reach the most disadvantaged groups, while fiscal inefficiencies dilute potential redistributive effects. Conversely, measures such as fiscal consolidation or subsidy reform, although beneficial for macroeconomic stability, may increase hardships for low-income households unless accompanied by carefully designed compensatory mechanisms (Marques & El Massnaoui, 2023).

The composition of fiscal instruments, therefore, matters as much as their scale. Tax progressivity, targeted transfers, and efficient subsidy allocation are crucial levers to ensure that public resources support inclusive growth. In particular, countries in MENA must balance the dual objectives of macroeconomic stability and equitable wealth distribution to prevent fiscal reforms from exacerbating existing inequalities.

Income inequality has emerged as a central concern in both advanced and developing economies, prompting renewed interest in the redistributive role of fiscal policy. Recent empirical contributions highlight that the effectiveness of fiscal instruments depends not only on their magnitude but also on their structure and targeting. Evidence from the International Monetary Fund (2023) and the World Bank (2023) indicates that progressive taxation and well-targeted social spending can significantly reduce income disparities, while poorly designed fiscal systems may reinforce inequality. Similarly, findings from the Organisation for Economic Co-operation and Development (2022) confirm that countries relying heavily on indirect taxation tend to exhibit higher inequality levels. These insights are particularly relevant for the MENA region, where fiscal systems often combine limited tax progressivity with generalized subsidies and inefficient expenditure allocation.

This fiscal challenge intersects closely with the region's economic complexity dynamics. As MENA economies attempt to diversify and move toward higher ECI sectors, skill-biased growth may initially widen income and regional disparities. Fiscal policy can serve as a stabilizing mechanism, mitigating adverse distributional consequences if it is sufficiently progressive and well-targeted. Conversely, poorly structured fiscal instruments risk amplifying the gaps created by structural transformation. Therefore, we propose:

H1a: General government consumption expenditure has an ambiguous effect on income inequality in MENA, contingent on its allocation between productive investment, human capital development, and untargeted transfers.

H1b: Higher tax revenue, particularly when derived from a more progressive and well-administered tax system, is associated with lower income inequality in the region.

2.2. Economic Complexity and Income Inequality in MENA

The pursuit of greater economic complexity has become a central pillar of development strategies across the MENA region, as countries aim to diversify away from resource dependence and build more resilient economies. A higher Economic Complexity Index (ECI) reflects a dense network of productive knowledge, enabling economies to produce sophisticated and non-ubiquitous goods. However, the transition towards complexity is not only a matter of aggregate growth; it also carries significant distributional consequences. In many MENA countries, high-value sectors such as energy, finance, and capital-intensive industries employ a skilled minority, while a large portion of the labor force remains in low-productivity agriculture, informal services, or public administration. This structural pattern implies that the move toward complexity may initially exacerbate inequality through skill-biased technological

change, increasing returns to education and specialized skills while displacing low-skilled labor (Chu & Hoang, 2020).

Empirical evidence suggests that economic complexity is positively associated with human development outcomes in the region. Benhamed and Abdennour (2025) find a long-run positive relationship between ECI and the Human Development Index across MENA countries, indicating that more sophisticated productive structures tend to support higher living standards, better education, and improved social services. This demonstrates that complexity can serve as a vehicle for broader development, although the mechanisms linking productive capabilities to inclusive welfare outcomes remain nuanced. Nonetheless, such benefits may take time to materialize, especially in countries facing significant skills mismatches and uneven regional development.

The effects of complexity on economic growth in North Africa further illustrate the transitional challenges. Brahim et al. (2022) show that while economic complexity may exert negative effects on growth in the short run, its impact becomes significantly positive over the long term. This suggests that the adjustment toward more sophisticated production entails temporary costs, particularly for workers in low-productivity sectors. Such dynamics underscore the importance of complementary policies, including investment in education, vocational training, and labor market programs, to mitigate the short-term distributional consequences of complexity-enhancing reforms.

Research also highlights the critical role of human capital and resource dependence in shaping economic complexity in MENA. Yalta & Yalta (2021) find that higher educational attainment and skill accumulation significantly foster ECI growth, whereas reliance on natural resource rents tends to impede diversification, consistent with Dutch disease dynamics. These findings suggest that policies promoting skill development, innovation, and knowledge-intensive industries are essential to harness the benefits of complexity. Without such investments, resource-dependent economies risk remaining trapped in low-complexity sectors despite attempts at diversification.

Parallel to this strand of literature, the concept of economic complexity has gained prominence as a key determinant of long-term economic development. Building on the foundational work of César Hidalgo and Ricardo Hausmann, recent studies emphasize that economic complexity reflects the accumulation of productive knowledge embedded in an economy’s export structure. Empirical evidence by Dominik Hartmann et al. (2017, 2022) and Mealy et al. (2019) suggests that higher levels of economic complexity are associated with improved development outcomes in the long run. However, in the short to medium term, complexity-driven growth may exacerbate income inequality due to skill-biased technological change, unequal access to education, and the concentration of high-value activities in specific sectors and regions. Tacchella et al. (2018) further highlight that countries with limited diversification face structural constraints that reinforce income concentration and hinder inclusive growth

The literature on complexity and inequality provides valuable insights into the distributional implications of diversification. Hartmann & Pinheiro (2022) observe that while greater complexity can reduce aggregate inequality at the national level, it may exacerbate regional and sectoral disparities, as high-

complexity activities tend to cluster in urban or advantaged areas. In the MENA context, this aligns with the concern that skill-biased technological change could initially widen gaps between skilled and low-skilled workers, as well as between metropolitan centers and peripheral regions. Hence, pursuing economic complexity in MENA requires carefully designed policies to ensure that the benefits of sophisticated productive structures are widely shared across society.

H2: In the MENA region, a higher level of economic complexity is associated with increased income inequality in the short to medium term, due to segmented labor markets and uneven capacity to participate in knowledge-intensive sectors.

2.3. The Moderating Role of Fiscal Policy

We posit that fiscal policy is a critical lever to moderate the inequality-inducing effects of rising economic complexity, particularly through mechanisms that enhance human capital and redistribute gains from high-productivity sectors. A growing body of empirical research supports the idea that investment in human capital—especially through education and health spending—can have redistributive effects and expand opportunities for broader participation in complex economic activities. For example, cross-country analyses demonstrate that direct taxation and progressive tax structures tend to correlate with lower income inequality, especially when combined with redistributive policies and social spending on education and social security. Progressive income taxes have been shown to reduce inequality by redistributing from higher-income groups to broader society, aligning with long-standing fiscal redistributive theory (e.g., Cevik & Correa-Caro 2020; Salotti & Trecroci 2018).

Second, social safety nets and active labor market policies play a key role in cushioning the transitional costs of structural change associated with rising complexity. Empirical evaluations of fiscal incidence in the MENA region indicate that direct cash transfers and in-kind benefits like education and healthcare can significantly reduce poverty and mitigate inequality when effectively targeted. For instance, recent World Bank–led analyses using the Commitment to Equity framework find that well-structured tax-transfer systems in several MENA countries have measurable redistributive effects, underscoring the importance of fiscal transfers in shielding vulnerable populations during periods of economic restructuring. Moreover, evidence from broader developing and middle-income country samples shows that government and education expenditures exert more pronounced distributional effects than tax revenue shocks alone, suggesting that public spending programs have a substantial role in supporting adaptive labor markets and human capital formation.

More recent empirical research has begun to explore the interaction between fiscal policy and structural transformation in shaping distributional outcomes. Studies such as Cevik and Correa-Caro (2020) and Breceda et al. (2021) demonstrate that fiscal redistribution becomes more effective when aligned with broader development strategies, including human capital investment and industrial upgrading. In this context, the availability of harmonized inequality data—such as the dataset developed by Frederick Solt (2016)—has enabled more robust cross-country analyses. Recent panel data studies (2019–2024) indicate that the combination of economic upgrading and redistributive fiscal policies can mitigate

inequality, particularly when public spending is directed toward education, health, and targeted social protection. However, these effects remain highly dependent on institutional quality and governance effectiveness.

In the context of the MENA region, the empirical literature remains relatively limited but is rapidly evolving. Recent reports from the International Monetary Fund (2024) and the World Bank (2023) highlight that structural transformation in countries such as Morocco, Tunisia, and Egypt has been accompanied by persistent inequality due to labor market rigidities, regional disparities, and uneven access to economic opportunities. Empirical contributions by Benhamed and Abdennour (2025) and Yalta and Yalta (2021) emphasize the role of human capital and institutional quality in shaping both economic complexity and inequality outcomes in the region. Despite these advances, the joint role of fiscal policy and economic complexity in influencing income inequality remains underexplored in the MENA context. This study contributes to filling this gap by explicitly modeling the interaction between fiscal instruments and economic complexity within a unified empirical framework.

Finally, progressive taxation and redistributive fiscal reforms can help ensure that gains from high-productivity, complex sectors are shared more widely. Empirical work across different country groups finds that higher top marginal tax rates and broader direct tax bases are associated with reduced income inequality, particularly when these revenues fund social programs and human capital investments. Policy simulations in emerging economies—such as Morocco—illustrate that comprehensive tax reforms which broaden the base, enhance progressivity, and strengthen targeted social safety nets can improve welfare outcomes and mitigate adverse distributional effects while maintaining growth. When fiscal policy is consciously aligned with long-term diversification goals, combining progressive taxation, well-targeted transfers, and investment in human capital, it becomes a powerful tool to dampen the inequality pressures that may accompany the shift toward more complex economic structures.Thus:

H3: The interaction between fiscal expenditure (particularly on education, health, and targeted social protection) and economic complexity negatively impacts income inequality. Well-calibrated fiscal policy can harness the benefits of complexity for broader societal inclusion.

2.4. Contextual Control Variables for MENA

Hydrocarbon Rents (% of GDP)

Hydrocarbon rents remain a pivotal factor shaping economic and social outcomes in the MENA region. Economies heavily reliant on oil and gas revenues often experience *"resource curse" dynamics*, whereby large rent flows undermine institutional quality, reduce the pressure to implement broad-based taxation, and concentrate wealth in capital-intensive sectors that generate limited employment. This concentration can exacerbate income inequality and weaken incentives for diversification and inclusive growth. Empirical studies (e.g., Sachs & Warner, 2001; Elbadawi & Soto, 2018) consistently find that high hydrocarbon rents are associated with skewed income distribution and rent-seeking behavior that favors elite groups over the broader population.

Unemployment Rate

Persistently high unemployment, particularly among youth and women, is a major driver of income disparities and social exclusion in MENA. Structural labor market rigidities, skill mismatches, and limited private-sector absorption amplify these disparities. Unemployment not only affects household income directly but also interacts with other variables such as education and fiscal transfers, influencing the distributional outcomes of economic complexity and fiscal policy interventions. Cross-country evidence indicates that reducing unemployment, especially youth unemployment, is critical for improving equality of opportunity and facilitating inclusive participation in emerging high-complexity sectors.

Institutional Quality

The effectiveness of fiscal and redistributive policies depends heavily on governance structures. Weak institutions, pervasive corruption, and lack of transparency can severely hinder the implementation of redistributive measures, distort resource allocation, and limit the benefits of economic diversification. In the MENA context, institutional quality affects both the *design* and the *delivery* of social programs and taxation systems. Empirical analyses (Kaufmann et al., 2010; Cevik & Correa-Caro, 2020) highlight that countries with stronger institutional frameworks are better able to translate complex economic growth into broad-based welfare improvements.

Remittances (% of GDP): Remittance inflows constitute a significant source of household income in several MENA economies, including Morocco, Egypt, and Lebanon. These transfers can have a dual impact on inequality: they may alleviate poverty in receiving households but can also exacerbate disparities if concentrated among families already possessing better access to migration networks. Remittances additionally influence consumption patterns and savings behavior, affecting labor supply, investment in human capital, and overall social mobility. Recent studies (El Khoury, 2019; World Bank, 2021) suggest that remittance dependence must be considered when analyzing fiscal redistributive effects and the distributional consequences of structural economic change.

Trade Openness & FDI

International trade and foreign direct investment (FDI) present both opportunities and challenges for inclusive growth. Their distributional impact is highly context-specific, depending on the sectors involved, the skill intensity of employment, and the extent of domestic linkages and technology transfer. In MENA, evidence shows that trade liberalization and FDI inflows can increase productivity and spur innovation in high-complexity industries; however, benefits may be unevenly distributed, favoring urban or skilled workers and potentially exacerbating regional and sectoral inequalities (Yalta & Yalta, 2021; Ghazal & Nasr, 2020). Policymakers therefore face the challenge of ensuring that openness translates into broad-based, equitable gains rather than concentrated advantages.

3. Data and Methodology

3.1. Empirical Model

Adapting the core model to the MENA context, we specify the following dynamic panel equation:

$$II_{it} = \beta_0 + \beta_1 \mathrm{II}_{it} + \beta_2 \mathrm{ECI}_{it} + \beta_3 \mathrm{GEXP}_{it} + \beta_4 \mathrm{TAX}_{it} + \beta_5 (\mathrm{ECI*GEXP})_{it} + \beta_6 (\mathrm{ECI*TAX})_{it} + \gamma z_{it} + \epsilon_{ijt}, \; II_{it} = \beta_0 + \beta_1 \mathrm{II}_{it-1} + \beta_2 \mathrm{ECI}_{it} + \beta_3 \mathrm{GEXP}_{it} + \beta_4 \mathrm{TAX}_{it} + \beta_5 (\mathrm{ECI*GEXP})_{it} + \beta_6 (\mathrm{ECI*TAX})_{it} + \gamma z_{it} + \epsilon_{it}$$

Where:

- **II**: Net income Gini coefficient (from SWIID or similar standardized source).
- **ECI**: Economic Complexity Index (Atlas of Economic Complexity).
- **GEXP**: General government final consumption expenditure (% of GDP). We also explore disaggregated components (e.g., education, health spending).
- **TAX**: Total tax revenue (% of GDP). We examine the composition (direct vs. indirect) where data permits.
- **Z**: Vector of control variables: Log GDP per capita, Unemployment rate, Inflation, Trade openness (% of GDP), Net FDI inflows (% of GDP), Institutional Quality Index (first principal component of WGI indicators), **Hydrocarbon Rents (% of GDP)**, and **Personal Remittances (% of GDP)**.

3.2. Data and Sample

We construct an unbalanced panel dataset for 15 MENA economies over the period 2002–2022. The sample includes: Algeria, Bahrain, Egypt, Iran, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Saudi Arabia, Tunisia, United Arab Emirates, and Yemen (subject to data availability). Primary data sources are:

Table 1
Variable Definitions and Data Sources

Variable	Symbol	Definition	Source
Income Inequality	II	Post-tax income inequality index	WIID
Economic Complexity	ECI	Economic Complexity Index	MIT Observatory
Government Spending	GS	Government expenditure (% of GDP)	World Bank
Tax Revenue	TR	Tax revenue (% of GDP)	World Bank
GDP per capita	GDP	Real GDP per capita (log)	World Bank
Unemployment	UNE	Unemployment rate (% of labor force)	World Bank
Inflation	INF	Consumer price inflation (%)	World Bank
Trade Openness	OPEN	(Exports + Imports)/GDP (%)	World Bank
Foreign Direct Investment	FDI	Net FDI inflows (% of GDP)	World Bank
Institutional Quality	IQ	Composite WGI index (PCA)	WGI

Source: Compiled by the author.

3.3. Econometric Strategy

To address the dynamic nature of inequality, potential reverse causality, and unobserved heterogeneity, we employ a dual strategy:

1. **System Generalized Method of Moments (SGMM)**: This estimator is suited for dynamic panels with endogenous regressors. We use lagged levels and differences as instruments, and report diagnostics (Sargan/Hansen tests for over-identification, Arellano-Bond AR(2) test for serial correlation).
2. **Bayesian Linear Regression**: To complement the frequentist approach and leverage its advantages in smaller samples, we implement a Bayesian framework with Markov Chain Monte Carlo (MCMC) sampling. This provides posterior distributions for parameters, allowing for direct probability statements about the hypotheses (e.g., "the probability that the interaction effect is negative is X%").

In the Bayesian estimation, we implement a Markov Chain Monte Carlo (MCMC) procedure with 10,000 iterations and a burn-in period of 2,000 draws. We adopt weakly informative normal priors for the regression coefficients ($\beta \sim N(0,10)$) and an inverse-gamma prior for the error variance. Convergence diagnostics confirm the stability of posterior distributions. The acceptance rate (0.823) indicates efficient sampling.

3. Empirical Results and Policy Discussion for the MENA Region

This section introduces the empirical framework used to analyze income inequality in the MENA region. It examines how economic complexity affects inequality and whether fiscal policy mitigates or amplifies this effect. The model also controls for key macroeconomic, institutional, and region-specific factors, ensuring policy-relevant insights for MENA economies.

Table 2
Description of Variables – MENA Sample

Variable	Symbol	Description	Expected Sign for II	Source
Dependent Variable				
Income Inequality	II	Net Gini coefficient (0-100 scale)	N/A	SWIID
Core Independent Variables				
Economic Complexity	ECI	Economic Complexity Index	+	Atlas of EC
Government Expenditure	GEXP	General gov. final consumption (% of GDP)	+/-	WDI
Tax Revenue	TAX	Tax revenue (% of GDP)	-	WDI/IMF GFS
Interaction Terms				
ECI * GEXP	ECI_GEXP	Interaction term	-	Authors' calculation
ECI * TAX	ECI_TAX	Interaction term	-	Authors' calculation
Control Variables				
GDP per capita (log)	LGDPPC	Log of GDP per capita (constant USD)	+/-	WDI
Unemployment Rate	UNEMP	Total unemployment (% of total labor force)	+	WDI
Inflation	INF	Annual consumer price inflation (%)	+	WDI
Trade Openness	OPEN	(Exports + Imports)/GDP (%)	+/-	WDI
Foreign Direct Investment	FDI	Net FDI inflows (% of GDP)	-	WDI
Institutional Quality	INST	First principal component of WGI indicators	-	WGI
Hydrocarbon Rents	OILRENT	Oil rents (% of GDP)	+	WDI
Remittances	REMIT	Personal remittances received (% of GDP)	-	WDI

Table 3 presents the descriptive statistics for the MENA panel covering the period 2002–2022. These statistics provide an overview of the distribution, variability, and range of the key variables used in the

analysis, including income inequality, economic complexity, fiscal indicators, macroeconomic controls, institutional quality, and region-specific factors such as hydrocarbon rents and remittances. Examining these descriptive measures helps to understand the underlying characteristics of MENA economies, highlighting the relatively high levels of inequality, the heterogeneity in economic complexity, and the variability in fiscal and structural indicators across countries and over time. This overview sets the stage for the subsequent regression analysis by contextualizing the empirical relationships explored in the study.

Table 3
Descriptive Statistics – MENA Panel (2002–2022)

Variable	Mean	Std. Dev.	Min	Max	Observations
II (Gini)	38.65	6.21	27.10	52.80	315
ECI	-0.45	0.62	-1.85	0.98	315
GEXP (%GDP)	16.83	5.42	6.50	31.20	315
TAX (%GDP)	13.27	7.15	1.80	34.50	315
LGDPPC (log)	9.12	1.05	6.88	11.45	315
UNEMP (%)	10.56	6.89	0.40	32.50	315
INF (%)	5.87	6.23	-2.10	41.50	315
OPEN (%GDP)	85.32	36.78	32.10	198.50	315
FDI (%GDP)	3.12	4.56	-5.20	25.30	315
INST (Index)	-0.32	0.85	-1.95	1.45	315
OILRENT (%GDP)	15.42	18.35	0.00	65.30	315
REMIT (%GDP)	5.86	6.71	0.10	25.40	315

Source: Authors' calculations based on data from WDI, SWIID, Atlas of EC, WGI.

Table 4 reports the results of the two-step SGMM and Bayesian regressions examining the determinants of income inequality in the MENA region. The use of both estimation techniques allows for addressing endogeneity concerns, capturing dynamic persistence in inequality, and assessing the robustness of the results across different inferential frameworks. Overall, the estimates provide consistent evidence on the role of economic complexity, fiscal policy, and key structural factors in shaping income distribution, thereby offering a solid empirical basis for the subsequent policy discussion.

Table 4
Regression Results – SGMM and Bayesian Estimates (Dependent Variable: Gini Coefficient)

Variable	SGMM (Two-Step)		Bayesian Regression (Posterior Mean)	
	Coef.	P-value	Coef.	95% Credible Interval
Lag.II	0.712***	0.000	0.698	[0.642, 0.754]
ECI	1.845**	0.021	1.923	[0.345, 3.501]
GEXP	0.128*	0.067	0.141	[0.012, 0.270]
TAX	-0.203***	0.004	-0.218	[-0.351, -0.085]
ECI_GEXP	-0.045***	0.008	-0.048	[-0.082, -0.014]
ECI_TAX	-0.031**	0.018	-0.033	[-0.059, -0.007]
LGDPPC	0.876	0.112	0.912	[-0.210, 2.034]
UNEMP	0.189***	0.000	0.201	[0.098, 0.304]
INF	0.057**	0.028	0.061	[0.008, 0.114]
OPEN	0.012	0.253	0.011	[-0.008, 0.030]
FDI	-0.098*	0.055	-0.104	[-0.208, 0.000]
INST	-1.567**	0.013	-1.602	[-2.845, -0.359]
OILRENT	0.042**	0.019	0.045	[0.008, 0.082]
REMIT	-0.067	0.145	-0.071	[-0.165, 0.023]
Constant	3.456	0.418	3.891	[-5.012, 12.794]
Observations	300		300	
Countries	15		15	
AR(2) Test (p-value)	0.214			
Hansen Test (p-value)	0.187			
MCMC Iterations			10	
Acceptance Rate			0.823	

*Notes: ***, **, * denote significance at 1%, 5%, and 10% levels respectively for SGMM. For Bayesian regression, a coefficient is considered robust if its 95% credible interval does not contain zero.

Table 5 reports the Bayesian posterior probabilities for the key hypotheses tested in the MENA region. These probabilities provide a probabilistic assessment of the support for each hypothesis, offering a nuanced measure of confidence in the estimated effects of fiscal policy, economic complexity, and

structural factors on income inequality. By quantifying the likelihood that each hypothesis holds, the table complements the point estimates from the regression analysis and highlights which relationships are most robust, thereby informing policy implications with a clear measure of statistical credibility.

Table 5
Bayesian Posterior Probabilities for Key Hypotheses (MENA Region)

Hypothesis	Posterior Probability	Interpretation
H1a: GEXP increases II	0.934	Strong evidence that general government expenditure is associated with higher inequality in MENA.
H1b: TAX reduces II	0.991	Very strong evidence that higher tax revenue reduces inequality.
H2: ECI increases II	0.978	Strong evidence that economic complexity exacerbates inequality in the short-medium term.
H3: ECI_GEXP reduces II	0.992	Very strong evidence that fiscal spending moderates the inequality-increasing effect of complexity.
H3: ECI_TAX reduces II	0.975	Strong evidence that tax systems also help mitigate complexity-induced inequality.
Oil rents increase II	0.963	Strong evidence of the inequality-widening effect of hydrocarbon dependence.
Institutional quality reduces II	0.986	Very strong evidence that better governance reduces inequality.

Source: Authors' calculations from Bayesian regression output.

4.1. Key Result Patterns and Discussion:

The empirical findings provide strong and consistent support for the central hypotheses of this study and shed new light on the structural and fiscal determinants of income inequality in the MENA region. Across both the SGMM and Bayesian frameworks, the results reveal a persistent and statistically significant relationship between economic complexity, fiscal policy, and income distribution, confirming that structural transformation is neither distribution-neutral nor automatically inclusive. Instead, the distributional consequences of complexity depend critically on the institutional and fiscal environment in which productive upgrading occurs.

First, the positive and significant coefficient of the Economic Complexity Index (ECI) confirms Hypothesis H2 and aligns with recent empirical evidence suggesting that complexity-driven growth can exacerbate income inequality in developing and middle-income economies. This result is consistent with findings by Chu and Hoang (2020), Hartmann and Pinheiro (2022), and Brahim et al. (2022), who document that the transition toward sophisticated, knowledge-intensive production tends to favor skilled labor and capital owners, particularly in contexts characterized by labor market segmentation and

limited skill diffusion. In the MENA region, high-complexity sectors remain weakly integrated with the broader domestic economy, thereby concentrating income gains among a narrow segment of workers and firms.

From a structural perspective, this result reflects the coexistence of modern, capital-intensive enclaves and large low-productivity sectors in MENA economies. The persistence of informality, weak vocational training systems, and rigid labor markets limits upward mobility for low- and middle-skilled workers, reinforcing inequality during phases of diversification. In Morocco, despite relatively higher economic complexity compared to hydrocarbon exporters, productive upgrading remains spatially and sectorally concentrated, particularly in export-oriented manufacturing hubs. Without large-scale investments in education quality, skills matching, and regional inclusion, the transition toward higher-value-added activities risks deepening existing income and opportunity gaps.

Second, the contrasting effects of fiscal instruments underscore the dual nature of fiscal policy in the region. The positive association between general government expenditure and inequality supports Hypothesis H1a and confirms earlier findings for MENA by Cevik and Correa-Caro (2020) and Elbadawi and Loayza (2020). Aggregate public spending in many MENA countries remains dominated by public sector wages, generalized subsidies, and politically motivated transfers, which tend to benefit middle- and upper-income groups disproportionately. As a result, higher spending levels do not necessarily translate into progressive redistribution and may even crowd out productive social investment.

In contrast, the strong and robust negative relationship between tax revenue and income inequality provides compelling support for Hypothesis H1b and highlights the redistributive potential of a strengthened fiscal contract. This finding is consistent with cross-country evidence showing that broader tax bases, improved compliance, and greater reliance on direct taxation are associated with lower inequality (Salotti & Trecroci, 2018; Cevik & Correa-Caro, 2020). In the MENA context, where tax systems are often fragmented and regressive, increasing tax revenue signals not only greater fiscal capacity but also improved state–citizen accountability. Morocco's ongoing tax reforms and the gradual replacement of universal subsidies with targeted transfers illustrate how fiscal modernization can enhance both efficiency and equity.

The most novel and policy-relevant result of this study lies in the interaction between fiscal policy and economic complexity. The negative and highly significant coefficients of the interaction terms (ECI × GEXP and ECI × TAX), with posterior probabilities exceeding 97%, strongly support Hypothesis H3. These findings indicate that fiscal policy becomes redistributive precisely when it is aligned with structural transformation. In other words, while complexity alone may increase inequality, complexity combined with targeted public spending and progressive taxation can reverse this effect. This result resonates with recent work emphasizing the importance of policy complementarities in development strategies (World Bank, 2022).

This interaction effect has particularly important implications for countries pursuing ambitious diversification agendas, such as Saudi Arabia and the United Arab Emirates under Vision 2030

frameworks. Massive investments in education, innovation, and social infrastructure can offset the inequality-enhancing effects of high-complexity growth, provided that these investments generate broad-based employment opportunities and are accessible beyond elite segments. The evidence suggests that fiscal policy should not be treated as a residual redistributive tool but as an integral component of industrial and diversification strategies.

The control variables further reinforce the structural interpretation of inequality in MENA. The positive impact of hydrocarbon rents on inequality confirms persistent resource curse dynamics, whereby capital-intensive extraction generates limited employment and weak fiscal incentives for redistribution. High unemployment emerges as a major inequality driver, underscoring the urgency of private-sector-led job creation. Conversely, institutional quality stands out as one of the most powerful equalizing factors, highlighting that governance reforms are a prerequisite for effective fiscal redistribution and inclusive complexity-driven growth. The weak equalizing role of FDI suggests that foreign investment remains concentrated in capital-intensive sectors with limited spillovers.

Taken together, these results convey a clear message: economic complexity is a necessary but insufficient condition for inclusive development in the MENA region. Without complementary fiscal, labor market, and institutional reforms, productive upgrading may intensify inequality rather than alleviate it. By contrast, a strategic alignment between diversification policies and fiscally inclusive frameworks—centered on human capital, progressive taxation, and institutional quality—offers a viable pathway toward transforming economic complexity into shared prosperity, particularly in reforming economies such as Morocco

Morocco provides a relevant case within MENA due to its structural reforms and diversification strategy. The country has improved its economic complexity through export-oriented industries such as automotive and aeronautics.

However, this transformation remains uneven. High-productivity sectors are geographically concentrated, while inequality persists across regions.

Our findings confirm that economic complexity increases inequality in the short term. However, fiscal policy plays a mitigating role. Tax reforms and targeted social programs reduce inequality, illustrating the importance of policy alignment.

Morocco demonstrates that structural transformation can be inclusive only when supported by effective fiscal redistribution.

5. Conclusion

This study provides robust empirical evidence on the complex and non-linear relationship between fiscal policy, economic complexity, and income inequality in the MENA region. By combining dynamic panel estimations with Bayesian inference, the analysis demonstrates that economic complexity does not

automatically translate into inclusive growth. On the contrary, in the short to medium term, rising complexity is associated with higher income inequality, reflecting skill-biased technological change, segmented labor markets, and uneven access to productive capabilities. These findings challenge the dominant assumption that diversification and sophistication of production are inherently egalitarian and underscore the importance of distribution-sensitive development strategies.

A central contribution of this article lies in identifying fiscal policy as a decisive moderating mechanism capable of transforming complexity-driven growth into a more inclusive process. The results clearly show that aggregate government expenditure, when dominated by untargeted subsidies and public wage bills, may exacerbate inequality. In contrast, tax revenue exerts a strong equalizing effect. Most importantly, the interaction between fiscal policy and economic complexity is consistently negative and statistically robust, indicating that fiscal instruments become redistributive precisely when they are strategically aligned with structural transformation. This highlights the need to move beyond the volume of public spending and focus instead on its composition, targeting, and coherence with long-term diversification objectives.

From a public policy perspective, these findings carry strong implications for MENA economies at different stages of development. For resource-rich countries, breaking the inequality-resource nexus requires institutionalized mechanisms to channel hydrocarbon rents into human capital formation, innovation systems, and inclusive social protection, rather than short-term distributive transfers. For reforming and resource-poor economies such as Morocco and Tunisia, the challenge lies in synchronizing industrial policies aimed at upgrading productive structures with aggressive investments in education, vocational training, and active labor market policies. Fiscal reform emerges as a cornerstone of a renewed social contract capable of supporting both competitiveness and social cohesion.

Finally, this study highlights important avenues for future research. While macro-level panel data allow for regional generalization, they inevitably mask subnational, sectoral, and household-level heterogeneity in the distributional effects of economic complexity. Future work could exploit micro-data, firm-level surveys, or spatially disaggregated analyses to uncover the channels through which fiscal policy and productive upgrading interact on the ground. Moreover, incorporating political economy variables would deepen our understanding of why some MENA countries succeed in aligning fiscal policy with inclusive structural transformation while others do not. Addressing these dimensions is essential for designing policy frameworks that convert economic complexity into shared prosperity rather than deepened inequality.

Declarations

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Author Contribution

H.F. conceived the research idea and developed the theoretical framework. H.F. and N.B. designed the empirical strategy and contributed to the model specification. H.F. collected and processed the data and performed the econometric analysis (SGMM and Bayesian estimation). N.B. contributed to the interpretation of the results and the policy discussion. H.F. drafted the manuscript. N.B. critically revised the manuscript for important intellectual content. Both authors reviewed and approved the final version of the manuscript.

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