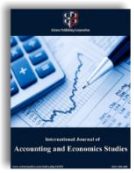
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Research paper



The Impact of Structural Transformation Trends in The Industrial Sector on The Economic Growth of The Non-Oil Sector in Saudi Arabia

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Abstract

This research aims to investigate the impact of structural transformation and economic freedom on non-oil economic growth in Saudi Arabia over the period 1996–2023. Using an Autoregressive Distributed Lag (ARDL) framework, we examine both short-run dynamics and long-run equilibrium relationships among key determinants, including industrial structural change, economic freedom, industrial employment, domestic credit, foreign direct investment, and urban population. The research model consists of measures of industrial structural change, economic freedom, industrial employment, domestic credit to the private sector, foreign direct investment, and urban population, along with interaction terms between structural change and economic freedom. The results show that structural transformation and economic freedom are significant drivers of non-oil GDP growth, with their interaction amplifying the positive effects of industrial diversification under strong institutional conditions. The findings suggest that Saudi Arabia's Vision 2030 objectives can be achieved by promoting high-productivity sectors, strengthening market-oriented institutions, and supporting industrial employment, investment, and urban-based economic activities to sustain long-term non-oil growth and reduce reliance on oil revenues.

Keywords: *Structural Transformation; Economic Freedom; Non-Oil GDP Growth; Industrial Sector; Saudi Arabia; ARDL; Vision 2030.*

1. Introduction

Saudi Arabia is undergoing a broad industrial renaissance, driven by ambitious national strategies to accelerate sustainable economic growth. Under Vision 2030 and the National Industrial Development and Logistics Program (NIDLP), the government has placed strong emphasis on industrial development as a key pathway for enhancing productivity, stimulating innovation, and diversifying the economic base away from oil dependence (Saudi Vision, 2024; NIDLP, 2024). The industrial sector has become a central pillar of non-oil economic expansion contributing to the Kingdom's objective of building a competitive and resilient economy (Alhowaish, 2020; Alkhateeb & Mahmood, 2022). Economic growth is a central objective for countries worldwide, as it serves as a key indicator of national prosperity and development. The industrial sector plays a pivotal role as a driver of economic growth, a relationship supported (Alhowaish, 2020; Alkhateeb & Mahmood, 2022).

As one of the world's largest oil-exporting nations, Saudi Arabia has sought to reduce its reliance on oil by diversifying sources of national income. The Kingdom's policies aim to broaden revenue streams, strengthen the trade balance, enhance foreign exchange reserves, and create employment opportunities to reduce unemployment (Looney, 2021). Aligned with Vision 2030's objectives, Saudi Arabia has implemented extensive structural reforms and initiatives to promote economic transformation. These measures include increasing local content, supporting national industrial development, and launching and expanding high-potential economic sectors, reflecting a strategic effort to modernize and diversify the economy (Saudi Vision, 2024; NIDLP, 2024; Alotaibi & Alotaibi, 2023).

The Kingdom of Saudi Arabia has placed significant emphasis on industrial development, providing extensive support and incentives to promote this sector. As a result, the Saudi industrial sector has experienced substantial growth, particularly evident in the expansion of industrial investments following the establishment of the Saudi Industrial Development Fund (SIDF), which has played a central role in financing and facilitating industrial projects across the Kingdom (Alhowaish, 2020; Alkhateeb & Mahmood, 2022). The advancement of industry and the integration of an industrial culture into Saudi society are considered key pillars for building a competitive economy and achieving sustainable development. By fostering industrialization, the Kingdom aims to enhance productivity, create employment opportunities, and strengthen the resilience of its non-oil economy (Looney, 2021; Alotaibi & Alotaibi, 2023).

The concept of structural transformation has evolved considerably in recent decades and remains a central theme in economic research and policy debates. Although extensively analyzed in both theoretical and empirical studies, structural transformation remains highly relevant given the complex challenges confronting contemporary economies (Hsieh & Rossi-Hansberg, 2023). Schlogl & Sumner (2020) defines

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structural transformation as a series of complementary developments that affect multiple dimensions of the economy, including the sectoral composition of GDP and employment, industrial organization, and political and institutional structures.

In the context of Saudi Arabia, structural transformation is particularly significant given the Kingdom's efforts to diversify its economy and reduce dependence on oil revenues. This study, therefore, examines the impact of structural transformation trends within the industrial sector on the economic growth of the non-oil sector, highlighting the role of industry in fostering economic diversification, employment generation, and sustainable development (Alhowaish, 2020; Alkhateeb & Mahmood, 2022; Alotaibi & Alotaibi, 2023).

Therefore, this research examines the impact of structural transformation in Saudi Arabia's industrial sector on the non-oil economy's economic growth from 1996 to 2023. Employing the Autoregressive Distributed Lag (ARDL) modelling framework, the study assesses how economic freedom transmits its effects through key channels, including industrial structural change. The findings aim to contribute to the literature on structural transformation in resource-dependent economies and provide evidence-based policy implications for enhancing the resilience and competitiveness of Saudi Arabia's non-oil sector. This study contributes to the Saudi-specific body of literature through an ARDL-ECM model to identify short-run adjustment and long-run impacts of structural change and economic freedom on non-oil growth. It also adds value through the explicit modeling of a relationship between structural change and economic freedom, thus testing the hypothesis of whether or not institutional quality boosts growth based on diversification in a resource-dependent economy.

2. Literature Review

Structural change has now been extensively interpreted as a way of reallocating output and the workforce from low-productivity activities, usually agriculture and low-value services, to higher-productivity manufacturing and contemporary services, in combination with shifts in technology, skills, and the spatial distribution of production. According to recent publications, this process is not automatic, but rather is conditional on the quality of institutional activities, trade integration, or macroeconomic management (Kamal & Fatima, 2023; Tasneem & Khan, 2024). In that perspective, industrialization is still part of the medium term, with structural change measured by its relative contribution to long-term, broad-based productivity improvements rather than mere sectoral changes (Wolf, 2023). The implication here is that the policy should intentionally encourage labour and capital mobility into high-productivity activities and reduce misallocation and dualism.

Since 2020, empirical evidence has consistently shown that countries that diversify into more complex industrial and service sectors grow faster and more adaptively. In a study using a sample of emerging economies, Kamal and Fatima (2023) demonstrate that the transition from primary commodity production to medium- and high-technology production is associated with greater long-run growth and reduced susceptibility to external shocks. This discovery is that the relocation of labour from low-productivity agriculture into export-oriented manufacturing and modern services can generate sizeable productivity gains through reallocation, but observe that premature deindustrialization and poor industrial policy have constrained the rate of reallocation (Tasneem & Khan, 2024). Research indicates that structural change may stall or even become counterproductive to growth when demand growth is too slow to justify continued industrialization, highlighting the role of domestic demand and macroeconomic stability in facilitating industrialization (Wolf, 2023). Combined with these, studies emphasize that structural transformation can be growth-enhancing only when coupled with consistent macro-industrial strategies.

Recent studies indicate that quality and the composition of structural change are essential for inclusive and sustainable growth. Nonetheless, this literature also indicates that structural change may be weakly pro-poor or even structural worsening with capital-intensive activities that create small-scale domestic connections and low wage jobs, which is an applicable concern to the petrochemical- and heavy-industry-oriented pattern of diversification in Saudi Arabia (Ali, 2020; Cyrek, 2024). The analysis of Poland reveals that the transformation of sectors towards high-productivity can be accompanied by increased job insecurity and low wage growth when the new activities are high-capital-intensive (Czek, 2024). This contrasts with situations in which structural change is linked to productivity improvements and better labour market performance in East Asia and Central Europe (Kamal & Fatima, 2023; Tasneem & Khan, 2024). The policy implication is that industrial policies are meant not only to raise average productivity but also to create good jobs in tradable manufacturing and knowledge-based services.

Ali (2020) reports that Saudi industrialization has been uneven in terms of spatial distribution and the division of subsectors, with capital-intensive petrochemicals and the heavy sector dominating growth but not being highly integrated with small and medium enterprises within the country. Even more recent evidence suggests that both the diversification of non-oil exports and industrial upgrading are now playing a more prominent role in non-oil GDP growth, particularly in downstream petrochemicals, metals, and manufacturing-related services (Hasanov et al., 2022). Raid et al. (2024) found positive correlations between a broader diversification index, which represents expansion in manufacturing, tourism, logistics, and business services, and non-oil output growth and non-oil fiscal revenues. These studies confirm the paper's assumption that the structure and evolution of the industrial sector are major drivers of non-oil economic performance in Saudi Arabia.

It is also becoming evident that structural transformation helps drive non-oil growth in a resource-rich economy. As demonstrated by Hasanov et al. (2022), diversification of non-oil exports into more advanced products in Saudi Arabia is linked to more stable export revenues and less susceptibility to oil price shocks, despite terms of trade and global demand adjustments. Kamal and Fatima (2023) also found that economies that can scale up manufacturing capacity in more technologically advanced segments experience greater spillovers into services, infrastructure, and human capital accumulation.

According to Tasneem and Khan (2024), urbanization and industrial employment are essential mediators of these impacts. In developed urban labour markets and industrial clusters, labour reallocation has a greater impact on aggregate productivity. Such processes reflect the Saudi case, in which urban-based industrial platforms and logistics corridors have been clearly deployed as tools for non-oil development. The institutional environment, and specifically economic freedom, has reoccupied a central role as a determinant of growth alongside structural change. Yang et al. (2023) demonstrate, using a global panel, that a greater economic freedom, reflected by the rule of law, regulatory efficiency and market openness, is positively related to both GDP growth and the indicators of inclusive growth, through the transmission factor of financial development. Hung et al. (2024) break this relationship down by quality of regulations and discover that in countries having high regulatory quality, there is a greater and more substantial impact of economic freedom; in countries where regulations are weak or inconsistent, certain aspects of the freedom, including the rapid liberalization without proper oversight, may have counteracted it or even been negative. In the Western Balkans, Bajrami et al. (2025) show that monetary freedom and property rights have a significant positive impact on growth. That performance is limited by oversized government spending, underscoring the need for a balanced, market-friendly state. Combined, such results indicate that economic freedom does not coherently promote growth; its increasing impact is conditional on the quality of the regulations and state capabilities, and thus, an unmonitored rapid liberalization can make the system more vulnerable instead of contributing to the continued structural improvement (Hung et al., 2024).

Economic freedom has also been linked to outcomes of structural transformation by several studies, instead of growth alone. According to Hung et al. (2024), good property rights, predictable regulation, and openness to trade reduce the risk of long-term industrial investment and help firms during an upgrading process to more complex activities. According to Yang et al. (2023), economic freedom enhances the distribution of both credit and foreign capital, thereby leading to the development of more productive sectors and increased financial inclusion. Raid et al. (2024) demonstrate that the non-oil sectors, namely manufacturing, logistics, and tourism, are at a greater growth pace when episodes of regulatory reform and trade liberalization are observed. However, they warn that institutional reforms should be planned to prevent macro-financial instability. This fact justifies the modelling decision in the current research: either to use economic freedom as a direct determinant of growth or to use it as an interaction term that moderates the effects of structural change.

The interconnection between structural change, economic freedom, and resource dependency is also attracting increasing interest. Ali (2020) further confirms that the success of diversification in Saudi Arabia does not depend on the extent or lack of industrial investments in the country, but instead on whether institutions encourage the entry, learning, and technological development of non-oil pursuits. Synthesizing findings at the country level, Kamal and Fatima (2023) and Tasneem and Khan (2024) find that non-resource growth is better realized in resource-rich countries, in the presence of a structural transition supported by a credible rule system, transparency in relationships between states and businesses, and discipline in state investments. In the example of Saudi Arabia, it means the industrial and regulatory changes of Vision 2030 will influence the non-oil GDP not only directly, altering the industry itself, but also indirectly, modifying the incentive to work motivation within the industry sector, diversification of exports, and the urban economy (Hasanov et al., 2022; Raid et al., 2024). Among the most significant models of the further non-oil development of the resource-abundant economies, one should mention industrial upgrading. The institutional quality and economic freedom greatly determine the rate and quality of this transformation. The interplay of these forces in Saudi Arabia has not been studied extensively at the country-specific level, particularly in time-series designs that help distinguish the short- and long-run equilibria. The study fills this gap and provides evidence on how institutional reforms can increase the growth effects of industrial transformation in the Saudi non-oil sector by modelling the relationship between economic freedom and structural change in an ARDL framework.

3. Methodology and Data

This study aims to examine the relationship between non-oil economic growth and the patterns of structural transformation within the industrial sector in Saudi Arabia over the period 1990–2023. To achieve this, we employ the Autoregressive Distributed Lag (ARDL) model. The ARDL framework is especially advantageous for small sample sizes and for variables that are either integrated of order I(1) or a mix of I(0) and I(1). Additionally, it allows for the concurrent estimation of both short-term dynamics and long-term equilibrium relationships.

3.1. Method

The time-series properties of all variables are assessed using the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests. Establishing that no series is integrated of order I(2) is crucial because the ARDL bounds-testing procedure is invalid in the presence of second-order integration. After confirming integration orders, cointegration among variables is examined using the ARDL bounds testing approach, which evaluates the presence of a long-run relationship by comparing the F-statistic to critical values. If the computed statistic exceeds the upper bound, long-run cointegration is confirmed. Once cointegration is established, the optimal ARDL(p, $q_1 \ldots q_6$) model is selected using criteria such as the Akaike Information Criterion (AIC). The long-run coefficients measure the sustained effects of structural transformation and other determinants on non-oil GDP, while the short-run dynamics are captured through the Error Correction Model (ECM). A negative and significant Error Correction Term (ECT) confirms that deviations from long-run equilibrium adjust back toward stability. To ensure the reliability and robustness of the ARDL estimates, model diagnostics include structural stability checks using the CUSUM and CUSUMSQ tests.

3.2. Data description

3.2.1. Data sources

This study uses annual data for Saudi Arabia covering 1996–2023, obtained from:

- Saudi Central Bank (SAMA)
- World Bank World Development Indicators
- UNIDO INDSTAT
- Heritage Foundation Index of Economic Freedom
- General Authority for Statistics
- UNCTAD for FDI statistics

These sources offer reliable macroeconomic and sectoral indicators relevant to structural transformation and economic freedom.

3.2.2. Variable definition and measurement

The empirical model includes variables representing industrial structural change, economic freedom, and macroeconomic fundamentals.

Endogenous Variable

Economic Growth: measured by GDP per capita, representing overall wealth creation and the non-oil economy's expansion.

Exogenous Variables

Structural Change (STC): measured by the share of manufacturing in GDP. This indicator captures the shift from low-productivity sectors (e.g., agriculture) to higher-value-added manufacturing. However, this proxy fails to make a distinction between traditional and high-technology production, or between exported and domestically-focused production, and thus the resulting estimates of its effects can only be understood as a globalized industrialization and not a narrowly-focused upgrading. Structural change contributes to productivity growth and non-oil economic expansion.

Institutional Quality (INST): proxied by the Economic Freedom Index, capturing rule of law, government size, regulatory efficiency, and market openness. Strong institutions facilitate structural change, promote private-sector growth, and enhance policy credibility.

Interaction Term (INST × STC): represents the combined effect of institutional quality and structural change on growth. Well-functioning institutions are expected to amplify the positive impact of structural transformation on non-oil economic growth**.**
Foreign Direct Investment (FDI): net inflows facilitate technology transfer and integration into global value chains. The effect of FDI depends on absorptive capacity and human capital. In Saudi Arabia, FDI supports non-oil industrial growth and diversification under Vision 2030**.**
Domestic Credit to the Private Sector: (% of GDP) indicates financial development and access to financing, supporting investment, entrepreneurship, and industrial expansion**.**
Urban Population: serves as a proxy for labour reallocation from rural to industrial sectors, reflecting the human capital potentially available to support industrial growth and urban-centred economic activity**.**
Industrial Employment (IEMP): The empirical literature suggests that industrial employment plays a central role in driving structural change, particularly when labour reallocation toward manufacturing enhances productivity and facilitates long-run economic transformation. Evidence indicates that sustained industrial employment growth is associated with more profound structural transformation and greater productivity convergence, reflecting the long-run effects of skill accumulation, technological upgrading, and diversification. However, this relationship may be weak or unstable in the short run due to adjustment costs, labour market rigidities, and sectoral mismatches, as highlighted by the phenomenon of premature deindustrialization. In resource-rich economies such as Saudi Arabia, oil dependence and Dutch disease effects further constrain industrial labour absorption, potentially weakening the short-term transmission of industrial employment to structural change. Moreover, aggregate industrial employment share does not indicate the quality of jobs or the level of skills, either of which restricts the credibility of the results to inform about the inclusiveness of structural change.
Table 1 summarises the descriptions of all variables, outlining their definitions and relevance to the model to clarify the study's scope and support understanding of their roles in the analysis.

Table 1: Variables Description

Variable	Code	Measurement
Non-oil GDP	NOGDP	Constant-price non-oil GDP
Economic Freedom Index	EF	Composite index reflecting institutional and regulatory quality
Structural Change Index	STC	Share or transformation index for industrial output
Industrial Employment (IEMP)	IEMP	Share of industrial employment in total employment (manufacturing, mining, utilities)
Domestic Credit to the Private Sector	DCPS	Private sector credit (% of GDP)
Foreign Direct Investment inflows	FDI	Net inflows (% of GDP)
Urban Population	URB	Percentage of population living in urban areas

Interaction Term (STC*EF): represents the combined effect of institutional quality and structural change on growth. Well-functioning institutions are expected to amplify the positive impact of structural transformation on non-oil economic growth.

3.2.3. Model specification

Since the variables under consideration are expected to display different integration properties, the study employs the Autoregressive Distributed Lag (ARDL) bounds-testing approach. This technique is well-suited for analyses involving small samples. It allows for the inclusion of regressors that are stationary at level, I(0), and/or at first difference, I(1), provided none are integrated of order I(2). Accordingly, and in line with established economic and econometric studies, the ARDL framework is used to estimate the following model:

$$\mathrm{NOGDP} = \alpha_0 + \sum_{k=1}^{n} \alpha_1 \Delta \mathrm{EF}_{t-k} + \sum_{k=1}^{n} \alpha_2 \Delta \mathrm{FDI}_{t-k} + \sum_{k=1}^{n} \alpha_3 \Delta \mathrm{STC}_{t-k} + \sum_{k=1}^{n} \alpha_4 \Delta \mathrm{IEMPP}_{t-k} + \sum_{k=1}^{n} \alpha_5 \Delta \mathrm{URB}_{t-k} + \emptyset \mathrm{EC}_{t-1} + \varepsilon_t \quad (1)$$

Where EC_{t-1} is the error correction term representing the long-run equilibrium derived from the cointegrating equation.
However, when incorporating economic freedom as an independent variable, Model (1) no longer fully captures its direct influence on non-oil GDP (NOGDP). Since the primary objective of this study is to examine the impact of economic freedom on key macroeconomic variables in Saudi Arabia, Model (1) is therefore extended and reformulated. The modified specification, presented as Model (2), is defined as follows:

$$\mathrm{NOGDP} = \alpha_0 + \sum_{k=1}^{n} \alpha_1 \Delta \mathrm{FD})_{t-k} + \sum_{k=1}^{n} \alpha_2 \Delta (\mathrm{EF} * \mathrm{STC})_{t-k} + \sum_{k=1}^{n} \alpha_2 \Delta (\mathrm{EF} * \mathrm{IEMP})_{t-k} + \sum_{k=1}^{n} \alpha_4 \Delta \mathrm{URB}_{t-k} + \emptyset \mathrm{EC}_{t-1} + \varepsilon_t \quad (2)$$

Where:
(STC*EF) is the interaction term between STC and EF
(IEMP*EF) is the interaction term between IEMP and EF
α_1, α_2, α_3 and α_4 capture the role of EF in mediating the impact of FDI, STC, IEMP and URB on the Non-oil GDP growth rate in KSA consecutively.

4. Empirical Results

4.1. The unit root test results

To begin the empirical analysis, unit root tests are conducted to determine the time series' stationarity. The study employs the Dickey–Fuller framework, as extended in the Augmented Dickey–Fuller (ADF) test, to assess whether each model variable is stationary and to determine its order of integration. The unit root results for both the level and first-difference forms of the variables are reported in Table 1. The optimal lag length for the ADF test is selected using the Akaike Information Criterion (AIC), which helps eliminate serial correlation in the residuals and ensures that the disturbance term behaves as white noise**.**
The ADF results presented in Table 2 reveal that the null hypothesis of a unit root cannot be rejected for any of the variables at the 5% significance level when tested in levels. However, all variables become stationary after first differencing, indicating that they are integrated of order one, I (1).

Table 2: Unit Root Test

Variables		ADF
LNOGDP	Level	-1.288538
	First Diff.	-10.05546
FDI	Level	-2.584270
	First Diff.	-4.028151
LSTC	Level	-1.014009
	First Diff.	-5.085328
LDCPS	Level	-1.472322
	First Diff.	-5.749673
LURB	Level	-1.631205
	First Diff.	-7.522134
LEF	Level	-2.391762
	First Diff.	-7.836306
LIEMP	Level	-1.926251
	First Diff.	-8.717078
LSTC * LEF	Level	-1.398478
	First Diff.	-4.714290
LIEMP* LEF	Level	-2.097586
	First Diff.	-4.281547

Notes: ADF-Dickey DA, Fuller unit root test with the Ho: Variables are I (1). All the Variables are significant at the 5% level.

The ADF test results show that all variables become stationary after first differencing, as the test statistics exceed the 5% critical values, leading to rejection of the null hypothesis of non-stationarity. Consequently, all series are integrated of order one, I(1), with none integrated of order two. This integration structure satisfies the conditions for applying the ARDL bounds test for cointegration.

4.2. ARDL bounds test cointegration results

Given that the variables exhibit different orders of integration, the presence of a long-run relationship is examined using the ARDL bounds testing framework, which is based on the unrestricted error-correction model representation.

The Autoregressive Distributed Lag (ARDL) Bounds Test was employed to examine the presence of a long-run relationship among the variables. The null hypothesis of the test assumes that there is no linear relationship among the variables. The estimated F-statistic is 6.557, which exceeds the upper bound critical values at all conventional significance levels. Accordingly, the null hypothesis of no cointegration is rejected, confirming the existence of a stable long-run equilibrium relationship among the variables. Based on this finding, the long-run coefficients and short-run dynamics are estimated using the ARDL error correction model. The results are displayed in Table 3. In conclusion, the results indicate a significant long-run relationship between the variables in the study.

Table 3: ARDL Bounds Test result

F-statistic	Significance level	Lower Bound	Upper Bound
6.557*	10%	2.08	3.00
	5%	2.39	3.38
	1%	3.06	4.15

* ,** ,***indicates significance at 1%, 5%, and 10%, respectively.
Source: Author's compilation

4.3. ARDL and ECM results

To evaluate the effect of the selected variables on NOGDP, we examine the long-term contributions of Structural Change, Foreign Direct Investment, Economic Freedom, Urban Population, Domestic Credit to the Private Sector and Industrial Employment. These findings are summarised in Table 4.

Table 4: Effects of Structural Transformation Via the Index of Economic Freedom on the Non-Oil GDP in Saudi Arabia

Variables	Equation 1	Equation 2
cst	0.016421 (7.921650)***	0.038168 (4.346534)***
DLEF	0.581939 (2.885414)**	-
DLSTC	0.553916 (9.923594)***	-
DLIEMP	0.166238 (5.436922)***	0.300239 (4.013744)***
DLDCPS	0.225135 (8.656918)***	0.054453 (1.836283)*
DFDI	0.015484 (7.873987)***	**0.003623** (2.207056)
DLURB	0.774316 (3.139961)***	**0.479926** (2.625361)**
D(LSTC*LEF)	-	0.690855 (5.311768)***
R-squared	0.974428	0.923106
Durbin-Watson	2.206223	2.342562

Notes: Dependent Variable: DNOGDPG; Method: the Autoregressive
Distributed Lag (ARDL) *, ** and *** Indicate the significances respectively 10%, 5% and 1%.

Table 4 presents the estimated short-run dynamics of non-oil GDP growth (DNOGDPG) in Saudi Arabia using an Error Correction Model (ECM) derived from the ARDL framework. Two model specifications are reported to examine the direct effects of structural transformation and economic freedom, as well as their interactive impact on non-oil economic growth.

The results from Equation (1) indicate that economic freedom and structural transformation have positive, statistically significant effects on non-oil GDP growth. Economic freedom promotes growth by improving institutional quality, market openness, and regulatory efficiency, while structural transformation supports diversification by reallocating resources toward more productive industrial and service

sectors. Industrial employment significantly enhances non-oil economic performance, underscoring the role of industrialization in diversification. In addition, domestic credit to the private sector, foreign direct investment (FDI), and urban population growth all contribute positively to non-oil GDP growth, highlighting the importance of financial development, foreign capital inflows, and urban agglomeration effects. The model explains a substantial proportion of the variation in non-oil GDP growth ($R^2 = 0.974$), with the Durbin–Watson statistic indicating no evidence of autocorrelation.

Equation (2) incorporates an interaction term between structural transformation and economic freedom to assess whether institutional quality amplifies the growth effects of structural change. The interaction term is positive and highly significant, indicating that structural transformation is more growth-enhancing when supported by strong market-oriented institutions and economic freedom. Industrial employment remains a key driver of non-oil growth, while domestic credit continues to have a weaker but positive short-run effect. FDI and urban population continue to exert significant positive influences, although with reduced magnitudes, suggesting that part of their impact operates through institutional and structural channels. The model's explanatory power remains high ($R^2 = 0.923$), and diagnostic statistics confirm well-behaved residuals. The positive roles of industrial employment, financial development, FDI, and urbanization further emphasize the importance of integrated industrial, financial, and institutional reforms. For Saudi policymakers, these results suggest that achieving the objectives of Vision 2030 requires simultaneously advancing structural diversification and strengthening economic freedom to foster sustained non-oil growth and reduce long-term dependence on oil revenues.

4.4. Diagnostic test results

To assess the robustness of the estimated model, several diagnostic tests were conducted to examine potential issues of autocorrelation, heteroskedasticity, and model misspecification. The results indicate that these problems are not present, confirming the reliability of the estimated coefficients**.**

In addition, parameter stability was evaluated using the CUSUM test at the 5% significance level, which is appropriate for ARDL-based ECM models. The CUSUM plot in Figure 1 shows that the test statistic remains within the critical bounds, indicating stable coefficients for non-oil GDP in the ECM specification over the sample period.

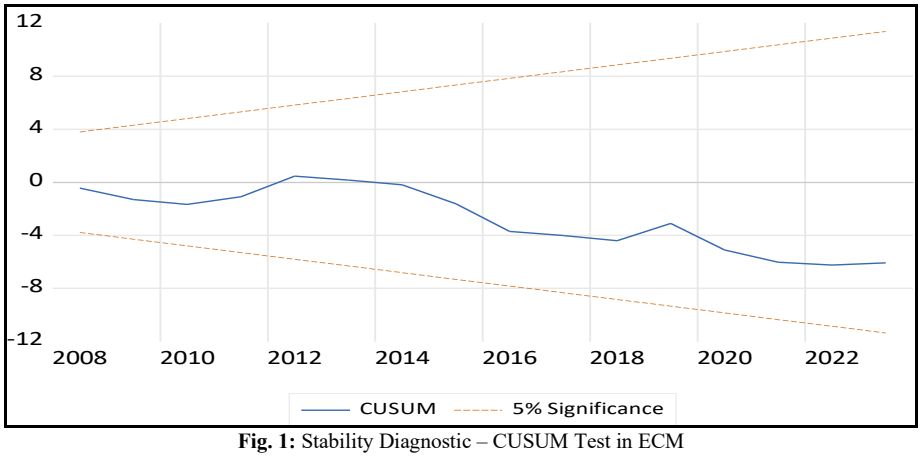


Fig. 1: Stability Diagnostic – CUSUM Test in ECM

5. Discussion

According to the ARDL-ECM estimates, structural transformation, proxied by the industrial share and industrial employment, is a fundamental determinant of non-oil GDP growth in Saudi Arabia, and the effect is more substantial as institutional quality and economic freedom increase. This trend is in line with emerging cross-country data that growth accelerations in emerging economies are directly linked to changes away from primary production to more complex manufacturing and services, assuming that this reallocation has to be supported by the consistent industrial policy and macro stability (Kamal & Fatima, 2023; Tasneem & Khan, 2024). The fact that Saudi yields attest to is that diversification is not a matter of swapping sectoral shares alone but of productivity-enhancing redistribution within an enabling institutional context.

The size and weight of the structural change and industrial employment coefficient indicate that the Saudi industrial sector is starting to serve as an actual engine of growth of the non-oil sector. This is consistent with empirical evidence from Poland and other middle-income nations, which finds that structural change is a positive factor for growth when labour shifts to high-productivity uses rather than low-wage, low-security categories (Cyrek, 2024). The present model, however, can only measure change in structure through manufacturing share and industrial employment, which does not allow differentiation between high-tech and export-oriented activities and low-value, capital-intensive subsectors. According to recent Saudi evidence, petrochemicals and heavy industry remain predominant and are not fully developed into domestic SMEs, which might limit the benefits of inclusive employment (Yasmin et al., 2020; Hasanov et al., 2022).

The economic freedom outcomes and the relationship between economic freedom and structural transformation provide a significant institutional layer. The positive and significant interaction term indicates that the growth contribution of industrial diversification is greater when market-oriented institutions, regulatory efficiency, and openness are stronger. This aligns with findings from panel studies across the global market, which show that economic freedom contributes to higher growth, primarily through the financial development and capital accumulation channels (Yang et al., 2023). However, recent literature also emphasizes that the growth impacts of economic freedom are conditional on the quality of regulation: in an environment with weak or ineffective regulation, rapid liberalization can lead to volatility or misallocation, but not sustained growth (Hung et al., 2024). The positive and significant interaction term substantiates the fact that economic freedom does not merely contribute to growth alongside the structural change, but enhances the growth impact of diversification as institutions are more market-conducted and transparent.

The current improvement in non-oil GDP growth driven by domestic credit, FDI, and urbanization is also consistent with recent reports from the Gulf and emerging economies. Non-oil export-specific modelling of Saudi Arabia reveals that the responsiveness of non-oil exports to improvements in competitiveness is greatly affected by deeper financial markets and a favourable trade framework (Hasanov et

al., 2022). Similarly, the literature on cross-country comparisons shows that financial deepening and credit growth are associated with structural upgrading and high-quality growth when supported by sound regulation and risk management (Yang et al., 2023). The high urban population impact of the ARDL result is aligned with the global literature that indicates urbanization increases productivity due to agglomeration, knowledge spillovers and labour market matching effect, whereas it also confirms the concerns that the gains of urban growth are conditional on the quality of infrastructure and governance (Kamal & Fatima, 2023; Tasneem & Khan, 2024). In Saudi Arabia, the high estimated coefficient may be due to the concentration of non-oil activities in some metropolitan corridors, rather than balanced spatial development.

Simultaneously, there is evidence that the estimated relations can represent a favourable reform episode rather than structural parameters that will be maintained. The evidence from time-series studies on Saudi structural change indicates that the growth effect of industrial reallocation is regime-sensitive to oil prices and to the timing of major investment waves (Yasmin et al., 2020). Equally, the non-oil export scenario simulations indicate that external shocks and real exchange rate movements may outweigh the effects of domestic reforms in the short run (Hasanov et al., 2022). The ARDL diagnostics indicate stable cointegration and coefficients, but using annual data after 1996-2023 results in a small sample size. The high R^2 values in both equations, together with multiple regressors and terms of interaction, also indicate that there is a non-trivial risk of over fitting despite standard diagnostics showing no evidence of any misspecification. The tests around the main policy milestones (e.g., the announcement of Vision 2030 and the COVID-19 shock) and alternative specifications (e.g., including oil prices or the fiscal stance) would reinforce the argument that the estimated long-run relations are strong.

The other weakness is also related to endogeneity and reverse causality, as economic freedom, FDI inflows, credit deepening, and even industrial share are most likely to be affected by non-oil development, in particular, in a reform-driven economy like Saudi Arabia. This means that even economic freedom, FDI inflows, credit deepening, and the industrial share can be affected by non-oil growth outcomes, especially when a booming non-oil sector is reinvested in institutional reforms and financial development. The recent research on structural change and growth highlights that causality is reciprocal and depends on the stage of development (Cyrek, 2024; Tasneem & Khan, 2024). The ARDL-ECM single-equation model is less biased than fully dynamic terms but less accommodating of simultaneity.

In spite of these caveats, the findings are an addition of beneficial country-specific evidence, to a body of literature that has been overtaken by cross-country panels. Recent studies on structural transformation and political economy suggest that more finer-grained accounts of how institutional changes influence sectoral relations in economies that are resource endowed are needed (Kamal and Fatima, 2023; Yasmin et al., 2020). The study confirms the policy options of integrating industrial upgrading with the enhancement of regulatory quality, transparency and market openness to enforce the study by demonstrating that the relationship between structural change and economic freedom is statistically and economically significant to Saudi non-oil growth. Simultaneously, comparative experience of Poland, Pakistan and other developing economies indicates that the structure of change and inclusiveness of their composition are as important as the pace of change (Cyrek, 2024; Tasneem and Khan, 2024). Future studies might thus build on the current model through inclusion of indicators of job quality, potential to innovate and environmental performance and by decomposing non-oil GDP into non-tradable and tradable. The fact that the coefficients of the structural change, industrial employment, credit, FDI and urbanisation are positive reveals that the building blocks to a non-oil growth model are present, but the small-sample size of evidence used, the possible endogeneity of key regressors and the imprecision of structural transformation measurement all suggest that the evidence should be interpreted with caution and refined further in future empirical studies.

6. Conclusion and Policy Implications

The current research demonstrates that structural change in the industrial sector and economic freedom are the primary drivers of non-oil GDP growth in Saudi Arabia between 1996 and 2023. According to the ARDL-ECM findings, a rise in the industrial share and industrial employment, coupled with an increase in the depth of domestic credit, FDI inflows, and greater urbanization, is linked to stronger non-oil growth. The strong, statistically significant correlation between structural change and economic freedom implies that diversification is most conducive to development when it is anchored in a favourable institutional framework typified by foreseeable regulation, market orientation, and the rule of law. Meanwhile, the limited sample size, the risk of endogeneity, and the aggregate nature of the structural indicators suggest that the estimates should be taken as indicative rather than conclusive. Industrial upgrading and institutional quality will reinforce each other as channels for non-oil growth.

According to the policy, the results favour an integrated Vision 2030 strategy that is not limited to building aggregate industrial capacity. The concerns of industrial policy should focus on high productivity, tradable activities, enhanced connections between large industrial ventures and home-based SMEs, and more skill-intensive employment, so that structural transformation can be more growth-promoting and inclusive. This comes immediately after the positive coefficients on structural change and industrial employment, which point to the non-oil growth to be greater when industrial growth creates employment and linkages than when it is entrenched in capital-intensive enclaves. The importance of the interaction term between structural change and economic freedom is in favor of emphasizing such institutional reforms, as the estimates are that diversification brings greater growth returns when it is implemented within stronger regulatory quality and market-oriented regulations. The development of finance in the country should be guided towards channelling credit to productive non-oil companies, with the FDI policy focused on technology-intensive segments with definite local-content and knowledge-transfer schemes.

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