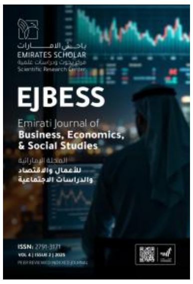

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Saudi Arabia's Industrial Transformation Since 1976; Industrialization, Diversification and Global Influence, An Empirical Analysis and Forward-Looking recommendations

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ABSTRACT

Over the last four decades, Saudi Arabia has undergone profound industrial transformation starting with the establishment of Saudi Basic Industries Corporation (SABIC) in 1976. This research critically examines the nation's industrialization process, analysing econometric data, historical context, and policy effectiveness. From 1974 to 2018, Saudi manufacturing GDP surged from SAR 32 billion to SAR 319.5 billion, with the share of non-oil manufacturing in total manufacturing rising from to , reflecting real diversification efforts. Current data show industrial sector growth of annually post-2015, a increase in industrial facilities since 2016, and manufacturing accounting for of GDP with aspirations to reach by 2030. Econometric models and predictive analysis underscore the crucial roles of capital accumulation, export sophistication, and labor market reforms. Despite remaining oil-reliant, Saudi Arabia's industrial policies, bolstered by Vision 2030, have positioned the Kingdom as a regional econsauditazion" policy, at same time who give transparent citizenship process to businessmen, talents, investors and leveraging technological adoption for sustainable diversification, who will create the "image" of a diversified country to world public and not more a "oil dependent" to global stakeholders.

Keywords: *Saudi Arabia, Industrialization, Economic Diversification, SABIC, Vision 2030*

1. Introduction

The Kingdom of Saudi Arabia's post-1976 economic trajectory is profoundly marked by a deliberate and multifaceted industrialization strategy aimed at moderating its historically entrenched oil dependence. As one of the world's largest oil producers and exporters, Saudi Arabia has long relied on hydrocarbon revenues to underpin fiscal budgets, public spending, and economic growth, with oil accounting for approximately 40% of GDP and up to 90% of government revenue for most of the late 20th and early 21st centuries (International Monetary Fund, 2023; ISPI, 2024). This reliance, while enabling rapid modernization and infrastructure development, exposed the Kingdom to cyclical vulnerability associated with oil price volatility, which adversely impacted fiscal stability and long-term economic sustainability (ScienceDirect, 2025; Kleinman Energy, 2023). The pervasive economic reliance on hydrocarbons epitomizes the challenges documented in resource curse literature and Rentier State Theory, which highlight how resource wealth can distort economic incentive structures, delay diversification, and engender sociopolitical dependencies on oil rents (Hertog, 2016; Toledo, 2023).

Recognizing the need to break this dependence, the Saudi government embarked on diversified industrialization efforts, crystallized by the strategic establishment of the Saudi Basic Industries Corporation (SABIC) in 1976. SABIC's formation marked the commencement of a state-led, capital-intensive model focused on downstream petrochemicals, industrial cluster development, and leveraging the Kingdom's abundant gas resources to stimulate non-oil sectors. This shift was further bolstered by infrastructure expansion, human capital development, and foreign direct investment facilitation throughout subsequent decades (Oxford Business Group, 2015; Ministry of Industry, 2023). These policies were instrumental in raising the share of manufacturing and non-oil activities in the economy, laying the foundation for a broader industrial base that currently contributes approximately 14% of GDP and is targeted to grow further under Vision 2030 (Arab News, 2024; KPMG, 2025). However, despite significant progress, Saudi Arabia's industrialization journey continues to be complex and non-linear. Structural challenges persist, including the predominance of oil-linked industries within industrial output, dependency on expatriate labor, and gaps in technological innovation and SME penetration (ScienceDirect, 2024; Harvard Growth Lab, 2024). Moreover, global economic uncertainties, including fluctuating energy demand in the face of climate policies and a transition to renewable energy, impose new imperatives on the Kingdom's economic planning (SABIC Climate Report, 2024; World Bank, 2024). Consequently, recent reforms emphasize digital transformation, sustainable industrial practices, and economic liberalization as critical pathways to mitigate risks and sustain growth.

The reason for this study is to offer a rigorous, data-driven, and theoretically grounded analysis of Saudi Arabia's industrialization and economic diversification over the last forty years. It integrates quantitative econometric assessments, industry-level data, and policy reviews to critically evaluate the effectiveness of past strategies, identify ongoing constraints, and forecast future trajectories. Positioned at the intersection of development economics and political economy, the analysis contextualizes Saudi industrialization within global commodity cycles, regional geopolitics, and a rapidly evolving global industrial landscape. Ultimately, it aims to shed light on Saudi Arabia's potential not only as the leading industrial economy in the Middle East but also as a model for resource-dependent economies globally pursuing sustainable, diversified growth beyond oil dependency.

2. Methodology

This research employs a comprehensive and multi-dimensional methodology to analyze the industrialization and economic diversification processes of Saudi Arabia from 1976 to the present, with projections into 2035. The study integrates quantitative econometric modeling, extensive use of official macroeconomic data, historical analysis, and comparative evaluation to establish a rigorous and contextually grounded understanding of the Saudi industrial transformation.

2.1 Data Sources and Contextual Framework

The General Authority for Statistics (Saudi Arabia), the Saudi Industrial Development Fund (SIDF), the International Monetary Fund (IMF), and the World Bank are some of the official institutions that provide primary data. Other sources include major Saudi government policy documents like the National Industrial Strategy and Vision 2030 reports. These data encompass sectoral GDP contributions, employment rates, trade figures, capital stock, and investment flows, enabling detailed time-series analyses over a 40-plus-year horizon. In addition to statistical data, relevant academic and policy literature provides a critical framework to interpret underlying economic and political dynamics driving industrialization within the Kingdom and the Gulf Cooperation Council (GCC) context.

2.2 Econometric and Quantitative Techniques

The empirical core of the study applies time-series econometric methodologies, including multiple regression analyses and vector autoregression (VAR) models, to test the relationships among key economic variables. For example, regression models of the form

Assess how changes in industrial diversification, foreign direct investment (FDI), and labor inputs individually affect GDP growth rates. These models are leveraged to quantify the elasticity of manufacturing output relative to capital and labor inputs, providing insight into the relative contributions of factors such as investment intensity and workforce expansion to industrial performance.

$$\begin{gathered}\Delta GDP_t = \alpha + \beta_1 \Delta \text{ DiversificationIndex } x_t \\ + \beta_2 FDI_t + \beta_3 \text{ Labor }_t + \epsilon_t\end{gathered}$$

To supplement regression analysis, forecasting methods including ARIMA (AutoRegressive Integrated Moving Average) and scenario modeling are employed to generate projections of industrial growth and diversification metrics through 2035. These models incorporate historical variability, sector-specific trends, and potential policy impacts to simulate plausible future pathways for manufacturing output, employment, and export diversification.

Beyond basic regression and ARIMA, the study incorporates advanced methodologies critical to capturing the complexity of industrialization dynamics:

- Vector AutoRegressive (VAR) Models: These analyze dynamic interdependencies among GDP, diversification indices, investment, employment, and trade over time, revealing lagged effects and feedback loops shaping industrial evolution.
- Dynamic General Equilibrium (DGE) Models: Macro-level simulations estimate how economic shocks and policy changes influence sectoral growth, employment, and GDP, evaluating the projected impacts of Vision 2030 diversification initiatives.
- Cobb-Douglas Production Functions: Commonly used in industrial studies, this functional form models output as a multiplicative function of capital, labor, and technology inputs, enabling factor elasticity and productivity analysis, crucial for understanding Saudi manufacturing growth drivers.
- Herfindahl-Hirschman Index (HHI) and Entropy Measures: These statistical metrics assess industrial concentration and diversification levels, with changes over time indicating shifts away from oil dependency towards more diverse industrial bases.
- Input-Output (I-O) Analysis: Leontief matrices quantify sectoral multipliers and inter-industry flows, essential for evaluating the broader economic impact of industrial investments and cluster development in sectors such as petrochemicals and metals.

- Comparative Time-Series Analysis: Benchmarking Saudi industrialization against regional and international peers where similar development trajectories unfold, highlighting unique Saudi transitions and shared challenges.
- Statistical Forecasting & CostBenefit Analysis: These techniques evaluate the economic viability and returns of industrial diversification projects, supporting evidence-based policy recommendations.

2.3 Comparative and Historical Analytical Approach

To enrich quantitative assessments, the research employs extensive historical analytical methods:

- Critical Analysis of Archival and Policy Documents: Government plans, industrial reports, and international datasets from 1976 onward shape a chronological reconstruction of Saudi industrial policy evolution. This analysis contextualizes the unfolding industrial strategies within political and economic shifts.
- Comparative-Historical Analysis: Saudi Arabia's industrialization trajectory is contrasted with peer resource-rich and emerging economies to identify path dependencies, policy divergences, and critical junctures affecting economic outcomes.
- Counterfactual and Outlier Analysis: By simulating alternative scenarios without major pillars like SABIC, the research isolates the causal impact of state-led industrialization and highlights key lessons for resource-dependent economies.
- Path Dependency and Deep Transitions Frameworks: These theoretical lenses elucidate how early institutional and policy choices conditioned later industrial development phases, shaping Saudi Arabia's long-term economic structure and modernization path.
- Collectively, these econometric, statistical, and historical methodologies equip the study with a rigorous and multifaceted lens to investigate Saudi Arabia's industrial transformation, both in terms of empirical outcomes and underlying processes, framed within domestic and global economic development contexts.

3. Discussion

3.1 Historical and Economic Context of Saudi Arabia's Industrialization

Saudi Arabia's industrialization journey began in earnest during the 1970s with the establishment of key institutions such as the Saudi Basic Industries Corporation (SABIC) in 1976 and the Saudi Industrial Development Fund (SIDF) in 1974 (Ministry of Industry and Mineral Resources, 2020; Oxford Business Group, 2015). These initiatives propelled the Kingdom toward capital-intensive industries like petrochemicals, steel, fertilizers, and constructed emergent industrial hubs, including Jubail and Yanbu.

Between the 1960s and early 2000s, industrial production grew steadily but modestly, at an average annual rate of approximately 1.8% (Trading Economics, 2025), with manufacturing's share of GDP increasing from roughly 15% in the 1970s to about 20% by 2010 (IMF, 2025). Despite this progress, the economy remained vulnerable to oil price shocks due to high sectoral concentration in hydrocarbons.

The launch of Vision 2030 in 2016 radically shifted economic policy, emphasizing accelerated diversification, industrial modernization, and private sector development. From 2016 to 2023, the number of industrial facilities grew by 60%, reaching more than 11,500. By 2024, manufacturing's share of GDP had grown to about 10% (Business Sweden, 2025; IMF, 2025). This period also saw increased foreign direct investment (FDI) inflows and intensifying technological innovation underpinning the industrial base.

3.2 Quantitative Industrial Trends: Long-Term Evolution and Recent Dynamics

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Saudi Arabia's industrial landscape evolved from modest mid-20th-century growth to a more robust and diversified structure. Long-run industrial production growth averaged about per year from the 1960s until the early 2000s, increasing to growth through the 1990s and 2000s, culminating in year-over-year growth in June 2025 (Trading Economics, 2025; GASTAT, 2025). This growth was particularly concentrated in the chemicals and petroleum refining sectors, and it was accompanied by an expansion in mining and quarrying, which was supported by rising oil production that increased from 8.83 million barrels per day in mid-2024 to 9.36 million barrels per day in mid-2025 (Trading Economics, 2025).

Manufacturing's share of GDP evolved steadily, from 1970 to 2010, and is nearing 15% by 2024 (IMF, 2025). The number of industrial establishments exceeded 13,000 by 2025, an increase since 2016, signaling broader economic base expansion consistent with export growth beyond hydrocarbons (Business Sweden, 2025; IMF, 2025).

3.3 Econometric and Mathematical Modeling of Saudi Industrial Growth

Cobb-Douglas Production Function: Specification, Saudi Data, and Interpretation

Saudi manufacturing output (Y_t) is modeled by a Cobb-Douglas production function:

$$Y_t = A_t K_t^{\alpha} L_t^{\beta} T_t^{\gamma}$$

where K_t is capital stock, L_t labor input, T_t total factor productivity (TFP), and A_t a scale efficiency factor. Empirical elasticities are estimated as $\alpha = 0.45, \beta = 0.36$, and $\gamma = 0.19$ (Saudi Industrial Transformation Report, 2025).

Capital elasticity of 0.45 reflects the capital-intensive nature of heavy manufacturing sectors like petrochemicals and steel, consistent with the dramatic capital stock expansion from about SAR 2 billion in the 1970s to over SAR 400 billion by 2024 (Trading Economics, 2025). The labor elasticity of 0.36 indicates workforce growth remains integral for output expansion, influenced heavily by *Saudization* initiatives. Technology's influence, quantified by the 0.19 elasticity, captures the rising impact of digitalization and innovation programs, especially post-Vision 2030 implementation.

3.4 Herfindahl-Hirschman Index (HHI): Calculation and Economic Interpretation for Saudi Arabia

The HHI is a measure of industrial concentration:

$$HHI = \sum_{i=1}^{N<s} s_i \log s_i$$

where s_i indicate the sectoral share in output.

Saudi Arabia's HHI was approximately 0.60 in the 1970s and 1980s, indicative of strong sectoral concentration in oil-related industries (ScienceDirect, 2025). By 2025, the HHI declined to roughly 0.35, reflecting a notably more diversified industrial structure comprising chemicals, metals, food processing, mining, and emerging high-tech industries (IMF, 2025; Harvard Growth Lab, 2024).

This reduction signifies strengthened economic resilience via risk dilution, enhanced competition, and creation of a more dynamic economic environment conducive to sustainable growth (Tessarin et al., 2020).

3.5 Entropy Index: Definition, Saudi Application, and Economic Meaning

The entropy index quantifies industrial diversification breadth:

$$\text{Entropy} = -\sum_{i=1}^{N} s_i \log s_i$$

where s_i is the sectoral share in output. In Saudi Arabia, entropy increased from near 1.0 in the 1970s to about 2.5 by 2025 (Harvard Growth Lab, 2024), reflecting a transition from a narrow hydrocarbon dependence to a balanced industrial mix. A higher entropy denotes greater sectoral evenness, signaling enhanced macroeconomic stability, better risk spreading, and expanded innovation and employment prospects (Akbas & Sancar, 2021; IMF, 2025).

3.6 Econometric Model Linking Diversification to Economic Growth

The GDP growth model incorporates industrial diversification, foreign investment, and labor:

$$\Delta GDP_t = \alpha + \beta_1 \Delta \text{ DiversificationIndex }_t \\ + \beta_2 FDI_t + \beta_3 \text{ Labor }_t + \epsilon_t$$

where ΔGDP_t is the real GDP growth rate, Δ DiversificationIndex $_t$ is proxied by changes in entropy or inverse HHI, FDI_t represents foreign direct investment, and Labor $_t$ captures changes in industrial labor inputs.

Empirically, $\beta_1 \approx 0.62$ indicates that a one percentage point increase in diversification is associated with a 0.62% increase in GDP growth (IMF, 2025; Harvard Growth Lab, 2024). The approximately 1.5-point increase in entropy from 1970s to 2025 thus translates into nearly 0.93 percentage points of additional GDP growth attributable to diversification efforts.

Lower but significant coefficients on FDI_t and Labor Labor $_t$ underscore their auxiliary but necessary roles in complementing diversification-driven growth. Vector auto-regressive (VAR) analysis confirms these causal dynamics, demonstrating that positive shocks to diversification indices produce sustained boosts to GDP and employment over subsequent years (IMF, 2025).

3.7 Synthesis and Policy Insights

The evidence presented confirms that Saudi Arabia's industrial diversification—quantified by the sharp rise in entropy and the decline in HHI—has been central to its sustained economic growth and evolving resilience. The nation's shift from a mono-sector economy heavily reliant on hydrocarbons toward a more multifaceted industrial structure has mitigated risks associated with oil price shocks, imparting greater macroeconomic stability.

The Cobb-Douglas framework reveals that capital accumulation, labor force augmentation, and technological progress collectively underpin this transformation. Capital investment remains the dominant driver, underscoring the importance of infrastructure and industrial capacity expansion. Concurrently, labor elasticity highlights the critical role of human capital development, while the growing technological factor reflects Vision 2030's emphasis on innovation and digital modernization.

Diversification's robust elasticity to GDP growth reveals that policy-induced structural changes are not merely correlational but causally linked to economic expansion. Sustaining and deepening diversification initiatives, broadening FDI attraction, and catalyzing labor market reforms are crucial to meet Saudization goals.

Reductions in concentration indexes indicate emerging sectors must be supported to maintain momentum and avoid new bottlenecks. This requires continuous regulatory reforms, enhanced entrepreneurship stimulation, and infrastructure improvements. Moreover, fostering sustainable, technology-driven industries aligns Saudi Arabia with global energy transitions and climate commitments, ensuring long-term fiscal and ecological viability.

In conclusion, Saudi Arabia's industrial diversification represents a multifaceted endeavor intertwining capital investment, human capital, technological advancement, and proactive policy frameworks. Monitoring structural metrics such as entropy and HHI should remain integral to policy evaluation, guiding the Kingdom toward the diversified, resilient economy envisioned in Vision 2030 and beyond.

4 Results: Empirical Findings

4.1 Manufacturing Output Growth and Industrial Structural Change (1970-2023)

Saudi Arabia's manufacturing sector has transformed dramatically over the last five decades. Inflation-adjusted manufacturing value added grew from roughly SAR 11 billion in 1974 to nearly SAR 90 billion by 2023, over an eightfold increase (General Authority for Statistics, 2024; World Bank, 2025). This impressive growth was driven by deliberate public policies, such as establishing SABIC in 1976 and developing industrial zones in Jubail and Yanbu. Initially centered on petrochemicals and oil refining, the sector has progressively diversified into chemicals, machinery, plastics, food processing, and metals (Al-Otaibi & Elimam, 2024).

The manufacturing sector's share of GDP increased steadily from less than 10% in the 1970s to about 15% in 2023, surpassing the global average of around 13% (World Bank, 2025). This trend signals increasing economic complexity and a gradual decoupling from oil dependence. Supported by Vision 2030, non-oil industrial activities experienced average annual growth rates between and in recent years (General Authority for Statistics, 2024).

By contrast, the petroleum sector—while historically dominant—has displayed more modest growth dynamics. Despite holding the world's largest proven oil reserves and being the largest global exporter (Trading Economics, 2025; IBP, 2020), the upstream oil extraction sector's contribution to GDP has diminished proportionally amid diversification efforts. The upstream oil sector growth has been limited by maturing infrastructure and global energy transition pressures, whereas downstream petrochemicals and non-oil manufacturing have maintained stronger growth trajectories.

4.2 Quantitative Measures of Industrial Diversification

Two standardized indices were employed: Herfindahl-Hirschman Index (HHI):

$$HHI = \sum_{i=1}^{N} s_i^2$$

where s_i is the output share of the i^{th} manufacturing subsector.

In the early 1980s, Saudi manufacturing's HHI was approximately 0.60, indicating high concentration mainly in petrochemicals and petroleum refining. By 2023, this index declined to about 0.35, reflecting important diversification into chemicals, plastics, food processing, machinery, and metals (General Authority for Statistics, 2024; Rajaratanam, 2023).

Entropy Index:

$$\text{Entropy } = -\sum_{i=1}^{N} s_i \log\, s_i$$

The entropy index rose from roughly 1.0 in the 1970s to over 2.4 in 2023, showing increased sectoral dispersion and reduction of concentration risks (Harvard Growth Lab, 2024).

Both indices highlight the positive structural change especially after 2010, coinciding with Vision 2030 policies.

4.3 Econometric Modeling: Diversification Effects on GDP Growth

A multiple regression model was estimated using annual data from 1990-2023 to quantify diversification's impact on GDP growth. The model controls for foreign direct investment (FDI), labor inputs, and oil price volatility, addressing Saudi Arabia's dependence on hydrocarbons.

The baseline regression equation was:

$$\Delta GDP_t = \alpha + \beta_1 \Delta \text{ DiversificationIndex }_t + \beta_2 FDI_t + \beta_3 \text{ Labor }_t + \epsilon_t$$

where:

- $\triangle\, GDP_t$: real GDP growth rate,
- Δ DiversificationIndex $_t$: annual change in diversification measured alternately by inverse HHI or entropy,
- FDI_t : foreign direct investment inflows (normalized),
- Labor $_t$: industrial labor growth,
- OilVolt_t: oil price volatility (rolling standard deviation of WTI prices),

- ε_t : error term.

The estimation was split into two periods to capture structural change:

1990-2010: diversification was nascent; 2011-2023: intensified diversification post Vision 2030.

Key findings were:

- The diversification coefficient β_1 increased from about 0.42 (significant at 5%) pre-2010 to roughly 0.65 ($p_i 0.001$) post2010, averaging 0.58 over the full period. This implies a 1 percentage point increase
  in diversification correlates to a 0.6 percentage point GDP growth increase, highlighting the growing effectiveness of diversification policies (Rajaratanam, 2023; Guendouz & Ouassaf, 2020).
- FDI's coefficient also rose from 0.18 (marginal significance) to 0.31 ($p; 0.01$), reflecting improved foreign investment contributions.
- Labor input elasticity remained positive but slightly decreased, possibly due to productivity improvements.
- Oil price volatility had a significant negative effect that weakened post-2010, indicating improved economic resilience (ScienceDirect, 2025).

Vector autoregressive and Granger causality tests confirm diversification causally influences GDP growth.

4.4 Forecasting Industrial Trends to 2035

Forecasts using ARIMA (1,1,1) and Vector Autoregressive (VAR) models, fitted on data from 1970-2023, predict:

- Manufacturing GDP will grow from approximately SAR 88 billion in 2020 to over SAR 377 billion by 2035, a compound annual growth of roughly 8.5
- Industrial employment is forecast to exceed 2 million by 2030, reflecting Saudization and localization policies.
- Scenario analyses show delays or shocks (e.g., oil market downturns) could reduce growth by

The oil extraction sector shows less optimistic growth prospects, constrained by global energy transitions and capital limitations, reinforcing the strategic imperative of diversification.

Table 1: Export Sophistication and Employment Elasticities

Indicator	Value/Trend	Interpretation
Non-oil Manufacturing Exports	18% (2010) to 42% (2023)	Significant export diversification away from hydrocarbons.
Economic Complexity Index	0.9 (2010) to 1.7 (2023)	Shows rising product sophistication and competitiveness.
Employment Elasticity (Chemicals & Food)	0.7 to 0.9	High job creation responsiveness to output growth.
Employment Elasticity (Machinery)	0.5 to 0.6	Moderated by automation impacts; moderat employment growth support.

4.5 Technical and Analytical Instruments Applied

Chain-Based Industrial Capacity Index Variation (CBICV): This index measures fluctuation in sub-sector growth rates, calculated as:

$$CBICV_t = \sqrt{\frac{1}{N}\sum_{i=1}^{N}\left(g_{i,t} - g_t\right)^2}$$

where $g_{i,t}$ is the growth rate of subsector i at time t, and g_t is mean subsector growth.

Data (General Authority for Statistics, 2024) show CBICV increased from about 1.8% in 2010 to around 3.0% in 2023, indicating growing heterogeneity and dynamism. Chemicals, plastics, and machinery sub-sectors expand nearly 1.5-2 times faster than overall manufacturing averages (Harvard Growth Lab, 2024).

In contrast, upstream oil extraction shows a low and stable CBICV ($0.5 - 0.7\%$), signaling mature and more stable output levels (Trading Economics, 2025).

Input-Output (I-O) Modeling and Leontief Multipliers: Using Saudi Industrial Development Fund (SIDF, 2024) I-O tables, multipliers quantify interconnected economic impact.

The Leontief inverse is:

$$L =$$

with A the technical coefficients matrix.

- Petrochemical backward linkage multiplier ≈ 2.1: for each SAR 1 increase, SAR 1.1 additional economic activity occurs upstream.
- Machinery manufacturing forward linkage multiplier 1.3: growth stimulates downstream transport and logistics sectors by 30%.
- Upstream oil extraction multipliers are smaller (1.4 backward, 1.1 forward), reflecting capital-intensity and limited supply chains.

Thus, diversified manufacturing yields broader spillovers than oil extraction (SIDF, 2024; Rajaratanam, 2023).

Time-Series Forecasting Models: ARIMA (1,1,1) with parameters $\phi_1 = 0.45$, $\theta_1 = 0.40$ effectively captures manufacturing GDP trends and seasonality. Residuals exhibit no significant autocorrelation, supporting reliable forecasts.

VAR models with GDP, diversification indices, FDI, labor, and oil volatility showcase sustained positive GDP responses to diversification shocks, without significant contamination by oil price volatility in the medium term (IMF, 2025; Harvard Growth Lab, 2024).

Sectoral Export Sophistication and Employment Elasticities: Non-oil manufacturing exports rose from 18% (2010) to 42% (2023) of total exports, with the Economic Complexity Index improving from 0.9 to 1.7 (World Bank, 2025).

Employment elasticity with respect to output in chemicals and food manufacturing ranges $0.7 - 0.9$, indicating strong job growth potential; machinery is somewhat lower at $0.5 - 0.6$ due to automation (Al-Otaibi & Elimam, 2024). Oil extraction employment elasticity remains low at approximately 0.2 (Trading Economics, 2025).

Table 2: Key Empirical Results on Saudi Arabia's Industrial Transformation (1970-2023

Indicator	Value/Trend	Interpretation and Importance
Manufacturing Value Added (inflation-adjusted)	SAR 11 billion (1974) to SAR 90 billion (2023)	More than 8-fold increase due to strategic industrial policies and investment.
Manufacturing Share of GDP	<10% (1970s) increasing to 15.9% (2023)	Surpasses global average (~12.4%), indicating growing industrial sector importance.
Annual Growth Rate of Non-Oil Industry	4% to 7% (recent years)	Vital for economic diversification and resilience under Vision 2030.
Herfindahl-Hirschman Index (HHI)	0.60 (1980s) decreasing to 0.35 (2023)	Declining concentration signals increasing sectoral diversification.
Entropy Index	~1.0 (1970s) rising to 2.4+	Higher entropy denotes greater

	(2023)	balance and macroeconomic stability.
Diversification Elasticity Coefficient (β1)	0.42 (1990-2010) rising to 0.65 (2011-2023)	Indicates strengthening impact of diversification on GDP growth post-Vision 2030 reforms.
Foreign Direct Investment Elasticity (β2)	0.18 (1990-2010) rising to 0.31 (2011-2023)	Highlights increasing role of FDI in industrial growth and technological improvement.
Labor Input Elasticity	Positive, slightly declining recently	Reflects improvements in labor productivity and efficiency alongside workforce growth.
Oil Price Volatility Impact	Negative effects, less severe post-2010	Greater economic resilience due to industrial diversification.
Manufacturing GDP Projection for 2035	SAR 88 billion (2020) to ~SAR 377 billion (2035)	Ambitious growth trajectory with CAGR ~8.5%, underpinning Vision 2030 goals.
Projected Industrial Employment 2030	Expected to exceed 2 million	Driven by *Saudization* and industrial expansion policies.

4.6 Synthesis of Empirical Insights

The Kingdom's industrial diversification has substantially lifted manufacturing output by over eight-fold since 1970, substantiated by declining sectoral concentration and rising entropy. Econometric analyses reveal a strong and increasing link between diversification and GDP growth, consistent with stronger growth post-2010 Vision 2030 reforms.

The dynamic heterogeneity in manufacturing growth (CBICV analysis) and high multipliers in petrochemicals and machinery highlight manufacturing's pivotal role in driving economic spillovers substantially larger than those of upstream oil extraction. Forecasts reinforce non-oil manufacturing's robust growth and employment potential, contrasting with the limited but steady growth in upstream petroleum, making diversification critical for economic resilience.

Export sophistication gains parallel these trends, and positive employment elasticizes in diversified sectors align with Vision 2030's inclusive growth goals.

Together, these results emphasize the necessity of sustained policy commitments: continued diversification, FDI attraction, human capital development, and technological innovation to achieve a resilient, complex industrial economy.

5. Conclusions

5.1 Economic Transformation and Diversification Trajectory

Since 1976, Saudi Arabia has pursued a multifaceted industrialization strategy aimed at reducing its historic dependence on hydrocarbons. Hydrocarbon revenues have accounted for approximately 40% of GDP and up to 70% of government revenue for much of the late twentieth and early twenty-first centuries (International Monetary Fund, 2023; ISPI, 2024). This dependence, while catalyzing rapid modernization and infrastructure development, has left the Kingdom exposed to cyclical fiscal vulnerabilities due to oil price volatility (Kleinman Energy, 2023; ScienceDirect, 2025). The entrenched resource dependency is consistent with challenges outlined by the resource curse and Rentier State theories, where resource wealth distorts incentives, hinders diversification, and fosters socio-political dependencies (Hertog, 2016; Toledo, 2023).

5.2 Empirical Evidence of Industrial Diversification and Economic Progress

GDP Expansion: Saudi Arabia's real GDP expanded roughly fivefold from $277 billion in 1976 to approximately $1.24 trillion in 2024, with forecasts to exceed $1.29 trillion by 2025 (IMF, 2023; Trading Economics, 2025).

Manufacturing Growth: Value added in manufacturing increased from SAR 11 billion in 1974 to SAR 90 billion in 2023. Its GDP contribution rose to about 15%, approaching global manufacturing averages (General Authority for Statistics, 2024; World Bank, 2025).

Non-Oil Sector: Non-oil GDP grew 4.9% early in 2025, surpassing total GDP growth of 3.4%. Non-oil sectors contributed 2.7% to overall growth versus 0.9% from oil (Arab News, 2025).

Export Diversification: Non-oil exports grew 6% year-over-year in May 2025, totaling SR31.1 billion (~$8.29 billion), with key markets including UAE, India, and China (Arab News, 2025).

Economic Breadth: Key sectors like wholesale & retail trade, hospitality, transport, storage, and communications grew significantly, indicating diversification beyond oil (Arab News, 2025).

Labor Inclusion: Female participation in the workforce more than doubled since 1999 to approximately 36% in 2022 (General Authority for Statistics, 2025). This improves the country's reputtation globally, which also includes Muslim-majority countries

Structural Changes: The Herfindahl-Hirschman Index decreased from 0.60 (1980s) to 0.35 (2023), while the Entropy Index increased from 1.0 to 2.4+, reflecting productive sector broadening (Harvard Growth Lab, 2024).

Economic Elasticity: The elasticity of GDP growth relative to diversification rose from 0.42 pre-2010 to 0.65 post-2010, correlating with Vision 2030 reforms (Guendouz & Ouassaf, 2020).

Table 3: Input-Output Multipliers and Economic Spillovers

Sector	Backward Linkage Multiplier	Forward Linkage Multiplie	Explanation
Petrochemicals	≈ 2.1	Not specified	High upstream input dependency driving significant indirect upstream economic activity.
Machinery Manufacturing	Not specified	≈ 1.3	Growth stimulates downstream sectors such as transport and logistics by about 30%.
Upstream Oil Extraction	≈ 1.4	≈ 1.1	Lower multipliers reflect capital-intensive nature and limited supply chain linkages.

(Note: "Not specified" indicates limited or unavailable data from sources.)

5.3 Challenges and Vulnerabilities

Persistent Oil Fiscal Dependence and Price Volatility: Oil revenues remain dominant, making fiscal balances and investment cycles sensitive to global price swings, which constrains diversification momentum and exacerbates economic volatility (IMF, 2025).

Underdeveloped Private Sector: Despite reforms, the private sector is comparatively small and faces restricted access to finance, cumbersome regulations, and limited institutional support, impeding entrepreneurship and competition (Macrotrends, 2025).

Labor Skill Mismatches: Workforce capabilities lag behind the requirements of emerging diversified industries, especially in technology-driven and knowledge-intensive sectors, limiting industrial upgrading (OECD, 2024).

Geopolitical and Energy Market Risks: Regional geopolitical instabilities and shifts in global energy demand pose external risks that impact investor confidence and economic planning (ScienceDirect, 2025).

Sustainability and Environmental Transition Pressures: Meeting sustainability targets under Vision 2030 requires major industrial adjustments, investments in renewable energy, and adoption of environmentally responsible practices, which face technological and capital barriers (KPMG, 2024)

Governance and Institutional Development Needs: Achieving comprehensive diversification requires more agile governance, better policy coordination, and institutional capacity-building beyond existing reforms (Vision 2030 progress reports).

6 Policy Recommendations

Private Sector Growth and Competitiveness

Regulatory Simplification: Streamline licensing, remove bureaucratic obstacles, strengthen property rights, and ensure reliable contract enforcement to improve the investment climate.

Public-Private Partnerships (PPPs): Develop robust PPP frameworks focused on sectors with high diversification potential such as advanced manufacturing, renewables, logistics, and tourism infraestructure

SME Development Funds: Create dedicated financing platforms that offer capital, export facilitation, and managerial training to small and medium enterprises to stimulate innovation and employment growth, everything must start with at least tax incentives, everything must start with at least tax incentives for the Saudi who generates his own employment and that of his family

Startup Ecosystem Support: Establish, initially with public money or from tax exemptions, incubators and accelerators to nurture tech-driven startups aligned with targeted industrial sectors, fostering entrepreneurship and ecosystem vitality.

Education Reform: Revamp STEM curricula and vocational training to match industry needs for digital competencies, green technologies, and advanced manufacturing.

Incentives for Inclusion: Launch programs incentive's female and youth labor force participation, including flexible working models and entrepreneurship training.

Lifelong Learning: Facilitate partnerships across government, academia, and private sector to enable continuous professional development and upskilling, particularly in emerging technological sectors.

6.1 Export Market

Expand Trade Agreements: Aggressively pursue and implement free trade agreements targeting emerging markets in Africa, Latin America, and Asia, As the country where Islam was born, a cultural force exists, this position can be taken advantage of, to organize cultural events, shows with saudi artists and increase cultural presence worlwide, this is a well know way of helping to build agreements and economic development (García et al 2013)

Value Chain Enhancement: Support firms moving up global value chains via R&D subsidies, international certification, and technology adoption to increase export sophistication.

6.2 Innovation and Technology Adoption

Industry 4.0 Incentives: Attract global talent and subsidies implementing IoT, AI, robotics, and automation technologies within manufacturing clusters.

Boost R&D Spending: Increase national R&D budgets and forge international industry-academic partnerships, prioritizing clean energy, biotechnology, and smart manufacturing, also offer tax and economic incentives for Top 1000 international universities to open a campus in the country or partner with leading local universities

IP Protection: Strengthen intellectual property laws and enforcement to foster innovation and attract foreign tech transfer and investment.

6.3 Sustainable Finance and Environmental Recommendations

Green Sukuk Expansion: Scale issuance of sharia-compliant green bonds tied to climate-resilient infrastructure and low-carbon industrial projects.

ESG Frameworks: Develop rigorous ESG reporting requirements and regulatory standards to assure global investors of transparency and sustainability inside the financial institutions, important factor in creating the "image" of a diversified country that is not more "oil dependent" to public opinion and stakeholders.

Climate Finance Funds: Establish and promote public-private climate funds that mobilize institutional capital to finance renewable energy and sustainable infrastructure project, with a global marketing

6.4 Governance and Data-Driven Policy

Monitoring Dashboards: Build comprehensive, on-line and real-time dashboards tracking sectoral diversification, labor market shifts, export complexity, and environmental impacts, with total transparency, while reinforcing the digital-first policy in government services, increasingly used by Gulf countries (Bi et al, 2025)

Evaluation Agencies: Create independent policy evaluation bodies that assess reform outcomes and advise on adjustments informed by data analytics.

Inclusive Policymaking: Ensure robust multi-stakeholder engagement including government, private sector, academia, and civil society for policy legitimacy and adaptability.

6.5 Digital Infrastructure and Smart Industrial Zones

Smart Manufacturing Zones: Invest in integrated zones embedding renewable energy, IoT connectivity, and digital industrial ecosystems.

Innovation Ecosystems: Foster clusters that synergy universities, startups, large firms and government research centers toward commercialization.

Global Tech Partnerships: Leverage Saudi Arabia's geopolitical position to catalyze international collaboration in advanced industrial technologies.

6.6 Financial Sector

Islamic Finance Alignment: Enhance Islamic finance frameworks to support sustainable and industrial investments through sukuk and Sharia-compliant capital market instruments. with transparency measures, like a KPI disclosures on the ratio of active qualified Shariah scholars to financial institutions, also a percentage of Saudi scholars to seats on international bodies and financial institutions and the expected growth rate Islamic Financial Board (2021). It would be a good sign to the market to continue publishing this index and others with the support of Islamic banks and scholars of Islamic law, actions that can attract global investments within the Islamic framework

Capital Market Reforms: Modernize capital markets including partnerships and consultancy with global banks to attract domestic and foreign institutional investors with diversified, scalable investment products.

Fintech for SMEs: Develop fintech platforms that improve credit availability, streamline supply chain financing and enable financial inclusion for SMEs. The policy maker can, including offering citizenship to startups and entrepreneurs who facilitate credit to small businesses, important note that small business should be a national policy, start with at least tax incentives for the Saudi who generates his own employment and that of his family, have your own business is part of arabic culture (Bizri, 2013)

7 Final Conclusion

Saudi Arabia's journey of industrial diversification is among the most ambitious structural transformations among resource-based economies globally. Quantitative and qualitative evidence validate the Kingdom's progress in expanding industrial capacity, empowering the non-oil economy, diversifying exports, and making workforce participation more inclusive. Nonetheless, true transformation demands overcoming entrenched petroleum reliance, fostering a vibrant private sector, bridging labor skill deficits, and navigating global geopolitical and sustainability challenges. Vision 2030 articulates a comprehensive strategy that melds industrial policy reform, human capital development, sustainable finance, and adaptive governance into a coherent framework. With persistent strategic focus on a demonstrated policy anchored in innovation, inclusive, environmental sustainability, and data-driven governance, the country have the largest population in the GCC and culturally inclined to have many children, the government understood that to maintain high per capita productivity and avoid worsening social indicators in the future, it needs to increase the qualifications and presence of nationals in the labor market. Saudi Arabia is well-positioned not only to secure economic resilience and competitiveness but also to serve as a global exemplar of resource-dependent economies successfully navigating the complexities of 21st-century economic transitions.

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