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The impact of economic diversification on Saudi Arabia's economic growth

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ABSTRACT

Economic diversification is important for promoting sustainable development and improving living standards worldwide. This study focuses on analyzing how economic diversification affects economic growth in Saudi Arabia. The research considers various factors such as economic growth, capital stock, fuel exports, human capital, imports, the number of companies listed per million people, non-oil Gross Domestic Product (GDP), oil GDP, stock market capitalization, the annual growth of total exports, and export diversification over the period from 2000 to 2023. Three separate models are examined, with total GDP, oil GDP, and non-oil GDP as the dependent variables in each model, respectively. The results show that fuel exports, total exports, and capital formation positively and significantly affect all three GDP categories. In contrast, export diversification is negatively and significantly related to oil GDP but positively and significantly influences non-oil GDP. Additionally, improvements in human capital positively impact all GDP categories, with a significant effect on non-oil GDP. The study suggests that promoting export diversification and investing in human capital can enhance non-oil GDP growth while reducing dependence on oil exports is crucial for economic resilience and sustainability.

1. Introduction

Recent research in evolutionary economics provides insights into the phenomenon of creative destruction by examining dynamic economic change. Through this lens, economic diversification emerges as a crucial determinant of economic transformation (Lipieta and Lipieta, 2023). Within the framework of evolutionary economics, the concept of creative destruction refers to the continual process of innovation and competition that leads to the obsolescence of existing products, technologies, and industries, while simultaneously giving rise to new ones. Economic diversification plays a significant role in this process by fostering the development of new industries and sectors, thereby contributing to overall economic dynamism and resilience (Bogdański, 2021). By investing in a variety of sectors, economies can adapt more effectively to changing market conditions and technological advancements. Diversification enables countries to harness the benefits of innovation and entrepreneurship, driving productivity growth and enhancing competitiveness on a global scale (Mohamed et al., 2022). Furthermore, economic diversification reduces dependence on any single industry or sector, mitigating the risks associated with sector-specific shocks and contributing to more stable and sustainable economic growth (Witt, 2022).

Saudi Arabia's economy is currently undergoing a significant transformation driven by comprehensive reforms outlined in the Vision 2030 initiative, launched by the Saudi government in 2016. These reforms aim to decrease the country's dependency on oil, diversify its sources of income, and enhance its global competitiveness. A key aspect of these reforms is the active promotion of diversification across various sectors of the economy. Significant investments are being made in non-oil industries such as manufacturing, petrochemicals, tourism, entertainment, renewable energy, and technology. These efforts are aimed at creating new revenue streams and employment opportunities, thereby reducing reliance on oil revenues. Notable progress has been observed, particularly in the non-oil sector, which has experienced significant growth acceleration since 2021, averaging 5 percent in 2023. Despite challenges such as additional oil production cuts affecting overall growth, the non-oil

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sector is anticipated to maintain a growth rate close to 5.5 percent in 2024, driven by robust domestic demand.

Furthermore, Saudi Arabia is implementing reforms to improve its business environment and enhance competitiveness. This includes regulatory reforms aimed at streamlining bureaucratic processes, enhancing transparency, strengthening the rule of law, and facilitating foreign investment. Additionally, significant investments are being made in infrastructure, education, and innovation to build a knowledge-based economy capable of sustaining long-term growth and prosperity.

Historically, the Kingdom of Saudi Arabia's development trajectory has been closely tied to the magnitude of its oil revenues. Additionally, the state's financial policies have been intricately linked to these oil revenues, rendering the Saudi economy highly susceptible to fluctuations in the global oil market. This sensitivity was particularly pronounced during the period when oil prices experienced a drastic decline of approximately 50% in 2014. This downturn significantly impacted the Kingdom's economy, prompting a realization of the need for economic diversification strategies. Recognizing, the vulnerabilities stemming from the lack of sustainability and stability in oil revenues, Saudi Arabia embarked on efforts to diversify its economic structure. The aim was to broaden the sources of income and diminish reliance on oil as the primary revenue stream. This strategic shift necessitates a transition from the current growth model to one grounded in balanced development principles.

Henceforth, this study aims to examine the intricate relationship between economic diversification and economic growth in the context of Saudi Arabia, spanning the years from 2000 to 2023. With a comprehensive approach, it aims to consider a multitude of variables that are pivotal in shaping the economic landscape of the country. These variables encompass economic growth, which serves as a fundamental indicator of overall economic performance, alongside the annual growth of capital stock, reflecting investments in productive assets that drive economic expansion. Additionally, the study delves into the dynamics of fuel exports, recognizing their significant role in the Saudi economy, and explores the annual changes in human capital, highlighting the importance of workforce development in fostering sustainable growth. Furthermore, it examines the annual changes in imports, reflecting the country's trade dynamics and external economic interactions. The number of companies listed per millions of population is another crucial aspect under scrutiny, shedding light on the vibrancy of the business environment and the extent of private sector participation in driving economic activity. Moreover, the study assesses the annual growth of non-oil Gross Domestic Product (GDP), which signifies the diversification efforts aimed at reducing dependence on oil revenues. Oil GDP growth is a key metric considered, given the prominent role of the oil sector in the Saudi economy, while the annual growth of the stock market provides insights into the performance of the financial sector. Furthermore, the study analyzes the annual growth of total exports, encompassing both oil and non-oil exports and evaluates the level of export diversification to gauge the resilience of the export sector to external shocks. Therefore, examining these specific variables over the specified timeframe, the study endeavors to offer valuable insights into the dynamics of economic diversification and its impact on overall economic performance in Saudi Arabia. Through empirical analysis and rigorous evaluation, it seeks to inform policymakers, businesses, investors, and other stakeholders, thereby contributing to the formulation of effective strategies to foster sustainable economic growth and development in the kingdom.

The subsequent sections of the paper are organized as follows: Section 2 thoroughly examines the pertinent literature, offering a comprehensive review of relevant studies and scholarly contributions. Subsequently, Section 3 delineates the data sources and methodology employed in the research. Section 4 undertakes a detailed analysis of the findings obtained from the estimation process. Lastly, Section 5 provides a comprehensive synthesis of the paper's key findings and delivers conclusive remarks derived from the research.

2. Literature review

Economic diversification is often linked with stability and sustainability in economic growth. When an economy heavily relies on a single income resource, it becomes vulnerable to fluctuations and risks associated with that particular resource. This over-reliance can hinder the economy's ability to maintain a consistent level of growth in the long run. Researchers such as Alhowaish and Al-Shihri (2014), Auty (2001), and Mobarak and Karshenasan (2012) have highlighted the importance of diversification to mitigate such risks and ensure sustained economic development. By diversifying income sources, economies can better withstand shocks and uncertainties, fostering stability and resilience over time. In addition, economic diversification facilitates the long-term expansion of economies and provides resistance against external shocks, including price fluctuations, technological shifts, and changes in global preferences. Consequently, prior research has affirmed the indispensability of economic diversification for ensuring sustainable, long-term growth (Pasinetti 1983; Saviotti 1996). When economic opportunities are lacking, individuals may settle for suboptimal wages or emigrate. The emigration of highly skilled workers leads to brain drain, impeding economic advancement in their home countries. Enhancements in education, healthcare, and infrastructure, while crucial, may not suffice to stimulate growth and development. A capable workforce requires these improvements and economic opportunities to actively contribute to

progress. Thus, economic diversification serves as a proxy indicator for the productive capabilities of a nation, influencing the quantity and quality of job options accessible to economic actors within the region.

Furthermore, economic diversification plays a crucial role in job creation by fostering multiple active sectors that contribute to a country's economic activities (Kayed and Hassan, 2011; Hanif et al., 2024). For instance, in Saudi Arabia, despite the oil sector being the primary contributor to the country's GDP, accounting for 40% of economic output, it employed only 4% of the Saudi workforce in 2022. This highlights the importance of diversifying the economy to create more employment opportunities across various sectors, thereby reducing dependence on a single industry for job provision.

Achieving balanced development between urban and rural areas is acknowledged as a significant advantage of economic diversification. Numerous studies have illustrated that in less diversified economies, development and job opportunities tend to be concentrated in urban regions or in proximity to oil fields, mines, and mineral processing plants (Auty, 2001; Haber and Menaldo, 2011; Hertog, 2010). This concentration aggravates disparities between urban and rural areas, leading to unequal distribution of economic benefits and opportunities. In contrast, economic diversification facilitates the spread of development across different regions, mitigating regional inequalities and fostering more inclusive growth.

Economic diversification not only impacts economic growth but also exerts a positive influence on political stability, social development, and institutional quality (Busse and Gröning, 2008; Bjorvatn et al., 2012). Conversely, many countries heavily reliant on a single natural resource often experience what is referred to as the "resource curse." In such cases, the nation depends almost entirely on that resource and fails to adequately diversify its income sources, leading to adverse effects on economic development (Haber and Menaldo, 2011; Radetzki, 2012; Kashcheeva and Tsui, 2015). This phenomenon underscores the importance of economic diversification in promoting broader societal benefits and sustainable development.

Jensen and Johnston (2011) conducted tests on models linking political risk to the resource curse theory in various countries. Their findings revealed a strong correlation not only between political risk and a nation's dependence on natural resources but also highlighted significant risks faced by business affiliates operating within the natural resource sector, such as oil and gas, particularly in less diversified economies. This underscores the vulnerability of economies overly reliant on a single resource and emphasizes the importance of economic diversification in mitigating associated risks and fostering economic resilience. According to Jensen and Johnston (2011), the association between natural resources and political risk extends beyond instances of contract breaches or nationalization of firms within the natural resource extraction sectors. Leaders in resource-dependent economies may have diminished incentives to honor contracts across all types of industries. Consequently, investors engaged in manufacturing and service sectors are exposed to heightened political risks due to the reduced government incentives to uphold a favorable reputation. This underscores the broader implications of political risk for investment and economic activity beyond the natural resource sector in such economies.

Corruption and income inequality have been associated with a low level of economic diversification within an economy, representing a negative manifestation of the natural resource curse theory (Serra and Fávero, 2018; Lashitew et al., 2021). Busse and Gröning (2008) conducted a study on the impact of natural resources on governance indicators in both developing and developed countries spanning from 1984 to 2007. Their findings revealed that "the within-country variation is sufficient to establish a negative impact of natural resource exports on corruption", particularly evident in less diversified economies. This underscores the detrimental effects of over-reliance on natural resources on governance and highlights the importance of economic diversification in promoting transparency and reducing corruption. According to the natural resource curse theory, resource-rich countries may not only fail to benefit from their advantageous resource endowment but could actually perform worse than less resource-endowed nations. However, whether natural resources are considered a curse or a blessing depends on various factors, including the quality of institutions and financial systems, as well as good governance practices by governments (Haber and Menaldo, 2011; Radetzki, 2012; Nchofoung and Ojong, 2023). Ploeg (2011) investigated the impact of natural resources on institutional quality across countries using a cross-sectional approach spanning from 1970 to 2002. The author concluded that "resource-rich countries with robust institutions, openness to trade, and substantial investments in exploration technology appear to reap the benefits of their natural resource abundance" (Ploeg, 2011). This highlights the importance of sound institutional frameworks and effective governance in determining whether natural resources serve as a curse or a blessing for a nation's development. As argued by Alexeev and Conrad (2009), discussions concerning the adverse effects of natural resources on economic growth and institutional quality, particularly in developing nations, have often been based on studies utilizing inaccurate variables and methodologies. Indeed, several studies have failed to uncover substantial evidence supporting a strong correlation between a country's reliance on natural resources and low economic growth (Ichime et al., 2024; Alexeev and Conrad, 2009; Ross, 1999). Sovacool and Brown (2010) further suggested that the

resource curse theory might oversimplify complex realities, stating that "the theory may be too simplistic and deterministic to fully explain why some countries appear to be 'cursed' with resources while others are 'blessed'". This underscores the need for a nuanced understanding of the relationship between natural resources and economic outcomes, taking into account various contextual factors and adopting rigorous analytical approaches.

Saudi Arabia's economic landscape has been predominantly shaped by its oil wealth. However, the volatility in oil prices and the finite nature of oil reserves have spurred the need for economic diversification. Saudi Vision 2030 is a pivotal framework in this regard, aiming to reduce oil dependency and foster a sustainable, dynamic economy (Houfi, 2021; Aljebrin, 2020). The initiative focuses on nurturing non-oil sectors such as tourism, manufacturing, and renewable energy to ensure long-term economic stability and growth. In this context, the manufacturing sector plays a pivotal role in diversifying the Saudi Arabian economy. Research suggests an anticipated annual growth rate exceeding 8% in this sector, poised to make a substantial contribution to the GDP (Havrlant and Darandary, 2021). The emphasis on high-value-added production segments underscores the transition towards a more diversified and balanced industrial foundation. This strategic focus aligns with efforts to broaden the economic base and reduce reliance on traditional sectors such as oil and gas.

Furthermore, tourism is identified as a crucial driver of economic diversification. Investment in tourism is seen as a solution to reduce unemployment and diversify the economy. Challenges such as the heavy reliance on foreign labor in the service sector and the need for domestic workforce development are being addressed to maximize this sector's potential (Al Yousif, 2020).

Current research is unique in its empirical approach and the inclusion of various relevant variables. By considering factors such as export diversification, human capital, trade index, and corporate activities like the number of companies listed on the Saudi stock exchange and stock market capitalization, this study provides a more comprehensive understanding of the relationship between economic diversification and growth. This approach allows for a more nuanced analysis, capturing the diverse factors that influence economic performance. For instance, export diversification can reduce dependency on a single export commodity or market, while investments in human capital can enhance productivity and innovation. Similarly, a vibrant stock market with a diverse array of listed companies can indicate a robust business environment and access to capital for growth. By empirically establishing these relationships, this research offers valuable insights for policymakers and stakeholders in Saudi Arabia and beyond, aiding in the formulation of strategies to promote sustainable and resilient economic development through diversification efforts.

3. Data and model specification

To investigate the impact of economic diversification on the economic growth of Saudi Arabia. This research specifies the model as follows:

$$Y_t = \beta_0 + \beta_1(K) + \beta_2(FEX) + \beta_3(HCAP) + \beta_4(IMP) + \beta_5(CORP) + \beta_6(NOILGDP) + \beta_7(OILGDP) + \beta_8(SMKT) + \beta_9(EXP) + \beta_{10}(ED) + \varepsilon_t \quad (i)$$

where, Y_t represents the economic growth measured as the annual changes in the growth rate of gross domestic product, K is the annual growth of capital stock which is measured as the total amount of physical and financial capital goods used in an economy at a specific point in time, FEX represents the fuel exports measured as a percentage of total merchandise exports, HCAP reflects the annual change in human capital, *IMP* corresponds to the annual change in imports, CORP is the number of companies listed per million of population, NOILGDP shows the annual growth of non-oil GDP, OILGDP indicates the oil GDP growth, SMKT reveals the annual growth of the stock market, EXP represents the annual growth of total exports, TRADE shows the trade balance growth and finally ED indicates the diversification of the export. Overall, this regression model provides a comprehensive framework for understanding the impact of non-oil diversification on Saudi Arabia's economic growth, incorporating both traditional economic indicators and specific variables. The research covers the time from 2000 to 2023, and all data is extracted from the World Bank's database.

4. Results and analysis

This research begins its empirical analysis by providing an overview of the selected variables through descriptive statistics, such as means, standard deviations, and pairwise correlations (Tables 1 and 2). The estimates in Table 2 show that the mean GDP growth rate is 3.584%, with a standard deviation of 3.997%. The GDP growth rates range from a minimum of -4.341% to a maximum of 11.242%, thereby indicating high variability in the GDP growth rate. Whereas the mean growth rate of non-oil GDP(NOILGDP) is 5.168%, with a standard deviation of 3.218%. The growth rates range from a minimum of -2.999% to a maximum of 9.873%. Similarly, the mean growth rate of fuel exports is 85.511%, with a standard deviation of 6.078 %. The minimum value observed is 67.623 %, and the maximum is 92.265 %. In addition, the average value of the export diversification index (ED) is around 0.764 and the highest value of the export diversification index observed is 0.8 and the lowest value of the export diversification index is 0.732. The standard deviation is approximately 0.017, which indicates the low variability in the export diversification index. Moreover, the average human capital growth (HCAP) is around 2.48% with a standard deviation of 0.15 indicating low variability

in human capital growth. The pairwise correlation analysis in Table 2 reveals several interesting insights regarding the relationship between GDP (Gross Domestic Product) and other selected variables. Notably, GDP demonstrates significant positive correlations with variables such as fuel exports (0.417), exports (0.860), oil GDP (0.931), human capital (0.498), trade (0.473), and stock market (0.739). These strong correlations suggest that an increase in these factors positively influences economic growth. Conversely, export diversification (0.222) exhibits positive but weaker correlations with GDP.

Table 1: Descriptive statistics

Variable	Observation	Mean	Standard deviation	Min	Max
Non-oil GDP growth	24	5.168	3.218	-2.999	9.873
Fuel exports	24	85.511	6.078	67.623	92.265
EXP	24	2.083	7.89	-10.721	20.918
CORP	24	4.831	.93	3.117	5.953
K	24	6.931	11.185	-11.12	26.195
OILGDP	24	1.924	6.748	-9.545	17.409
HCAP	24	2.481	.157	2.205	2.714
IMP	24	6.216	12.373	-19.728	34.982
GDP	24	3.584	3.997	-4.341	11.242
SMKT	24	91.088	91.696	10.204	372.26
ED	24	.764	.017	.732	.8

Table 2: Pairwise correlations

Variables	NOIL GDP	FEXP	EXP	CORP	K	OIL GDP	HCAP	IMP	GDP	SMKT	ED
NOILGDP	1.000										
FEXP	0.721*	1.000									
EXP	0.219	0.254	1.000								
CORP	-0.392	-0.601*	-0.276	1.000							
K	0.225	0.379	0.248	-0.503*	1.000						
OILGDP	0.219	0.241	0.910*	-0.217	-0.010	1.000					
HCAP	-0.437*	-0.741*	-0.164	0.753*	-0.401	-0.160	1.000				
IMP	0.655*	0.622*	0.367	-0.577*	0.441*	0.283	-0.402	1.000			
GDP	0.523*	0.417*	0.860*	-0.268	0.062	0.931*	-0.222	0.473*	1.000		
SMKT	0.417*	0.302	0.167	-0.584*	0.552*	0.053	-0.235	0.739*	0.165	1.000	
ED	-0.347	-0.078	-0.064	-0.182	-0.081	-0.080	-0.332	-0.232	-0.216	0.253	1.00

*: p<.1

Table 3 presents the results of the Augmented Dickey-Fuller (ADF) unit root test conducted on the selected variables at both the level and first difference. The ADF test is a widely used statistical method to determine whether a time series is stationary or exhibits a unit root, which implies non-stationarity. Table 3 provides the p-values associated with each variable under consideration for both the level and first difference specifications. A p-value below a certain significance threshold (commonly 0.05) indicates evidence against the presence of a unit root, suggesting that the series is stationary. Conversely, a higher p-value suggests that the series may possess a unit root, indicating non-stationarity. Analyzing the results, it's evident that the significance of the ADF test varies across the variables. For instance, variables like exports (EXP), GDP, capital formation (K), oil GDP (OILGDP), and stock market capital SMKT) demonstrate p-values below 0.05 at the level, indicating evidence against the presence of a unit root and hence, stationarity. However, variables such as corporate (CORP), fuel exports (FEXP), export diversification (ED), and human capital (HCAP) exhibit non-stationarity. This implies that these variables may require further differencing or alternative transformations to achieve stationarity for reliable modeling and forecasting purposes. Nonetheless, after differencing once, all variables demonstrate stationary behavior, thereby enhancing their suitability for rigorous time series analysis and forecasting applications. Overall, the ADF unit root test results provide valuable insights into the stationarity properties of the economic variables examined, aiding in selecting appropriate modeling techniques for time series analysis.

Table 3: ADF unit root test

Variable	P-value	P-value
	Level	1st diff
CORP	0.331588	0.045013
ED	0.313241	0.000341
EXP	0.009479	0.012742
FEXP	0.105453	0.040614
GDP	0.005468	0.000147
HCAP	0.999999	0.000353
IMP	0.161742	0.000755
K	0.000653	4.36E-11
NOILGDP	0.617896	4.41E-06
OILGDP	0.006477	0.00035
SMKT	0.065496	0.082871

Table 4 presents the estimates from the model specified in Eq. i. We specified three equations while considering GDP, oil GDP, and nonoil GDP as dependent variables, respectively.

GDP Growth Model

$$\Delta GDP_t = \beta_0 + \beta_1 \Delta FEXP_t + \beta_2 \Delta EXP_t + \beta_3 \Delta K_t + \beta_4 \Delta IMP_t + \beta_5 \Delta SMKT_t + \beta_6 \Delta ED_t + \beta_7 \Delta HCAP_t + \beta_8 \Delta CORP_t + \varepsilon_t \quad (1)$$

Oil GDP Growth Model

$$\Delta OILGDP_t = \beta_0 + \beta_1 \Delta FEXP_t + \beta_2 \Delta EXP_t + \beta_3 \Delta K_t + \beta_4 \Delta IMP_t + \beta_5 \Delta SMKT_t + \beta_6 \Delta ED_t + \beta_7 \Delta HCAP_t + \beta_8 \Delta CORP_t + \varepsilon_t \quad (2)$$

Non-Oil GDP Growth Model

$$\Delta NOILGDP_t = \beta_0 + \beta_1 \Delta FEXP_t + \beta_2 \Delta EXP_t + \beta_3 \Delta K_t + \beta_4 \Delta IMP_t + \beta_5 \Delta SMKT_t + \beta_6 \Delta ED_t + \beta_7 \Delta HCAP_t + \beta_8 \Delta CORP_t + \varepsilon_t \quad (3)$$

Our estimates reveal fuel exports' positive and statistically significant impact on the GDP growth rate which reveals the importance of the oil sector in fueling economic activity and driving overall economic performance in the country. It reflects the significant role that oil plays in supporting various sectors of the economy, including manufacturing, construction, transportation, and services. Estimates in Eq. 1 also show the positive and statistically significant impact of capital formation on the GDP of Saudi Arabia, highlighting the significance of investment in physical assets such as machinery, equipment, infrastructure, and construction projects for driving economic growth in the country. In Saudi Arabia, gross fixed capital formation plays a critical role in supporting various sectors of the economy, including oil and gas, manufacturing, construction, transportation, and telecommunications. Investment in infrastructure projects, such as roads, ports, airports, and utilities, not only enhances production and distribution efficiency but also contributes to economic diversification and job creation. Eq. 2 considers the oil GDP as the dependent variable and evaluates the impact of selected variables on the oil GDP. The estimates in Eq. 2 reveal the positive and statistical impact of fuel exports, total exports, and gross fixed capital formation on the non-oil GDP growth rate in Saudi Arabia. Export diversification has a negative and statistically significant impact on oil GDP in Saudi Arabia indicating the complex relationship between diversification efforts and the dominance of the oil sector in the country's economy. Finally, Eq. 3 specifies the non-oil GDP as a dependent variable and finds a positive and statistically significant impact of fuel exports, gross fixed capital formation, and volume of imports on the non-oil GDP in Saudi Arabia. The positive impact of the volume of imports on non-oil GDP suggests that imports play a significant role in supporting economic activity and growth in Saudi Arabia. Imports of raw materials, intermediate goods, and capital equipment are essential for the functioning of various industries, allowing them to produce goods and services for domestic consumption and export. The positive impact of gross fixed capital formation on non-oil GDP highlights the importance of investment in physical assets for stimulating economic growth in sectors outside of oil. Investments in infrastructure, manufacturing facilities, technology, and other productive assets contribute to the expansion and modernization of non-oil industries, boosting their output and overall contribution to GDP. Moreover, the positive impact of fuel exports on non-oil GDP suggests that the revenues generated from oil exports still have spillover effects on other sectors of the economy. These effects could include increased consumer spending, investments, and government expenditure in non-oil sectors due to the inflow of oil revenues. In addition, estimates in Eq. 3 reveal a positive and statistically significant impact of export diversification on the non-oil GDP of Saudi Arabia which underscores the importance of reducing dependence on oil and promoting a more diversified and resilient economy. It highlights the potential benefits of diversification efforts in stimulating growth, enhancing competitiveness, and ensuring economic sustainability in the country. Furthermore, development in human capital has a positive and statistically significant impact on non-oil GDP in Saudi Arabia which indicates that investments and improvements in human capital, such as education, training, and skill development, lead to positive economic outcomes in non-oil sectors of the Saudi Arabian economy.

Table 5 provides the regression diagnostics for Eq. i to assess the quality and reliability of our estimates. These diagnostic tests help to understand if the model is adequately capturing the relationships between the variables and if the model's predictions are valid. For instance, the Jarque Bera test is a test for the normality of the residuals (errors) in the regression model. It assesses whether the residuals follow a normal distribution, which is one of the key assumptions of linear regression and the estimates in Table 5 indicate the Jarque Bera test statistic value of 1.371554 and the associated p-value of 0.503699 (or 50.37%). A p-value above a chosen significance level (usually 0.05) indicates that there is no evidence to reject the null hypothesis of normality, suggesting that the residuals are normally distributed. Similarly, the Durbin-Watson test detects the presence of autocorrelation in the residuals, which refers to the correlation between consecutive residuals.

The Durbin-Watson statistic ranges from 0 to 4. A value around 2 indicates no autocorrelation, while values significantly below 2 suggest positive autocorrelation and values significantly above 2 suggest negative autocorrelation. In our case, the Durbin-Watson statistic is 2.219, indicating no significant autocorrelation in the residuals. Furthermore, variance inflation factor (VIF) is a measure of multicollinearity, which occurs when two or more independent variables in a regression model are highly correlated. Generally, VIF values above 10 are considered indicative of multicollinearity issues. The estimates in Table 5 show that VIF values are between 0 and 11, suggesting no severe multicollinearity issues. Finally, heteroscedasticity

refers to the unequal spread of residuals across the range of predictor variables. Table 5 presents the White test for heteroscedasticity. A significant p-value suggests the presence of heteroscedasticity and the estimates in Table 5 reveal that the White test has a p-value of 0.0739, which is greater than the significance level of 0.05. Hence, there is no evidence to reject the null hypothesis of homoscedasticity (equal variance of residuals). Overall, based on the diagnostic test results provided, the regression model appears to meet the assumptions of normality, no autocorrelation, no severe multicollinearity, and no homoscedasticity, suggesting that the model is adequately specified.

Table 4: Model estimation

	(1)	(2)	(3)
	DGDP	DOILGDP	DNOILGDP
DFEXP	.055***	.131***	.152**
	(.023)	(.035)	(.086)
DEXP	.429***	.883***	.068
	(.051)	(.07)	(.055)
DK	.118***	.23***	.084**
	(.037)	(.05)	(.04)
DIMP	.095	-.015	.124*
	(.06)	(.082)	(.065)
DSMKT	-.004	.007	-.004
	(.009)	(.012)	(.01)
DED	-31.973	-126.784**	82.751*
	(37.587)	(51.153)	(40.474)
DHCAP	2.994	6.16	11.266**
	(8.028)	(10.925)	(8.644)
DCORP	.36	1.346	.058
	(1.149)	(1.563)	(1.237)
_CONS	-.146	-.497	.448
	(.506)	(.688)	(.544)
Observations	23	23	23
R-squared	.893	.937	.866

Standard errors are in parentheses; ***: p<.01; **: p<.05; *: p<.1

Table 5: Diagnostics test

	Normality		Autocorrelation		Multicollinearity		Heteroscedastiy	
							White test	
Diagnostics test	Jarque Bera test	1.371554	Durbin Watson	2.219			P-value (chi-square)	0.0739
	P-value	0.503699 (50.36%)	LMF	1.0587	VIF Test	0<VIF<11		
			P- value F(2,18)	0.3675			F-stats	2.9296

5. Conclusion

This study examines the impact of economic diversification on economic growth in Saudi Arabia. In this context, current research employs variables such as economic growth, annual growth of capital stock, fuel exports, annual change in human capital, annual change in imports, number of companies listed per millions of population, annual growth of non-oil GDP, oil GDP growth, annual growth of the stock market, annual growth of total exports and the exports diversification for the time 2000–2023. This research specifies the three models while considering GDP (total), oil GDP, and non-oil GDP as dependent variables respectively, and employs the differenced regression since most of the variables are stationary at first difference. Our estimates find the positive and statistically significant impact of fuel exports, total exports, and capital formation on the three classifications of GDP variables. In addition, this research finds a negative and statistically significant impact of export diversification on oil GDP whereas export diversification has a positive and statistically significant impact on non-oil GDP. Moreover, development in human capital has a positive impact on all three GDP variables but this impact is statistically significant for non-oil GDP.

The findings reveal that export diversification negatively impacts oil GDP but positively affects non-oil GDP, aligning with Vision 2030's goal of reducing the economy's dependency on oil. To achieve this, policymakers should enhance support for non-oil sectors through targeted incentives, subsidies, and infrastructure development. Investment in technology, manufacturing, and services will foster growth in these areas, creating a balanced economic structure. Vision 2030 initiatives such as the National Industrial Development and Logistics Program (NIDLP) can be pivotal in accelerating this diversification, reducing vulnerability to oil market fluctuations, and ensuring sustainable long-term growth. The positive impact of human capital development on all GDP classifications, with a significant effect on non-oil GDP, highlights the importance of education and workforce skills in economic diversification. Saudi Arabia should focus on improving the quality of education and vocational training, as emphasized in Vision 2030. Programs such as the Human Capability Development Program (HCDP) should be prioritized to equip the population with skills needed in emerging industries. By fostering a skilled and adaptable workforce, the country can enhance productivity and innovation, driving growth in both oil and non-oil sectors.

The current research reveals the positive influence of fuel exports, total exports, and capital formation on economic growth. Vision 2030 aims to expand Saudi Arabia's export capacity and diversify its export base. Enhancing trade agreements, reducing trade barriers, and improving logistics and infrastructure will support this goal. Additionally, encouraging both domestic and foreign investment through favorable policies and stable economic conditions can increase capital formation. Initiatives such as the Saudi Export Development Authority (SEDA) play a crucial role in this expansion, driving overall economic growth. The positive impact of stock market growth on GDP suggests that a robust financial sector is crucial for economic development. Vision 2030's Financial Sector Development Program aims to strengthen financial markets by enhancing regulatory frameworks, promoting transparency, and encouraging more companies to list on the stock exchange. These measures can attract both domestic and international investors, increasing capital availability for businesses and fostering economic growth.

Despite the positive impact of fuel exports on GDP, the negative relationship between export diversification and oil GDP suggests a need to carefully manage the transition away from oil dependency. Vision 2030 outlines a strategic plan to balance oil and non-oil economic activities to ensure stability. While promoting non-oil sectors, the country should also invest in technologies and practices that maximize the efficiency and sustainability of its oil production. Initiatives such as the National Transformation Program (NTP) support this dual focus, ensuring that oil remains a key economic driver during the transition period.

By aligning these policy insights with Vision 2030, Saudi Arabia can effectively navigate its economic diversification journey, enhancing sustainable growth and reducing its dependency on oil revenue.

List of abbreviations

ADF	Augmented Dickey-Fuller (unit root test)
CORP	Number of companies listed per million population
DCORP	First difference of CORP
DED	First difference of export diversification index
DEXP	First difference of total exports
DFEXP	First difference of fuel exports
DGDP	First difference of gross domestic product
DHCAP	First difference of human capital
DIMP	First difference of imports
DK	First difference of capital formation (K)
DNOILGDP	First difference of non-oil GDP
DOILGDP	First difference of oil GDP
DSMKT	First difference of stock market capitalization
ED	Export diversification index
EXP	Total exports
FEX	Fuel exports
FEXP	Fuel exports
GDP	Gross domestic product
HCAP	Human capital
HCDP	Human capability development program (Saudi Vision 2030)
HWWI	Hamburg institute of international economics
IMP	Imports
LMF	Lagrange multiplier f-test (autocorrelation test)
NIDLP	National industrial development and logistics program (Saudi Arabia Vision 2030)
NOIL	Non-oil
NOILGDP	Non-oil gross domestic product
NTP	National transformation program (Saudi Arabia Vision 2030)
OIL	Oil
OILGDP	Oil gross domestic product
OPEC	Organization of the petroleum exporting countries
SEDA	Saudi export development authority
SMKT	Stock market capitalization
TRADE	Trade balance growth
VIF	Variance inflation factor (for multicollinearity test)

Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

Al Yousif MA (2020). Renewable energy challenges and opportunities in the Kingdom of Saudi Arabia. International Journal of Economics and Finance, 12: 9. https://doi.org/10.5539/ijef.v12n9p1

Alexeev M and Conrad R (2009). The elusive curse of oil. The Review of Economics and Statistics 91: 586-598. https://doi.org/10.1162/rest.91.3.586

Alhowaish AK and Al-Shihri FS (2014). Economic trends of Saudi urban system (1992–2010). Journal of Engineering Sciences, 42: 216-225. https://doi.org/10.21608/jesaun.2014.114303

Aljebrin MA (2020). Do non-oil exports facilitate economic growth in Saudi Arabia? Journal of Management Information and Decision Sciences, 23: 450-476.

Auty R (2001). Resource abundance and economic development. Oxford University Press, Oxford, UK.

Bjorvatn K, Farzanegan MR, and Schneider F (2012). Resource curse and power balance: Evidence from oil-rich countries. World Development, 40(7): 1308-1316. https://doi.org/10.1016/j.worlddev.2012.03.003

Bogdański M (2021). Employment diversification as a determinant of economic resilience and sustainability in provincial cities. Sustainability, 13(9): 4861. https://doi.org/10.3390/su13094861

Busse M and Gröning S (2008). Does trade openness lead to better governance? Hamburg Institute of International Economics (HWWI), Hamburg, Germany.

Haber S and Menaldo V (2011). Do natural resources fuel authoritarianism? A reappraisal of the resource curse. American Political Science Review, 105: 1-26. https://doi.org/10.1017/S0003055410000584

Hanif W, Hadhri S, and El Khoury R (2024). Quantile spillovers and connectedness between oil shocks and stock markets of the largest oil producers and consumers. Journal of Commodity Markets, 34: 100404. https://doi.org/10.1016/j.jcomm.2024.100404

Havrlant D and Darandary A (2021). Economic diversification under Saudi Vision 2030. Discussion Papers ks--2021-dp06, King Abdullah Petroleum Studies and Research Center, Riyadh, Saudi Arabia. https://doi.org/10.30573/KS--2021-DP06

Hertog S (2010). Defying the resource curse: Explaining successful state-owned enterprises in rentier states. World Politics, 62: 261-301. https://doi.org/10.1017/S0043887110000055

Houfi MA (2021). Is the impact of the economic diversification on economic growth symmetric or asymmetric? Evidence from Saudi Arabia. International Journal of Economics and Finance, 13: 1-11. https://doi.org/10.5539/ijef.v13n10p1

Ichime MO, Awogbemi TO, and Ezi CT (2024). Economic diversification: As panacea for sustainable economic growth in Nigeria. International Journal of Advanced Economics, 6: 65-75. https://doi.org/10.51594/ijae.v6i4.1055

Jensen NM and Johnston NP (2011). Political risk, reputation, and the resource curse. Comparative Political Studies, 44: 662-688. https://doi.org/10.1177/0010414011401208

Kashcheeva M and Tsui KK (2015). Political oil import diversification by financial and commercial traders. Energy Policy, 82: 289-297. https://doi.org/10.1016/j.enpol.2015.02.025

Kayed RN and Hassan MK (2011). Saudi Arabia's economic development: Entrepreneurship as a strategy. International Journal of Islamic and Middle Eastern Finance and Management, 4: 52-73. https://doi.org/10.1108/17538391111122203

Lashitew AA, Ross ML, and Werker E (2021). What drives successful economic diversification in resource-rich countries? The World Bank Research Observer, 36: 164-196. https://doi.org/10.1093/wbro/lkaa001

Lipieta A and Lipieta A (2023). Adjustment processes within economic evolution—Schumpeterian approach. Journal of the Knowledge Economy, 14: 3221-3259. https://doi.org/10.1007/s13132-022-00912-3 **PMCid:PMC8941377**

Mobarak A and Karshenasan A (2012). The impact of institutional quality on relation between resource abundance and economic growth. Iranian Economic Review, 16: 95-110.

Mohamed MM, Liu P, and Nie G (2022). Causality between technological innovation and economic growth: Evidence from the economies of developing countries. Sustainability, 14(6): 3586. https://doi.org/10.3390/su14063586

Nchofoung TN and Ojong N (2023). Natural resources, renewable energy, and governance: A path towards sustainable development. Sustainable Development, 31: 1553-1569. https://doi.org/10.1002/sd.2466

Pasinetti LL (1983). Structural change and economic growth: A theoretical essay on the dynamics of the wealth of nations. Cambridge University Press, Cambridge, UK.

Ploeg FVD (2011). Natural resources: Curse or blessing? Journal of Economic Literature, 49: 366-420. https://doi.org/10.1257/jel.49.2.366

Radetzki M (2012). Politics—not OPEC interventions—explain oil's extraordinary price history. Energy Policy, 46: 382-385. https://doi.org/10.1016/j.enpol.2012.03.075

Ross ML (1999). The political economy of the resource curse. World Politics, 51: 297-322. https://doi.org/10.1017/S0043887100008200

Saviotti PP (1996). Technological evolution, variety and the economy. Edward Elgar Publishing, Cheltenham, UK. https://doi.org/10.4337/9781035334858

Serra RG and Fávero LPL (2018). Multiples' valuation: The selection of cross-border comparable firms. Emerging Markets Finance and Trade, 54: 1973-1992. https://doi.org/10.1080/1540496X.2017.1336084

Sovacool BK and Brown MA (2010). Competing dimensions of energy security: An international perspective. Annual Review of Environment and Resources, 35: 77-108. https://doi.org/10.1146/annurev-environ-042509-143035

Witt U (2022). Innovative capitalism needs institutional co-evolution. Journal of Open Innovation: Technology, Market, and Complexity, 8(3): 131. https://doi.org/10.3390/joitmc8030131