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Sectoral value addition and its impact on economic growth in Saudi Arabia: An ARDL approach

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ABSTRACT

Saudi Arabia is working to reduce its reliance on oil by diversifying its economy, making it important to understand how different sectors contribute to Gross Domestic Product (GDP) growth. This research explores the connection between sectoral value addition and economic growth in Saudi Arabia, using data from 1980 to 2022. The aim is to identify which sectors can support long-term economic growth in line with the goals of Vision 2030. The study uses the autoregressive distributed lags (ARDL) model to analyze the yearly growth rates of value addition in different sectors and their impact on GDP growth. The results show that the construction, mining, services, and financial sectors have a positive and significant effect on economic growth. These findings highlight key sectors that influence GDP growth, suggesting that targeted investments and policy measures in these areas could strengthen economic stability and sustainability. The study emphasizes the need to promote growth in a variety of sectors to meet the broader economic aims of Vision 2030.

1. Introduction

The resurgence of growth theory in the early 1980s sparked a substantial increase in empirical research on economic growth over the subsequent decades. Although much of this empirical growth literature has concentrated on the factors influencing overall economic growth, there has been comparatively less attention given to the growth dynamics within individual economic sectors (Cervellati et al., 2023).

The impact of various factors on economic growth remains a prominent area of research in economics. Nevertheless, there is a recognized imperative to continuously monitor the evolving impact of key economic sectors on overall economic growth. These growth drivers encompass the cumulative effects of policy implementation, globalization, and other economic shocks (Garin et al., 2018). The growth of key sectors in the economy often indicates potential increases in a country's economic growth and income levels. For example, developing the agricultural sector can boost growth in other related sectors, leading to overall economic progress. Agriculture not only provides essential materials for industrial and manufacturing processes but also supplies food for everyone in the economy. Because of its critical role, agriculture creates jobs in related sectors and improves living standards. The connections between different economic sectors reflect how commerce works, with agriculture, industry, manufacturing, and services all playing supportive roles that contribute to the overall growth of the economy.

The Industrial Revolution is a clear example of how industrial growth can support economic development while maintaining the importance of the agricultural sector compared to others (Gabriel and Ribeiro, 2019). For economists aiming to understand economic dynamics and shape effective policies, especially in resource-rich countries like Saudi Arabia, it is essential to evaluate how different sectors have recently contributed to economic growth. There is limited research on the effects of sectoral value-addition in natural resource-driven economies within the GCC region, which makes Saudi Arabia a suitable case for this study. By using the autoregressive distributed lags (ARDL) approach, which provides greater estimation efficiency than commonly used residual-based methods, this study aims to offer important insights into the influence of different sectors on Saudi Arabia's economic growth. The primary objective of this research is to analyze and quantify the influence

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of value-added growth across key sectors in the Saudi Arabian economy. Specifically, the study aims to assess the impact of growth in the manufacturing, services, construction, mining, financial, and agricultural sectors, which encompasses fishery and forestry, on the overall economic landscape of Saudi Arabia. By focusing on data spanning from 1980 to 2023, the research seeks to provide a comprehensive understanding of how these sectors contribute to the country's economic development and growth during this period. This analysis will offer valuable insights into each sector's relative importance and performance, informing policymakers, stakeholders, and researchers about the key drivers of economic growth in Saudi Arabia over the past four decades. Saudi Arabia has distinct economic characteristics influenced by its vast natural resources, notably oil, strategic geographical positioning, and government policies. The Kingdom's economy is primarily oil-based, with the petroleum sector contributing significantly to its GDP, government revenue, and export earnings. The government plays a pivotal role in the economy, owning key industries, including oil and gas. In addition, government spending, particularly in infrastructure, healthcare, education, and public services, is a major driver of economic activity (Sallam, 2021). The Public Investment Fund (PIF), one of the world's largest sovereign wealth funds, aims to diversify the economy, invest in strategic sectors, and support the Vision 2030 reform agenda, launched in 2016 to reduce oil dependence, transform the Kingdom into a global investment powerhouse, and connect three continents. With a predominantly young population, Saudi Arabia faces the challenge and opportunity of harnessing the potential of its youth through increased investment in education, training, and job creation. The Kingdom's strategic location at the crossroads of Asia, Africa, and Europe offers significant trade and investment opportunities, positioning it as a key player in regional and global economic dynamics. While the oil sector remains crucial, efforts are underway to develop and expand non-oil sectors, including tourism, entertainment, mining, manufacturing, and renewable energy, to create new sources of growth, employment, and revenue. Moreover, fiscal reforms, including the introduction of value-added tax (VAT) and subsidy reforms, aim to enhance fiscal sustainability and reduce reliance on oil revenues. Active engagement in global trade and investment and efforts to foster economic partnerships and global collaborations further underscore Saudi Arabia's role as a leading member of international organizations and its commitment to shaping the global economic landscape.

The remainder of this paper is structured as follows: Section 2 provides a review of the related literature, encompassing a thorough examination of relevant studies and scholarly contributions in the field. Section 3 subsequently delineates the data sources utilized and introduces the research model. Section 4 offers a comprehensive analysis of the obtained results, presenting insightful observations derived from our analysis. Finally, Section 5 concludes the paper by summarizing the principal findings of the research and offering policy implications based on the current study's results.

2. Literature review

The literature on sectoral growth primarily draws from the dual economy model proposed by Ranis and Fei (1961) and Sen (1966). This model aims to explain economic growth by highlighting the roles of agriculture and industry and their interactions. The dual economy model positions the agricultural sector as the foundation of a developing economy, serving as a source of capital necessary for the transition to the next phase of economic development: industrialization. As industrialization progresses, the agricultural sector gradually becomes a peripheral component of the economic system, characterized by minimal internal economic integration and weak intersectoral linkages. In this context, researchers and scholars have extensively examined the causal relationship between economic growth and sectoral contributions to GDP in both short and long-term contexts across different countries. For example, Hwa (1988) and Sastry et al. (2003) identified the agricultural sector as a dominant force, significantly contributing to overall economic growth.

Similarly, Gollin et al. (2002) contended that agricultural productivity plays a crucial role in economic development through the structural transformation model. The study further emphasized the reasons behind the slow pace of industrialization. Likewise, Turan Katircioglu (2006) found that agricultural output and economic growth are co-integrated and exhibit bidirectional causation over the long run for North Cyprus. Furthermore, Awokuse and Christopoulos (2009) explored the dynamic interaction between agricultural productivity and economic growth by analyzing fifteen developing and transition economies in Latin America, Asia, and Africa. Their study used a range of economic variables and identified agriculture as a major driver of economic growth, emphasizing its role in economic development. The results also highlighted the positive impact of trade openness on GDP per capita. In addition, Xuezhen et al. (2010) identified a positive relationship between the primary sector and economic growth. This underscores the substantial contribution of the primary sector to overall economic development.

Similarly, Jatuporn et al. (2011) conducted an empirical study on Thailand, covering the period from 1961 to 2009, and identified a long-run causal relationship between agriculture and economic growth. Their findings indicated that agriculture significantly contributes to long-term economic stability, while economic development reciprocally enhances agricultural growth. However, the connection between agriculture and economic growth is not universally accepted. For instance,

Katircioglu (2004) examined North Cyprus and found that despite agriculture being a fundamental part of its economy, it does not significantly contribute to economic development. This study also revealed a co-integration between real GDP, industrial output, and the service sector, indicating that these sectors are more crucial drivers of economic growth in North Cyprus.

Additionally, several empirical studies explored the causal relationships between the growth of various sectors and overall economic development, considering both short-term and long-term perspectives. Tregenna (2008) emphasized that the manufacturing sector is crucial for stimulating demand in the service sector and significantly contributes to the overall economy due to its strong backward linkages in South Africa. Similarly, Szirmai (2012) highlighted that while the secondary sector has played a significant role in economic development, it cannot be considered the sole engine of economic growth. This study covered 67 emerging and 21 advanced nations from 1950 to 2005. Matahir (2012) found that the primary and secondary sectors in Malaysia are co-integrated in the long run and identified a one-way causality from the industrial sector to the agricultural sector in both short and long terms from 1970 to 2009. Moreover, Verner and Fiess (1999) conducted a comprehensive analysis of sectoral growth in Ecuador using multivariate cointegration analysis. Their study revealed significant long-run relationships between the agricultural, industrial, and service sectors. By deriving dynamic sector models, the researchers combined short-run linkages with long-run dynamics, highlighting the interconnectedness of these sectors. The findings suggest that understanding the interdependencies between sectors is crucial for formulating effective policies aimed at enhancing economic growth in Ecuador. Bhattacharya and Mitra (1989) concluded that the relative growth of income and employment in the secondary and tertiary sectors significantly influences the nature of the agriculture-industry relationship. Gemmell et al. (1998) employed time-series econometric techniques to investigate the linkages between agricultural, manufacturing, and service GDPs (and productivity) in Malaysia. Their results indicated a significant long-run impact of both the manufacturing and service sectors on agricultural productivity. In a separate study, Block (1999) calculated macroeconomic growth multipliers arising from income shocks in Ethiopia's primary sector, as well as the modern and traditional secondary sectors. Furthermore, Blunch and Verner (1999) analyzed three African economies and found at least one statistically significant long-term relationship for sectoral GDP through composite sectoral growth.

The significance of these linkages was further emphasized by Gani and Clemes (2002), who discovered that the growth of tertiary activities exerts a statistically significant positive effect. Furthermore, their results underscored a strong positive impact of growth in the secondary sector and government expenditure on tertiary activities. Clemes et al. (2003) found robust, positive bi-directional effects between the growth of the tertiary sector and the secondary sector in ASEAN economies.

Moreover, Craigwell et al. (2008) examined the relationships between the primary, secondary, and tertiary sectors in Barbados over the past five decades, both in the long and short run. Their results revealed a single cointegrating relationship in both sub-periods. Furthermore, Subramanian et al. (2009) demonstrated that the tertiary sector served as the major driver of development for both the primary and secondary sectors during the initial phases of development in Poland and Romania. In his empirical study, Eddine Chebbi (2010) found that all Tunisian economic sectors were co-integrated and exhibited unidirectional movement. On the contrary, Rahman et al. (2011) did not find the service sector to be an influential factor in Bangladesh's GDP growth and suggested that the primary and secondary sectors are the most significant contributors to Bangladesh's GDP.

Hussin and Yik (2012) explored how economic sectors influenced economic growth in China and India over the period from 1978 to 2007. Their study analyzed three main sectors: agriculture, manufacturing, and services. The study found contrasting impacts of these sectors on overall economic growth in the two countries. Specifically, while manufacturing plays a pivotal role in driving economic growth in China, the services sector emerges as the leading contributor to economic expansion in India.

Burren and Neusser (2013) examined if changes in sectoral composition contributed to the decline in U.S. output volatility between 1949 and 2005, assessing its relative influence, and their findings indicate that the transition toward the service sector explains roughly 30% of the decrease in GDP volatility, even amid increased volatility observed in certain sectors during the same period. Moreover, Singariya and Sinha (2015) identified bidirectional causality between the primary sector and economic growth in India. They also observed a unidirectional causality running from the secondary sector to economic growth, as well as from the primary sector to the secondary sector.

For Saudi Arabia, Alhowaish and Al-Shihri (2015) examined the relationship between sectoral development (agriculture, oil, industry, and services) and economic growth spanning from 1970 to 2012. Their study reveals bidirectional causality among the sectoral outputs over the short term. The findings suggest that the economic performance of the services and industrial sectors significantly influences the overall income of the Saudi economy, which, in turn, is contingent upon the growth of the oil and gas sector. Additionally, the growth of the agricultural sector is closely linked to the performance of the industrial sector. Also, Malikov et al. (2016) highlighted agriculture as the dominant

employment sector in Uzbekistan. Using a VAR model, Islam et al. (2017) found a significant relationship between industrial production and GDP per capita with carbon emissions. Popoola et al. (2017) identified agriculture as the largest contributor to economic growth in Nigeria, followed by the manufacturing and oil sectors, while the building and construction sectors made the smallest contribution. Cantore et al. (2017), utilizing the Generalized Method of Moments (GMM) on data from 80 countries spanning 1980 to 2010, underscored the secondary sector's role as a driver of economic growth.

Gabriel and Ribeiro (2019) examined the role of manufacturing in driving economic growth for a dataset comprising 115 countries from 1990 to 2011. The study suggests the manufacturing sector functions as an "engine of growth" in developing countries, persistently serving as a key strategic sector for economic development throughout the sample period. Nonetheless, the study also identifies a decline in the relative importance of manufacturing linkages in both developed and developing countries over time. Also, Khan (2020) employed simulation techniques to analyze the Nepalese economy, concluding that improvements in labor productivity and sectoral contributions positively impact economic growth, welfare, and household income in Nepal.

Kumar and Paramanik (2020) explored the connection between financial development and economic growth in India. Their study concluded that financial development has a positive long-term impact on economic growth, contrasting with its short-term effects. Additionally, the research found that both positive and negative changes in financial development symmetrically influence the Indian economy. On the other hand, Luong et al. (2020) revealed that economic growth indicators negatively and statistically significantly impact the shadow economy. Furthermore, Ngo et al. (2020) emphasized that the size of the market influences foreign direct investment (FDI), while Nurlanova et al. (2020) identified innovative activities as the most important factor affecting sustainable development.

Moreover, Sallam (2021) found a two-way causal relationship between manufacturing and economic growth in Saudi Arabia. An increase in manufacturing or economic growth leads to a corresponding increase in the other. Additionally, an increase in manufacturing also stimulates growth in the service sector. The study suggests that manufacturing has a direct impact on economic growth and an indirect effect through its influence on the services sector. From the review of the literature, it is evident that the contribution of different sectors to the economic development of various countries has been a topic of significant research interest.

Many studies have examined how adding value in different economic sectors relates to overall economic growth, providing useful information for countries looking to diversify their economies. For example, Enongene (2024) studied how value-added contributions in agriculture, manufacturing, industry, and services impact poverty reduction in Sub-Saharan Africa. The research showed that all these sectors play a positive and significant role in reducing poverty, with agriculture being the most influential. This indicates that increasing value addition within sectors can promote both economic growth and poverty reduction.

Likewise, Yanikkaya and Altun (2020) explored how participation in global value chains affects sectoral value-added and overall productivity growth. They found that sectors more engaged in global value chains see higher productivity and output growth. This emphasizes the role of sectoral value addition in fostering economic development.

These findings highlight the critical role of sectoral value addition in boosting economic growth and provide valuable insights for policymakers focused on economic diversification and development strategies. In contrast, imports had a negative effect, while the manufacturing sector and exports were insignificant. In the short run, imports continued to have a negative impact, with no significant effects from other variables. These findings underscore the need to prioritize the development of agriculture, industry, and service sectors for sustained economic growth. This is particularly relevant for Saudi Arabia, where Vision 2030 aims to reduce oil dependency and enhance growth in diversified sectors. While analyzing the role of the informal sector in a developing economy context, Sultana et al. (2024) found that the informal sector has an asymmetric impact on domestic output and economic growth in Bangladesh in both the short and long term. Specifically, a decrease in the informal sector's contribution has a disproportionately larger negative effect on output and economic growth. Additionally, the research highlights that urbanization and capital growth are significant drivers of economic growth, further emphasizing the importance of these factors in Bangladesh's economic development.

For Saudi Arabia, Alam et al. (2022) examined the long-term effects of demand-side factors such as investment, exports, imports, and three categories of government expenditures (health, education, and other government spending) on GDP growth, spanning the time 1985 to 2018. The study finds a positive long-term relationship between GDP and investment, exports, and government spending on education. Conversely, GDP growth is negatively influenced by imports, government health expenditures, and other types of government spending. The study concludes that while investment, exports, and educational expenditures promote GDP growth in the long run, imports and certain types of government spending have detrimental effects on the economic growth of Saudi Arabia.

However, there is a dearth of literature on the impact of sectoral value addition on economic growth, especially in the context of the country's

transition and diversification phases. Henceforth, to the best of our knowledge, there has been no recent study that specifically explores the sectoral contribution to the economic growth of Saudi Arabia using the time series data related to sectors such as construction, mining, and financial sectors.

3. Data and model specification

To examine the impact of sectoral value addition on the economic growth of Saudi Arabia, current research employs the time series data for the period 1980 – 2022, and the data is extracted from the WBG (2023). Model specification is as follows:

$$GDP_t = \beta_0 + \beta_1(MANU)_t + \beta_2(CONST)_t + \beta_3(SERVICES)_t + \beta_4(AGRICUL)_t + \beta_5(MINING)_t + \beta_6(FINANCIAL)_t + \varepsilon_t \quad (1)$$

where, GDP is gross domestic product annual growth at time t, β_1 quantifies the impact of the manufacturing sector on the overall economy while β_2 reflects the influence of the construction sector. β_3 is the coefficient associated with the services sector, and β_5 measures the agricultural sector's contribution. Additionally, β_5 and β_6 represent the contributions of the mining sector and the financial sector, respectively. All variables are expressed as the annual growth in the value added by each selected sector to the economy. The construction sector variable includes the annual growth in the value added by the construction sector, and it represents the additional value created by construction processes. It is calculated by subtracting the cost of materials and other inputs from the total value of construction projects completed. The services sector variable is calculated by subtracting the cost of inputs (like labor, materials, and other operational costs) from the total revenue generated by the services provided. The services sector includes a wide range of industries, such as finance, healthcare, education, retail, hospitality, and professional services. The agricultural sector is included as it provides insights into the performance and contribution of the agriculture sector to the overall economic growth of a country. The agriculture sector plays a crucial role in ensuring food security, providing employment, and contributing to the export earnings of many countries. In addition, the value added by the mining sector in Saudi Arabia plays a crucial role in generating government revenue, providing employment opportunities, and attracting foreign investments. Finally, the financial sector is an important contributor to the country's overall economic growth and stability. The financial sector variable reflects the efficiency, profitability, and resilience of the financial institutions and their impact on the national economy. Additionally, a robust and well-functioning financial sector can facilitate capital allocation, promote investment, and foster innovation, thereby contributing to long-term economic development and diversification in countries like Saudi Arabia.

To examine the linkages between the sectoral value addition and economic growth in Saudi Arabia, this research employs ARDL model since the selected variables are not stationary at levels. We specify the ARDL model as follows:

$$y_t = \alpha_0 + \alpha_1 t + \sum_{i=1}^{p} \aleph_i \, y_{t-1} \sum_{j=1}^{k} \sum_{l_j=0}^{q_j} \beta_{j,lj} \, z_{j,t-l_j} + \varepsilon_t \quad (2)$$

where, y_t is the dependent variable, $z_1, \ldots, z_k$ are k independent variables, α_0 is the constant term, α_1 is trend coefficient, $\aleph_i$ is the coefficient for the lagged dependent variable, $\beta_{j,lj}$ is the coefficient for lags of the k independent variables and ε_t is an innovation.

On the other hand, Eq. 2 can also be written as:

$$\aleph(L) = 1 - \sum_{i=1}^{p} \aleph_i \, L^i \;\; and \;\; \beta_j(L) = \sum_{l_j=0}^{q_j} \beta_{j,lj} \, L^{lj}$$

Finally, we can rewrite Eq. 2 as follows:

$$\aleph(L) y_t = \alpha_0 + \alpha_1 t + \sum_{j=1}^{k} \beta_j \, (L) z_{j,t} + \varepsilon_t \quad (3)$$

where, L is the lag operator and $\aleph(L)$ and $\beta_j(L)$ as the lag polynomials.

4. Results and analysis

This research initiates its empirical analysis by providing a descriptive summary of the selected variables, outlining the means and standard deviations as presented in Table 1. Table 1 encompasses seven key variables: GDP, Manufacturing (MANUF), Construction (CONST), Services, Agriculture (AGRICUL), Mining, and Financial. The Gross Domestic Product (GDP) has an average value (mean) of 2.293 with a standard deviation of 7.385. The minimum GDP observed is -20.73, while the maximum is 17.013 across the 43 observations. The manufacturing sector shows an average value of 9.599 but with a higher standard deviation of 12.536. The range of values is substantial, with a minimum of -17.385 and a maximum of 39.796. The construction sector has an average value of 4.277 and a standard deviation of 8.329. The observed values range from a minimum of -14.71 to a maximum of 20.92. The services sector has the highest mean value of 43.22, with a relatively low standard deviation of 7.387. The values for services range from 27.326 to 56.931. The agriculture sector shows an average value of 4.881 and a standard deviation of 5.106. The data varies between a minimum of -2.199 and a maximum of 19.317. The mining sector has an average value of 9.514 but a significant standard deviation of 31.958. The range is extensive, with values spanning from -46.867 to 72.31. Lastly, the financial sector has an average value of 4.512 and a standard deviation of 7.742. The observed values for this sector range from -22.345 to 19.161.

Table 1: Descriptive statistics

Variable	Observation	Mean	Standard deviation	Min	Max
GDP	43	2.293	7.385	-20.73	17.013
MANUF	43	9.599	12.536	-17.385	39.796
CONST	43	4.277	8.329	-14.71	20.92
SERVICES	43	43.22	7.387	27.326	56.931
AGRICUL	43	4.881	5.106	-2.199	19.317
MINING	43	9.514	31.958	-46.867	72.31
FINANCIAL	43	4.512	7.742	-22.345	19.161

The pairwise correlation table (Table 2) offers an overview of the relationships between the GDP and six explanatory variables: manufacturing sector, construction, services, agriculture, mining, and financial. Conversely, GDP shows a negative correlation with the services and agriculture sectors. These findings provide valuable insights into the sectoral dynamics influencing GDP growth. The positive correlations with construction, mining, and financial sectors suggest their potential role as drivers of economic growth, while the negative correlations with services and agriculture sectors may warrant further investigation into the factors affecting their contributions to GDP.

Table 2: Pairwise correlations

Variables	GDP	MANUF	CONST	SERVICES	AGRICUL	MINING	FINANCIAL
GDP	1.000						
MANUF	0.162	1.000					
CONST	0.528***	0.504***	1.000				
SERVICES	0.153	-0.105	-0.575***	1.000			
AGRICUL	-0.161	-0.210	-0.414***	0.318**	1.000		
MINING	0.245***	0.750***	0.400***	0.149	-0.236	1.000	
FINANCIAL	0.354**	0.371**	0.727***	-0.732***	-0.601***	0.271*	1.000

***: p<0.01; **: p<0.05; *: p<0.1

After analyzing the descriptive statistics and pairwise correlations, the current study employs a stationarity test on the dataset to ensure the reliability of its modeling approach. We utilized the Augmented Dickey-Fuller (ADF) test, a widely recognized method in econometrics and time series analysis, to identify the presence of a unit root in the univariate time series data. A unit root signifies non-stationarity in a time series, suggesting that the statistical properties of the series, such as its mean and variance, are not constant over time. Based on the results presented in Table 3, all the selected variables demonstrated stationarity at the first difference level. This finding indicates that the original variables might contain a unit root, implying non-stationarity in their raw form. Consequently, simply employing a multivariate regression model might not be appropriate for estimating the relationships among these variables. The necessity for first-order differencing points to potential unit root issues in the data, which could lead to complications like spurious regression or biased parameter estimates if not appropriately addressed. In addition, it is important to note that both the tests are performed with drift and trend, considering a year lag (due to the smaller number of observations).

Given that selected variables have different orders of integration, we employed an ARDL model for our analysis. The ARDL model is a powerful econometric tool designed to examine the long-term relationships between a dependent variable and its lagged values and the lagged values of one or more independent variables. This approach is particularly advantageous for analyzing time series data that may exhibit mixed orders of integration without requiring prior knowledge of the variables' orders of integration. The ARDL model allows for the inclusion of both short-term dynamics (captured by the differenced values of the variables) and long-term dynamics (captured by the coefficients associated with the lagged variables). This makes it particularly useful for analyzing dynamic relationships between variables in a time series context.

Table 3: ADF unit root test

	P-value	P-value
	Level	1st difference
AGRICUL	0.203897	0.00023
CONST	0.01158	5.47E-05
FINANCIAL	0.206443	0.000903
GDP	0.003167	1.95E-06
MINING	0.004254	0.0001
MANUF	0.009455	0.001375
SERVICES	0.205247	0.000747

Table 4 presents the estimates from the ARDL model specification, and it shows a positive and statistically significant impact of construction industry value addition on the economic growth of Saudi Arabia as the construction sector plays a pivotal role in infrastructure development, which is fundamental for economic progress. Infrastructure, including roads, bridges, airports, and utilities, facilitates trade, enhances connectivity, and attracts investments, thereby stimulating economic activity and growth. Moreover, the government of Saudi Arabia has been actively promoting and investing in infrastructure and mega-projects as part of its Vision 2030 initiative. These large-scale projects not only drive the construction sector but also contribute significantly to the country's overall economic growth.

The estimates in Table 4 show that the value added by the services sector has a positive and significant impact on Saudi Arabia's economic growth. This impact can be explained by several

factors. First, the services sector includes a broad range of activities such as finance, transportation, tourism, education, healthcare, and information technology. These services are essential for supporting other parts of the economy by providing necessary infrastructure, facilitating business activities, and boosting productivity.

Second, the services sector is a major source of job creation in Saudi Arabia. As the population grows and urbanization increases, there is a rising demand for services such as healthcare, education, and retail, which leads to more jobs and income for many people.

Third, the services sector often shows high levels of innovation and productivity growth due to advances in technology and new business models. This innovation often benefits other sectors of the economy, promoting overall growth and improving competitiveness.

The services sector is also strongly connected to other sectors like manufacturing, agriculture, and construction through various linkages. For example, efficient transportation and logistics services improve the competitiveness of manufacturing and export-oriented businesses. In addition, the services sector plays a key role in attracting foreign direct investment (FDI) and international trade in services. Saudi Arabia's strategic location, favorable business policies, and investments in infrastructure have brought in significant FDI in areas like finance, tourism, and telecommunications, further contributing to economic growth. These results align with the findings of Alhowaish and Al-Shihri's (2015) study.

Table 4: ARDL model estimation

	(1)	(2)	(3)
	GDP	GDP	GDP
	(2,0,0,0,0,2,0)	(1,0,0,0,0,1,0)	(1,0,0,0,0,0,0)
L.GDP	-.278	-.174	-.183
	(.167)	(.161)	(.17)
L2.GDP	.069		
	(.155)		
MANUF	-.112	-.17	-.225
	(.145)	(.142)	(.148)
CONST	.548***	.582***	.671***
	(.199)	(.195)	(.201)
SERVICES	.839***	.632**	.448**
	(.289)	(.265)	(.166)
AGRICUL	.321	.153	.219
	(.267)	(.258)	(.27)
MINING	-.018	-.022	.024
	(.06)	(.058)	(.057)
FINANCIAL	.463***	.425**	.404***
	(.193)	(.185)	(.101)
L.MINING	.089**	.088**	
	(.039)	(.04)	
L2. MINING	.088*		
CONST	-39.906***	-28.759**	-20.541
	(13.719)	(12.488)	(12.582)
Observations	41	42	42
R^2	.545	.465	.386

L: First ag term; L2: Second lag term;***: p<0.01; **: p<0.05; *: p<0.1

Also, our estimates show a positive and statistically significant impact of the value addition generated by the financial sector on the economic growth of Saudi Arabia, suggesting that policies, developments, or advancements in the financial sector, such as banking reforms, increased lending activities, or the growth of financial markets, have a tangible and meaningful effect on the broader economy. This impact can manifest in various ways, including facilitating business investments, enabling smoother trade transactions, promoting consumer spending through easier access to credit, and attracting foreign investments.

The estimates in Table 4 show a positive and significant long-term impact of the mining sector on Saudi Arabia's economic growth, which can be explained in several ways. First, Saudi Arabia has large reserves of natural resources, especially oil and gas, which are vital to the global energy market. The mining sector, primarily driven by oil production, makes up a significant part of the country's GDP, government revenue, and export earnings. Over the years, the steady production and export of these resources have greatly contributed to the nation's economic growth and prosperity. Second, the mining sector has supported industrialization and diversification in Saudi Arabia. The revenues from mining have been invested in infrastructure, education, healthcare, and other critical areas, helping to diversify the economy, reduce reliance on oil, and create a more resilient and sustainable economic foundation.

Third, the mining sector has provided many employment opportunities for Saudi citizens, offering jobs that range from manual labor in oil extraction and refining to specialized roles in engineering, management, and research. This has helped to lower unemployment, raise living standards, and improve the overall quality of life.

Additionally, the mining sector has drawn significant FDI and technology transfers, especially in exploring and extracting minerals and metals beyond oil. Government policies, incentives, and regulatory measures have encouraged international collaboration and investment, fostering growth and modernization within the sector.

The mining sector has also promoted the development of related industries and services, such as transportation, logistics, manufacturing, and finance, through strong interconnections. This has led to a diverse and integrated economic network that supports and strengthens the growth and resilience of the mining industry.

5. Conclusion

This paper aims to examine the impact of sectoral value addition on the economic growth in Saudi Arabia. In this context, current research employs variables such as GDP growth rate and the annual growth rate in the value addition of agriculture, construction, mining, services, financial, and manufacturing sectors. This study covers the time from 1980 – 2022. This research employs the ARDL model as some variables are stationary and some are nonstationary at levels. Our estimates reveal a positive and statistically significant impact of the value addition generated by the construction, mining, and services sectors. These results align with

the findings of Alhowaish and Al-Shihri's (2015) study, which also identified significant contributions from key economic sectors to Saudi Arabia's overall economic growth. The positive and statistically significant impact of value addition generated by the construction, mining, and services sectors in Saudi Arabia suggests several practical implications for policymakers and stakeholders.

For instance, the construction sector's positive impact indicates its crucial role in driving economic growth. This sector often acts as a catalyst for development by providing essential infrastructure, creating jobs, and stimulating demand for various goods and services. The government's focus on mega projects, urban development, and housing initiatives under Vision 2030 further amplifies this sector's significance. By continuing to invest in large-scale construction projects, Saudi Arabia can enhance its infrastructure, attract foreign investment, and support other sectors like tourism and retail.

Moreover, the mining sector's substantial contribution highlights the importance of mineral resources beyond oil. Saudi Arabia's rich deposits of minerals, such as gold, phosphates, and bauxite, present opportunities for economic diversification. The Kingdom's strategic initiatives to develop its mining industry can reduce reliance on oil revenues and create new revenue streams. Investing in mining infrastructure, improving regulatory frameworks, and fostering partnerships with international mining companies can enhance productivity and sustainability in this sector.

Similarly, the services sector's impact reflects its growing role in the economy, driven by tourism, finance, healthcare, and education. As Saudi Arabia aims to transform into a knowledge-based economy, developing the services sector is crucial. Expanding tourism through initiatives like NEOM and the Red Sea Project, enhancing financial services to support business growth, and investing in healthcare and education will create a diversified economy with multiple income sources. The services sector can also offer employment opportunities, reduce unemployment rates, and improve the quality of life for citizens.

These findings highlight the importance of having a diversified economic plan, where different sectors work together to support sustainable and inclusive growth. By continuing to use the potential of key sectors, especially the mining industry, Saudi Arabia is in a good position to boost its economic stability, competitiveness, and global standing. However, it is crucial for the country to maintain a balanced approach that promotes sustainable development, protects the environment, and ensures inclusive growth for all. Given the significant positive impact of the construction, mining, and services sectors on Saudi Arabia's economic growth, it is important to create future strategies and recommendations that take into account global challenges such as climate policies, political tensions, pandemics, and changes in monetary conditions.

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.

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