# The Impact of Economic Complexity on Economic Development in Saudi Arabia (1991–2021)

**Eman Saad AlOtaibi[1]**

[1]Lecturer, College of Business Administration, Department of Economics, Taif University, Kingdom of Saudi Arabia.

Email: esotaibi@tu.edu.sa

**Dr. Mohamed Abd ElNaby Mohamed Sallam[2]**

[2] Associate Professor, Department of Economics, College of Economics and Administrative Sciences, Al Imam Mohammad Ibn Saud Islamic University (IMSIU), Riyadh, Saudi Arabia; Department of Economics, Faculty of Commerce, Kafr Elsheikh University, Egypt.

Email: mohamedsallam_2010@yahoo.com

## Abstract:

This study aimed to measure the effect of the Economic Complexity Index (ECI) on economic development by constructing a composite variable representing economic development. It also included the average oil prices as a control variable, given the critical role oil prices play in supporting economic development in the Saudi economy. The study utilized data from the period 1991–2021 and demonstrated the existence of a cointegrating relationship between the study variables in both the short and long run using the Autoregressive Distributed Lag (ARDL) methodology through the Bounds Test.

The results indicated a positive but statistically insignificant relationship at the 5% significance level between economic complexity and economic development in the short run. However, in the long run, the relationship was positive and statistically significant at the 5% level. Additionally, the control variable (oil prices) had a positive and significant effect on economic development in the long run. The findings from the product space analysis revealed that Saudi Arabia possesses untapped knowledge and productive capabilities for manufacturing various complex products, particularly in the chemicals and machinery sectors. Furthermore, Saudi Arabia achieved an advanced ranking in the Economic Complexity Index, surpassing developed G20 countries such as Russia, Spain, Canada, and Australia in 2021.

**Keywords:** Economic Development, Economic Complexity, Average Oil Prices, Saudi Arabia, Product Space, Competitiveness.

## 1. Introduction:

Saudi Arabia ranked 19th globally in terms of GDP in 2021, with a GDP of $804.9 billion, and 38th in terms of GDP per capita, reaching $21,162. Additionally, it ranked 32nd in the Economic Complexity Index in 2020.

To enhance and develop these levels, it is essential to identify the most complex products that should be produced to contribute to increasing GDP and, consequently, funding various aspects of economic development.

### 1.1 Research Problem:

The research problem revolves around the impact of both economic complexity and average oil prices on economic development in Saudi Arabia.

In light of this problem, the study seeks to answer the following sub-questions:

- What is the fundamental concept of economic complexity, and how complex is the Saudi economy?
- What is the product space, and how does Saudi Arabia perform in this area?
- How is Saudi Arabia positioned in global markets?

### 1.2. Significance of the Study:

The importance of this study lies in both theoretical and practical aspects:

**Theoretical Significance:**

- The necessity of evaluating whether economic complexity and average oil prices positively impact various aspects of economic development.
- Enriching the Arab economic research library with theoretical knowledge about significant economic concepts, particularly given the scarcity of Arab studies in this field.

**Practical Significance:**

- The study coincides with Saudi Arabia's Vision 2030, which aims to develop the economic system and diversify income sources through a knowledge-based sustainable economy.
- The study's findings and recommendations are expected to assist policymakers in Saudi Arabia in developing and enhancing economic policies capable of achieving sustainable economic development.

### 1.3. Research Hypotheses:

Based on economic theory, this study assumes the following:

- There is a positive relationship between economic complexity and economic development.
- Assuming that average oil prices act as a control variable, there is a positive relationship between average oil prices and economic development.

### 1.4. Research Objectives:

The primary objective of the study is to measure the relationship between economic complexity and economic development.

Several secondary objectives stem from the main objective, including:

- Analyzing Saudi Arabia's industrial exports using the product space and economic complexity.
- Identifying new products that could enhance the complexity of Saudi Arabia's economy, leading to a more diverse and attractive product mix within its current capabilities.
- Constructing a composite variable representing economic development in the Saudi economy.

### 1.5. Study Terms:

**Economic Complexity:**

A measure of the productive knowledge embedded in a society, reflected in the products it manufactures. This knowledge is assessed by evaluating the diversity and sophistication of a country's industrial product basket.

**Economic Development:**

As defined by Seidman (2005), "Economic development is the process of creating and utilizing physical, human, financial, and social assets to generate economic welfare and improve the quality of life for a community."

### 1.6. Research Methodology:

To achieve its objectives, this study will follow two methodologies:

- **Descriptive-Analytical Method:** To describe and analyze economic complexity, Saudi Arabia's complex products, and the product space.
- **Quantitative and Econometric Method:** To estimate the relationship between the independent and dependent variables under study and to construct the composite variable for economic development, which includes several economic variables.

### 1.7. Study Boundaries:

- **Spatial Boundaries:** The study is limited to Saudi Arabia.
- **Temporal Boundaries:** The period from 1991 to 2021.

## 2. Previous Studies

Several studies have measured the relationship between economic complexity and economic development. Among these is the study by (Felipe et al., 2012), which expressed economic development through GDP per capita across 124 countries using data on 5,107 products for the period 2001–2007. The researchers categorized products into three levels of complexity: high, medium, and low. Their findings indicated a positive correlation between GDP per capita and the share of exports comprising more complex products. They identified machinery, chemicals, and metals as the most complex products, while raw materials, basic goods, wood, textiles, and agricultural products were the least complex. Japan, Germany, and Sweden ranked as the most complex economies, while Cambodia, Papua New Guinea, and Nigeria ranked as the least complex. Additionally, high-income countries were found to be the primary exporters of the most complex products, whereas low-income countries primarily exported fewer complex goods.

Another study by (Alencar et al., 2018) analyzed the relationship between economic complexity and development in Argentina, Brazil, Chile, and Mexico using a descriptive and analytical approach, incorporating product space methodology and the Economic Complexity Index (ECI). Their key findings included:

- Mexico had the highest economic complexity but the lowest income per capita.
- Chile had the lowest economic complexity but the highest per capita income, primarily due to its smaller population compared to the other countries studied.

Similarly, (Britto et al., 2019) aimed to analyze the relationship between economic complexity and economic development, focusing on Brazil and South Korea. They employed a descriptive and analytical methodology using product space analysis, along with quantitative methods to calculate the Revealed Comparative Advantage (RCA) index, the Product Complexity Index (PCI), and the Economic Complexity Index (ECI). Their results revealed the following:

- The Structural Development Index positively correlated with GDP per capita.
- From 1965 to 1975, South Korea's production structure underwent rapid transformation, with notable increases in low-tech goods production, while Brazil's output remained relatively unchanged.
- From 1975 to 1995, the structural gap between the two countries narrowed. South Korea became less diverse but increased its share of medium- and high-tech industries, while Brazil diversified by establishing more medium- and high-tech industries.

- After 1995, South Korea accelerated its structural transformation, increasing the share of medium- and high-tech industries in its exports, whereas Brazil's structural changes stagnated, significantly reducing its economic complexity.
- Brazil's economic complexity remained nascent due to the insufficient development of medium- and high-tech industries.

In the study by (Mealy et al., 2019), the authors provided an explanation of economic complexity and its relationship to economic development. They used mathematical, descriptive, and analytical methods to calculate the Economic Complexity Index (ECI) and the Product Complexity Index (PCI), distinguishing between complexity and diversification. Their findings included:

- The ECI successfully explained variations in GDP per capita and future growth rates across countries, underscoring the importance of accumulating diverse production capabilities.
- Both ECI and diversification were identified as variables contributing to development.
- The relationship between diversification and development is well-established in economic literature, following a U-shaped pattern where countries diversify initially and specialize later in the development process. This aligns with other empirical studies showing a positive correlation between export diversification and economic growth, particularly in less developed countries.
- Unlike diversification, the application of ECI and PCI to export data highlighted patterns of specialization across countries, with richer nations tending to export more complex, technologically advanced products, while poorer nations exported less complex, lower-value products.
- This finding emphasized the importance of technological upgrading in the development process, reinforcing the role of technological capabilities as a crucial determinant of economic development.

Finally, (Le et al., 2022) conducted a study on economic complexity and economic development in Asian countries. Using a descriptive and analytical approach, they analyzed both the ECI and PCI, and employed econometric methods to measure the impact of economic complexity on economic development for the period 2000–2017. Utilizing trade data for over 5,000 products across 197 countries, the researchers concluded the following:

- Among the 197 countries, Japan maintained the highest ranking throughout the study period, with most of its key products possessing high PCI values. South Korea was recognized as a developed country, exporting high-tech products. It ranked 41st in 2000, entered the top 10 economies by 2012, and ranked among the top 5 by 2014.

- Most countries with low economic complexity were in Africa, relying heavily on exports of natural resources like crude oil and petroleum gas (e.g., Chad, Papua New Guinea, Angola, Nigeria, Equatorial Guinea) or agricultural products (e.g., Guinea-Bissau, Ethiopia), which are less complex.
- Complex products, primarily in the chemical industries, were exported by developed countries such as Japan, the USA, and South Korea, while less complex products were mainly exported by developing countries in Africa and Asia.
- High-complexity countries exported high-quality products, whereas low-complexity countries exported lower-quality goods. Among Asian countries, Singapore exported high-quality products, while Brunei exported lower-quality products. Vietnam demonstrated rapid improvement in export quality compared to other nations such as the Philippines, Thailand, and Malaysia.
- The study found a positive impact of economic complexity on economic development in the examined countries. All results indicated that economic complexity, along with infrastructure, education level, trade openness, and financial openness, contributed to economic growth in Asian countries.

## 3. Theoretical Framework

### 3.1 Concept of Economic Development

There are multiple definitions of economic development, and no single, universally accepted definition exists. According to Todaro (1977), economic development is a multidimensional process involving the reorganization and reorientation of the entire economic and social system. Thus, economic development is the process by which a nation improves the living standards of its people along with their political and social welfare.

Turner and Hulme (1997) define development as an economic component that deals with wealth creation and the improvement of material living conditions, along with equitable distribution. The social component is measured by well-being in areas such as health, education, housing, and employment. The political dimension includes values such as human rights, political freedom, suffrage, and forms of democracy. The cultural aspect acknowledges that cultures provide identity and self-worth, representing a way of life characterized by systems of meaning, symbols, and beliefs about the ultimate purpose of life and history. Furthermore, there is a commitment to sustainable and environmentally sound development to ensure that the current generation does not compromise the prospects of future generations.

Tayebwa (1992) considers development as a broad term that goes beyond economic growth or material well-being. It encompasses the economic, social, and political aspects of the entire society, including security, culture, social activities, and political institutions.

From the preceding definitions of economic development, it is evident that they all agree that economic development is a comprehensive process of growth and improvement that covers economic, social, and political aspects. Collectively, these lead to increased individual well-being, higher living standards, and greater gross domestic product (GDP) and gross national product (GNP), as well as optimal education, poverty reduction, unemployment alleviation, and the promotion of freedoms.

### 3.2. Objectives of Economic Development

The objectives of economic development vary from one country to another and from one time period to another within the same country due to differences in economic, social, and political conditions. Nevertheless, there are common core objectives shared by all developing countries, including the following:

- Increasing real national income.
- Raising the standard of living for society members.
- Reducing income and wealth disparities.
- Implementing fundamental changes in the structure of the national economy (Al-Jarrah & Al-Muhaimeed, 2020).

### 3.3. Economic Complexity

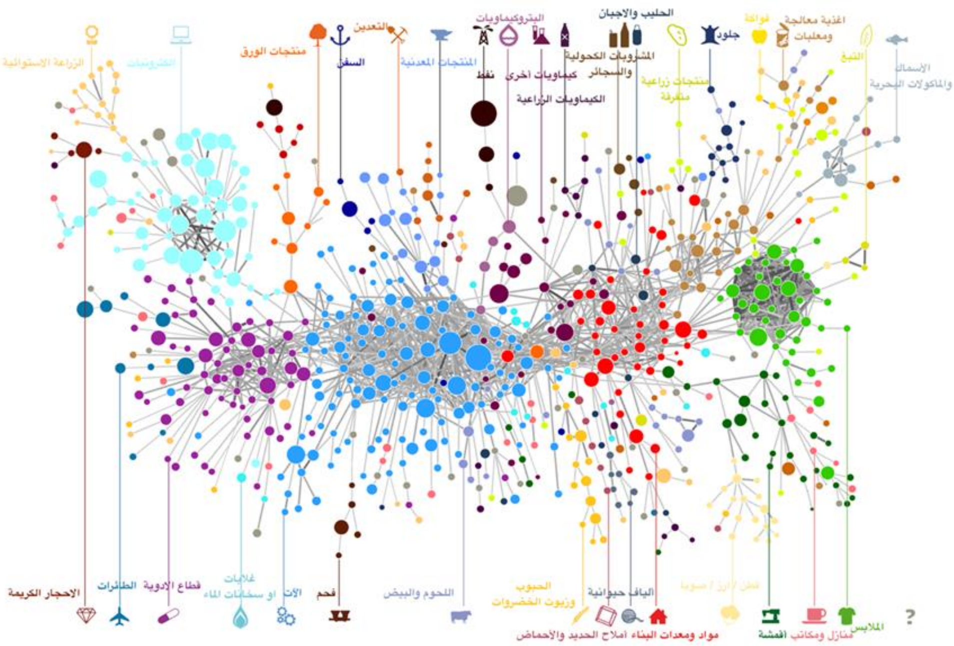
One of the most important modern economic theories is the theory of economic complexity, which measures the set of productive capabilities available in a country (Hidalgo & Hausmann, 2009). These capabilities include, for example, human capital, technology, and the legal system. According to Felipe et al. (2012), the diversity of these capabilities, quantified by economic complexity, determines the level of productivity. Therefore, economic complexity helps explain the differences between countries in terms of income levels and, consequently, economic development (Hidalgo & Hausmann, 2009).

Economic complexity is measured by the structure of production, considering the diversity and ubiquity of products. The greater the diversity of products requiring sophisticated capabilities and the lower the ubiquity of those products, the higher the level of economic complexity. Complex goods demand advanced capabilities, possessed by only a few countries, making them less common and more exclusive to a limited number of economies (Hausmann et al., 2014).

### 3.4. Product Space

The product space is a network that links products likely to be exported together and can be used to predict the evolution of an economy's export structure. Products are connected based on the similarity of capabilities required to produce them. The most complex products are located at the center of the product space and are highly interconnected, while less complex products are found at the periphery with fewer connections (Hausmann et al., 2014). Figure (1) illustrates the connections between products that form the productive space, showing that the products with the highest economic complexity are in the center, whereas those with lower complexity are on the margins.

**Figure (1) :product space**



**Source: (Hausmann et al., 2014)**

Figure (1) illustrates the product space for 750 products. According to (Hidalgo et al., 2007), the most advanced products are concentrated at the core of a densely connected network, while less advanced products occupy the less connected periphery. The core comprises products such as minerals, machinery, and chemicals, whereas the periphery includes a variety of other product categories. At the top of the periphery are products related to fishing, tropical agriculture, and grain cultivation. On the left side are clothing and textiles, followed by a second group consisting of animals and agriculture. At the bottom of the product space is a large group of electronics and metals, followed by forestry and paper products.

## 4. Economic Complexity in Saudi Arabia

In this section, we will determine the level of economic complexity in the Saudi economy, explore the product space, and review Saudi Arabia's exports in 2021. We will assess its competitive capacity by identifying the complexity of its exported products.

### 4.1. The Level of Complexity in the Saudi Economy

The level of economic complexity indirectly measures the knowledge embedded in an economy. Two common methods are used to measure economic complexity based on global trade data.

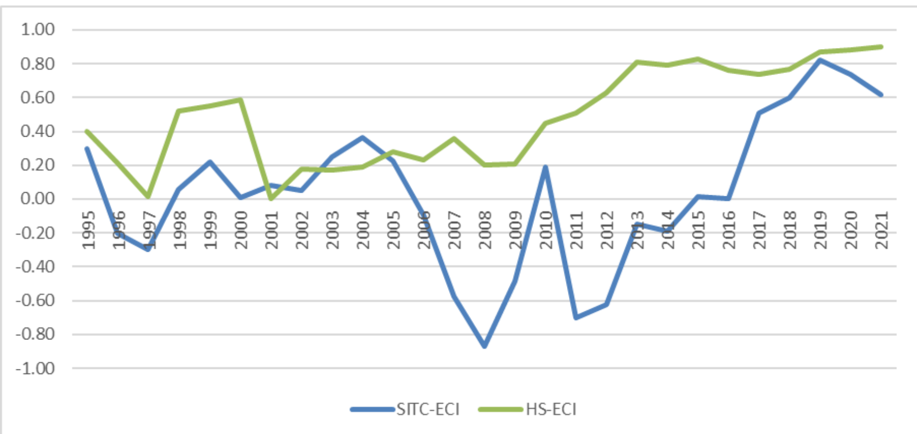
- **SITC Classification Method**:

This method employs trade data classified under the Standard International Trade Classification (SITC). It covers a longer period but involves fewer products—approximately 700—spanning from 1962 to 2021. The index ranges from -3.3 to 3.3.

- **HS Classification Method**:

This method uses the Harmonized System (HS) classification. It covers a shorter period but includes a greater variety of products—approximately 5,000—covering the period from 1995 to 2021. The index ranges from -2.5 to 2.5, where an upward trend indicates an increase in economic complexity. The results and the ranking of countries on the economic complexity scale differ according to these two methods. Figure (2) displays the average Economic Complexity Index (ECI) for Saudi Arabia according to both methods.

**Figure (2): The Economic Complexity Index (ECI) Rate in the Kingdom of Saudi Arabia**




***Source**: Based on data from the Observatory of Economic Complexity (OEC) and the Atlas of Economic Complexity, 2021.*

Figure (2) shows the average Economic Complexity Index for Saudi Arabia. According to the SITC method, the highest ECI was recorded in 2019 at 0.82, and the lowest in 2008 at -0.87. By the HS method, the highest ECI was in 2021 at 0.90, while the lowest was in 1997 at 0.02. The table below presents Saudi Arabia's ranking in the Economic Complexity Index according to both methods.

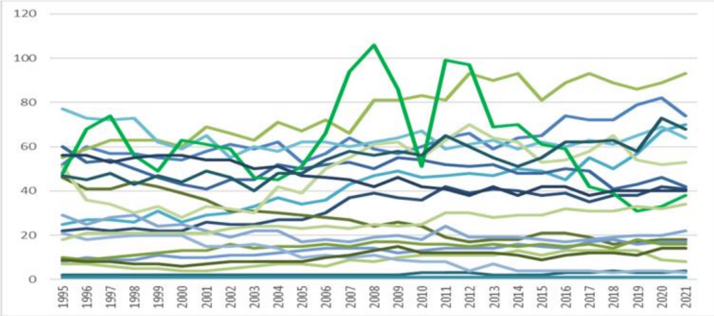
**Table (1) Saudi Arabia's Ranking by Economic Complexity Index**

| SITC Classification | HS Classification | Year | SITC Classification | HS Classification | Year |
|---|---|---|---|---|---|
| 86 | 52 | 2009 | 48 | 42 | 1995 |
| 51 | 41 | 2010 | 68 | 51 | 1996 |
| 99 | 41 | 2011 | 74 | 63 | 1997 |
| 97 | 38 | 2012 | 56 | 37 | 1998 |
| 69 | 32 | 2013 | 49 | 34 | 1999 |
| 70 | 32 | 2014 | 63 | 33 | 2000 |
| 61 | 32 | 2015 | 61 | 42 | 2001 |
| 59 | 35 | 2016 | 59 | 40 | 2002 |
| 42 | 35 | 2017 | 46 | 39 | 2003 |
| 39 | 34 | 2018 | 45 | 43 | 2004 |
| 31 | 32 | 2019 | 51 | 37 | 2005 |
| 33 | 32 | 2020 | 66 | 47 | 2006 |
| 38 | 31 | 2021 | 94 | 44 | 2007 |
| | | | 106 | 54 | 2008 |

***Source***: *Based on data from the Observatory of Economic Complexity (OEC) and the Atlas of Economic Complexity, 2021.*

Table (1) shows Saudi Arabia's ranking in the Economic Complexity Index from 1995 to 2021. It is evident that the HS classification, which covers a broader range of products, placed Saudi Arabia in more advanced positions compared to the SITC classification. Saudi Arabia recorded its lowest rank in 1997 and its highest rank in 2021 according to the HS classification, while according to the SITC classification, the lowest rank was in 2008 and the highest in 2019.

**Figure (3) Economic Complexity Index (ECI) for G20 Countries**



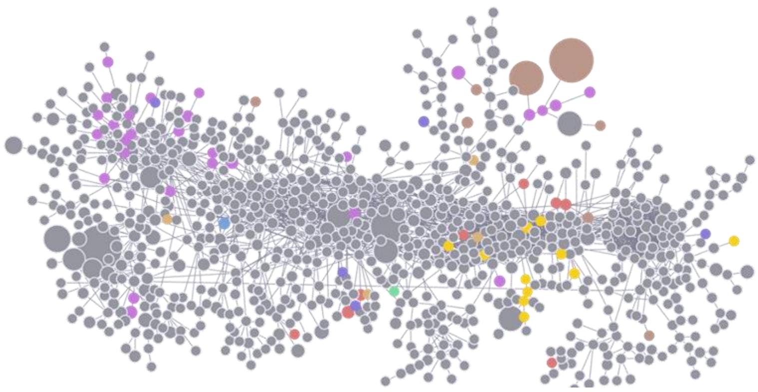

*Source: Based on data from the Atlas of Economic Complexity.*

Figure (3) illustrates the comparison of the Economic Complexity Index (ECI) for Saudi Arabia with the G20 countries. Saudi Arabia ranked relatively high compared to some countries from 1995 to 2006. However, by 2010, Saudi Arabia had outperformed countries such as Australia, Argentina, Indonesia, Russia, South Africa, and India. In 2011 and 2012, the ranking declined, placing Saudi Arabia last among the G20 countries. In 2013 and 2014, Saudi Arabia improved slightly, surpassing Australia. In 2015 and 2016, Saudi Arabia outperformed Australia, Argentina, Indonesia, and South Africa. From 2017 to 2018, Saudi Arabia advanced further, surpassing Argentina, Australia, Brazil, Indonesia, India, Russia, South Africa, and Turkey, with consistent improvements against Turkey since 2018. From 2019 to 2021, Saudi Arabia also surpassed Canada and Spain.

### 4.2. Product Space in the Saudi Economy

The Product Space reflects how products are interconnected based on the knowledge required to produce them. More complex products are typically located at the core of the Product Space map, while less complex products are positioned at the periphery. Below is an analysis of the Product Space for Saudi Arabia in 2021.

**Figure (4): Product Space of Saudi Arabia in 2021**



*Source: Atlas of Economic Complexity*

Figure (4) displays the products exported by Saudi Arabia in 2021 and their interconnections. The size of each circle indicates its share of global exports. For example, crude metals, including crude oil, dominate with an export value of approximately $118 billion out of a total export value of $938 billion, accounting for 12.57% of global exports. The revealed comparative advantage (RCA) of crude metal products ranges from 1.44 to 12.5, indicating that Saudi Arabia exports these products 1.44 to 12.5 times more than its "fair share," suggesting a high comparative advantage. However, crude oil and crude metal exports are located at the periphery, indicating lower economic complexity and weaker interconnections with other products.

In contrast, the chemical products sector shows an RCA ranging from 1.56 to 17.4, with highly complex products like phenols, phenol alcohols, and amine compounds located at the core of the Product Space. Less complex chemical products are positioned on the left and right peripheries, showing weaker interconnections.

Saudi Arabia's agricultural exports, with RCA values between 1.09 and 2.85, exhibit low complexity, with product complexity scores ranging from -1.954 to 0.12. The textile sector has only one product located in the core, indicating potential for producing additional products with available capacities, as the proximity between products suggests higher economic complexity. The RCA for this product is 1.96.

In the stone products sector, Saudi Arabia exports several products, the most complex being drawn and blown glass with a complexity of 1.808 and an RCA of 7.58. Other less complex products include tiles made from natural stone, gypsum, polished glass, and asphalt.

The metals sector exports low-complexity products like iron rods, iron pipes, scrap copper and aluminum, and aluminum pipes. The transportation sector shows a variety of products, some located near the core, such as work trucks with an economic complexity of 0.601, while others, like aircraft launch equipment, locomotives, and special-purpose ships, are located at the periphery, indicating lower complexity.

In the machinery sector, Saudi Arabia exports high-complexity products such as internal combustion engines with an RCA of 1.14 and a product complexity score of 1.136.

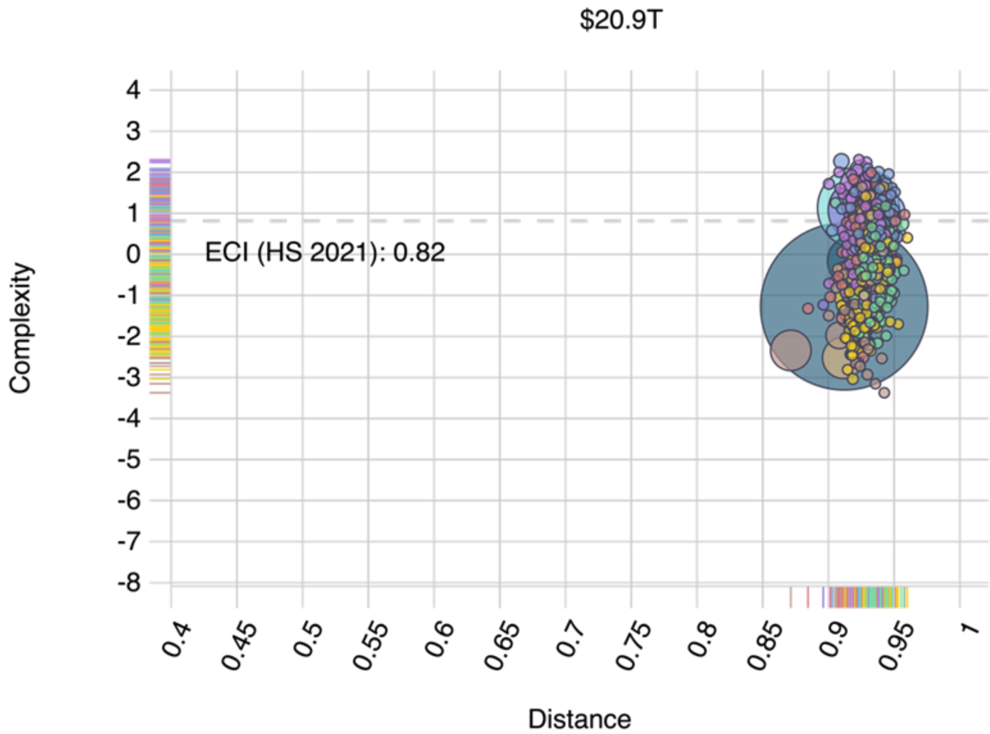
The Product Space highlights potential opportunities for Saudi Arabia to diversify its exports based on its existing knowledge base. Using the concept of "distance," if Saudi Arabia exports product A, it can likely export product B if it requires similar capabilities. The distance ranges from 0 to 1, where a distance closer to 0 indicates shorter proximity and lower risk. If Saudi Arabia exports a large number of products related to product A, the likelihood of shorter distances and closer proximity to zero increases.

### Opportunity Gains

Are all products beneficial to the Saudi economy? This question can be addressed using the "Opportunity Gain" criterion, which assesses the potential impact of adding a new product on Saudi Arabia's economic complexity. Opportunity Gain measures the potential contribution of a new product by opening the door to more complex products. It quantifies the benefit Saudi Arabia would gain by producing product B. This gain depends on the extent to which the new product facilitates the production of increasingly complex goods.

The following figure illustrates all potential opportunities for Saudi Arabia based on distance (ranging from 0 to 1) and Opportunity Gain (ranging from -0.8 to 2) across various sectors.

**Figure (5): Potential Opportunities in Saudi Arabia, 2021**




*Source: Atlas of Economic Complexity.*

Figure (5) shows that Saudi Arabia has the capacity to produce approximately 1,131 products based on its capabilities in 2021, distributed across nine key sectors, which will be detailed later. These sectors include textiles, agriculture, stones, raw minerals, metals, chemicals, vehicles, machinery, and electronics. This is determined based on the criteria of proximity and Opportunity Gain (OG). Below, we highlight only the economically viable products by focusing on the high values of Opportunity Gain and selecting products with high economic complexity.

**Table (2): Products with Viable Opportunities for Production and Export in Saudi Arabia**

**Products with Viable Opportunities for Production and Export (Textile Sector)**

| Products | Proximity | Product Complexity | Opportunity Gain | Products | Proximity | Product Complexity | Opportunity Gain |
|---|---|---|---|---|---|---|---|
| Non-woven textiles | 0.94 | 0.97 | 0.91 | Synthetic filament yarns | 0.91 | 1.25 | 0.79 |
| Technical textile materials | 0.93 | 1.08 | 1.02 | Textile conveyor belts | 0.94 | 1.03 | 0.94 |
| Textile hoses and similar pipes | 0.94 | 1.11 | 1.00 | | | | |

**Products with Viable Opportunities for Production and Export (Agriculture Sector)**

| Products | Proximity | Product Complexity | Opportunity Gain | Products | Proximity | Product Complexity | Opportunity Gain |
|---|---|---|---|---|---|---|---|
| Label printing | 0.94 | 0.86 | 0.84 | Transparent paper | 0.94 | 1.65 | 0.86 |
| Newspapers, magazines, and journals | 0.94 | 0.89 | 0.94 | | | | |

**Products with Viable Opportunities for Production and Export (Stone Sector)**

| Products | Proximity | Product Complexity | Opportunity Gain | Products | Proximity | Product Complexity | Opportunity Gain |
|---|---|---|---|---|---|---|---|
| Ceramic fixtures for artistic tools | 0.923 | 1.16 | 0.90 | Laboratory, sanitary, or pharmaceutical glassware | 0.928 | 0.98 | 1.00 |
| Mills | 0.935 | 1.25 | 1.12 | Glassware signage | 0.932 | 1.43 | 1.05 |
| Other refractory ceramic goods | 0.937 | 1.00 | 0.89 | Mica powder | 0.935 | 1.04 | 0.79 |

**Products with Viable Opportunities for Production and Export (Metals Sector)**

| Products | Proximity | Product Complexity | Opportunity Gain | Products | Proximity | Product Complexity | Opportunity Gain |
|---|---|---|---|---|---|---|---|
| Other iron or steel articles | 0.94 | 0.93 | 0.85 | Iron or steel chains | 0.95 | 1.47 | 1.17 |
| Screws and similar articles | 0.94 | 1.62 | 1.31 | Saws | 0.94 | 1.58 | 1.20 |
| Basic metal fittings | 0.95 | 0.95 | 0.86 | Flat-rolled alloy steel products, width < 600mm | 0.94 | 1.50 | 1.07 |
| Flat-rolled stainless steel > 600mm | 0.93 | 1.14 | 0.77 | Machine knives and blades | 0.94 | 1.71 | 1.35 |
| Tools for interchangeable hand tools | 0.94 | 1.58 | 1.29 | Springs | 0.94 | 0.98 | 0.86 |

**Chemical Products with Promising Opportunities for Production and Export in Saudi Arabia**

| Products | Distance | Product Complexity | Opportunity Gain | Products | Distance | Product Complexity | Opportunity Gain |
|---|---|---|---|---|---|---|---|
| Vaccines and Sera | 0.92 | 1.68 | 0.94 | Vinyl Acetate Polymers | 0.92 | 1.38 | 0.91 |
| Heterocyclic Compounds with Nitrogen Atoms Only | 0.93 | 1.22 | 0.81 | Hydrides, Nitrides, Azides, Silicides, Borides | 0.93 | 1.68 | 0.89 |
| Diagnostic or Laboratory Reagents | 0.92 | 1.42 | 1.00 | Photographic Plates | 0.91 | 1.61 | 0.92 |
| Catalytic Preparations | 0.94 | 1.05 | 1.04 | Prepared Culture Media for Microorganisms | 0.93 | 1.12 | 1.15 |
| Self-Adhesive Plastic Sheets | 0.93 | 1.12 | 1.09 | Natural Polymers | 0.94 | 0.90 | 0.92 |
| Acrylic Polymers | 0.93 | 1.77 | 1.10 | Artificial Graphite | 0.93 | 1.29 | 0.96 |
| Chemical Elements for Electronics | 0.92 | 2.06 | 0.95 | Ion-Exchange Resins Based on Polymers | 0.93 | 1.87 | 1.16 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Glue and Adhesives | 0.92 | 1.51 | 1.10 | Carboximide Derivatives Compounds | 0.93 | 0.75 | 1.09 |
| Lubricating Oils | 0.92 | 1.79 | 1.25 | Esters of Inorganic Acids of Non-Metals | 0.92 | 1.35 | 1.05 |
| Antibiotics | 0.94 | 1.08 | 0.84 | Pickling Preparations for Metal Surfaces | 0.93 | 1.59 | 1.11 |
| Vitamins | 0.93 | 1.13 | 0.92 | Developed Photographic Film | 0.92 | 2.31 | 0.88 |
| Fillers, Gauze, and Bandages | 0.93 | 1.10 | 0.97 | Other Chemically Pure Sugars | 0.94 | 1.10 | 1.14 |
| Silicone in Primary Forms | 0.92 | 1.93 | 1.27 | Non-Metal Halides | 0.93 | 1.67 | 0.93 |
| Petroleum Resins | 0.91 | 1.48 | 1.14 | Composite Rubber | 0.93 | 1.16 | 0.97 |
| Enzymes | 0.93 | 1.21 | 0.95 | Unvulcanized Rubber Rods | 0.94 | 1.24 | 1.10 |
| Non-Sized Cellulose | 0.91 | 1.14 | 0.87 | | | | |

**Products with Promising Opportunities for Production and Export in Saudi Arabia (Vehicles Sector)**

| Products | Distance | Product Complexity | Opportunity Capture | Products | Distance | Product Complexity | Opportunity Capture |
|---|---|---|---|---|---|---|---|
| Cars | 0.92 | 1.07 | 0.88 | Tractors | 0.93 | 1.02 | 0.87 |
| Motor vehicle parts | 0.93 | 1.20 | 1.07 | Self-propelled railcars | 0.94 | 1.52 | 0.88 |

**Products with Promising Opportunities for Production and Export in Saudi Arabia (Machinery Sector)**

| Products | Distance | Product Complexity | Opportunity Capture | Products | Distance | Product Complexity | Opportunity Capture |
|---|---|---|---|---|---|---|---|
| Machines not elsewhere classified | 0.92 | 2.04 | 1.29 | Navigational instruments | 0.93 | 1.22 | 0.99 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Devices for thermally controlled valves | 0.94 | 1.72 | 1.28 | Machines using laser or similar methods | 0.94 | 1.76 | 1.18 |
| Centrifugal devices | 0.94 | 1.00 | 0.96 | Lathes for metal removal | 0.94 | 1.73 | 1.13 |
| Pumps, compressors, fans, etc. | 0.93 | 1.39 | 1.11 | Auxiliary machinery for knitting/textiles | 0.93 | 1.37 | 1.07 |
| Pumps for liquids | 0.94 | 1.31 | 1.24 | Paper-making machines | 0.95 | 1.62 | 1.12 |
| Laboratory photographic equipment | 0.91 | 2.27 | 0.83 | Metal sheet gaskets | 0.93 | 1.04 | 1.04 |
| Drive shafts | 0.94 | 1.31 | 1.13 | Steam turbines | 0.94 | 1.29 | 1.19 |
| Parts for cranes and drilling machines | 0.93 | 1.08 | 0.92 | Machines with grinding stones for metals | 0.94 | 1.59 | 1.14 |
| Measuring instruments | 0.93 | 1.63 | 1.12 | Nuclear reactors and related equipment | 0.93 | 1.42 | 0.90 |
| Printers and copiers | 0.93 | 1.05 | 0.96 | Machines for textile fiber preparation | 0.94 | 1.31 | 1.10 |
| Instruments for physical/chemical analysis | 0.93 | 1.77 | 1.23 | Other machinery parts and accessories | 0.93 | 1.25 | 0.94 |
| Equipment for material temperature alteration | 0.94 | 1.32 | 1.12 | Non-optical microscopes | 0.93 | 2.09 | 1.18 |
| Piston engines for internal combustion | 0.93 | 1.44 | 1.11 | Optical microscopes | 0.93 | 1.13 | 0.86 |
| Ball or roller bearings | 0.94 | 1.41 | 1.12 | Metal drilling machines | 0.94 | 1.05 | 1.04 |
| Automatic regulating instruments | 0.93 | 1.14 | 0.93 | Stone-working machines | 0.94 | 1.37 | 1.19 |
| Dishwashers | 0.94 | 1.25 | 0.98 | Drafting tables and machines | 0.93 | 1.53 | 1.25 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Other lifting machines | 0.93 | 1.04 | 1.02 | Machines for testing material properties | 0.94 | 1.67 | 1.00 |
| Electrical measuring devices | 0.93 | 1.32 | 1.03 | Furnace burners | 0.94 | 1.24 | 1.02 |
| Machines for processing rubber/plastics | 0.94 | 1.71 | 1.21 | Metallurgical machines | 0.94 | 1.13 | 1.01 |
| X-ray equipment | 0.92 | 1.50 | 1.17 | Planing and metal cutting machines | 0.95 | 1.96 | 1.18 |
| Instruments for fluid/gas measurement | 0.92 | 1.12 | 0.96 | Musical instrument parts | 0.94 | 1.41 | 1.19 |
| Forklift trucks | 0.93 | 1.29 | 1.25 | Non-metal/glass polishing or rolling machines | 0.94 | 1.88 | 1.15 |
| Metal foundry casting boxes | 0.94 | 1.45 | 1.17 | Typewriter ribbons and ink pads | 0.91 | 1.11 | 0.83 |
| Machinery parts without electrical features | 0.93 | 1.29 | 1.05 | Boiler auxiliary parts | 0.93 | 1.18 | 0.87 |
| Textile processing machines | 0.95 | 1.29 | 0.93 | Welding machines | 0.94 | 0.99 | 1.09 |
| Machine tools for metal shaping/forging | 0.93 | 1.44 | 1.15 | Bookbinding machines | 0.93 | 1.01 | 1.01 |
| Metal manufacturing centers | 0.94 | 2.01 | 1.15 | Musical instruments | 0.94 | 1.33 | 1.14 |
| Electric lamp assembly machines | 0.92 | 1.62 | 0.99 | | | | |

**Products with Profitable Opportunities for Production and Export in Saudi Arabia (Electronics Sector)**

| **Products** | **Distance** | **Product Complexity** | **Opportunity Gain** | **Products** | **Distance** | **Product Complexity** | **Opportunity Gain** |
|---|---|---|---|---|---|---|---|
| Batteries | 0.94 | 1.19 | 1.01 | Radar | 0.93 | 1.07 | 1.00 |
| Vacuum Cleaners | 0.94 | 1.22 | 0.92 | Electric Welding Machines | 0.94 | 1.51 | 1.31 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Audio Storage Media | 0.92 | 1.60 | 0.84 | Industrial Electric Ovens | 0.93 | 0.89 | 1.08 |
| Single-Function Electrical Machines, n.e.s. | 0.93 | 1.40 | 0.84 | Electrical Traffic Signals and Controls | 0.93 | 1.03 | 0.98 |

*Source: Based on data from the Atlas of Economic Complexity.*

From the above, it is evident that Saudi Arabia possesses untapped capabilities for producing various products across multiple sectors. Among the most notable is the chemicals sector, where the Kingdom demonstrates significant expertise and high economic complexity. Expanding production in this sector will elevate Saudi Arabia's economic complexity, enabling it to achieve higher global rankings.

Additionally, the machinery sector is characterized by numerous high-complexity products that Saudi Arabia has the productive and intellectual capacity to manufacture, based on its current capabilities.

### 4.3. Competitiveness in the Saudi Economy

According to the theories of economic complexity, a country's industrial competitiveness can be estimated by examining its export basket, i.e., the products it can export. Below is a table that outlines the products Saudi Arabia exported in 2021, which contributed 2% or more to global exports and were exported with a revealed comparative advantage (RCA > 1), along with the level of complexity of these products.

**Table (3): Complexity of Saudi Arabia's Exported Products in 2021**

| Products | Product Complexity | Products | Product Complexity |
|---|---|---|---|
| Milk | -0.042 | Phenols and Phenol Alcohols | 1.624 |
| Fermented Dairy Products | -0.196 | Ethers | 0.067 |
| Avocado, Pineapple, Mango, etc. | -1.81 | Epoxides | 1.595 |
| Pasta | -1.153 | Aldehydes | 0.941 |
| Fruit Juices | -0.931 | Ketones and Quinones | 1.314 |
| Raw Hides of Cattle or Horses | -1.14 | Saturated Non-Cyclic Monocarboxylic Acids | 0.864 |

| | | | |
|---|---|---|---|
| Raw Sheep or Lamb Hides | -1.43 | Unsaturated Cyclic Monocarboxylic Acids | 1.314 |
| Tanned Sheep Hides | -1.954 | Amino Compounds | 1.058 |
| Tanned Hides of Other Animals | -2.08 | Oxygen-Function Amino Compounds | 0.537 |
| Cardboard | 0.03 | Isocyanates | 0.996 |
| Toilet Paper | 0.12 | Nitrogen Fertilizers | -1.397 |
| Raw Sulfur | -1.796 | Mixed Fertilizers | -0.931 |
| Natural Sand | -0.911 | Other Coloring Materials | 0.314 |
| Cement | -1.461 | Mixed Alkylbenzene | -0.012 |
| Crude Petroleum Oils | -2.388 | Polyethylene Polymers | -0.21 |
| Refined Petroleum Oils | -0.989 | Polypropylene Polymers | 0.177 |
| Petroleum Jelly | -0.246 | Styrene Polymers | 0.716 |
| Petroleum Coke | -0.802 | Acrylic Polymers | 1.209 |
| Coal Tar Oil (High-Temperature) | 0.049 | Polyacetals | 0.762 |
| Sodium Hydroxide | 0.34 | Asphalt | -0.128 |
| Ammonia | -1.296 | Gypsum | -0.275 |
| Acyclic Hydrocarbons | 0.271 | Drawn or Blown Glass | 1.808 |
| Cyclic Hydrocarbons | 0.681 | Polished Glass | -0.312 |
| Hydrocarbon Derivatives | 0.942 | Iron Bars | -1.461 |
| Acyclic Alcohols | -0.327 | Copper Waste and Scrap | -0.954 |
| Cyclic Alcohols | 0.891 | Monofilament Fibers | 0.14 |
| Internal Combustion Engines (Spark-Ignition) | 1.136 | Uninsulated Copper Wire | -0.333 |
| Work Trucks | 0.601 | Unwrought Aluminum | -1.17 |
| Aircraft Launch Equipment | -0.073 | Aluminum Waste or Scrap | -0.714 |
| Locomotives and Pusher Vessels | -0.929 | Aluminum Plates > 0.2mm | 0.421 |
| Special Purpose Ships | -1.092 | Aluminum Containers < 300L | -0.045 |
| Other Vehicles | -0.194 | Metal Stoppers and Covers | 0.113 |

*Source: Based on data from the Observatory of Economic Complexity (OEC) and the Atlas of Economic Complexity 2021.*

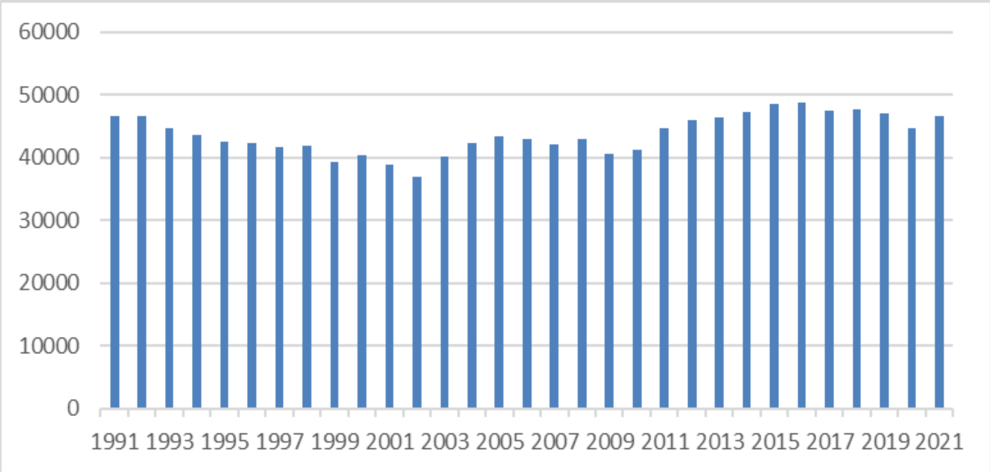
## 5. Economic Development in Saudi Arabia:

### 5.1. Development Indicators in the Saudi Economy

**Per Capita GDP:**

This represents the total value added by all resident producers in the economy, including any taxes on products minus subsidies, divided by the population. The following figure illustrates the average per capita GDP in Saudi Arabia during the study period, expressed in constant prices using the purchasing power parity (PPP) method.

**Figure (6): GDP Per Capita, Purchasing Power Parity (Constant 2017 International Dollars)**




*Source: Based on data from the Saudi Central Bank.*

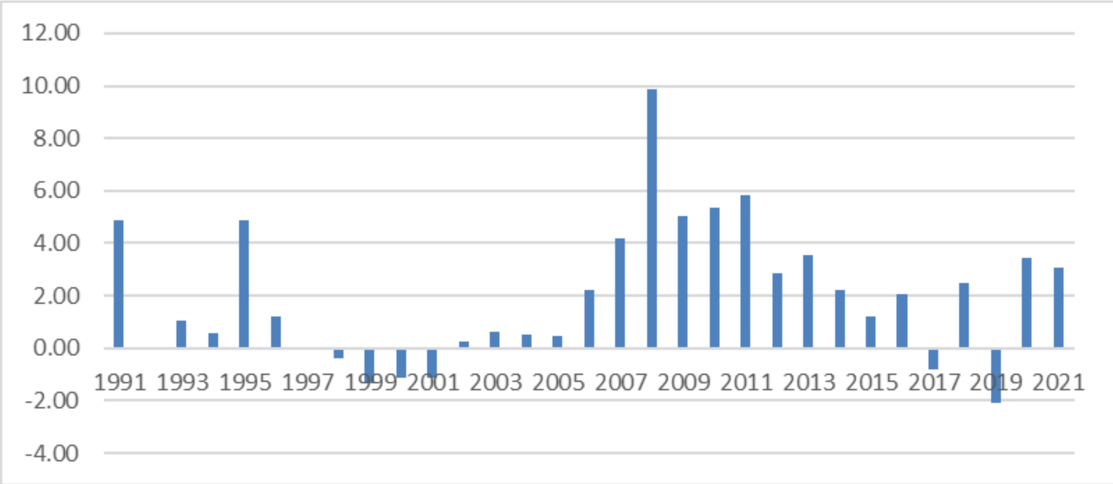
Figure (6) indicates that the highest per capita GDP rates were recorded in 2016. The increase in income levels during this period was primarily due to rising oil prices, which remained at elevated levels from 2011 to 2016. The lowest value was observed in 2002, with the most significant decline occurring in 1999 and 2009. The drop in 2009 was due to a 30% decrease in average oil prices compared to 2008. Conversely, the highest growth in per capita GDP occurred in 2003, with an increase of 9%, and in 2011, with an 8% rise, driven by the average oil price reaching approximately $107 per barrel in 2011. The average per capita GDP in constant prices was $43,437.87, and in 2021, it rose by 4%.

**Inflation Rate:**

Inflation is defined as the rate of increase in prices over a specified period. The following figure shows the inflation rate in Saudi Arabia during the study period.

Academic Journal of Research and Scientific Publishing | Vol 6 | Issue 69
Publication Date: 05-01-2025 ISSN: 2706-6495

**Figure (7): Inflation Rate**



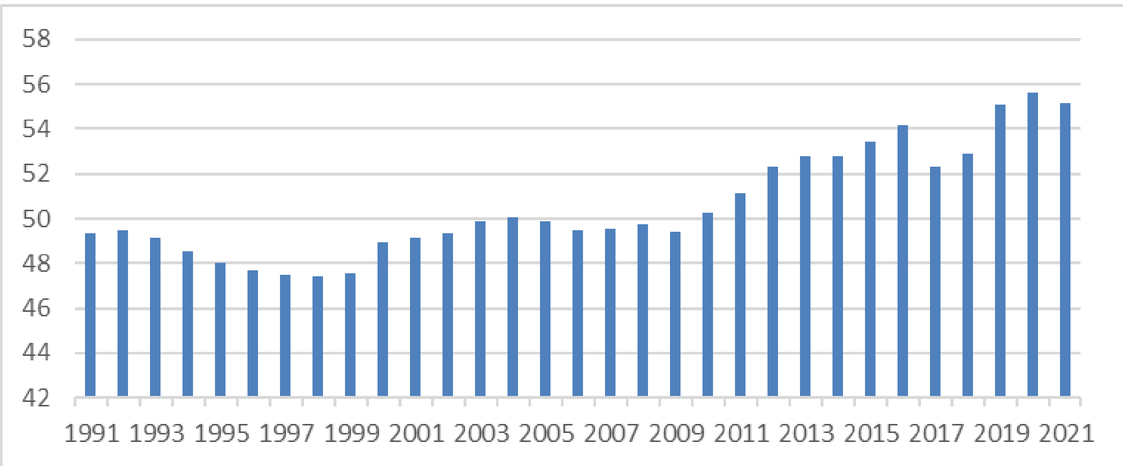

*Source: Based on data from the World Bank.*

Figure (7) illustrates significant fluctuations in inflation rates between periods of increase and decrease. The highest rate was recorded in 2008 when food prices surged by approximately 30%. The most substantial growth in inflation occurred in 2006, with a 361% increase compared to 2005. Inflation declined in 2019 by approximately -2.09 points, a 185% decrease compared to 2018. In 2021, the inflation rate was 3.06, marking an 11% decrease compared to 2020.

**Employment Rate:**

The employment rate is the ratio of employed individuals to the total population. Employment is defined as individuals aged 15 and above working for wages or profit. The following figure illustrates the employment rate in Saudi Arabia during the study period.

**Figure (8): Employment Rate**




*Source: Based on data from the World Bank.*

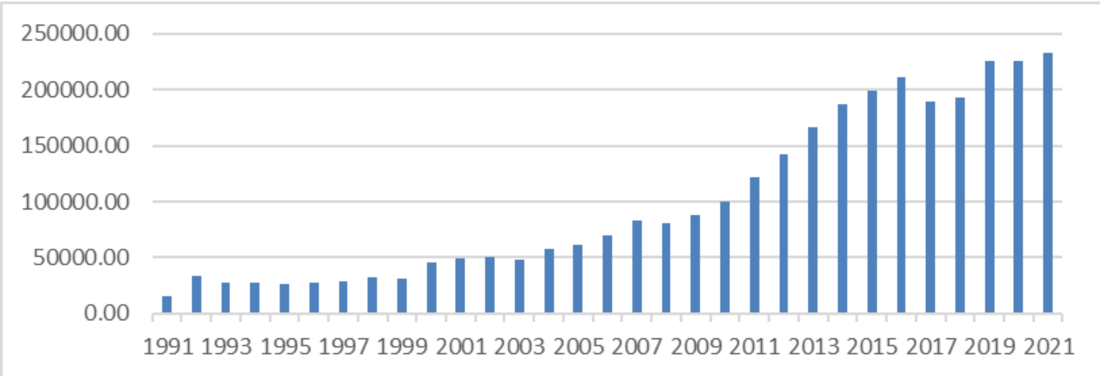
Figure (8) shows that the lowest employment rate was recorded in 1998 at 47.4%, while the highest rate was in 2020 at 55.6%, with an average of 49.76%. The largest decline in employment growth occurred in 2017, with a drop of approximately 3% compared to 2016.

The highest growth rate was in 2019, where employment increased by nearly 4%. Other changes in employment rates fluctuated between -1% and 3%.

**Government Expenditure on Education:**

According to (OECD, 2023), government expenditure on education includes direct spending on educational institutions as well as public subsidies related to education provided to households and managed by educational institutions.

**Figure (9): Government Expenditure on Education**



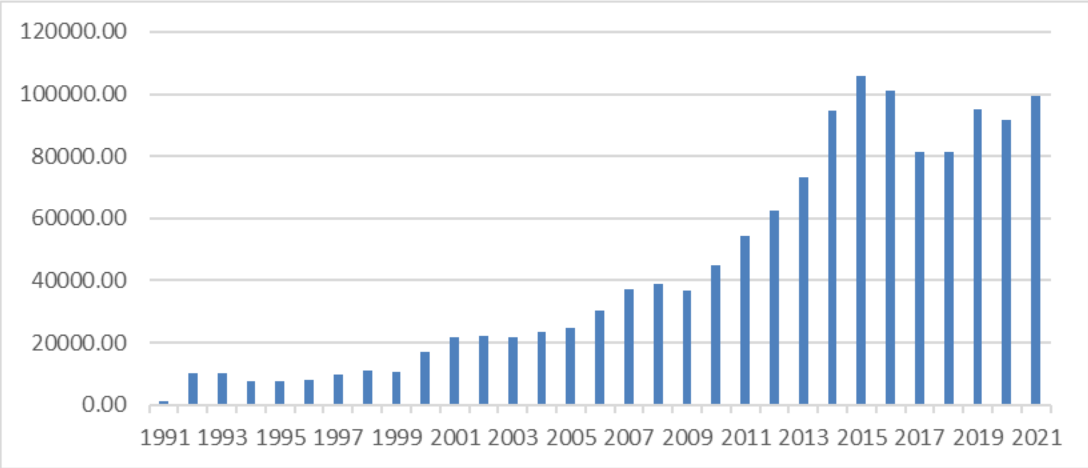

*Source: Based on data from the Saudi Central Bank.*

Figure (9) illustrates that the lowest government expenditure on education occurred in 1991, amounting to approximately 14,906.00 million SAR, while the highest expenditure was in 2021, reaching about 232,580.76 million SAR, with an average of 69,429.00 million SAR over the period. A significant decline was observed in 2017, with an 11% decrease compared to 2016. The highest increase was in 1992, at 127%, followed by a 48% rise in 2000, attributed to a 54% increase in average oil prices that year. In 2011, the increase was 22%, while both 2004 and 2007 witnessed a 20% rise compared to the previous years. In 2021, government expenditure on education increased by 3%.

**Government Expenditure on Health:**

According to the World Health Organization (WHO), government health expenditure encompasses all spending allocated to health services, family planning activities, nutrition activities, and health-related emergency aid.

**Figure (10): Government Expenditure on Health**




*Source: Based on data from the Saudi Central Bank.*

Figure (10) shows government health expenditure between 1991 and 2021, with the highest level in 2015, amounting to 105,825.90 million SAR, and the lowest in 1991, at 1,108.00 million SAR. The average expenditure during the study period was 30,503.00 million SAR. The highest change occurred in 1992, with an increase of 831%, followed by a 59% rise in 2000. This surge is linked to the rise in average oil prices, as seen with government expenditure on education, where the average oil price reached $26.18 per barrel, representing a 54% increase. In 2021, government expenditure on health rose by 8%.

### 5.2. Constructing a Composite Index for Economic Development:

Several studies have introduced composite indices to measure economic development, such as those by (Meyer et al., 2016; Salvati & Carlucci, 2014; Santos & Santos, 2014). These studies utilized various economic, social, demographic, and environmental dimensions, along with numerous variables. In this section, we aim to identify the variables to be included in constructing our index based on the relevant indicators of economic development in Saudi Arabia's economy and previous studies. We propose using five variables encompassing both economic and social dimensions.

**Per Capita Gross Domestic Product (PGDP):**

Per capita gross domestic product is a global measure used to assess the prosperity of nations. Economists employ it alongside GDP to analyze a country's prosperity based on its economic growth. Smaller, wealthier countries and the most advanced industrial nations tend to achieve the highest per capita GDP.

**Inflation Rate (INF):**

Advocates of development through inflation, such as Kaldor, Robertson, Rostow, Hamilton, and Keynes, argue that such a policy is fruitful for capital formation through the redistributive effects of inflation in favor of the wealthy class, who have a higher propensity to save and invest compared to the poor, thus transferring disguised unemployment into industry.

Kaldor (1959) noted that "a slow and stable rate of inflation helps achieve a steady rate of economic progress." Similarly, Robertson (1928) favored a policy of raising price levels. This slow and stable inflation policy is particularly significant in underdeveloped economies, where a large proportion of the workforce is self-employed, and price incentives (via moderate inflation) hold greater importance than wage incentives.

On the contrary, some argue that inflation may hinder development rather than contribute to it. According to Fischer (1993), inflation reduces growth by lowering investment and productivity growth. Furthermore, fiscal deficits diminish capital accumulation and productivity growth.

Friedman (1971) completely disagrees with the policy of "development through inflation," particularly in developing economies. He rejects the argument that inflation stimulates development through its redistributive effects. According to him, it is a mistake to consider deficit financing or printing money as a source of income distinct from taxes and borrowing.

**Employment Ratio (EMR):**

The employment ratio variable was used to create a composite development variable in the study by Meyer et al. (2016), highlighting the correlation between employment rates and levels of economic development. An increase in employment is associated with higher economic development.

**Government Expenditure on Education (GEE) and Government Expenditure on Health (GEH):**

Several studies, such as those by Moosa & Smith (2004) and Abu El-Fotouh & Saad (2022), identify government spending on education and health as indicators of economic development. Studies by Hajebi et al. (2023) and Tomić (2015) demonstrated the positive role of government expenditure on education in GDP growth and economic development. Investment in youth education, training for economic participation, and development in research, development, and science can contribute to the advancement of new technologies and knowledge.

Regarding government expenditure on health, studies by Ndaguba & Hlotywa (2021) and Zhang et al. (2020) also emphasize its positive role in economic development. Investment in health may lead to increased income for healthcare workers, better job opportunities, and improved facilities.

According to Qehaja et al. (2023), countries with higher levels of government health expenditure tend to achieve higher economic growth and, consequently, economic development. Investment in healthcare can increase the supply of health incentives, support human capital, and enhance productivity and economic performance.

Government expenditure on education and health is expressed as a percentage of GDP.

### 5.3. Calculating the Economic Development Index (EDI):

To calculate the composite Economic Development Index, several steps will be followed as outlined below:

**First:** Ensuring the appropriateness of the variables for constructing the composite variable. This is achieved using various methods and tests. Here, we will calculate Cronbach's Alpha and McDonald's Omega coefficients to verify the reliability, validity, and suitability of the variables, as well as their consistency.

**Table (4): Reliability Tests**

| Cronbach's Alpha | N of Items |
|---|---|
| .766 | 5 |
| **McDonald's Omega** | |
| .787 | 5 |

***Source:*** *Calculations performed using SPSS.*

Table (4) shows the result of Cronbach's Alpha coefficient, which is .766, a good and acceptable value. Similarly, McDonald's Omega coefficient is .787, which is also a good and acceptable value.

**Table (5): Item-Total Statistics**

| Item | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted | McDonald's Omega if Item Deleted |
|---|---|---|---|---|---|
| PGDP | 2.13354 | .581 | .435 | .760 | .828 |
| INF | 2.37419 | .737 | .108 | .842 | .831 |
| EMR | 2.32548 | .425 | .824 | .600 | .620 |
| GEE | 1.99190 | .529 | .674 | .676 | .790 |

| | | | | | |
|---|---|---|---|---|---|
| GEH | 2.02648 | .526 | .705 | .666 | .840 |

***Source:*** *Calculations performed using SPSS.*

From Table (5), the **Corrected Item-Total Correlation** column represents the correlation between each sub-index and the total value of the other sub-indices after excluding the respective sub-index from the total value. It is observed that the sub-index *Employment Ratio (EMR)* has the highest correlation value with the other variables at (0.824), followed by the sub-index *Government Expenditure on Health (GEH)* with a correlation of (0.705). The next is the sub-index *Government Expenditure on Education (GEE)* at (0.674), followed by the sub-index *Per Capita GDP (PGDP)* at (0.435). The weakest correlation is observed for the sub-index *Inflation Rate (INF)*, with a correlation value of (0.108).

The **Cronbach's Alpha if Item Deleted** column shows the value of Cronbach's Alpha after removing each sub-index individually. The results indicate that reliability improves if the inflation rate indicator is excluded. On the other hand, reliability decreases if any of the following indicators are excluded individually: *Per Capita GDP, Employment Ratio, Government Expenditure on Health, or Government Expenditure on Education.*

The **McDonald's Omega if Item Deleted** column shows the value of McDonald's Omega after removing each sub-index individually. The results indicate that reliability improves if the following variables are excluded individually: *Per Capita GDP, Inflation Rate, Government Expenditure on Health, or Government Expenditure on Education.* However, reliability decreases if the *Employment Ratio* is removed.

**Second: Data Normalization**

Before normalizing the data, we first examine the descriptive statistics of the variables, as shown below:

**Table (6): Descriptive Statistics of Variables**

| | PGDP | INF | EMR | GEE | GEH |
|---|---|---|---|---|---|
| **Mean** | 43753.75 | 1.963559 | 50.58381 | 0.258352 | 0.105900 |
| **Median** | 43437.87 | 1.222070 | 49.76000 | 0.269726 | 0.118412 |
| **Maximum** | 48691.27 | 9.870248 | 55.60400 | 0.313199 | 0.150320 |
| **Minimum** | 36946.75 | -2.093333 | 47.40100 | 0.116613 | 0.008668 |
| **Std. Dev.** | 3097.404 | 2.630776 | 2.403915 | 0.047785 | 0.033681 |
| **Skewness** | -0.173682 | 0.854496 | 0.650881 | -1.032737 | -1.047238 |

| | | | | | |
|---|---|---|---|---|---|
| **Kurtosis** | 2.135384 | 3.774923 | 2.315283 | 3.560343 | 3.319651 |
| **Jarque-Bera** | 1.121454 | 4.548160 | 2.794421 | 5.916049 | 5.798303 |
| **Probability** | 0.570794 | 0.102892 | 0.247286 | 0.051921 | 0.055070 |
| **Sum** | 1356366. | 60.87034 | 1568.098 | 8.008907 | 3.282898 |
| **Sum Sq. Dev.** | 2.88E+08 | 207.6295 | 173.3642 | 0.068502 | 0.034032 |
| **Observations** | 31 | 31 | 31 | 31 | 31 |

***Source:*** *Calculations performed using EVIEWS.*

From Table (6), it is observed that the variables to be included in the composite variable do not share the same unit of measurement, have different ranges, and exhibit varying minimum and maximum values. To address this issue, we will normalize the data.

**Methodology for Normalization**

The following general formula is used to create the sub-indices:

$$Z_t = \left(\frac{X_t - X_{min}}{X_{max} - X_{min}}\right)$$

Where:

- Zt: The normalized value of variable X.
- Xt: The actual value of the indicator during the study period.
- Xmin : The minimum value of variable X.
- Xmax:The maximum value of variable X.

By applying this formula, the variables used to construct the composite variable will have a common range, yielding values between 0 and 1. The equation is applied to all variables.

**Third: Determination of Weighted Scores**

To determine the weighted scores, the method of constructing weights based on statistical models will be adopted using Principal Component Analysis (PCA). The first step in creating weights using PCA involves verifying the correlation between the data.

**Table (7): Pearson Correlation Coefficient Between Variables Comprising the Economic Development Index**

| Variables | PGDP | INF | EMR | GEE | GEH |
|---|---|---|---|---|---|
| **PGDP** | 1 | .112 | .698** | .040 | .529** |
| **INF** | .112 | 1 | .096 | -.245 | -.345 |
| **EMR** | .698** | .096 | 1 | .393* | .415* |

| | | | | | |
|---|---|---|---|---|---|
| **GEE** | .207 | .034 | .695** | 1 | .941** |
| **GEH** | .217 | .112 | .684* | .941** | 1 |

***Source:*** *Calculations performed using SPSS.*

Table (7) illustrates the Pearson correlation coefficients between the variables under study. A positive correlation between two variables indicates a direct relationship, meaning they increase or decrease together. Conversely, a negative correlation indicates an inverse relationship, where an increase in one variable results in a decrease in the other. The results from the table show positive relationships among the following variables:

- Per capita GDP and employment rate.
- Per capita GDP and the ratio of government health expenditure to GDP.
- Employment rate and the ratio of government education expenditure to GDP.
- Employment rate and the ratio of government health expenditure to GDP.
- The ratio of government health expenditure to GDP and the ratio of government education expenditure to GDP.

In the second step, factor analysis is performed to determine a specific number of latent factors representing the data. Factor analysis decomposes the variance in the data into that accounted for by common and unique factors. This enables the creation of weights that represent the information content of individual indicators without reducing their number.

Each factor relies on a set of loadings, which measure the correlation between individual indicators and the latent factor. When performing factor analysis, only a subset of principal components (factors) that explain the most variance are retained based on the following three conditions:

- Presence of latent root (Eigenvalue) values greater than or equal to 1.
- Individual contribution to explaining general variance greater than 10%.
- Cumulative contribution to explaining general variance exceeding 70% (Commission, 2008).

**Table (8): Total Variance Explained**

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 2.798 | 55.967 | 55.967 | 2.798 | 55.967 | 55.967 | 2.538 | 50.766 | 50.766 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 1.071 | 21.423 | 77.390 | 1.071 | 21.423 | 77.390 | 1.331 | 26.623 | 77.390 |
| 3 | .949 | 18.974 | 96.364 | | | | | | |
| 4 | .127 | 2.548 | 98.911 | | | | | | |
| 5 | .054 | 1.089 | 100.000 | | | | | | |

**Source:** Calculations performed using SPSS.

Based on the above-mentioned criteria and Table (8), it is evident that there are only two factors with significant Eigenvalues:

- The first factor explains **55.967%** of the total variance.
- The second factor explains **21.423%** of the total variance.

These factors cumulatively contribute to explaining **77.39%** of the total variance. The remaining factors contribute minimally, explaining less than 2% of the total variance.

**Table (9): Rotated Component Matrix**

| Variable | Component 1 | Component 2 |
|---|---|---|
| **PGDP** | 0.276 | 0.830 |
| **INF** | -0.080 | 0.596 |
| **EMR** | 0.770 | 0.535 |
| **GEE** | 0.973 | -0.011 |
| **GEH** | 0.957 | 0.036 |

**Extraction Method:** Principal Component Analysis.

**Rotation Method:** Varimax with Kaiser Normalization.

**Note:** Rotation converged in 3 iterations.

**Source:** Calculations performed using SPSS.

Table (9), which represents the Rotated Component Matrix, shows the following:

- The **first factor** contributes significantly to three variables:
  - Employment rate (**EMR**) with a loading of **0.770**.
  - Ratio of government education expenditure to GDP (**GEE**) with a loading of **0.973**.
  - Ratio of government health expenditure to GDP (**GEH**) with a loading of **0.957**.
- The **second factor** contributes significantly to two variables:
  - Per capita GDP (**PGDP**) with a loading of **0.830**.

- Inflation rate (**INF**) with a loading of **0.596**.

**Step Three: Construction of Weights**

Using Table (9), weights for each variable are determined by identifying the highest contribution of each variable to one of the factors, following the method outlined by (Commission, 2008):

**Sum of Variable Weights:**

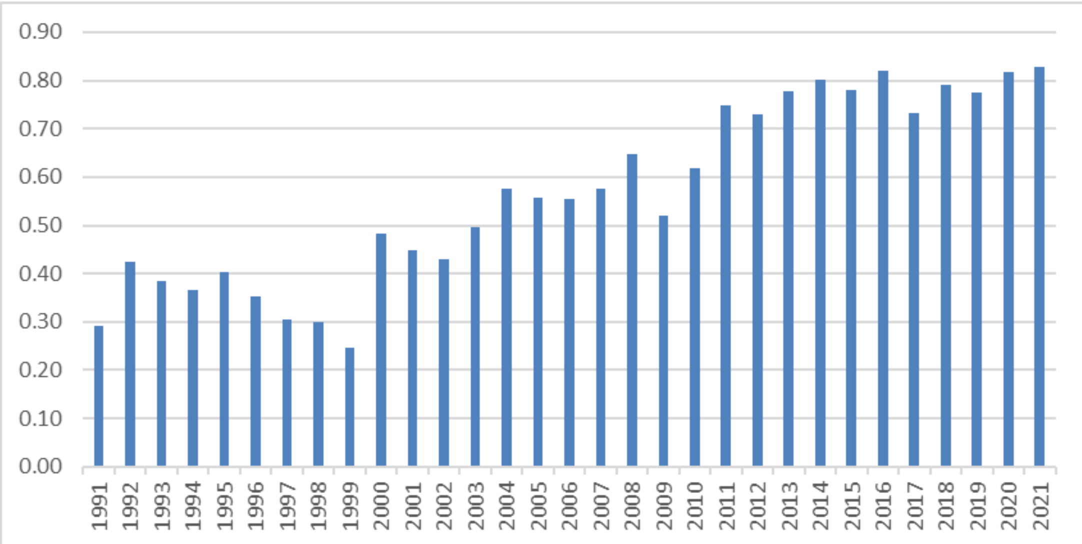
$$W_1 + W_2 + W_3 + W_4 + W_5 = 0.201163 + 0.14445 + 0.186621 + 0.235822 + 0.231944 = 1$$

**Step Four: Aggregation**

Assuming that the variables positively influence economic development, the aggregation formula for the composite index is determined as follows:

$$EDI = (W_1 \times PGDP) + (W_2 \times INF) + (W_3 \times EMR) + (W_4 \times GEE) + (W_5 \times GEH)$$

**Figure (11): Economic Development Index**




***Source:*** *Based on new indicator data.*

### Analysis of Results

**Figure (11)** illustrates that the Economic Development Index (EDI) has experienced several fluctuations, reflecting periods of increases and decreases:

- In **1992**, the index was high due to increases in inflation, per capita GDP, and government health expenditure.
- In **1999**, the index saw its lowest value due to declines in all variables during a period when the average price of oil was **\$17.45 per barrel**.
- The following year (**2000**), the index rose by nearly **50%**, driven by increased oil prices, with an average price of **\$26.81 per barrel**.

- In **2016**, the index was high due to significant increases in per capita GDP and government expenditures on education and health.
- In **2020 and 2021**, the index rose again as a result of the **COVID-19 pandemic**, during which government expenditures on education and health increased significantly to address the crisis.

## 6. Methodology for Measurement, Econometric Model, Descriptive Analysis, and Estimation

This section presents an overview of the variables, formulation of the econometric model, descriptive statistics of the variables in detail, graphical representation, and statistical data. It also includes the analysis and estimation of the econometric model through stationarity tests, cointegration analysis, and the determination of economic relationships between the dependent and independent variables. Lastly, it evaluates the quality and validity of the estimated model.

### 6.1. Econometric Model Formulation and Definition of Variables

To measure the relationship between structural change, economic complexity, and economic development, the following equation is proposed:

$$\boldsymbol{EDI_t = \beta_0 + \beta_1 ECI_t + \beta_2 OP_t + \varepsilon_t}$$

Where:

- β0\ Constant Coefficient
- β1,β2\ Represents the regression coefficients for the independent variables.

**First:** The dependent variable is the **Economic Development Index (EDI)**:

This is the composite index created in this study. The most general measure of economic development is the increase in per capita GDP, as it approximates the overall increase in productivity. However, in certain cases, especially in oil-producing countries, per capita GDP does not necessarily reflect the level of productivity or economic development. Employment rates and inflation levels are also considered good indicators of economic development. Furthermore, government expenditures on education and health contribute to reflecting the level of development and the state's interest in educating and developing human resources and promoting public health. Therefore, a composite variable comprising five variables has been created: per capita GDP, employment rate, inflation rate, government spending on education, and government spending on health.

**Second:** The independent variable is the **Economic Complexity Index (ECI)**:

This measures the relative knowledge intensity of an economy. Empirical studies have shown that economic complexity is linked to economic development and per capita GDP.

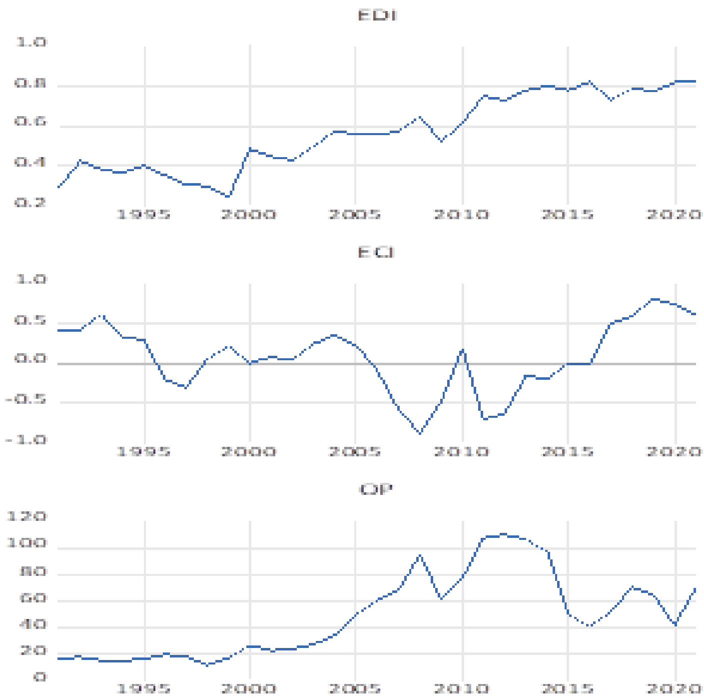
**Third:** The control variable is the **Average Oil Prices (OP)**:

Oil prices are calculated annually by taking the average of oil prices. Saudi Arabia's oil production reaches approximately 7 million barrels per day. A study by (Al-Murabit & Jumaa, 2019) demonstrated the positive impact of rising oil prices on economic growth rates and, consequently, economic development in Saudi Arabia.

## 6.2. Descriptive Statistics of the Variables in the Econometric Model

Descriptive analysis is a critical method for presenting economic data, providing an initial overview of the nature of economic variables over time. This is achieved through graphical representations and descriptive methods. The following section presents a graphical description of these variables along with their calculated values.

**Figure (12): Graphical Representation of Study Variables**




*(Source: Calculated from the study's dataset)*

**Source: Created using EVIEWS**

**Table (10): Descriptive Statistics for the Variables in the Econometric Model**

| Variable | Mean | Median | Maximum | Minimum | Std. Dev. | Skewness | Kurtosis | Jarque-Bera | Probability | Sum | Observations |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OP | 49.22241 | 41.91000 | 110.2200 | 12.20000 | 31.69967 | 0.610560 | 2.117848 | 2.742102 | 0.253840 | 1427.450 | 31 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| EDI | 0.567610 | 0.556844 | 0.820854 | 0.246663 | 0.181024 | -0.053528 | 1.687967 | 2.093909 | 0.351005 | 16.46069 | 31 |
| ECI | 0.055862 | 0.060000 | 0.820000 | -0.870000 | 0.432860 | -0.314757 | 2.499544 | 0.781483 | 0.676555 | 1.620000 | 31 |

**Source:** Calculated using EVIEWS.

Table (10) shows the results of descriptive statistical calculations for the variables in the econometric model to describe the nature of these variables. The following provides a detailed analysis of these variables:

- **Dependent Variable (Economic Development Index - EDI):**
  - The mean value of the economic development index during the study period (1991–2021) was 0.567610, with a median value of 0.556844.
  - The maximum value reached 0.820854, while the minimum value was 0.246663.
  - The standard deviation was 0.181024, indicating moderate variability.
  - The skewness value of -0.053528 suggests a slightly left-skewed distribution, with a kurtosis value of 1.687967, as shown in Figure (21).
  - The Jarque-Bera and Probability test results indicate that the data follow a normal distribution, with a p-value of 0.351005, which is greater than 0.05.
- **Independent Variable (Economic Complexity Index - ECI):**
  - The mean value of the economic complexity index during the study period was 0.055862, with a median value of 0.060000.
  - The maximum value was 0.820000, and the minimum value was -0.870000.
  - The standard deviation was 0.432860, reflecting moderate variability.
  - The skewness value of -0.314757 indicates a slightly left-skewed distribution, with a kurtosis value of 2.499544, as shown in Figure (12).
  - The Jarque-Bera and Probability test results confirm that the data follow a normal distribution, with a p-value of 0.676555, which is greater than 0.05.
- **Control Variable (Average Oil Prices - OP):**
  - The mean value of oil prices during the study period was 49.22241, with a median value of 41.91000.

- The maximum value reached 110.2200, while the minimum value was 12.20000.
- The standard deviation was 31.69967, indicating relatively high variability.
- The skewness value of 0.610560 suggests a slightly right-skewed distribution, with a kurtosis value of 2.117848, as shown in Figure (21).
- The Jarque-Bera and Probability test results indicate that the data follow a normal distribution, with a p-value of 0.253840, which is greater than 0.05.

### 6.3. Econometric Analysis and Estimation of the Study Models

To analyze and estimate the econometric model, we first determine the stationarity of the time series through the **Unit Root Test**. The **Augmented Dickey-Fuller (ADF) Test** is used to assess the stationarity of the study variables.

- **Null Hypothesis (H0H_0H0):** The series contains a unit root and is non-stationary.
- **Alternative Hypothesis (H1H_1H1):** The series does not contain a unit root and is stationary.

Decision criteria:

- If the absolute test statistic is less than the absolute critical value at the 5% significance level and the p-value is greater than 0.05, the null hypothesis is rejected, indicating stationarity.
- Otherwise, the null hypothesis cannot be rejected, indicating the presence of a unit root and non-stationarity of the series.

**Table (11)** presents the results of this test:

**Table (11): Results of the Stationarity Test for Time Series**

| **Variables** | **Augmented Dickey-Fuller Unit Root Test** | | | |
|---|---|---|---|---|
| | **Level** | | **First Level** | |
| | Intercept | Trend and intercept | Intercept | Trend and intercept |
| **Economic Development (EDI)** | -0.387767 | -3.325407 | -5.366102 | -5.292710 |
| 5% level | -2.967767 | -3.568379 | -2.971853 | -3.580622 |
| P-values | 0.8987 | 0.0814 | **0.0001** | **0.0010** |
| **Economic Complexity (ECI)** | -2.016366 | -1.965962 | -5.404926 | -5.471681 |

| | | | | |
|---|---|---|---|---|
| 5% level | -2.963972 | -3.568379 | -2.967767 | -3.574244 |
| P-values | 0.2786 | 0.5955 | **0.0001** | **0.0006** |
| **Average Oil Prices (OP)** | -1.528118 | -1.966538 | -4.936787 | -4.828755 |
| 5% level | -2.963972 | -3.568379 | -2.967767 | -3.574244 |
| P-values | 0.5059 | 0.5952 | **0.0004** | **0.0029** |

**Source:** Based on results obtained using EVIEWS.

### Analysis of the Results:

**1. Dependent Variable (Economic Development Index - EDI):**

- **Level:**
  - The absolute test statistic value (-0.387767) is smaller than the absolute critical value (-2.967767) at a 5% significance level under the intercept scenario, with a p-value of 0.8987 (greater than 0.05).
  - Similarly, under the trend and intercept scenario, the absolute test statistic value (-3.325407) is smaller than the critical value (-3.568379) at a 5% significance level, with a p-value of 0.0814 (greater than 0.05).
  - This indicates the rejection of the null hypothesis, confirming the presence of a unit root and implying that the series is non-stationary at level.
- **First Level Difference:**
  - The absolute test statistic value (-5.366102) is greater than the absolute critical value (-2.971853) at a 5% significance level under the intercept scenario, with a p-value of 0.0001 (less than 0.05).
  - Similarly, under the trend and intercept scenario, the absolute test statistic value (-5.292710) is greater than the critical value (-3.580622), with a p-value of 0.0010 (less than 0.05).
  - This indicates the acceptance of the null hypothesis, suggesting that the series is stationary at the first level difference.

**2. Independent Variable (Economic Complexity Index - ECI):**

- **Level:**
  - The absolute test statistic value (-2.016366) is smaller than the absolute critical value (-2.963972) at a 5% significance level under the intercept scenario, with a p-value of 0.2786 (greater than 0.05).

- Similarly, under the trend and intercept scenario, the absolute test statistic value (-1.965962) is smaller than the critical value (-3.568379), with a p-value of 0.5955 (greater than 0.05).
- This indicates the rejection of the null hypothesis, confirming the presence of a unit root and implying that the series is non-stationary at level.

- **First Level Difference:**
  - The absolute test statistic value (-5.404926) is greater than the absolute critical value (-2.967767) at a 5% significance level under the intercept scenario, with a p-value of 0.0001 (less than 0.05).
  - Similarly, under the trend and intercept scenario, the absolute test statistic value (-5.471681) is greater than the critical value (-3.574244), with a p-value of 0.0006 (less than 0.05).
  - This indicates the acceptance of the null hypothesis, suggesting that the series is stationary at the first level difference.

**3. Control Variable (Average Oil Prices - OP):**

- **Level:**
  - The absolute test statistic value (-1.528118) is smaller than the absolute critical value (-2.963972) at a 5% significance level under the intercept scenario, with a p-value of 0.5059 (greater than 0.05).
  - Similarly, under the trend and intercept scenario, the absolute test statistic value (-1.966538) is smaller than the critical value (-3.568379), with a p-value of 0.5952 (greater than 0.05).
  - This indicates the rejection of the null hypothesis, confirming the presence of a unit root and implying that the series is non-stationary at level.
- **First Level Difference:**
  - The absolute test statistic value (-4.936787) is greater than the absolute critical value (-2.967767) at a 5% significance level under the intercept scenario, with a p-value of 0.0004 (less than 0.05).
  - Similarly, under the trend and intercept scenario, the absolute test statistic value (-4.828755) is greater than the critical value (-3.574244), with a p-value of 0.0029 (less than 0.05).
  - This indicates the acceptance of the null hypothesis, suggesting that the series is stationary at the first level difference.

**Cointegration Test:**

Before conducting the cointegration test, it is necessary to determine the appropriate lag length for the econometric model. Table (12) summarizes the lag selection criteria.

The results show agreement among the criteria, indicating a single optimal lag.

**Table (12): Lag Length Selection**

| Lag | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|
| 0 | -127.2473 | NA | 1.598435 | 8.982574 | 9.124019 |
| 1 | -80.21816 | 81.08477* | 0.116665* | 6.359873* | 6.925651* |
| 2 | -73.54764 | 10.12079 | 0.140303 | 6.520527 | 7.510638 |

**Source:** Based on results obtained using EVIEWS.

**Results of the Cointegration Test:**

The ARDL (Autoregressive Distributed Lag) methodology was applied as per Pesaran et al. (2001). The Bound Test was used to test for cointegration within the ARDL framework.

**Table (13): Bound Test Results**

| F-statistic | Lower Bound - I(0) | Upper Bound - I(1) | Significance Level |
|---|---|---|---|
| 3.907911 | 3.1 | 3.87 | 5% |

**Source:** Based on results obtained using EVIEWS.

The results in Table (13) indicate that the calculated F-statistic (3.907911) is greater than both the lower bound (3.1) and the upper bound (3.87) at the 5% significance level. This confirms the presence of cointegration among the variables and a long-term equilibrium relationship between the independent variables and the dependent variable. Therefore, the null hypothesis of no cointegration is rejected, and the alternative hypothesis is accepted.

**Model Estimation and Error Correction Term:**

Given the existence of cointegration, the model was estimated using an Error Correction Model (ECM) to evaluate the short-term and long-term dynamics between the independent and dependent variables.

**Table (14): ARDL-UECM Error Correction Model**

*Selected Model: ARDL(1,1,0).*

| Variable | Coefficient | Prob |
|---|---|---|
| D(ECI) | 0.029090 | 0.4635 |
| CointEq(-1)* | -0.339758 | 0.0003 |

**Source:** Based on results obtained using EVIEWS.

Table (14) shows a positive but statistically insignificant relationship between economic complexity and economic development in the short term. The coefficient for the error correction term (CointEq(-1)) is significant and negative, indicating that approximately 33% of short-term deviations from the long-term equilibrium in economic development are corrected within one year, suggesting it takes around three years to restore long-term equilibrium.

**Long-Term Estimation Results:**

**Table (15): Long-Run Coefficient Estimation**

*Selected Model: ARDL(1,1,0).*

| Variable | Coefficient | Prob |
|---|---|---|
| ECI | 0.278099 | 0.0096 |
| OP | 0.006691 | 0.0000 |

**Source:** Based on results obtained using EVIEWS.

Table (15) highlights a statistically significant positive relationship between economic complexity and economic development. A 1% increase in the Economic Complexity Index (ECI) leads to a 0.27% rise in economic development. Similarly, average oil prices have a significant positive effect, where a 1% increase in average oil prices results in a 0.066% increase in economic development.

### 6.4. Statistical and Econometric Evaluation of the Estimated Model

To ensure the quality of the model, the absence of structural changes, and the stability and consistency of the parameters, several tests are employed, including autocorrelation tests, normality tests, and heteroskedasticity tests. These are explained in detail below:

**First: LM Test for Autocorrelation**

**Table (16): LM Test for Autocorrelation**

| F-statistic | Obs*R-squared | Prob. F(1,24) | Prob. Chi-Square(1) |
|---|---|---|---|
| 1.140754 | 1.361241 | 0.2961 | 0.2433 |

**Source:** Based on results obtained using EVIEWS.

The results of the Lagrange Multiplier (LM) autocorrelation test indicate no autocorrelation in the residuals, as the p-value of 0.2961 is greater than 0.05. Therefore, the null hypothesis of no autocorrelation in the residuals is accepted. Additionally, the p-value for the Chi-Square test is 0.2433, which is also greater than 0.05, further confirming the absence of autocorrelation.

**Second: Heteroskedasticity Test**

**Table (17): Heteroskedasticity Test**

| **Breusch-Pagan-Godfrey** | | |
|---|---|---|
| **Test** | **Calculated Value** | **p-value** |
| **F-statistic** | 0.677693 | 0.6138 |
| **Obs*R-squared** | 2.934713 | 0.5688 |

**Source:** Based on results obtained using EVIEWS.

The results of the Breusch-Pagan-Godfrey test indicate no heteroskedasticity problem in the residuals. The p-value of 0.6138 for the F-statistic is greater than 0.05, and the p-value for the Chi-Square test is 0.5688, which is also greater than 0.05. Thus, the null hypothesis of no heteroskedasticity is accepted.

**Third: Normality Test**

**Table (18): Normality Test of Residuals**

| | **Jarque-Bera** | **p-value** |
|---|---|---|
| **Result** | 3.990467 | 0.135982 |

**Source:** Based on results obtained using EVIEWS12.

The results of the Jarque-Bera test for normality indicate that the residuals are normally distributed, as the p-value of 0.135982 is greater than 0.05.

**Fourth: Model Specification Test**

To verify the adequacy of the estimated model, the Ramsey RESET test is used. The null hypothesis assumes the correctness of the estimated model, while the alternative hypothesis assumes the model is incorrect.

**Table (19): Ramsey RESET Test**

| | **Value** | **df** | **Probability** |
|---|---|---|---|
| **t-statistic** | 0.126165 | 24 | 0.9007 |
| **F-statistic** | 0.015918 | (1, 24) | 0.9007 |
| **Likelihood ratio** | 0.019890 | 1 | 0.8878 |

***Source:*** *Based on results obtained using EVIEWS 12.*

The results in Table (19) show that the p-value for the F-statistic is 0.9007, which is greater than 0.05. Hence, the null hypothesis is accepted, indicating that the estimated model is correctly specified.

## 7. Results and Recommendations

### 7.1 Results

The study reached the following conclusions:

- There is a statistically significant positive relationship at a 5% significance level between economic complexity and economic development in the long run. This finding aligns with previous studies (Britto et al., 2019; Felipe et al., 2012; Le et al., 2022; Mealy et al., 2019). The results indicate that a 1% change in the Economic Complexity Index (ECI) leads to a 0.21% increase in economic development. This relatively high value highlights the strong influence of economic complexity on economic development. Economic complexity serves as a crucial metric reflecting the advancement of products and exports in Saudi Arabia.
- There is a statistically significant positive relationship at a 5% significance level between average oil prices and economic development in the long run. The findings show that a 1% change in average oil prices results in a 0.0066% increase in economic development. Although Saudi Arabia heavily relies on oil exports, this effect remains relatively small.
- Saudi Arabia's most complex exports in the chemical sector include drawn and blown glass, epoxides, phenols, and phenol alcohols.
- Saudi Arabia has untapped production capabilities to manufacture more complex products across various sectors, as indicated by the results of measuring proximity and the opportunity gain metric. Most of these opportunities are in the chemical and machinery sectors.
- Saudi Arabia ranked 31st globally in the Economic Complexity Index (ECI) in 2021, surpassing several advanced G20 countries, including Canada, Australia, Spain, and Russia.

### 7.2. Recommendations

- Focus on producing and exporting complex products within Saudi Arabia’s capabilities.
- Increase domestic investment to support local industries, enhance economic development, and contribute to creating new job opportunities.

## 8. Referances

Abu El-Fotouh, M. S., & Saad, M. (2022). The Knowledge Economy and Its Impact on Achieving Sustainable Development in Malaysia: An Empirical Study for the Period 1990-2019. Journal of the Faculty of Economics and Political Science, 23(3), 107-134.

Al-Jarrah, M. A., & Al-Muhaimid, A. A. (2020). Principles of Macroeconomics: Concepts and Basics (7th Edition).

Al-Marabit, M. J., & Jumaa, M. (2019). The Impact of Oil Price Fluctuations on Economic Growth Rates: A Comparative Study Between Libya and Saudi Arabia During the Period 2000 to 2017. The Scientific Journal for Commercial and Environmental Studies, 10(Second Issue, Part 1), 561-590.

Alencar, J. F., Freitas, E., Romero, J. P., & Britto, G. (2018). Economic Complexity and Development: An Analysis of the Latin American Case. Novos estudos CEBRAP, 37(2), 247-271 .

Britto, G., Romero, J. P., Freitas, E., & Coelho, C. (2019). The great divide: Economic complexity and development paths in Brazil and the Republic of Korea. Cepal Review .

Commission, J. R. C.-E. (2008). Handbook on constructing composite indicators: methodology and user guide. OECD publishing .

Felipe, J., Kumar, U., Abdon, A & ,.Bacate, M. (2012). Product complexity and economic development. Structural Change and Economic Dynamics, 23(1), 36-68 .

Fischer, S. (1993). The role of macroeconomic factors in growth. Journal of monetary economics, 32(3), 485-512 .

Friedman, M. (197 .(1Government revenue from inflation. Journal of political Economy, 79(4), 846-856 .

Hajebi, E., Billing, C., & Hajebi, M. (2023). The Effect of Government Expenditure on Education on the Enrollment Rate of Different Educational Levels in Selected OECD Countries. International Journal of Scientific Research and Management (IJSRM), 11(05), 2783-2795 .

Hausmann, R., Hidalgo, C. A., Bustos, S., Coscia, M., & Simoes, A. (2014). The atlas of economic complexity: Mapping paths to prosperity. Mit Press .

Hidalgo, C. A., & Hausmann, R. (2009). The building blocks of economic complexity. Proceedings of the national academy of sciences, 106(26), 10570-10575. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2705545/pdf/zpq10570.pdf

Hidalgo, C. A., Klinger, B., Barabási, A.-L., & Hausmann, R. (2007). The product space conditions the development of nations. Science, 317(5837), 482-487 .

Kaldor, N. (1959). Economic growth and the problem of inflation. Economica, 26(104), 287-298 .

Le, T. T. M., Niem, L. D., & Kim, T. (20 .(22Economic Complexity and Economic Development in ASEAN Countries. International Economic Journal, 36(4), 556-568. https://doi.org/10.1080/10168737.2022.2142643

Mealy, P., Farmer, J. D., & Teytelboym, A. (2019). Interpreting economic complexity. Science advances, 5(1), eaau1705 .

Meyer, D., De Jongh, J., & Meyer, N. (2016). The formulation of a composite regional development index. International journal of business and management studies, 8(1), 100-116 .

Moosa, I. A., & Smith, L. (2004). Economic development indicators as determinants of medal winning at the Sydney Olympics: an extreme bounds analysis. Australian economic papers, 43(3), 288-301 .

Ndaguba, E. A., & Hlotywa, A. (2021). Public health expenditure and economic development: The case of South Africa between 1996 and 2016. Cogent Economics & Finance, 9(1), 1905932 .

OECD. (2023). Public spending on education (indicator .(

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. Journal of applied econometrics, 16(3), 289-326 .

Qehaja, S. S., Qehaja, D., Hoti, A., & Marovci, E. (2023). The relationship between government health expenditure and economic growth: Evidence from western Balkan countries. International Journal of Applied Economics, Finance and Accounting, 15(1), 10-20. https://doi.org/10.33094/ijaefa.v15i1.724

Robertson, D. H. (1928). Theories of banking policy. Economica(23), 131-146 .

Salvati, L., & Carlucci, M. (2014). A composite index of sustainable development at the local scale: Italy as a case study. Ecological Indicators, 43, 162-171 .

Santos, M. E., & Santos, G. (2014). Composite indices of development .

Seidman, K. F. (2005). Economic development finance. Sage .

Tayebwa, B. (1992). Basic Economic: The economic problems STA. In: Kampala.

Todaro, M. P. (1977). Economic Development in the Third World: An introduction to problems and policies in a global perspective. Pearson Education .

Tomić, Z. (2015). Analysis of the impact of public education expenditure on economic growth of European Union and BRICS. Economic analysis, 48(1-2), 19-38 .

Turner, M., & Hulme, D. (1997). Governance, administration and development: Making the state work. Springer .

Zhang, X., Zong, G., & Xiao, D. (2020). Effects of government healthcare expenditure on economic growth based on spatial Durbin model: evidence from China. Iranian Journal of Public Health, 49(2), 283 .