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King Abdullah Petroleum Studies and Research Center

Economic Diversification Under Saudi Vision 2030: Sectoral Changes Aiming At Sustainable Growth

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March 2021

10.30573/KS--2021-DP06

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Executive Summary

Economic conditions continuously evolve. We easily notice sudden shocks, such as the 2008 financial crisis or the recent economic downturn inflicted by the COVID-19 pandemic. At the same time, there are adjustments taking place at a much slower pace, spread over decades with wide-ranging technological, structural, and social impacts. This study focuses on such a long-term and wide-ranging change envisaged for Saudi Arabia, outlined in the Saudi Vision 2030 initiative – a blueprint for the Kingdom's socioeconomic transformation. The aim of this paper is to understand the macroeconomic and structural implications of Vision 2030's key transformation targets and its implementation in more detail, with an emphasis on economic diversification and the associated sectoral adjustments. The discussion contributes to shaping the roadmap toward a diversified and sustainable Saudi economy.

Economic diversification is one of the pillars of the transformation, as it is closely linked to benefits such as resilience to external shocks, promoting entrepreneurial opportunities, and developing the national skills base, among others. To capture the wide-ranging technological and structural adjustments, we rely on the input-output framework, which provides rich sectoral granularity and represents the vital energy and petrochemical sector well. We identify specific clusters of thematically linked activities that will contribute most to the diversification process throughout this decade. These range from the well-established petrochemicals sector to new diversification focal sectors such as advanced manufacturing and services. We measure the impact on Saudi Arabia's economic structure of proceeding with the diversification paths outlined in Vision 2030 by applying the Shannon-Weaver index to sectoral gross domestic product (GDP) and household income. We also conduct a sensitivity analysis to scrutinize the benefits of diversification for the resilience of the Saudi economy to external demand shocks. The developments in the expenditure components indicate a move toward a more advanced and sustainable economy overall, while the transformation within the energy sector points to a shift of Saudi Arabia to a modern energy hub that provides fuels according to future demand.

Indeed, the applied measure of economic diversification indicates a considerable improvement in sectoral diversity over the coming decade, which in turn will make the Saudi economy more resilient to external demand shocks, as suggested by the outcome of the sensitivity analysis. The preferred diversification pathways will promote the private sector, boost local content, and produce higher value-added exports, making the economy more self-sufficient and less dependent on revenues linked to the basic oil and gas sector. Some of the diversification focal sectors are mostly in their infancy and have a vast potential for expansion, especially in creating value-added and higher-skilled jobs, acquiring know-how and new technologies, and establishing a basis for homegrown research and development. Overall, the study tracks how the implementation of the Vision 2030 key transformation targets could move the Saudi economy toward a sustainable growth model, mainly through viable economic diversification.

Introduction

The last decade has brought about substantial changes that have had profound implications for traditionally hydrocarbon resource-rich economies. Some of the adjustments have been in response to changes on the supply side, such as the shale oil and gas revolution in the United States and the discovery of new reserves worldwide. Other adjustments have been in response to changes on the demand side, including increasing support for renewable energy and an expansion in the use of electric vehicles. Whether global oil demand will peak is currently under discussion, while oil supply has shifted from being scarce to relatively abundant by historical standards. Carbon pricing could prove to be another crucial adjustment factor – attributing a global value to carbon may speed up the transition to clean energy and may also provide an opportunity for growth in renewables or carbon capture use and storage. Besides these longer-term transformations, oil-exporting countries are also exposed to sudden and severe shocks, such as the 2008 financial crisis and the recent economic downturn caused by the response measures to the spread of the COVID-19 virus. This produced pronounced declines in global oil prices and a substantial reduction in government income and overall wealth.

Economic conditions may change radically over either the short or long term. The question is whether there is no other option for a hydrocarbon resource-rich economy than to be held hostage to the fluctuations in global oil prices, which are likely going to remain part of macroeconomic developments and cycles. The general solution to a changing environment is: adapt! From the macroeconomic perspective, this means diversifying the economy to broaden its income base and significantly reduce its dependence on oil revenues. Saudi Vision 2030 (CEDA 2016) represents a complex plan for substantial socioeconomic transformations that will move the economy toward more diversification and sustainability over the coming decade. We introduce the term ‘preferred diversification paths’ to mark sets of thematically connected economic activities. These are mutually coherent from a macroeconomic perspective and reflect Vision 2030 transformation targets. This discussion paper examines Vision 2030’s preferred diversification paths for the Saudi economy in more detail, with a focus on the foreseen adjustments in the sectoral composition of the economy, alongside broader macroeconomic shifts.

This paper’s evaluation of the impacts of the diversification measures is based on the updated Vision 2030 Input-Output Table (V2030 IOT), which maps the changing structure of the Saudi economy over the coming decade. While a traditional IOT represents a static snapshot of an economy in a single year, the V2030 IOT is dynamic and captures the expected economic transformation until 2030 (Havrlant 2020). The tool enables a better grasp of a particular economic plan and sets the basis for a future assessment of the transformation. We discuss the assumed expansion of the diversification focal sectors, their changing contribution to the country’s overall economic activity, and identify the preferred diversification paths for the Saudi economy. The advances in economic diversification are measured by applying the Shannon-Weaver index to sectoral gross domestic product (GDP) and household income. This measurement indicates a considerable increase in the diversity of the country’s economic structure facilitated by the implementation of the Vision 2030 key transformation targets. The expected sectoral changes are wide-reaching, so basic macroeconomic relations, such as an increase in the relative share of household income and consumption, reflecting the buoyant expansion of the private sector, are also subject to adjustments. The share of the services sector is set to almost double over the projection horizon, while non-oil exports should benefit from further progress in advanced

manufacturing. Both manufacturing and services will likely contribute to an increase in local content as import intensity recedes in areas with higher value-added, such as advanced metal and plastic products, pharmaceuticals and tourism.

Our analysis shows that upscaling petrochemicals to higher value-added production, the introduction of renewables into the energy mix on a larger scale, boosting the private sector share in advanced manufacturing, and the promotion of specific services are key to the Kingdom's successful economic diversification. Renewable energy represents a considerable opportunity for diversification and growth within the energy sector, and potentially in the agriculture, advanced manufacturing, and services sectors. Some of the diversification focal sectors are naturally embedded in the existing industrial structure of the Saudi economy, while there is the potential for further economic development from boosting high value-added production and setting the stage for research and development. Other diversification measures are in initial development phases but carry a huge potential for growth in terms of value-added and job creation, particularly in the services sector. We conduct a sensitivity analysis by applying a stylized shock to final demand in the basic oil and gas sector to examine the effects of the diversification initiatives on the resilience of the Saudi economy to external shocks. Indeed, enhanced sectoral diversity would considerably boost the country's economic resilience between 2020 and 2030.

The next section discusses economic diversification more generally, focusing on its broader benefits and measurement. Section 3 provides the background on the updated V2030 IOT, which creates the basis for sectoral projections reflecting the key Vision 2030 socioeconomic transformation targets. Selected diversification focal sectors are introduced in Section 4, along with the preferred diversification paths and their integration into the Kingdom's existing industrial structure. The resulting broader macroeconomic adjustments of the wide-reaching sectoral shifts are addressed in Section 5, and specific aspects of the diversification process related to the sustainability of the energy sector are discussed in Section 6. Concluding remarks and considerations are presented in the final section.

Diversification and Its Measurement

The recent COVID-19-induced economic downturn has clearly demonstrated that individual sectors can be affected in a heterogeneous way during a severe economic downturn, as discussed by Havrlant et al. (2020) for the Saudi economy. Some sectors, such as air transport and tourism, were heavily exposed to the shock and almost ceased operating, while other sectors, such as healthcare and water transport, were only marginally affected. The timing in sectoral response also matters, with some sectors suffering quick losses due to an instant fall in global demand and prices, mediated by the highly liquid global markets. This was the case for most commodities, including oil and gas. Meanwhile, the decline in other sectors, food industry or selected durable goods and services, may have a significant lag. It makes an enormous difference whether a large part of an economy collapses within a few weeks and months, or whether the decline is spread gradually over several quarters, with some sectors more resilient and slower to respond than others.

Overall, an overrepresentation of one sector in the national or regional economy creates a basis for sudden and severe economic downturns with potentially wide-ranging socioeconomic implications and an insufficient buffer area. Such a setup implies more severe repercussions for the labor market and fiscal health, including an elevated likelihood of malicious second-round effects such as the obsolescence of capital, long-term unemployment, and a deterioration of skills. Moreover, it makes a difference whether the economy shows an excessive concentration in the automotive industry, such as in some middle-European countries, or in the oil and gas sector, such as in many hydrocarbon resource-rich countries. There are some clear advantages from a concentration in the car industry, such as the accumulation of know-how in automation, a denser supply chain, positive spillover effects to other sectors and the development of advanced skills. In any case, appropriate economic diversification is a credible and feasible way to mitigate the vulnerability of any mono-sectoral economy. It also offers some additional non-negligible benefits for economic resilience and sustainability, and the potential for positive spillovers to the environment and livability. The wide-reaching positive socioeconomic effects of suitable economic diversification are listed below.

- Resilience to external shocks
- Improved internal stability
- Opening entrepreneurial opportunities
- Development of skillful labor force
- Attraction and retention of talents
- Broader government income base
- Improved livability
- Positive environmental spillovers

A diversified economy provides more opportunities for a highly skilled labor force and creates the right incentives to attract and retain talented people. These factors are the basis of entrepreneurship and business development. Indeed, an economy is a densely interconnected system with many loops and feedbacks. Once the economic environment is right, emerging opportunities create further opportunities, establishing a virtuous spiral. However, this is not a straightforward or trivial task, as even the most advanced economies cannot get some aspects of their economic and regulatory framework to work for the benefit of society in an efficient way (Cherif et al. 2016). Getting the economic environment right is a complex and dynamic process, especially

as societies face continuous and, often, rather swift adjustments. The following areas are key to making economic adaptation, transformation and diversification a long-term success.

- Education: establishing appropriate skills and incentives
- Labor market: allocating labor efficiently and improving skills
- Business environment and regulation: supporting emerging businesses
- Sectoral composition: lower or higher value-added production, including research and development (R&D)
- International linkages: strengthening the position of advanced production in global value chains, improving non-oil trade balances

This study focuses on adjustments in the sectoral composition and international linkages, which are crucial to economic diversification. We follow the key targets of Saudi Vision 2030, the Kingdom's blueprint for socioeconomic transformation. Vision 2030 reflects the Kingdom's determination to become a global investment powerhouse and substantially boost its non-oil sector and revenues. The implementation of Vision 2030 will significantly change the economy's sectoral composition, with the manufacturing and service sectors becoming pillars of its sustainable growth. We elaborate on how the country's economic structure is expected to change from 2020 to 2030 in more detail, attempting to answer questions such as, Which sectors have high growth potential? Which are suitable for increasing local content? Are there good opportunities for growth through exports? What are the main macroeconomic and sectoral consequences of the transformation? Economies in various stages of development have different needs, possibilities and bottlenecks concerning economic adaptation. This paper attempts to detail the preferred diversification paths for Saudi Arabia and to quantify the sectoral and macroeconomic impacts of their implementation.

We measure the expected degree of economic diversification for the Saudi economy between 2020 and 2030. Various alternative measures of economic diversification are widely used, such as the Ogive Index (Tress 1938), the Hirschman-Herfindahl Index (Herfindahl 1950; Hirschman 1964), the Krugman Specialization Index (Krugman 1991), among others. This study does not aim to discuss the subtle differences among these measures, and their application would most likely lead to congruent conclusions. We apply the Shannon-Weaver index to examine the magnitude of the envisaged sectoral changes (Hackbart and Anderson 1975) over the coming decade. The selected index has the desirable properties of an appropriate diversification measure: it is independent of the ordering of industries, can be decomposed, and meets the axiom of progressive transfers. More details on the properties can be found in Theil (1971). In principle, the original Shannon entropy function from the field of communications theory (Shannon 1948) is applied to sectoral GDP shares in the economy as follows. With $p_1, p_2, \dots, p_n$ denoting the relative share of each of the n economic sectors, the entropy measure of diversification $D(p_1, p_2, \dots, p_n)$ can be calculated as

$$D(p_1, p_2, \dots, p_n) = -c \sum_{i=1}^{n} p_i \log p_i ,$$

where the scale of measurement c is defined by an arbitrary constant. For convenience, this is usually set in a way that D lies between zero and one, such as for $c = 1/\log n$, or between zero and 100, as in this application.

If one industry completely dominates and its share comes close to one, with all the other sectoral shares becoming negligible, the diversification index approaches zero value, with

$\lim_{p\to 1} p\log p = 0$ and for all other sectors $\lim_{p\to 0} p\log p = 0$

In contrast, with all sectors in the economy represented equally, the Shannon-Weaver index approaches its maximum value of $c\log n$ (or 100 in our specification), pointing to a complete sectoral diversification with

$p_1 = p_2 = \cdots = p_n = {}^1/_n$ and $D(1/n, 1/n, \ldots, 1/n) = c\log n$

At such a stage, any sector can take the role of a basis for adaptation and further development, should economic conditions change. The economy is also resilient to sudden shocks, as it does not collapse all at once, with individual sectors responding in a heterogeneous way and in various time horizons. Meanwhile, the more the weight of a single sector increases at the expense of other industries, the lower the economic diversification and the value of the index. In the case of an economy with only one dominant sector, the index approaches zero. Such is the case even if there are many different industries and services in the economy, albeit with insignificant weights compared with the prevailing sector. In this case, the economy is not diversified at all. Its ability to withstand any sudden shock and respond to challenges such as the changing technological environment is very limited.

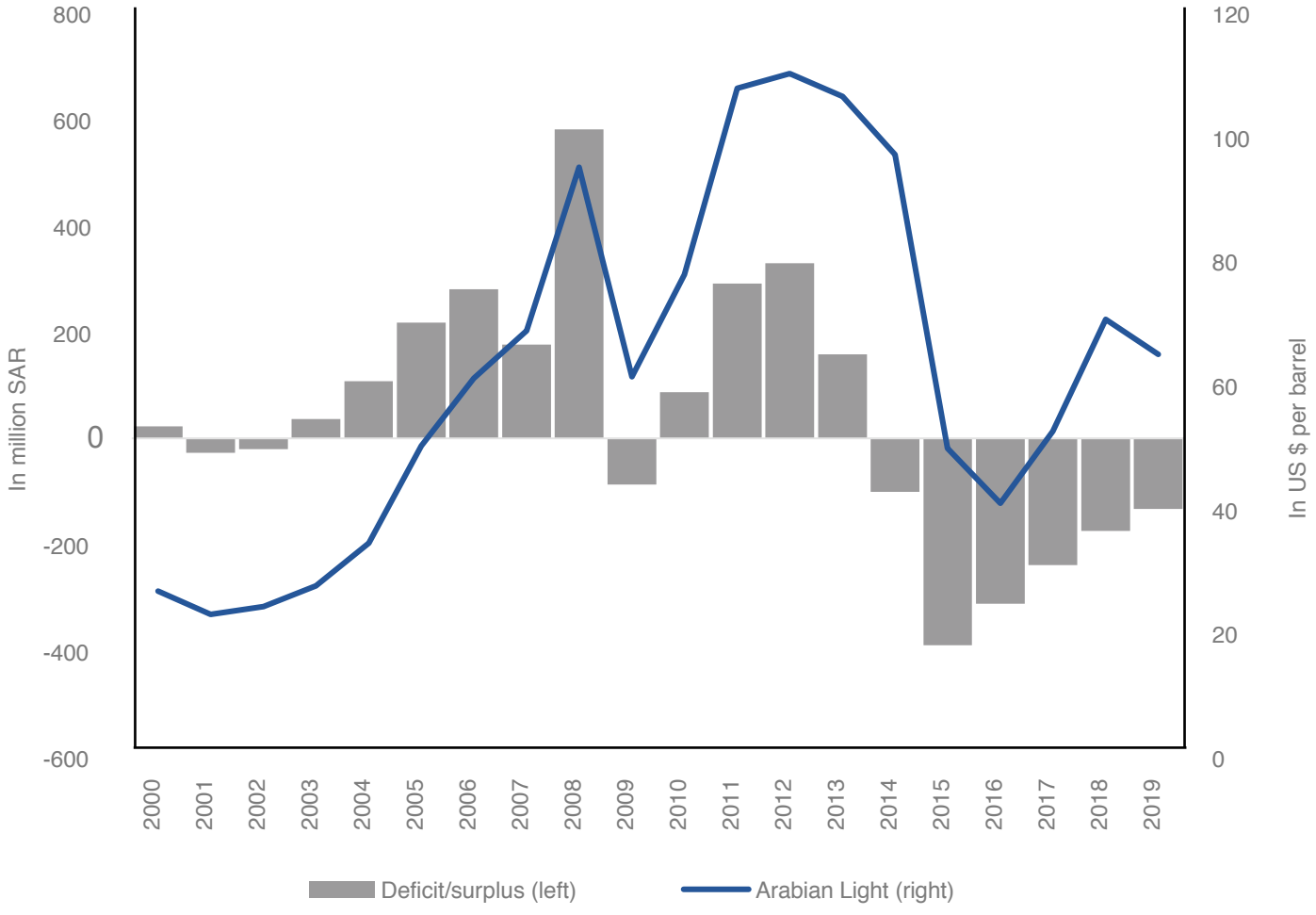
Experience shows that economic diversification is an extremely complex and perilous process, which also takes time. One may argue that some loss of efficiency and returns-to-scale may be at stake, especially considering the mass production in heavily integrated production schemes. However, the speed and extent of the past decade's globalization, which has brought about production efficiency and has reduced labor costs to extremely low levels, has likely reached its limits and revealed some considerable setbacks. These include an implied reduction in regional economic resilience, the increasing length of production chains and more fragile supply security.

In contrast, a less concentrated and more diversified national or regional economy can offer more resilience to external shocks, internal stability, broader business opportunities, and advanced skills development. Having three different snapshots of the Saudi economy at our disposal, we calculate and compare the Shannon-Weaver diversification index for 2020, 2025 and 2030 based on GDP. This metric also maps the strong development of sectors that had only a marginal role initially. The strong development of these sectors is predominantly linked to the introduction of new technologies such as robotics, industrial automation, and data security services. We also assess the evolution of the diversification index in the case of household income, which also undergoes a substantial adjustment, along with the maturation of the private sector and the increasing weight of household spending. The diversification index for household income is constructed in a similar way to that for GDP, applying the Shannon-Weaver index. Our sensitivity analysis examines the beneficial effects of increased sectoral diversity for increased resilience to external demand shocks. It applies a stylized shock to final demand in the basic oil and gas sector and evaluates its impacts on total output and GDP over the projection horizon.

Saudi Vision 2030 and V2030 IOT

Substantial volatility in global oil prices over the past decade implies that oil-exporting countries face pronounced spikes and drops in their incomes and, potentially, also in their social wellbeing. Saudi Arabia was not spared this rough ride, as is obvious from the close link between the oil price and the government deficit shown in Figure 1. Vision 2030 aims, among other things, to reduce the country's exposure to oil price volatility, which brings forward the need for a labor market reset, given the Kingdom's growing youth population. Economic diversification is part of Saudi Arabia's broader transformation plan to make its economy sustainable and able to provide attractive job opportunities and incentives to its current and future labor force. In essence, this is a long-term task involving significant adjustments in the structure of the economy, the introduction of new technologies, adapting to best practices in production and services, and perhaps the emergence of entirely new industries. Given the significant structural shifts in the Saudi economy due to the ongoing economic transformation and diversification, it is important to base an analysis of this on an appropriate IOT (Beidas-Strom et al. 2011).

Figure 1. Oil price and government deficit.



Source: SAMA Annual Statistics.

To capture these types of wide-ranging adjustments, we rely on the input-output framework (Leontief 1936, 1951), which provides rich sectoral granularity and represents the vital energy sector along with the oil and gas industry well. However, it is costly and time-consuming to produce a good quality IOT, as it requires many surveys and underlying data to be collected and compiled. A high-quality IOT is published on a five-year basis, even in advanced economies, and projections are mostly not accessible to the public. For these reasons, we utilize an approach that combines macroeconomic forecasts with the RAS method to acquire IOT projections for 2020, 2025 and 2030. More iterations were conducted to achieve consistent and credible outcomes, which are also broadly in line with the available General Authority for Statistics (GaStat) data. The fine-tuned V2030 IOT projections are currently publicly accessible on the "KAPSARC Data and Tools" webpage. The basics of the input-output framework and the core of the applied projection approach are briefly described below. Further details can be found in the dedicated methodology paper (Havrlant et al. 2020). Let us start with the standard IOT segments shown in Table 1.

Table 1. Structure of the V2030 IOT.

Inputs (purchases) / Outputs (sales)	Sector (1)	Sector (2)	…	Sector (n-1)	Sector (n)	**INTERMEDIATE OUTPUT**	Household consumption	Government purchases	Investment expenditure	Exports	**FINAL DEMAND**	**TOTAL OUTPUT**
Sector (1)						u (1)					f (1)	x (1)
Sector (2)						u (2)					f (2)	x (2)
…			**Z**			…			**F**		…	…
Sector (n-1)						u (n-1)					f (n-1)	x (n-1)
Sector (n)						u (n)					f (n)	x (n)
INTERMEDIATE INPUT	v (1)	v (2)	…	v (n-1)	v (n)							
Imports	m (1)	m (1)	…	m (n-1)	m (n)							
Taxes less subsidies on products												
INTERMEDIATE CONSUMPTION												
Compensation of employees												
Other taxes less subsidies on product			**G**									
Consumption of fixed capital												
Net operating surplus												
VALUE ADDED AT BASIC PRICES	g (1)	g (2)	…	g (n-1)	g (n)							
TOTAL INPUT	x (1)	x (2)	…	x (n-1)	x (n)							

The transaction matrix Z represents flows of intermediate inputs and outputs between all economic sectors, with $n \times n$ dimensions for an IOT including n sectors (Miller and Blair 2009). The row sums of Z form the vector of the intermediate outputs u, while its columns sum up to the vector of intermediate inputs v. Meanwhile, all inputs acquired from abroad are represented by the vector of imports m. The structure of other domestic inputs of production and related payments, such as employee compensation, government taxes, capital depreciation and business profits, are recorded in the value-added matrix G. This sums up column-wise to the overall value-added vector g.

On the output side, the final goods and services produced in the economy are represented by the final demand matrix F. These are purchased by households for consumption, by the government to provide services, by business owners for investment and exported abroad. The row sums of F form the vector of final demand f. The intermediate input, imports and value-added sum up to the total input x, while intermediate output and final demand add up to the total output, also denoted x, with these being equal for each sector. With σ representing an appropriate unit vector, we get the balance of total input and total output, representing a closed economic system as follows.

$$x^T = \sigma^T Z + m + g = v + m + g \quad \text{and} \quad x = Z\sigma + f = u + f$$

Given the high sectoral granularity, the input-output models help us understand the implications of various government policies and measures affecting a particular industry, a group of sectors, or the whole economy. In principle, the IOT reflects a country's System of National Accounts (United Nations 1999, 2008), as it is well suited for measuring and modeling economic activity and adjustments from various perspectives, including the main variables such as GDP, value-added, household income, imports and exports, and total output representing the overall size of the economy (Stone 1961). To proceed with the economic impact measurement, the matrix of technical coefficients A, also called the direct requirements matrix, is derived directly from the inter-industry transaction matrix Z and total output x. The total output vector has to be transformed into a diagonal matrix $\hat{x}$ (diagonalized), so that the resulting A matrix has appropriate dimensions as

$$A = Z\hat{x}^{-1}.$$

The individual technical coefficient $a_{ij} = z_{ij}/x_j$ measures a fixed proportion between input and output for given sectors. Within this structure, the input-output model relates the economy's total output and final demand in the following manner

$$x = Ax + f,$$

with f standing for final demand. This formula can be rewritten as

$$x = (I - A)^{-1} f = Lf.$$

The above equation is core for the input-output analysis, with final demand being directly linked to the total output of the economy. The matrix inverse is referred to as the total requirements matrix or the Leontief inverse matrix and denoted as L. It is well suited for investigating the impact of adjustments in the final demand of a single sector or a group of industries on the overall economy. The column-sums of the L matrix represent simple output multipliers that incorporate both the direct and indirect effects of changes to final demand. We apply the total output multipliers in our sensitivity analysis, conducted to explore the benefits of the foreseen sectoral diversification to the resilience of the Saudi economy to external demand shocks.

Other types of requirement matrices and multipliers can be constructed based on the Leontief inverse (Ten Raa et al. 2003; Kop Jansen and Ten Raa 1990), such as the L_g matrix shown below that relates to value-added and provides the standard value-added multipliers, with $\hat{g}^T$ denoting the diagonalized and transposed value-added vector.

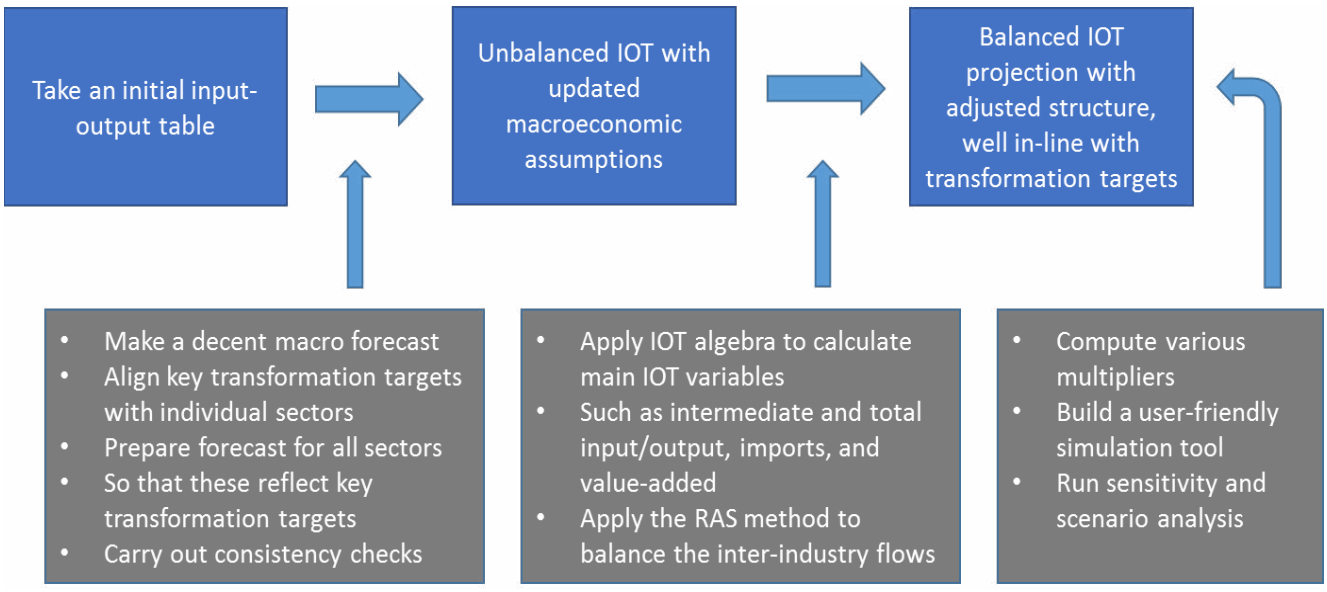
$$L_g = \hat{g}^T \hat{x}^{-1} L.$$

In a similar manner, we construct a GDP-related requirement matrix L_{gdp} to proceed with our sensitivity analysis, using a stylized shock to final demand in the basic oil and gas sector, with f^1 representing the new level of final demand incorporating the shock. The impact on the sectoral GDP levels is calculated by applying the GDP-related requirement matrix, while the effect on overall GDP is the sum of all sectors.

$$gdp^1 = L_{gdp} f^1.$$

Various IOT updates are usually based on available historical datasets for the main IOT variables, such as final demand, value-added, inter-sectoral transactions, and import and export schemes. In contrast, this study aims at understanding the likely picture of the Saudi economy over a longer projection horizon. To achieve this goal, we combine macroeconomic forecasts, expert judgment of individual sectors, and the RAS method to balance the projected IOTs. This hybrid approach enables the introduction of different growth paths for the main macroeconomic variables, so that the Vision 2030 transformation plan is reflected in an appropriate and consistent way. The framework is also flexible enough to accommodate sudden economic adjustments with relative ease, such as the introduction of new technologies or entirely new sectors into the economy. The basic steps taken to acquire the set of projected V2030 IOTs between 2020 and 2030 are shown in Figure 2.

Figure 2. Projecting the V2030 IOT for 2020, 2025 and 2030.



Our V2030 IOT projection approach allows us to address key macroeconomic transformation targets set out in Saudi Vision 2030 and related government documentation. In this exercise, we assume that these targets will be implemented gradually throughout the decade and reached in 2030. From a sectoral perspective, this makes the outcome a viable scenario that can be used as a reference point on the diversification path. The foreseen major adjustments we could accommodate reasonably well within the input-output framework, using the selected projection methodology, are listed below:

- Increase the contribution of the private sector to GDP
- Increase the local content of the oil and gas sector
- Raise the share of non-oil exports in non-oil GDP
- Improve the country's position in global logistics
- Boost the capacity to welcome Umrah pilgrims and support tourism
- Promote household spending on entertainment activities in the Kingdom
- Increase the country's renewable energy capacity
- Increase the government's non-oil revenue

Overall, we acquired a more detailed picture of what the Vision 2030 socioeconomic transformation plan represents from the perspective of sectoral diversification and specific macroeconomic impacts from 2020 to 2030. Not all areas addressed by the ambitious transformation plan could be analyzed, as some of them are outside the scope of this study and its methodology. We did our best to accommodate the key economic adjustments that could be incorporated reasonably well within the input-output framework and our projection approach.

Preferred Diversification Paths and High Growth Potential Sectors

The expected adjustments in broad economic sectors and their relative shares reflect our long-term macroeconomic forecast based on 2019 data, along with expert judgment for individual sectors based on Vision 2030 and other related government documentation. Given the foreseen adjustments in the sectoral composition of the economy, it is certain that the expansion in some sectors will be stronger than in others. The sectors expected to lead the diversification process are set to grow faster than the overall economy, thus increasing their share in overall GDP. Some sectors will have a diminishing share of GDP, expanding at a slower pace than the overall economy and the leading sectors. We use the term 'preferred diversification paths' to mark clusters of economic activities that are thematically linked, are mutually coherent from the macroeconomic perspective and reflect the key transformation targets of Vision 2030. Table 2, below, presents the expected growth rates and shifts in the relative GDP shares of broad economic sectors between 2020 and 2030.

It should be noted that all sectors continue to expand over the projection horizon; thus, no single sector contracts in absolute terms. The already large and mature sectors, such as the basic oil and gas sector, government services, and agriculture, continue to grow at a slower pace than the overall economy. The overall economy, propelled by the diversification focal sectors, is expected to expand by 5.4% yearly. In some cases, activity is expected to be partially transferred to advanced manufacturing. This transfer also contributes to adjustments in relative proportions of the major sectors. We expect, for instance, significant development of the gas industry linked to the Master Gas System and rising hydrogen exports. This would, however, require a boost to advanced manufacturing and energy transport should the Saudi economy become a leader in low-carbon energy, related manufacturing, and an energy transport hub. A similar transfer of activity to advanced manufacturing is associated with the implementation of new agriculture and food processing technologies, and efforts related to launching carbon capture use and storage (CCUS).

In other terms, the economy is expected to get bigger over the coming decade. The size of every sector is expected to increase in absolute terms as they continue to expand. The main thing that changes is the way the economy is segmented, letting the initially tiny sectors increase their share in comparison with the larger ones. The relative sizes of the economic sectors will be more evenly distributed, yielding a more diversified economy. The government income base is expected to enlarge, with a greater diversity in the sources of income. This will contribute to improved fiscal stability and resilience to external shocks.

The manufacturing and services sectors will become further pillars of sustainable economic growth and will lead the diversification process. Manufacturing is expected to expand by more than 8% annually over the coming decade, increasing its relative share to almost 12% of overall economic activity. Most of this growth is assumed to happen in the high value-added production areas. Meanwhile, the services sector is expected to grow some 10% annually on average, implying that its relative GDP share will climb to almost 40% in 2030. This reflects the likely boom in tourism, transportation, communications and financial services. The continued growth in the basic oil and gas sector is expected to become somewhat milder than the rapid expansion of the diversification focal sectors. Its share is set to gradually decline as the diversification process picks up steam and will

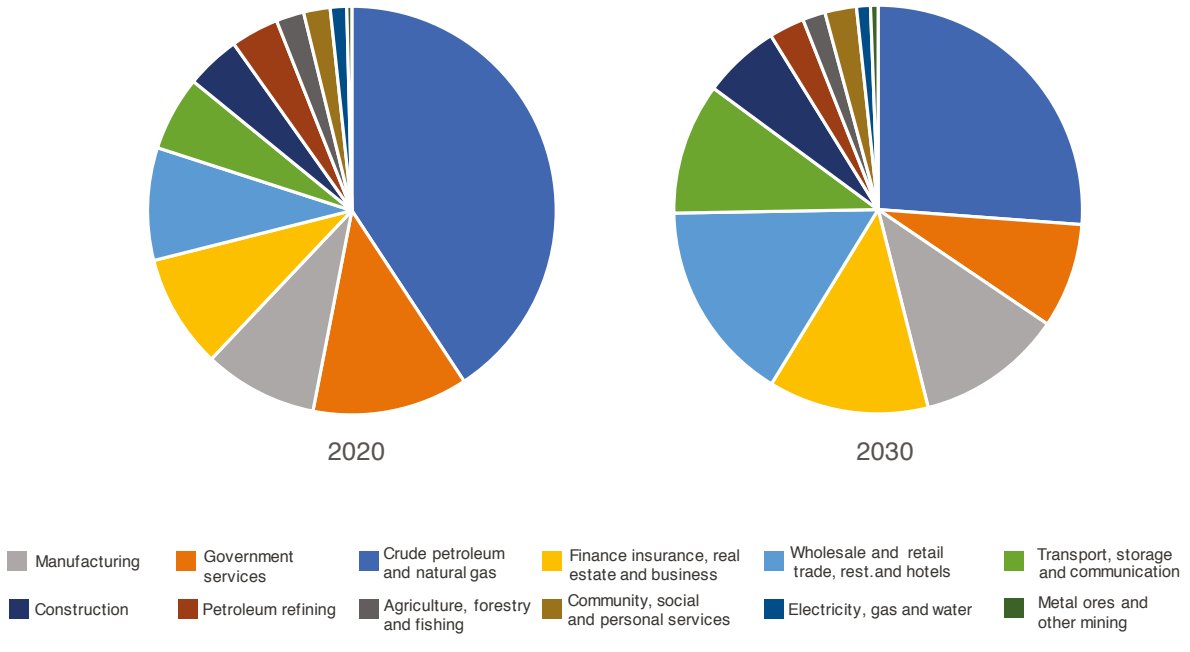
make up roughly a quarter of the economy in 2030. However, this does not mean that the importance of oil and gas will diminish, as the higher value-added follow-up industries such as intermediate and specialty chemicals, rubber and advanced plastic products, and pharmaceuticals create an integral part of one of the preferred diversification paths discussed below. These oil- and gas-related industries create the basis for manufacturing to increase its overall share, as shown in Figure 3.

Table 2. Annual GDP growth and expected relative sectoral shares, 2020-2030.

Economic activity	Annual GDP growth in 2020-2030 (%)	GDP share in 2020 (%)	GDP share in 2030 (%)	GDP share adjustment in 2020-2030 (p.p.)
Agriculture, forestry and fishing	3.3	2.2	1.8	-0.4
Crude petroleum and natural gas	0.9	40.7	26.2	-14.6
Metal ores and other mining	8.7	0.4	0.6	0.1
Petroleum refining	2.2	3.8	2.8	-1.0
Manufacturing	8.2	9.0	11.6	2.6
Electricity, gas and water	3.6	1.3	1.1	-0.2
Construction	9.2	4.3	6.1	1.8
Wholesale and retail trade, rest. and hotels	11.8	8.9	16.0	7.1
Transport, storage and communication	11.5	5.9	10.4	4.4
Finance, insurance, real estate and business	9.1	9.0	12.7	3.7
Community, social and personal services	7.2	2.1	2.5	0.4
Government services	1.4	12.3	8.3	-4.0

Note: rest.= restaurants.

Figure 3. Adjustments in relative sectoral shares between 2020 and 2030.



Preferred Diversification Paths and High Growth Potential Sectors

Turning to the supposed manufacturing leaders in the diversification process, our V2030 IOT projection points to two underlying diversification paths, with the focus on the boost for advanced high value-added products. With the existing industrial setup of energy, basic petrochemicals and metal production, the Kingdom benefits from both paths. The industries listed below are an integral part of a production chain with large growth potential, and they are ready to be further developed and have more prominence in the future structure of the Saudi economy:

Basic oil and gas sector: High value-added follow-up industries such as specialty chemicals, advanced rubber and plastic products, and basic pharmaceutical products are suitable candidates for advances in technology and establishing research and development centers.

Metal production and power generation: High value-added products with large and growing domestic and global demand are suitable candidates for growth through exports, subject to efficiency and competitiveness. Such products include advanced metal products, motor vehicles, and high value-added manufacturing related to energy storage, transport and distribution.

Table 3. Manufacturing sectors with high growth potential.

Sector	Annual GDP growth in 2020-2030 (%)	GDP share in 2020 (%)	GDP share in 2030 (%)	GDP share adjustment in 2020 2030 (p.p.)
Basic pharmaceutical products	46.5	0.00	0.01	0.01
New high value-added manu.	37.0	0.00	0.01	0.01
Rubber and plastic products	8.7	0.09	0.12	0.03
Fabricated metal products	8.7	0.93	1.26	0.33
Specialty chemical products	8.7	0.07	0.09	0.02
Motor vehicles, trailers	8.7	0.08	0.11	0.03
Non-metallic mineral products	8.7	0.30	0.41	0.11
Basic metals - aluminum	8.7	0.10	0.14	0.04
Machinery and equipment	8.7	0.41	0.55	0.14
Basic steel products	8.7	0.17	0.23	0.06
Computer, electronic equip.	8.7	0.63	0.85	0.22
Ships and boats manufacturing	8.7	0.03	0.04	0.01
Intermediate chemical products	7.8	1.79	2.24	0.45
Food products, beverages	7.8	2.51	3.15	0.64

Note: manu.= manufacturing; equip.= equipment.

Despite an expected rapid annual expansion over the coming decade, the GDP share of the advanced manufacturing sectors remains relatively small or even negligible in most cases. Table 3 lists the industries considered to have high growth potential and to be part of the suggested diversification strategies mentioned above.

The services sector will become the biggest contributor to economic activity in the Kingdom over the coming decade as the economy transforms into a more advanced one. Some of the expansion, such as the likely boom in financial and business services, telecommunications and real estate services, will resemble the diversification process in manufacturing.

Some services complement the country's overall economic growth, and some, such as aviation, railroad and road transport, support its aspiration to become the regional transportation hub. Specific services are closely interconnected with the country's ongoing social adjustments, including changing attitudes toward recreational, cultural and sporting activities. Indeed, with two coastlines – the Red Sea and the Gulf – the economy is looking to benefit from developing tourism and related activities. Household consumption is expected to drive both wholesale and retail trade, with increases in household income coming from the thriving private sector. Table 4 shows the expected developments within the services sector.

Table 4. Services are expected to contribute significantly to economic diversification.

Sector	Annual GDP growth in 2020-2030 (%)	GDP share in 2020 (%)	GDP share in 2030 (%)	GDP share adjustment in 2020-2030 (p.p.)
New digital services	29.4	0.00	0.01	0.01
Railroad transport	13.0	0.00	0.00	0.00
Air transport	11.9	1.28	2.32	1.04
Wholesale retail trade	11.8	8.64	15.53	6.90
Recreational, cultural, sport act.	11.8	0.28	0.50	0.22
Road transport	11.4	0.81	1.39	0.59
Pipeline transport - hydrocarbons	11.4	0.17	0.29	0.12
Water transport	11.4	0.03	0.05	0.02
Telecommunications	11.4	3.65	6.32	2.66
Financial and business services	9.7	4.51	6.68	2.17
Real estate services	8.5	4.54	6.04	1.51
Health and social work	7.2	1.40	1.65	0.25

Note: act.= activities

The diversification in manufacturing will likely create demand for a new type of services, such as data storage and management, and the advanced monitoring of energy transport and distribution. For instance, the implementation of smarter power distribution, such as smart grids and smart meters, would require specific telecommunication and data management services. The following specific diversification paths rely mainly on the further development of services:

- Support for recreational infrastructure: tourism-related services, railroad and air transport, and the entertainment industry.
- Building advanced telecommunications infrastructure: new digital services related to data storage and management, advanced monitoring of energy transport and distribution.

It seems that the expected adjustments in the power sector point to a substantial opportunity for economic diversification, including green job creation, implementing new technology, gaining know-how of advanced electricity transfer and reducing the sector's environmental impact. Harnessing renewable sources of energy seems to represent an enormous potential for the Saudi economy, given the advantages such as the country's abundance of empty space, solar irradiation and wind. Despite some impediments such as the hot climate and dusty environment, it seems that current renewable technologies can operate well even under such tough conditions. The solar sector is expected to grow some 45% every year in our projection, as measured in final demand, implying an increase of some 40 times between 2020 and 2030. The wind-based power sector is expected to expand almost 33% annually over the same period, with the overall final demand value increasing 17 times, as shown in Table 5, below.

Table 5. Expected adjustments in the power sector.

Sector	Annual GDP growth in 2020-2030 (%)	GDP share within the group in 2020 (%)	GDP share within the group in 2030 (%)	GDP share adjustment in 2020-2030 (p.p.)
Electricity solar-based	44.3	0.01	0.03	0.02
Electricity wind-based	32.5	0.01	0.02	0.01
Electricity natural gas	5.4	13.71	15.14	1.43
Water	3.5	24.53	24.37	-0.16
Electricity other hydrocarbons	3.1	61.75	60.45	-1.30
Total electricity and water	3.6	100.00	100.00	0.00

In contrast, the non-natural gas hydrocarbon-based power sector is expected to grow at a slower pace than the overall economy, as efficiency in energy distribution and consumption increases over the coming decade. The share of natural gas power generation in the power sector is expected to increase relative to other hydrocarbon-based energy sources.

Although the projected rate of growth of the renewable power sector is substantial, its share in overall GDP remains negligible. This shows that the economic potential of renewable energy is enormous. Moreover, a broad-scale adoption of renewables in power generation is linked to profound developments in other sectors, such as manufacturing and services. We see two of the preferred diversification paths for the Saudi economy building on the expansion of the renewable energy sector:

- Renewable energy: manufacturing of high value-added components and devices linked to power generation; manufacturing of advanced energy storage and transport, such as batteries and hydrogen technologies.

- Renewable energy: water desalination and transport, the introduction of new production technologies in agriculture, such as vertical farming and aquaculture.

In an ideal case, the preferred diversification path would include (i) the introduction of appropriate technology, followed by (ii) acquiring the relevant operational know-how and experience, and ultimately (iii) establishing domestic research and development in the dedicated areas. The V2030 IOT projection shows that the preferred renewable-related diversification paths are a good fit for the Saudi economic environment. The country already has extensive experience in the energy sector, and it has recently launched experimental hydrogen-based energy storage projects. Global demand for clean energy will likely grow significantly over the coming decade. It makes sense for an oil-exporting economy to prepare itself for this shift in terms of technology, manufacturing, infrastructure, processes, regulation, skills, development, and research. This will help it to transform into an energy-exporting economy more broadly. Also, the potential positive spillover effects for retaining a skilled labor force and attracting talent are not negligible.

Acquiring clean water through renewable sources of energy and feeding it into modern agricultural production, such as vertical farming, represents a similar opportunity as in the energy sector for both manufacturing and the labor market. Such a diversification path also has the potential to improve livability in the dry climate areas of the country and to boost national and regional food security. The share of the water sector in GDP is expected to remain almost unchanged. This reflects an assumption about efficiency improvements in water transport and distribution over the coming decade, which would counterbalance the likely increase in final demand and use.

Overall Macroeconomic Adjustments

Let us turn to the overall macroeconomic adjustments implied by the implementation of the Vision 2030 transformation plan, bearing in mind the previously specified key targets and sectoral diversification. The economy is expected to shift to a more advanced pattern, with household consumption taking the lead and accounting for more than 40% of final expenditure in 2030. This is enabled by the increase in disposable income, stemming from the private sector's increasing share of overall economic activity. The diversification will likely increase household budgets, as sectors with higher-skilled and better-paid jobs will gain share through initial government support followed by buoyant organic growth. In contrast, expenditure related to government consumption will grow by less than the overall economy, reducing its share to below 15% of real GDP by the end of the decade. We also identify relatively rapid investment growth, with the real value accounting for more than a quarter of total spending in 2030.

Indeed, robust investment activity is an essential driver of any diversification effort. Table 6, below, shows the breakdown of real GDP expenditure components. It should be noted that all expenditure components continue to expand over the projection horizon, and are thus expected to increase in absolute terms. However, some of the components grow at a slower rate than the overall economy, which leads to the reduction of their relative share in overall economic activity. Government consumption and oil exports, for instance, continue to grow by roughly 2% annually, but their relative share in overall expenditure declines as the economy gets more advanced, and other components such as household consumption, investment, and non-oil exports gain in their relative importance.

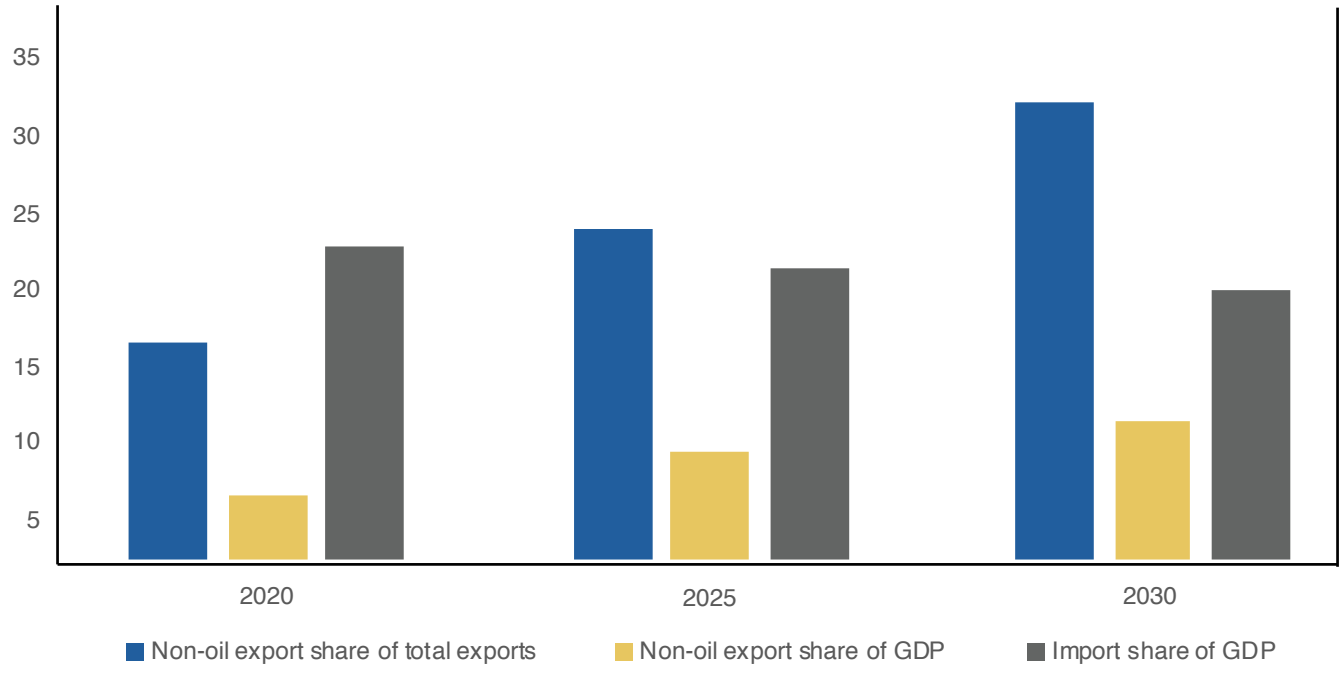
Table 6. Real GDP expenditure components.

Expenditure component	Annual GDP growth in 2020-2030 (%)	GDP share in 2020 (%)	GDP share in 2030 (%)	GDP share adjustment in 2020-2030 (p.p.)
Household consumption	7.2	34.6	40.6	6.0
Government consumption	2.6	19.2	14.5	-4.7
Investment	6.8	23.8	26.9	3.1
Exports	3.8	47.7	40.6	-7.1
Oil exports	1.6	38.5	26.5	-12.0
Non-oil exports	10.2	9.2	14.1	4.9
Imports	4.3	25.3	22.6	-2.7

As a result of the manufacturing and services sector becoming more prominent, we observe the growing strength in non-oil exports, which are about to expand by some 10% per annum on average, accounting for more than 14% of real GDP by the end of the decade. Even compared with the size of the overall economy, non-oil exports represent the second-largest increase after household consumption. Non-oil exports are set to account for roughly one-third of total exports in 2030, compared with less than a fifth in 2020, as shown in Figure 4. Meanwhile, oil exports will likely experience a milder growth over the projection horizon, somewhat below the growth of the overall economy, implying a reduction in their relative share. This is, however, milder than the reduction in the weight of the basic oil and gas sector, pointing to some resilience in oil and gas exports on the one hand and efficiency gains in domestic consumption on the other. The softer export surplus also indicates that the economy will become more self-sufficient and less dependent on oil revenue.

In contrast, the share of imports is expected to recede, even with booming household consumption. This is enabled by a substantial increase in local content, either through progress in the local manufacture of advanced products or through the increasing share of spending on local services. The diversification enables a certain degree of substitution of domestic production, be it tires, cars, measurement and communication devices, or other higher value-added products. The development of tourism and the provision of increased recreational opportunities would also motivate domestic and foreign consumers to allocate a larger part of their budgets to the Saudi economy. Still, overall imports will continue to grow, which will mainly comprise imports of technology for investment purposes and other unsubstitutable consumer items. However, the pace of import growth is expected to slow down gradually over the projection horizon.

Figure 4. Developments in export and import shares.



The anticipated boost in local content, accompanied by lower import intensity in numerous areas, is reflected in the advanced integration of economic sectors: both domestically produced intermediate inputs and final outputs. If more domestically produced intermediate inputs are supplied into the overall production chain, selected industries and services can draw on those and import fewer goods to maintain their final output levels. The implication noticeable within the input-output framework is upward pressure on total output multipliers (Ten Raa et al. 2003; Kop Jansen and Ten Raa 1990). For instance, the total output multiplier of 2.3 for specialty chemicals means that the economy has to generate 2.3 Saudi Arabian riyals (SAR) in total output, representing also the intermediate inputs provided by other sectors, to satisfy 1 SAR of final demand for specialty chemicals. There are some large sectors of the Saudi economy, such as crude oil and natural gas, refined petroleum products, electricity generation, and water treatment, for which the total output multipliers will likely increase over the projection horizon, as shown in Table 7.

Table 7. Sectors with increasing total output multipliers.

Sector	2020 total output multipliers	2030 total output multipliers	2020 - 2030 change (in %)
Agriculture and aquaculture	1.6	1.9	21.3
Non-metallic mineral products	2.4	2.9	18.4
Railroad transport	2.1	2.4	13.0
Financial and business services	1.6	1.8	16.4
Rubber and plastic products	2.0	2.3	14.0
Basic and advanced metal prod.	2.1	2.3	12.6
Refined petroleum products	1.5	1.7	10.1
Real estate services	1.3	1.4	8.8
Specialty and interm. chemicals	2.1	2.3	8.4
Railway and car related manuf.	1.5	1.6	8.2
Crude oil and natural gas	1.1	1.2	7.6
Water	2.9	3.1	7.2
Residential building construction	2.0	2.1	7.2
Food products and beverages	1.8	1.9	6.9
Electricity natural-gas-based	1.7	1.8	6.2

Note: prod.= products; interm.= intermediate; manuf.= manufacturing.

At the same time, selected traditional sectors show a considerable increase in total output multipliers while contributing significantly to economic diversification. Among these sectors are agriculture and aquaculture, basic and advanced metal products, high value-added chemicals, beverage production, financial and business services, and railroad transport. In contrast, total output multipliers are expected to remain almost unchanged for other diversification focal sectors over the projection horizon, such as renewable energy, pharmaceuticals, new high value-added manufacturing, and new digital services. These sectors are relatively intensive in domestic value-added, reflecting elevated requirements for a skilled labor force and the need to import high-tech capital to implement recent production schemes. These production schemes would, however, contribute noticeably to high-skilled job creation, increased household income and the introduction of new technologies, while also setting the basis for future research and development.

The expected advances in economic diversification become apparent when applying the Shannon-Weaver index to the Saudi economy, as captured in the V2030 IOT over the projection horizon. We calculate the diversification index D for 50 sectors, setting the scale of measurement $c = 100/\log 50$ and acquiring its value between 0 and 100. The diversification index approaches zero if one industry completely dominates the economy and others become negligible. With all sectors represented equally, the index approaches 100, indicating the highest degree of diversification. We calculate the diversification index for two different variables, namely sectoral GDP and household income. As the selected key transformation targets of Vision 2030 are implemented, the value of the index is set to rise between 2020 and 2030, as shown in Table 8, below.

Table 8. Shannon-Weaver diversification index.

	2020	2025	2030
Shannon-Weaver index for GDP	61.9	66.0	69.5
Shannon-Weaver index for household income	67.4	69.6	71.1

Overall Macroeconomic Adjustments

The diversification index based on sectoral GDP increases to almost 70 in a decade, up from 62 in 2020. This indicates considerable progress toward a more diversified and sustainable economy once the measures reflecting the Vision 2030 key targets are implemented. The Shannon-Weaver index for household income also rises, although more gradually because they are starting from a higher value. The relatively higher diversification of household income compared with GDP likely shows that the deployment of an adequate and skilled labor force has to precede the full operation of any advanced and high value-added enterprise. In other words, the skills come first, then the setup of a high value-added enterprise, and lastly, the full-production phase followed by the integration of the enterprise into global markets and its boost to non-oil exports. These macroeconomic adjustments point to the private sector gradually taking the lead, subject to a beneficial economic transformation and the success of entrepreneurial initiatives aiming at providing high value-added goods and services. The future of the Saudi economy presented in this study is one possible outcome, while the reality may differ. However, we believe that the broad trends outlined provide a consistent and viable indication of the path toward a more advanced, diversified, and sustainable economy.

To examine the effects of the diversification measures on the resilience of the Saudi economy to external shocks, we conduct a sensitivity analysis exercise based on a simplified shock to final demand in the basic oil and gas sector. Such a shock could be a consequence of a global economic downturn, which would also imply a substantial reduction in worldwide energy demand, usually accompanied by a decline in oil and gas prices. This type of shock was observed, for instance, after the 2008 financial crisis and during the recent economic downturn caused by the lockdown measures used to combat the COVID-19 pandemic. For the purpose of showing the adjustments in economic resilience due to the increase in sectoral diversity, we assume a simplified direct shock of -10% to final demand in the basic oil and gas sector. We are aware that direct shocks to other sectors would likely occur simultaneously in a real-world economic downturn, so we consider this a sensitivity analysis only as opposed to a fully fledged simulation scenario. At the same time, the enhanced resilience to an external oil and gas demand shock at the end of the projection horizon is rather obvious, as shown in Table 9, below.

Table 9. Sensitivity analysis of a final demand shock to the basic oil and gas sector.

Year	Shock to oil and gas sector (%)	Total output impact (%)	Direct impact ratio (% of impact)	Indirect impact ratio (% of impact)	Impact-to-shock ratio (%)	GDP impact (%)
2020	-10	-2.9	92	8	112	-4.1
2025	-10	-2.4	89	11	116	-3.3
2030	-10	-1.8	86	14	120	-2.6

The sensitivity analysis of total output (including both intermediate and final production) shows that the impact of the stylized final demand shock to the basic oil and gas sector results in an overall contraction in total output of -1.8% in 2030. This is measured as a deviation from the baseline and is well below the impact of -2.9% a decade earlier. Such mitigation of the overall negative impact on total output is observed despite the increase in the impact-to-shock ratio over the projection horizon. This points to an advanced integration of the basic oil and gas sector into the economy. Such a structural adjustment is also indicated by the expected rise in the share of the indirect impact stemming from all other sectors in the economy to 14% by 2030. This clearly signals that more sectors are set to have a relationship to the basic oil and gas industry in the diversified economy, reflecting the boost to the interlinkages in domestic production schemes. The overall impact of the stylized shock on GDP is reduced by more than a third between 2020 and 2030 due to the economic diversification.

Sustainability in the Transforming Energy Sector

All societies can be thought of as an evolution of three elements: economic, social, and environmental. Each element has a dynamic and complex scheme that attempts to achieve the self-regulation of the entity. However, they are all connected in a tremendously complex system. For any economy to be sustainable, each dimension needs to be able to adapt and promote co-evolution.

The role of energy in the Kingdom has been changing since 2014. Historically, energy prices in Saudi Arabia have been administered by the government. This involves selling fossil fuels and their derivative products at below market prices to economic agents to generate energy to use. In 2016, Saudi Arabia initiated its first energy price reform, reshaping the incentive structure of energy use to improve efficiency and reduce waste for all economic agents by removing its intervention in energy markets (AlGhamdi 2019). These changes, in parallel to the potential benefits of developing within and across the energy sector, have proven to have long-sustaining positive outcomes on the social and economic landscape of Saudi Arabia.

Vision 2030, as discussed previously, aims to move Saudi Arabia through a structural transformation. In summary, this transformation process will reallocate economic activity across a more diverse base of economic sectors. Undergoing such a process will undoubtedly require substantial energy. For example, increasing the provision of local content products within any sector's value chain requires a varying degree of energy as an input, depending on each sector's energy intensity. Therefore, it is imperative to adopt and operationalize alternative energy sources and not strain the current and future energy sources with export potential. The lion's share of Vision 2030 entails a large transition from the current state of the economy toward non-oil manufacturing. Transforming the energy sector and building capacity will provide sustained benefits without causing negative societal externalities from environmental impacts. The environmental benefits of this shift would help prevent health problems caused by excessive emissions (WHO 2020). The push for energy transition coincided with the Kingdom being a signatory to the 2015 Paris Agreement, with the goal of avoiding up to 130 million tonnes of carbon dioxide equivalent emissions per year by 2030. Furthermore, reforming the energy sector would help create both temporary and permanent jobs that would uplift and energize many of the country's youth (GaStat 2019). This would also contribute to a key target of Vision 2030 to lower the unemployment rate to 7% by 2030. Economic diversification will be successful if the Kingdom can produce goods competitively. This will prove challenging, given the established and mature sectors the Kingdom will be competing with globally. The Kingdom can gain a substantial first-mover advantage, however, in the energy sector. The Kingdom has adequate land and several sunbelt spots that it could leverage to produce renewable energy, such as solar and wind. In 2020, Saudi Aramco spearheaded the Kingdom's first shipment of hydrogen to Japan; 40 tonnes of high-grade blue ammonia to be used for zero-carbon power generation. The move is a signal of the global community's shifting preference for cleaner energy and a signal of Saudi Arabia's future energy potential.

Under the Saudi G20 presidency, G20 member countries endorsed the concept of the Circular Carbon Economy (CCE). The CCE offers a well-integrated approach to maintain and reinforce a mechanism of sustainable growth.

At its core, the CCE is a departure from a linearly structured economy to a circular one. The aim is to provide the same goods and services while using fewer resources, to reuse as much as possible, and to recycle elemental materials that cannot be further reused (CCE Guide 2020).

Conclusion

The sectoral composition of the Saudi economy is set to change over the coming decade, reflecting the broader shifts within the energy sector on the one hand and the Vision 2030 plan for socioeconomic transformation on the other. We have applied the input-output framework to map the envisaged sectoral and macroeconomic adjustments in more detail, considering key transformation targets and focusing on identifying the diversification focal sectors. The expected shifts in the sectoral structure are large enough to result in some profound macroeconomic adjustments on the way to a more advanced and sustainable economy.

Many of the Vision 2030 preferred diversification paths build on the existing industrial base of the Saudi economy. They develop the base further toward goals such as more advanced petrochemical production, higher value-added manufacturing in energy storage and distribution, and sophisticated pharmaceutical production. These areas ultimately set the basis for future research and development. Other preferred diversification paths are mostly in their starting positions but carry huge potential for expansion. These include the harnessing of renewable energy, coupled with the manufacturing of related parts and devices and the introduction of modern agriculture technologies. The services sector represents another pillar of future economic growth, involving tourism development, new digital services related to data storage and management, and advanced energy transportation and monitoring services. The analysis shows that despite the strong expansion of the diversification focal sectors, their relative share in overall economic activity often remains small. This points to the enormous potential for creating value-added and higher-skilled jobs, acquiring know-how, and introducing new technologies along the preferred diversification paths.

As the economy transforms into a more advanced and diversified one, the private sector is set to take the lead, being the carrier of high-level knowledge and skills, innovative capabilities, and research and development. Household income and private consumption are expected to benefit from these adjustments, with private consumption likely accounting for more than 40% of overall expenditure in 2030. Local content is expected to strengthen over the projection horizon, along with a noticeable reduction in import intensities in selected manufacturing and service sectors. The diversification progress implies a considerable increase in the contribution of non-oil exports to above 14% of overall GDP in 2030, largely driven by the boost to high value-added manufacturing. The share of private services will almost double to account for some 40% of overall economic output at the end of the projection horizon. These beneficial adjustments are determined by taking the appropriate measures to transform the economic environment and to promote auspicious entrepreneurial initiatives in the specified sectors.

Appropriate economic diversification substantially broadens the government's income base, fosters resilience to external shocks, builds entrepreneurial opportunities and a skillful labor force, boosts the chances for the retention of talents, has positive effects on overall livability and positive environmental spillovers.

The diversification of the Saudi economy is expected to significantly increase with the successful implementation of the Vision 2030 key transformation targets. This is obvious not only from the rising share of high value-added manufacturing and the services sector in overall GDP, but also from the application of the Shannon-Weaver index on the Saudi economy over the projection horizon. The diversification index is estimated to increase to almost 70 at the end of the decade, indicating a considerable shift in the country's economic structure compared with 2020. This measurement provides a clear signal about advances in economic diversification, looking at both major variables such as GDP and household income, with household income advancing slightly. It seems beyond doubt that the variety in sectoral contributions to non-oil exports, job creation and government income would be promoted accordingly. At the same time, our sensitivity analysis indicates a substantial improvement in the resilience of the diversified economy to external demand shocks, reflecting a boost to interlinkages in domestic production schemes.

The observed economic developments within the Saudi economy from 2020 to 2030 will most likely differ in some respects from the V2030 IOT projection as it is hard to accurately predict all sectoral developments. However, we predominantly aim for consistency in this sectoral and macroeconomic outline. We believe that it does so and provides a credible and viable mapping of the upcoming economic diversification and macroeconomic adjustments, reflecting Vision 2030's key transformation targets. It is a matter of fact that reasonable projections based on real-world assumptions can, in turn, impact policymakers' decisions and, as such, transform the existing economic environment. Perhaps some sectors may receive even more support and prominence when their growth potential is fully revealed and understood. Overall, this study contributes to a better understanding of the transformation process and the Kingdom's future economic structure. The outline of the future economic structure and the presented trends could help fine-tune the roadmap toward a more advanced, diversified, and sustainable Saudi economy.

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About the Project

The Vision 2030 Dynamic Input-Output Table research project aims at a better understanding of the macroeconomic and sectoral developments in the Saudi economy, especially in the light of the Saudi Vision 2030 initiative for economic transformation. We apply a framework for an input-output table projection that enables the introduction of significant structural and technological changes which are expected to take place in the Saudi economy over the coming decade. The Vision 2030 economic transformation plan includes a set of ambitious diversification targets, covering energy efficiency, the introduction of new technologies, adjustments in the labor market, and support for various emerging sectors to boost local content. Overall, the project focuses on a detailed mapping of the economic transformation process, giving policymakers another tool to shape the roadmap toward a more advanced, diversified, and sustainable Saudi economy.

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