IJEM
International Journal of Economics and Management
Journal homepage: http://www.ijem.upm.edu.my

Sustainable Economic Growth and Saudi Arabia Vision 2030: An Input-Output Analysis of Key Sector Performance and Total Factor Productivity

TAHIRA YASMIN[a*], GHALEB A. EL REFAE[a] AND SHOROUQ ELETTER[a]

[a]*College of Business, Al Ain University, United Arab Emirates*

ABSTRACT

Due to technical innovation and the rapid digital transformation process, many economies have gone through structural transformation. This paper examines the role of key sectors in Saudi Arabia's economy in light of Vision 2030. The current study has used three latest input-output tables: 2020, 2025 and 2030 respectively, to capture the change in sectoral performance by using input-output linkages analysis. The study reveals that there are changes in overall economic activities that highlight the key sectors with changes in economic growth. This further justifies the role of key sectors in the Kingdom of Saudi Arabia and visionary policies. The overall result indicates that it is important to diversify the economy and further suggests there should be more focus on key sectors such as tourism, healthcare, metals, chemicals, rubber, renewable energy and digital services. Furthermore, the Total Factor Productivity (TFP) has displayed changes during 2020-2030 in the form of intermediate inputs and value-added elements due to digital innovation and infrastructure. This implies that Saudi Arabia needs to have regulatory reforms to attract foreign investment, and, by encouraging digital innovation, the kingdom can build a modern and knowledge-based economy. The digital tools will not only enhance productivity but will be a core pillar of sustainability goals.

JEL Classification: D57, L16, Q33, Q01, D24

Keywords: Input-output linkages; economic diversification; key sectors; sustainable growth; Total Factor Productivity

Article history:
Received: 9 December 2025
Accepted: 14 April 2026

[*] Corresponding author: Email: tahira.yasmin@aau.ac.ae
DOI: http://doi.org/10.47836/ijeam.20.1.06

INTRODUCTION

With the pace of development and innovation there is rapid change in growth patterns and sectoral performance. In the long term, the sectoral performance evolves through various changes by going through different stages of growth. Myrdal (1957) highlighted that investment plans may spread favorable effects, but they might lead to a decline in certain industries. This further justifies that there is a question of balanced or unbalanced growth based on the structural change by having invisibilities of certain public and private investment plans. Looking forward, the main objective of any policy maker should be how to sustain an economic diversification model with fruitful trajectory.

It is crucial for the aggregate economic growth to monitor the performance of those sectors that stimulate the domestic supply chains and increase local value added. Not only this, it is equally important to design appropriate policies for the sectors that enable development of new industries to promote knowledge and innovation spillovers. This will result in overall total factor productivity that improves efficiency and innovation capacity. Sometimes the structural decomposition process has a dramatic sector shift impact that also leads to changes in productivity growth. It requires restructuring government spending and improving the performance of capital and the labor market to raise the desired economic productivity level. There are various challenges in economies to manage the TFP, such as technical gaps and innovation, which means slower technological diffusion to local firms or lack of digital transformation. In the same aspect, there are certain issues of weak human or institutional quality; inefficient resource allocation; sustainability constraints and slow structural transformation from the input or output side (see Khan, 2020; Norbu et al., 2021; Lufin and Soto-Díaz, 2022; Stamopoulos et al., 2022; Bao et al., 2023; Borghi, 2023; Miranda-Pinto et al., 2023; Zha et al., 2023).

Based on the factor productivity concerns and issues, input-output linkages analysis can capture the final demand input and output changes in any economy. Leontief (1937) proposed the input-output closed economy model characterizes true factor input and output in the form of economic activities. But in order to analyze growth, Leontief (1970) proposed a model with variations in output that considered changes in final demand. Various researchers have used input-output analysis to capture the changes in economic activities with the passage of time. Yu (2018) highlighted that input-output (I-O) modelling is an effective economic analysis tool in capturing the interdependencies in industries. He provided an introduction and review of various I-O models such as single and regional with various model characteristics. The study discussed in detail the role of the transportation sector considering the forward and backward linkages by capturing the economic impact. It is important to identify the key sectors in any economy for effective policy initiative. Furthermore, it is impossible to get exact predictions as the uncertainty element is always there, and uncertainty can be reduced by using multiple approaches. Another study, by Firdausy and Buhaerah (2022) discussed that the post COVID-19 government of Indonesia needed to maintain the domestic input in the tourism sector. It was justified by input-output simulation analysis that the tourism industry was affected the worst during COVID-19 due to output reduction. In this context, it is important that the government has close collaboration with the private sector and tourism stakeholders to determine effective policies for rehabilitation of this sector.

In summary, based on the above discussion, the current study aims to analyze Saudi Arabia's upstream and downstream industries to offer implications by targeting Saudi's Vision 2030. This study has contributed to previous studies by highlighting these two-fold interesting facts: Firstly, the kingdom's economy has gone through various changes since the 1970s by emerging as the world's largest oil exporter. So, it is vital to explore the spillover effect of various activities with the pace of economic growth. Secondly, the historical predominance of the oil sector raises the question whether the country is ready to implement the various diversification policy initiatives as part of Vision 2030. Not only this, the large inflows of foreign exchange are boosting government spending and generating domestic demand also in various service sectors. Alternatively, another interesting aspect is that Saudi Arabia as an oil resourced based economy has generated a novel resource dominant strategy to have less dependence on extractive industries. The ambitious plan of Vision 2030 aims to prominently reflect non-oil growth by spurring strong domestic demand, especially increased private non-oil investment.

The rest of the paper is organized as follows: Section 2 summarizes the previous studies while Section 3 gives a brief overview of Saudi Arabia Vision 2030. Followed by the methodology and result findings as in Section 4 and 5 respectively. Lastly, Section 6 comprises conclusion and policy implications.

LITERATURE REVIEW

The mechanism of 'economic equilibrium' can be conceptualized easily by Leontief's open input–output model. This is rooted in the feature that prices of inputs are determined by the fixed technical coefficients (Leontief, 1951). In the nineteenth and early twentieth century the concept of economic equilibrium was refined while as the role of prices became central in defining the state of competitive equilibrium (see Walras, 1874; Pareto, 1906; Cassel, 1924). The expansion of the input-output framework is related to various economic analyses by relaxing the assumption of fixed technical coefficients. The input-output model can capture the magnitude of change in any specific sector from the demand and supply side. Hirschman (1958) elaborated that linkages serve as an equilibrium inducement mechanism by allocating the scarce resources by initiating various decisions. He has highlighted that backward linkages usually are compulsive and have more pressure within sectors. Whereas, the forward linkages exert weaker pressure to utilize the output from one sector to the other one. He also suggested that if the market mechanism is very sluggish it can be replaced with institutional linkages. Furthermore, Dietzenbacher and Van Der Linden (2002) highlighted the interdependencies in the European Community by using input-output linkages. By hypothetical extraction method focused on the sectoral and spatial dimension in order to disclose these sectoral performances.

Heo and Lee (2019) assessed the role of the Information and Communication Technology (ICT) industry in the Korean economy. The study used input-output analysis to analyze inter industry linkages to understand the spillover effect of this sector in overall economic activities. It was concluded that the ICT sector has stronger connectedness within manufacturing and services. This means that it is important to promote intra-industry induced systems in order to increase the utilization of products and services from other sectors by the ICT sector. Moreover, Ali et al. (2019) compared the performance of the construction industry in three economies Bangladesh, Sri Lanka and Nepal by applying input-output linkages analysis. The current paper examined the demand and supply side linkages and also applied a hypothetical extraction method to capture the overall sectoral impact. The findings revealed that the construction sector has strong backward and weak forward linkages in three economies.

Han (2022) evaluated structural change and linkages in the economic system for the Chinese economy amid COVID-19 using input-output analysis. The main results indicated that the pandemic accelerated structural transformation in China by posing severe threats in traditional sectors like finance and petroleum. But at the same time, digital and scientific research expanded their activities amid social distancing. This suggests some regrowth sectoral policies to foster research and innovation capability as a growth driver for the economy. In another study, Syed et al. (2023) estimated economic losses in Pakistan during COVID-19 by employing the input-output method to present a realistic picture. This methodology helped to capture the direct and indirect losses by finding changes in final demand and total output level. The study specifically focused on the 46 days complete lockdown that resulted in 19% decrease in final demand by having overall loss of approximately 75.6 million USD.

Brito et al. (2024) examined the potential of the fisheries sector in Cape Verde by using the standard bioeconomic and input-output models. The study computed the output and employment multipliers and economic sustainability of this specific sector. The overall findings provided insights for policy makers to reduce the fishing efforts and increase the harvest for biological sustainability. Meanwhile, the output multipliers should focus on promoting artisanal vessels in order to attain higher employment multipliers. Zhao and Ding (2024) examined the input-output multipliers of transport sectors from 2012 to 2020 in the Chinese economy. They highlighted that transport sectors induced and employment multipliers are close to 40% and 60% respectively. So, it was suggested that these findings will help to capture the economic contribution of these sectors that play a vital role in the economy.

Norbou et al. (2021) examined the forward and backward linkages in Asia-Pacific LDCs. The study highlighted that in recent years there is a reduction in poverty with the structural transformation process, especially the movement of labor from the agricultural sector. However, the agricultural sector still is a key sector in the region as the job creation potential is higher and increased productivity can further accompany stronger linkages. Huang et al. (2022) employed input-output linkages to determine the extent of structural changes in the Indian economy. The study highlighted the inter sectoral changes during 2000-2019 by using causative matrix. It was concluded that manufacturing sectors have profound resource and scale intensive

linkages with service sectors. It suggested intersectoral help in designing policies specifically in key sectors in an economy.

It is important to identify the key sectors in an economy, so Silva et al. (2024) investigated the exporting manufacturing sectors exposure in Brazil during recession. The study identified that based on the economic activities, the sectors that were more reliant on domestic activity affected more as compared to those that were less dependent. Tian (2024) explored the Chinese cultural industries from the perspective of demand and supply by input-output social network analysis. It was disclosed that cultural industries have generated productive demand for other sectors. Furthermore, these industries participate in overall economic activities but also have internal complexity and structural harmony.

The key factor of productivity is vital in effective allocation of resources and using right factor inputs. Wolf (1994) mentioned that input-output analysis provided some features to measure TFP growth. This can be done by using growth output, final output mix change and composite technical change. Later, in another study Wolf (1997) justified that R&D is a significant determinant of industry TFP. Furthermore, there are spillovers from the R&D by suppliers having technical change and information technologies.

Kazekami (2024) demonstrated the relationship between input-output multipliers and TFP in Tokyo. The key findings showed that sectors with high multipliers have low TFP that reduces the income per worker. Furthermore, the sectors with high productivity create only few jobs whereas the sectors with large influence on job creation do not have a a huge impact on economic activities. So, it is not only important to promote a certain sector but is equally necessary to have a spillover effect on the overall economy.

In light of previous studies, the current study makes full use of Saudi Arabia's latest input-output tables to capture the changes in sectoral performance in light of Vision 2030. The identification of key sectors and intersectoral linkages will showcase the relevant policies as part of economic growth. At the same time, the study has used productivity referred as efficiency change to assess the change and speed of technological integration. Most importantly, if any sector has implied a new innovation policy or strategy the outcome should reflect in the form of productivity.

SAUDI ARABIA VISION 2030

The Kingdom of Saudi Arabia is blessed with many natural resources and dynamic social, cultural and economic advantages that enabled the economy to take a leading position in the world. The role of public and private sector policies has a paramount importance in transforming the economy towards diversity and sustainability. The country is leading towards a new success story in the region by focusing on "Vision 2030" and shaping the future of Saudi Arabia. The government is fostering the economy by attracting foreign direct investment, innovative strategies and talent management to ensure a prosperous future. The ultimate goal to attain, "Vision 2030" is based on three pillars: an ambitious nation, a thriving economy and a vital society.

His Highness Royal Highness Prince Mohammed bin Salman bin Abdulaziz the Crown Prince, Prime Minister, & Chairman of the Council of Economics and Development Affairs has stated that:

> "*Building a vibrant and prosperous private sector is a national priority for the kingdom, and today we are initiating a new era that is more powerful in terms of cooperation and partnership between the public and private sectors"*
>
> Kingdom of Saudi Arabia (2016)

Based on the statement, the collaboration between the public-private sector will lead to a trustworthy leadership to execute the development plans by unifying the society. This can further help to optimize resource allocation by minimizing the risks and generating an innovative economy.

By considering the business and economic dimension of "Vision 2030" in Saudi Arabia, it sheds light on some prominent aspects that strengthen sustainable economic growth. Table 1 displays the planning goals by identifying the focused sectors by having allocation of investment plans.

Table 1 Planning Goals of Saudi Arabia as Vision 2030

Planning Goals	Impact on Saudi Arabia Economy	Focused Sectors
National Investment Strategy	➢ Private sector contribution to GDP 65% ➢ Contribution of non-oil sectors from 16% to 50% ➢ Reducing unemployment 7% ➢ Be in top ten economies in Global Competitiveness Index 2023	➢ Manufacturing ➢ Transport and logistics ➢ Tourism ➢ Healthcare ➢ Renewable Energy
FintechSaudi	➢ Support for all small and medium enterprises (SMEs) ➢ Enhance innovation and experimentation	➢ Education
Made in Saudi	➢ Aim to support local businesses ➢ Promote local products and services ➢ Goal to increase non-oil exports by 50% of non-oil GDP	➢ Industrial
NEOM	➢ To transform the Red Sea coast of the northwest ➢ Using Public investment funds to attain Sustainable living and working ➢ Promoting projects such as: THE LINE; Oxagon; Trojena; Sindalah	➢ Residential, ➢ Commercial, ➢ Industrial ➢ Transportation
Empowering the private sector	➢ Develop collaboration between public and private sectors ➢ Investment in local companies ➢ Enhance efficiency, digitization and quality of private sector services	➢ Private Sector
Monsha'at	➢ Empower SMEs by diversifying funding	➢ Small and Medium Enterprises (SMEs)
Shareek	➢ Support large Saudi companies to accelerate business projects ➢ Aim to increase private sector GDP contribution to 65% ➢ Support key four sectors with 12 projects by creating 64,000 local jobs ➢ Investment of 120 billion riyals in major companies ➢ Aim to attain 466 billion riyals of GDP	➢ Petrochemicals ➢ Telecoms ➢ Logistics ➢ Marine

Source: Vision of 2030 Kingdom of Saudi Arabia

The aim of these planning goals is also reflected in desired SDGs of Saudi Arabia. Various investment plans aimed to pave the path of sustainability by protecting the planet and ensuring prosperity. That is to say, the study aims to support Saudi decision makers in the development of effective strategies by investigating economic activities.

DATA AND RESEARCH METHODOLOGY

The input-output (I-O) model is a statistical tool for economics analysis that measures impact internally or externally. This further dissects the changes and impact within and the economy or regionally by capturing the linkages analysis. Furthermore, it also helps to formulate various policies by capturing the changes in sectoral basis by focusing on interdependencies. The model also considers some other areas of economics such as: business cycle, environmental issues, employment changes as associated with exports (see Peters et al., 2010; Trefler and Zhu, 2010; Lenzen et al., 2012; Acemoglu et al. 2012).

The current study has utilized the three latest input-output tables of 2020, 2025 and 2030 respectively as published by King Abdullah Petroleum Studies and Research Center (KAPSARC, 2023). These tables consist of 50 sectors, and the current research did sectoral based analysis without any aggregation (see Table A1). These tables were specifically published in light of Saudi Arabia socio-economic transformation targets in Vision 2030. It is projected that with new diversification policies the sectoral composition will change by having new reflections in macroeconomic variables. This further displays a comprehensive data approach to evaluate the possible allocation of resources as internally and externally.

The main framework of input-output tables is based on a double entry matrix that provides composition of various inputs as rows and output as columns. The sectoral interaction displays a comprehensive picture of all economic activities in any economy by utilizing the entire resources. The key equation of input-output analysis is captured in Leontief Open Model as in Equation 1 below:

$$X = (I - A)^{-1} \quad (1)$$

where, X is the total level of output, $(I-A)^{-1}$ is the Leontief inverse and y are the vector of final demand (Miller and Blair, 2009). Moreover, Huang et al. (2023) justified that a multi-objective dynamic model can help to improve the stability of the solution of dynamic input-output framework by considering a goal programming aspect.

In the framework of the input-output model, production of a particular sector has two-dimensional impact from the demand and supply side. This means that with the new planning policies and initiatives, if sector *j* increases its output level this will lead to a high demand (as a purchaser). This causation will reflect as the demand driven side and used as the term, "backward linkages" as interconnection from the input side. On the other hand, the increased output level of sector *j* will result in additional supplies from this sector (as a supplier). So, this direction is from the supply side model and represents as, "forward linkages."

Represented in the simplest form the direct backward linkages by which sector *j* strengthens depends on the interindustry inputs as in Equation 2.

$$BL(d)_j = \sum_{i=1}^{n} a_{ij} \tag{2}$$

To capture both direct and indirect linkages in the economy it was proposed total backward linkages by Rasmussen, (1957) in Equation 3.

$$BL(t)_j = \sum_{i=1}^{n} l_{ij} \tag{3}$$

Capturing the sectoral performance from the supply side, Equation 4 shows the direct forward linkages are the row sum of total intermediate sales by a sector as proposed by Chenery and Watanabe (1958). In addition, the sum of inverse from row side considers the total forward linkages (see Equation 5) respectively.

$$FL(d)_j = \sum_{j=1}^{n} b_{ij} \tag{4}$$

$$FL(t)_j = \sum_{j=1}^{n} g_{ij} \tag{5}$$

In summary, it is important to have a normalized measure of backward and forward linkages to indicate the key sectors for effective policy making. This normalization is known as "Index of the Power of Dispersion" by considering an index with average value of unity. Based on the sectoral interconnectedness, the phenomenon of identifying "leading" sectors means these sectors are more connected in economic activities. Grouping these key sectors in clusters can indicate how the derived information from demand and supply side can introduce different prevalent measures (see Hirschman,1958; Laumas, 1975; Schultz and Schumacher,1976; Hewings, 1982).

On the other hand, using technical coefficients, a_{ij}, value added coefficients, v_j, and total industry output, x_j can measure the TFP rate as follows in Equation 6:

$$x_j = \sum_{i=1}^{n} a_{ij}\, x_j + v_j x_j = \left(\sum_{i=1}^{n} a_{ij} + v_j\right) x_j \tag{6}$$

Applying the differentiated equation this will result as follows (see Equation 7):

$$dx_j = d\left[\left(\sum_{i=1}^{n} a_{ij} + v_j\right) x_j\right] = \left(\sum_{i=1}^{n} a_{ij} + v_j\right) dx_j + \left(\sum_{i=1}^{n} da_{ij} + dv_j\right) x_j \tag{7}$$

In summary, the rate of TFP growth can be determined as in Equation 8:

$$\tau_j = -\left(\sum_{i=1}^{n} da_{ij} + dv_j\right) \tag{8}$$

One of the interesting aspects of TFP is to analyze v_j by decomposing the components of labor and capital respectively. This has represented a measure of sectoral technical change to capture the changes with various economic policies proposed by Leontief et al. (1953). This can further capture portion of change accounted for by old ($a_{ij}^0 \; and \; v_j^0$) and new technology ($a_{ij}^1 \; and \; v_j^1$) to meet the input need (see Equation 9):

$$x_j^1 - x_j^0 = \Delta x_j = \left(\sum_{i=1}^{n} a_{ij}^0 + v_j^0\right) x_j^1 - \left(\sum_{i=1}^{n} a_{ij}^0 + v_j^0\right) x_j^0 \; + \left(\sum_{i=1}^{n} a_{ij}^1 + v_j^1\right) x_j^0 - \left(\sum_{i=1}^{n} a_{ij}^0 + v_j^0\right) x_j^0 \tag{9}$$

Furthermore, some studies are concerned about the rate of productivity change relative to just initial output (Saranga and Banker, 2010; Miguéis et al., 2012). That can be found by normalizing the total level of output, x_j^0 as displayed in Equation 10:

$$\tau_j = -\left(\sum_{i=1}^{n} \Delta a_{ij} + \Delta v_j\right)$$

So,

$$\Delta x_j = \Delta\left[\left(\sum_{i=1}^{n} a_{ij} + v_j\right) x_j\right] = \left(\sum_{i=1}^{n} a_{ij} + v_j\right) \Delta x_j - \tau_j x_j^0 \tag{10}$$

$$\left(\sum_{i=1}^{n} a_{ij}^0 + v_j^0\right) x_j^1 - \left(\sum_{i=1}^{n} a_{ij}^0 + v_j^0\right) x_j^0 \; + \left(\sum_{i=1}^{n} a_{ij}^1 + v_j^1\right) x_j^0 - \left(\sum_{i=1}^{n} a_{ij}^0 + v_j^0\right) x_j^0$$

Lastly, in the matrix form this can be stated in the form of Equation 11:

$$\Delta x = [\langle i'A + \hat{v}\rangle]\Delta x + [\langle i'\Delta A\rangle + \langle \Delta v x\rangle]x$$

and

$$\tau = -[(i'\Delta A) + \Delta v] = -\left[\left(\sum_{i=1}^{n} \Delta a_{ij} + \Delta v_j\right)\right] \tag{11}$$

Overall, the interaction terms are also labeled in the structural decomposition method due to close resemblance with TFP analysis.

RESULT FINDINGS

The findings of the current study shed light on some interesting facts about the Saudi Arabia economy in light of backward and forward linkages (See Table A2). In summary, Table 2 displays the result of forward and backward linkages in four quadrants as the first quadrant displays the sectors that are not strongly connected to other sectors. In this quadrant the independent sectors represent mainly those sectors such as crude oil, some metals, education, health and public administration sectors. This justifies that the kingdom has the independence of these sectors in planning and the decision-making process.

Whereas, the second quadrant includes the sectors as they are dependent on or connected to other sectors. This is one of the vital quadrants in any economy as this comprises key sectors as they are connected to each other. It is the key aspect to focus on these sectors carefully with comprehensive planning policies. Khemraj and Pasha (2024) mentioned that the interconnected sectors are overpowered and can spread the favorable multiplier effects in the growth process. The kingdom is focusing on Vision 2030 in light of SDGs, especially enhancing the quality to have a better future. The key sectors are comprised mainly of mining, real estate and tourism, wood, hydrocarbons, financial, transport and digital services.

Furthermore, the third quadrant included the sectors which are dependent on interindustry supply (only backward linkage greater than 1). In the current analysis from the supply side, food, refined petroleum, machinery, ships and construction sectors are playing an important role. Whereas, the fourth quadrant summarized the sectors that mainly depended on interindustry demand (only forward linkage greater than 1). These sectors are also part of planning for demand in, for example, agriculture, mining, new high value-added manufacturing, hydroelectricity, financial and digital services. Overall, the study demonstrates the strengthening

linkages and factor productivity that is accelerating Saudi Arabia towards Vision 2030. The forward and backward linkages reveal that there is high resilience on output levels of some sectors such as rubber, chemicals, metals and energy while some emerging industries remain comparatively weak. The findings highlight that collectively to foster intersectoral connectivity there should be a transition towards high value-added production. Strengthening the backward linkages with local content development can further promote forward linkages as downstream manufacturing will expand digital and technological infrastructure as strategic priorities. At the same time, this whole mechanism will improve whole supply chain integration with improved human capital quality, R&D investment and SMEs TFP accordingly.

Table 2 Classification of backward and forward linkage results

Direct or Total Backward Linkages	Direct or Total Forward Linkages	
	Low (<1)	High (>1)
Low (<1)	3,4,18,20,22,25,26,36,37,39,43,44,45,46,47,48	2,8,10,11,12,14,15,16,17,19,28,32,40,49
High (>1)	6,7,9,21,23,24,33,34	1,5,13,27,29,30,31,35,41,42,50

In summary, the key sectors as having high backward and forward linkages justified the relevant policies and ambitious plans as part of the Vision 2030 agenda and SDGs. The Kingdom of Saudi Arabia's initiatives to promote clean and affordable energy are clearly indicated as part of the electricity and hydrocarbon sector. Energy is an input, and if this factor of production is used in production it will result in a green economy. Furthermore, the country had a large allocation of investment for transportation and infrastructure development. For the manufacturing sectors, there are changes as a responsible production process with value added supply chains. Lastly, the digital transformation is an entire change that means a new service sector by eliminating paper work. All of the country's visionary plans are showcasing the efficient management of natural resources to increase economic expansion. The stable financial system and advancement will facilitate the reliable and sustainable methods with significant implications for environmental sustainability and climate change. The key findings match with some previous studies in light of key sustainable plans and sectoral performance (see Jum'a, 2023; Zhang et al., 2023; Dhahri et al., 2024; Sekhar et al., 2024).

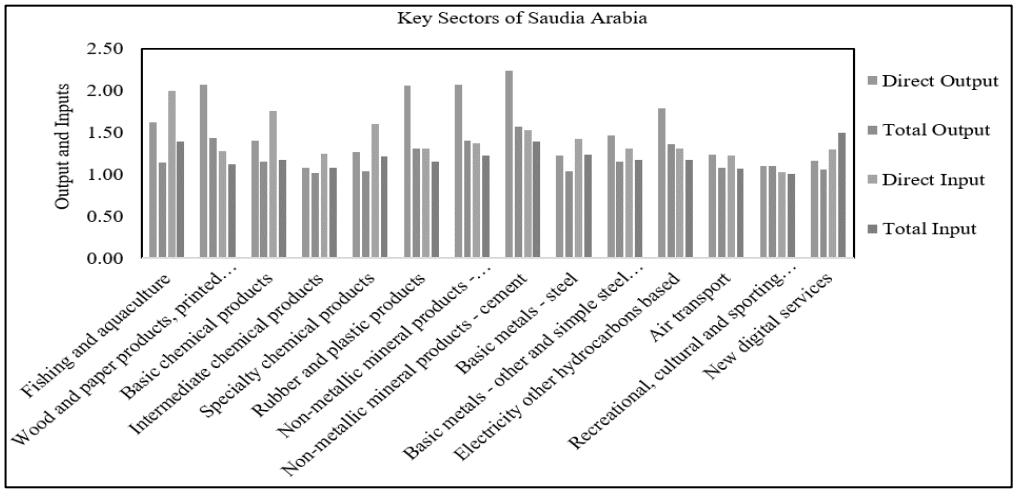

Figure 1 Key sectors of Saudi Arabia

Furthermore, the TFP analysis shows that there is change in factor productivity during 2020-2030 based on intermediate and value-added inputs (see Table A3). Various sectors have shown between the years 2020-2030, the increase in the intermediate inputs as negative elements in $\Delta A^{(2020\text{-}2030)}$ were cancelled out by the decrease in productivity of value added as positive elements of $\Delta v^{(2020\text{-}2030)}$. These findings justified the change in direct and indirect requirements in determination of total level of output. Current factor productivity also supports findings of Moreau and Aligishiev (2024) that Saudi Arabia National Investment Strategy (NIS) in light of Vision 2030 has resulted in labor supply reform and public sector efficiency. Another interesting finding by Al-Mahish et al. (2024) indicated that there is stable integration between inputs and outputs in the refining sector of Saudi Arabia. This further shows that crude oil has an important role in production, infrastructure development and technological advancement.

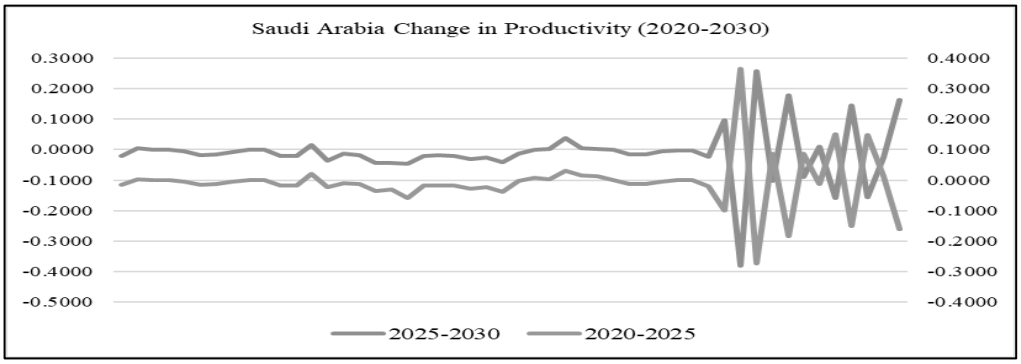

Figure 2 Change in TFP in Saudi Arabia 2020-2030

In summary, the changes in productivity between 2020-2030 displays a moderate change while having modest fluctuations. With knowledge spill over and technical diffusion, there are changes in factor accumulation that will raise TFP over time. There are some short-term productivity frictions that are expected to enhance long term allocative efficiency by having particular investment in Artificial Intelligence (AI). Overall, Saudi Arabia's changing TFP reflects a transition period with productivity enhancing reforms, their full effects will materialize gradually as human capital and innovation ecosystems.

CONCLUSION & POLICY IMPLICATIONS

In summary, the degree of diversification should further enforce the products the country produces. This means that the change should reflect in economic activities that lead to a prominent reflection in sectoral performance. The mapped policies should show the network and linkages impacts directly and indirectly in Saudi Arabia's economy. Being more diversified and owning technical capabilities will lead towards the new road of dynamic structural change by having new identification. The critical insights from the research findings is to promote the key sectors as they have direct and indirect impact on upstream or downstream supply chains (see Bekhet, 2010; Yasmin and Bekhet, 2017; Maeno, 2023; Tang and Yang, 2023).

In the context of factor productivity, Saudi Arabia should boost levels of capital and labor by managing technological advancement. Economic growth matters for the economy as it raises the overall level of output, but technical change can drive the TFP. The economy can ensure effective linkages with the broader economy by technical upgrading and adding new knowledge to the existing stock. Moreover, there should be careful implication of government subsidies, interest income and loan deposits that can reflect changes in output and input mix. The overall results suggest that the TFP is the key central concern for the Saudi economy to achieve structural transformation that is envisioned in Vision 2030. However, there are still some challenges to constrain productivity growth across the economy. Despite different reforms, there is still oil sector dominance that limits the diversification and reduces the diffusion of productivity enhancing innovation across non-oil sectors. There are still some human capital gaps that undermine the efficient use of innovative technologies by having limited technical capabilities. Moreover, the factor productivity is still low in some small sectors due to availability or limited access to finance and digitalization. The structural constraints collectively impede Saudi Arabia from capital driven to knowledge driven growth that can lead improvements in TFP which is essential for long term goals of competitiveness under Vision 2030.

Another interesting aspect is that the availability of comprehensive data about economic activities of Saudi Arabia is putting forth new insights for researchers and policy makers. This provision of projected data in light of Vision 2030 will motivate the analytics to deduce the effective reforms and policies based on comprehensive analysis. Moreover, the most vital benefit of the provision of data will facilitate an in-depth analysis that comes up with practical implications for Saudi Arabia decision makers to achieve Vision 2030.

The kingdom is also highlighting the importance of collaboration by bringing together government ministries, private sector entities and foreign leaders to achieve a green future. For the long term, social welfare is another aspect of Saudi Arabia's vision that means the coupling coordination relationship between eco-environment and social welfare. It is recommended that future studies examine the impact of government spending on various sectors to ensure the correct allocation of timely investment plans. This paper strongly

recommends future studies proceed with further analysis based on allocation of investment packages per sector. By having such analysis, the estimated economic growth per sectoral performance outcomes will shed light on what extent Saudi Arabia resource endowment has generated output per sector.

REFERENCES

Acemoglu, D., Carvalho, V. M., Ozdaglar, A., & Tahbaz-Salehi, A. (2012). The network origins of aggregate fluctuations. *Econometrica*, *80*(5), 1977-2016.

Ali, Y., Sabir, M., & Muhammad, N. (2019). A comparative input-output analysis of the construction sector in three developing economies of South Asia. *Construction Management and Economics*, *37*(11), 643–658. https://doi.org/10.1080/01446193.2019.1571214

Al-Mahish, M., Alzahrani, F., Elzaki, R., & Ben Slama, M. (2024). Economies of scale in Saudi Arabia's refining sector: An application of modern econometric models. *Heliyon*, *10*(9), e30150.

Bao, X., Gao, L., Jin, Y., & Sun, J. (2023). Industrial agglomeration and firm exports: Micro-evidence based on input-output linkages. *Economic Modelling*, *119*, 106123.

Bekhet, H. A. (2010). Ranking Sectors Changes of the Malaysian Economy: Input-Output Approach. *International Business Research*, *3*(1), 107-130.

Borghi, R. A. Z. (2023). Structural change and industrial linkages: a perspective on China's growth pattern, 1995-2009. *International Review of Applied Economics*, *37*(2), 253-274. doi:10.1080/02692171.2023.2184464

Brito, J. A. F., Nguyen, T. V., & Kristófersson, D. M. (2024). Evaluating the sustainability and potential of the Blue Economy: A bioeconomic and input–output analysis of the fisheries sector in Cape Verde. *Ocean & Coastal Management*, *250*, 107042.

Chenery, H. B., & Watanabe, T. (1958). International Comparisons of the Structure of Productions. *Econometrica*, *4*, 487–521.

Dhahri, S., Omri, A., & Mirza, N. (2024). Information technology and financial development for achieving sustainable development goals. *Research in International Business and Finance*, *67* (Part A), 102156.

Dietzenbacher, E., & Van Der Linden, J. A. (2002). Sectoral and Spatial Linkages in the EC Production Structure. *Journal of Regional Science*, *37*(2), 235 – 257.

Firdausy, C. M., & Buhaerah, P. (2025). Building back better tourism sector post-COVID-19 pandemic in Indonesia: input-output and simulation analysis. *Journal of Policy Research in Tourism, Leisure and Events*, *17*(1), 51–68. https://doi.org/10.1080/19407963.2022.2143511

Heo, P. S., & Lee, D. H. (2019). Evolution of the linkage structure of ICT industry and its role in the economic system: the case of Korea. *Information Technology for Development*, *25*(3), 424–454. https://doi.org/10.1080/02681102.2018.1470486

Hewings, G.J.D. (1982). The Empirical Identification of Key Sectors in an Economy: A Regional Perspective. *The Developing Economies*, *20*, 173–195.

Hirschman, A. O. (1958). *The Strategy of Economic Development*. Yale University Press. New Haven.

Huang, L., Han, Y., Zheng, C., & Zhang, S. (2023). A Multi Objective and Dynamic Input Output Optimization Model and Algorithm. *Procedia Computer Science*, *228*, 155-162.

Huang, Y., Haseeb, M., Khan, J., & Hossain, M.E. (2022). Structural changes and economic landscape of the Indian economy: 2000-2019. *Review of Economic Development*, *27*(1), 395-422.

Jum'a, L. (2023). The impact of green supply chain management practices on sustainable development goals: The case of mining sector in Jordan. *Environmental Development*, *48*, 100934.

Kazekami, S. (2024). Linkage, sectoral productivity, and employment spread. *Structural Change and Economic Dynamics*, *69*, 108-123.

Khan, M. A. (2020). Cross sectoral linkages to explain structural transformation in Nepal. *Structural Change and Economic Dynamics*, *52*, 221-235.

Khemraj, T., & Pasha, S. (2024). Structural change and sectoral interconnectedness in two resource-abundant economies. *Resources Policy*, *88*, 104529.

King Abdullah Petroleum Studies and Research Center (KAPSARC) (2023). *Vision 2030 Input-Output Table for the Year 2020, 2025, 2030*. Available at: https://datasource.kapsarc.org/explore/dataset/vision-2030-input-output/information/

Kingdom of Saudi Arabia. (2016). *Vision 2030*. Vision2030.gov.sa. Retrieved from https://www.vision2030.gov.sa/media/rc0b5oy1/saudi_vision203.pdf

Laumas, P. (1975). Key Sectors in Some Underdeveloped Countries. *Kyklos*, *28*, 62–79.

Lenzen, M., Moran, D., Kanemoto, K., Foran, B., Lobefaro, L., & Geschke, A. (2012). International trade drives biodiversity threats in developing nations. *Nature*, *486*, 7401.

Leontief, W. (1937). Interrelation of Prices, Output, Savings and Investment. *Review of Economist and Statistics*, *19*(3), 109–132.

Leontief, W. (1970). *The dynamic inverse. In A. P. Carter & A. Brody (Eds.), Contributions to input-output analysis*, 17–46. North-Holland Publishing.

Lufin, M., & Soto-Díaz, J. (2022). Technology, geography, and diversification in a small mineral economy. *The Extractive Industries and Society*, *11*, 101080.

Maeno, K. (2023). Identifying critical sectors in the restructuring of low-carbon global supply chains. *Energy Economics*, *127*(Part A), 107025.

Miguéis, V. L., Camanho, A. S., Bjørndal, E., & Bjørndal, M. (2012). Productivity change and innovation in Norwegian electricity distribution companies. *Journal of the Operational Research Society*, *63*(7), 982–990. https://doi.org/10.1057/jors.2011.82

Miller, R. E., & Blair, P. D. (2009). *Input Output Analysis: Foundations and Extensions*. Prentice-Hall.

Miranda-Pinto, J., Silva, A., & Young, E. R. (2023). Business cycle asymmetry and input-output structure: The role of firm-to-firm networks. *Journal of Monetary Economics*, *137*, 1-20.

Moreau, F., & Aligishiev, Z. (2024). Diversification in sight? A macroeconomic assessment of Saudi Arabia's vision 2030. *International Economics*, *180*, 100538.

Myrdal, G. (1957). *Economic Theory and Underdeveloped Regions*. London: Gerald Duckworth.

Norbou, N. P., Tateno, Y., & Bolesta, A. (2021). Structural transformation and production linkages in Asia-Pacific least developed countries: An input-output analysis. *Structural Change and Economic Dynamics*, *59*, 510-524.

Peters, G. P., Guan, D., Hubacek, K., Minx, J. C., & Weber, C. L. (2010). Effects of China's Economic Growth. *Science*, *328*(5980), 824-825.

Saranga, H., & Banker, R. D. (2010). Productivity and technical changes in the Indian pharmaceutical industry. *Journal of the Operational Research Society*, *61*(12), 1777–1788. https://doi.org/10.1057/jors.2009.142

Schultz, S., & Schumacher, D. (1976). Key Sectors in Some Underdeveloped Countries: A Comment. *Kyklos*, *29*, 765–766.

Sekhar, J., Samuel, M. S., Glivin, G., Le, T., & Mathimani, T. (2024). Production and utilization of green ammonia for decarbonizing the energy sector with a discrete focus on Sustainable Development Goals and environmental impact and technical hurdles. *Fuel*, *360*, 130626.

Silva, T. C., Valenca, P. R. M., & Tabak, B. M. (2024). Economic performance of exporting sectors: Evidence for manufacturing in Brazil. *Economic Systems*, *48*(2), 101220.

Stamopoulos, D., Dimas, P., &Tsakanikas, A. (2022). Exploring the structural effects of the ICT sector in the Greek economy: A quantitative approach based on input-output and network analysis. *Telecommunications Policy*, *46*(7,) 102332.

Syed, F., Nazir, N., & Ullah, A. (2023). The COVID-19 lockdown in Pakistan: Estimating economic losses using input–output analysis. *Regional Science Policy & Practice*, *15*(8), 1672-1688.

Tang, L., & Yang, J. (2023). Towards a low-carbon future for China's power supply chain: Critical sectors identification and scenario analysis. *Journal of Environmental Management*, *347*, 119115.

Tian, Y. (2024). Industrial Linkages and Digital Synergy: The Input-Output Analysis of Chinese Cultural Industries. *The Journal of Arts Management, Law, and Society*, *54*(1), 17–41. https://doi.org/10.1080/10632921.2023.2273443

Trefler, D., & Zhu, S. C. (2010). The structure of factor content predictions. *Journal of International Economics*, *82*(2), 195-207.

Vision of 2030 Kingdom of Saudi Arabia. Available at: https://www.vision2030.gov.sa/en/progress/business-economy/

Wolff, E. N. (1994). Productivity measurement within an input–output framework. *Regional Science and Urban Economics*, *24*(1), 75–92.

Wolff, E. N. (1997). Spillovers, linkages and technical change. *Economic Systems Research*, *9*(1), 9–23.

Yasmin, T., & Bekhet, H. A. (2017). Sectoral capabilities and productive structure: An input-output analysis of the key sectors of the Malaysian economy. *International Business Management*, *2*(2), 1-21.

Yu, H. (2018). A review of input–output models on multisectoral modelling of transportation–economic linkages. *Transport Reviews*, *38*(5), 654-677. doi:10.1080/01441647.2017.1406557

Zha, J., Li, C., Wang, X., He, L., & Shu, H. (2023). What caused the wage changes in tourism-related industries? A demand-side analysis based on an extended input-output model. *Current Issues in Tourism*, *26*(19), 3191-3208. doi:10.1080/13683500.2022.2110043

Zhang, M., Lin, C., & Wei, Y. (2023). Natural resources exploration, efficiency of energy resources and financial development: Resources sector analysis via least square with structural breaks. *Resources Policy*, *85*(Part A), 104010.

Zhao, B., & Ding, Y. (2024). Multiplier effects of transport sectors in China's national economy: An input-output approach. *Research in Transportation Business & Management*, *53*, 101109.

APPENDICES

Table A1 Details of sectors

No.	Sectors
1	Agriculture
2	Fishing and aquaculture
3	Crude oil and natural gas
4	Metal ores
5	Other mining and quarrying products
6	Food products, beverages and tobacco
7	Other manufacturing
8	Wood and paper products, printed and recorded media
9	Refined petroleum products
10	Basic chemical products
11	Intermediate chemical products
12	Specialty chemical products
13	Basic pharmaceutical products
14	Rubber and plastic products
15	Non-metallic mineral products - gypsum, ceramics and other
16	Non-metallic mineral products - cement
17	Basic metals - steel
18	Basic metals - aluminum
19	Basic metals - other and simple steel products
20	Fabricated metal products
21	Machinery and equipment n.e.c.
22	Computer, electronic and precision equipment
23	Motor vehicles, trailers and semi-trailers
24	Ships and boats manufacturing
25	Railway related manufacturing
26	Aircraft manufacturing
27	New high value-added manufacturing
28	Electricity other hydrocarbons based
29	Electricity natural gas based
30	Electricity solar based
31	Electricity wind based
32	Water
33	Residential building construction
34	Other construction
35	Wholesale retail trade
36	Road transport
37	Pipeline transport - hydrocarbon
38	Railroad transport
39	Water transport
40	Air transport
41	Other transport and telecommunications
42	Financial and business services
43	Real estate services
44	Public administration and defense; compulsory social security
45	Education
46	Health and social work
47	Sewage and refuse disposal, sanitation and similar activities
48	Other services
49	Recreational, cultural and sporting activities
50	New digital services

Source: Input-output Table 2020, 2025 & 2030

Table A2 Backward and Forward Linkages Findings

No.	Sectors	2020				2025				2030			
		Direct Output	Total Output	Direct Input	Total Input	Direct Output	Total Output	Direct Input	Total Input	Direct Output	Total Output	Direct Input	Total Input
1	Agriculture	1.23	1.04	0.82	0.91	1.38	1.09	0.96	0.98	1.56	1.16	1.10	1.04
2	Fishing and aquaculture	1.62	1.14	2.00	1.39	1.71	1.17	1.93	1.38	1.82	1.20	1.81	1.34
3	Crude oil and natural gas	0.30	0.74	0.18	0.64	0.34	0.75	0.22	0.64	0.41	0.77	0.25	0.64
4	Metal ores	0.71	0.86	0.55	0.76	0.76	0.87	0.59	0.76	0.80	0.87	0.59	0.75
5	Other mining and quarrying products	1.70	1.26	0.56	0.80	1.72	1.28	0.73	0.86	1.80	1.33	0.94	0.95
6	Food products, beverages and tobacco	0.40	0.77	1.10	1.02	0.41	0.77	1.10	1.03	0.41	0.77	1.07	1.03
7	Other manufacturing	0.67	0.85	1.12	1.05	0.69	0.85	1.12	1.05	0.71	0.85	1.10	1.03
8	Wood and paper products, printed and recorded media	2.07	1.43	1.27	1.12	2.10	1.47	1.27	1.12	2.10	1.50	1.23	1.09
9	Refined petroleum products	0.83	0.94	1.04	0.87	0.98	1.00	1.11	0.88	1.14	1.06	1.16	0.90
10	Basic chemical products	1.40	1.15	1.76	1.18	1.43	1.16	1.72	1.18	1.46	1.17	1.67	1.17
11	Intermediate chemical products	1.08	1.02	1.24	1.08	1.12	1.04	1.25	1.09	1.16	1.05	1.24	1.09
12	Specialty chemical products	1.27	1.04	1.60	1.22	1.33	1.06	1.60	1.23	1.38	1.07	1.58	1.24
13	Basic pharmaceutical products	1.47	1.19	0.89	0.97	1.14	1.06	0.66	0.85	0.91	0.95	0.71	0.85
14	Rubber and plastic products	2.06	1.31	1.31	1.15	2.14	1.35	1.41	1.21	2.19	1.36	1.46	1.24
15	Non-metallic mineral products - gypsum, ceramics and other	2.07	1.40	1.37	1.23	2.13	1.44	1.41	1.28	2.18	1.48	1.48	1.36
16	Non-metallic mineral products - cement	2.23	1.57	1.53	1.39	2.28	1.62	1.57	1.46	2.33	1.67	1.61	1.55
17	Basic metals - steel	1.22	1.04	1.42	1.24	1.30	1.06	1.46	1.27	1.37	1.09	1.46	1.27
18	Basic metals - aluminum	0.39	0.73	0.91	0.96	0.43	0.73	0.94	0.97	0.47	0.73	0.95	0.98
19	Basic metals - other and simple steel products	1.47	1.15	1.30	1.18	1.55	1.17	1.35	1.21	1.64	1.20	1.40	1.24
20	Fabricated metal products	0.00	0.64	0.78	0.91	0.00	0.63	0.78	0.91	0.00	0.62	0.76	0.90
21	Machinery and equipment n.e.c.	0.02	0.64	1.07	1.03	0.02	0.63	1.06	1.03	0.02	0.62	1.04	1.01
22	Computer, electronic and precision equipment	0.14	0.68	0.94	1.00	0.16	0.67	0.94	1.00	0.17	0.67	0.93	0.99
23	Motor vehicles, trailers and semi-trailers	0.12	0.68	1.24	1.13	0.13	0.68	1.26	1.15	0.14	0.67	1.21	1.13
24	Ships and boats manufacturing	0.10	0.66	1.37	1.17	0.09	0.65	1.36	1.16	0.08	0.64	1.27	1.13
25	Railway related manufacturing	0.10	0.67	0.54	0.84	0.11	0.67	0.57	0.85	0.11	0.66	0.58	0.86

Source: Input-output Tables 2020, 2025 & 2030

Table A2 Cont.

No.	Sectors	2020				2025				2030			
		Direct Output	Total Output	Direct Input	Total Input	Direct Output	Total Output	Direct Input	Total Input	Direct Output	Total Output	Direct Input	Total Input
26	Aircraft manufacturing	0.36	0.77	0.44	0.77	0.42	0.79	0.48	0.78	0.47	0.79	0.49	0.78
27	New high value-added manufacturing	1.20	1.04	0.71	0.88	0.97	0.95	0.53	0.78	0.75	0.86	0.64	0.82
28	Electricity other hydrocarbons based	1.79	1.36	1.30	1.18	1.85	1.40	1.33	1.21	1.91	1.45	1.36	1.23
29	Electricity natural gas based	1.73	1.23	1.17	0.96	1.75	1.24	1.13	0.95	1.78	1.27	1.14	0.96
30	Electricity solar based	1.36	1.08	0.62	0.84	0.93	0.94	0.46	0.74	0.54	0.80	0.38	0.69
31	Electricity wind based	1.36	1.08	0.62	0.84	1.01	0.96	0.49	0.76	0.64	0.84	0.43	0.71
32	Water	1.79	1.63	1.78	1.65	1.83	1.67	1.74	1.66	1.87	1.71	1.70	1.66
33	Residential building construction	0.09	0.66	1.23	1.13	0.10	0.65	1.22	1.13	0.11	0.64	1.19	1.13
34	Other construction	0.11	0.67	1.38	1.17	0.12	0.66	1.36	1.18	0.13	0.65	1.34	1.18
35	Wholesale retail trade	1.13	1.03	0.77	0.88	1.08	1.01	0.72	0.85	1.05	1.00	0.67	0.82
36	Road transport	0.93	0.97	0.58	0.80	0.92	0.97	0.57	0.79	0.90	0.95	0.53	0.76
37	Pipeline transport - hydrocarbon	0.12	0.67	0.60	0.81	0.09	0.66	0.58	0.80	0.07	0.64	0.54	0.77
38	Railroad transport	2.51	1.52	1.62	1.21	2.55	1.55	1.74	1.26	2.59	1.57	1.78	1.28
39	Water transport	0.75	0.90	0.49	0.76	0.73	0.89	0.46	0.74	0.70	0.88	0.42	0.71
40	Air transport	1.23	1.08	1.23	1.07	1.21	1.07	1.19	1.05	1.17	1.06	1.13	1.02
41	Other transport and telecommunications	1.52	1.20	0.67	0.83	1.51	1.20	0.64	0.81	1.49	1.20	0.58	0.77
42	Financial and business services	1.82	1.34	0.79	0.88	1.82	1.35	0.86	0.92	1.85	1.38	0.96	0.96
43	Real estate services	0.54	0.83	0.45	0.75	0.60	0.84	0.51	0.77	0.64	0.85	0.52	0.76
44	Public administration and defense; compulsory social security	0.08	0.66	0.65	0.83	0.10	0.66	0.65	0.82	0.13	0.66	0.64	0.81
45	Education	0.65	0.85	0.61	0.82	0.70	0.86	0.66	0.83	0.84	0.91	0.73	0.85
46	Health and social work	0.97	0.98	0.97	0.99	1.04	1.01	1.00	1.00	1.08	1.03	0.99	0.99
47	Sewage and refuse disposal, sanitation and similar activities	0.08	0.66	0.67	0.85	0.09	0.66	0.67	0.84	0.10	0.65	0.65	0.83
48	Other services	0.91	0.99	0.96	0.97	1.00	1.03	1.00	0.98	1.06	1.05	1.01	0.97
49	Recreational, cultural and sporting activities	1.10	1.10	1.03	1.00	1.09	1.10	1.00	0.99	1.08	1.10	0.96	0.96
50	New digital services	1.16	1.06	0.74	0.87	1.00	1.00	0.64	0.81	0.72	0.88	0.61	0.79

Source: Input-output Tables 2020, 2025 & 2030

Table A3 Total Factor Productivity Change during 2020-2030

No.	Sectors	2030-2025	2025-2030
1	Agriculture	-0.0165	-0.0220
2	Fishing and aquaculture	0.0015	0.0051
3	Crude oil and natural gas	-0.0001	-0.0001
4	Metal ores	-0.0002	-0.0015
5	Other mining and quarrying products	-0.0055	-0.0052
6	Food products, beverages and tobacco	-0.0141	-0.0173
7	Other manufacturing	-0.0135	-0.0161
8	Wood and paper products, printed and recorded media	-0.0062	-0.0091
9	Refined petroleum products	-0.0002	-0.0002
10	Basic chemical products	-0.0004	-0.0004
11	Intermediate chemical products	-0.0181	-0.0216
12	Specialty chemical products	-0.0169	-0.0208
13	Basic pharmaceutical products	0.0201	0.0141
14	Rubber and plastic products	-0.0242	-0.0351
15	Non-metallic mineral products - gypsum, ceramics and other	-0.0109	-0.0135
16	Non-metallic mineral products - cement	-0.0123	-0.0178
17	Basic metals – steel	-0.0353	-0.0450
18	Basic metals – aluminum	-0.0315	-0.0434
19	Basic metals - other and simple steel products	-0.0574	-0.0473
20	Fabricated metal products	-0.0173	-0.0199
21	Machinery and equipment n.e.c.	-0.0168	-0.0193
22	Computer, electronic and precision equipment	-0.0170	-0.0197
23	Motor vehicles, trailers and semi-trailers	-0.0268	-0.0310
24	Ships and boats manufacturing	-0.0235	-0.0267
25	Railway related manufacturing	-0.0381	-0.0410
26	Aircraft manufacturing	-0.0022	-0.0145
27	New high value-added manufacturing	0.0088	-0.0014
28	Electricity other hydrocarbons based	0.0030	0.0026
29	Electricity natural gas based	0.0314	0.0380
30	Electricity solar based	0.0145	0.0048
31	Electricity wind based	0.0135	0.0015
32	Water	-0.0009	-0.0011
33	Residential building construction	-0.0129	-0.0151
34	Other construction	-0.0133	-0.0155
35	Wholesale retail trade	-0.0059	-0.0064
36	Road transport	0.0000	-0.0042
37	Pipeline transport – hydrocarbon	0.0000	-0.0024
38	Railroad transport	-0.0196	-0.0227
39	Water transport	-0.1004	0.0965
40	Air transport	0.3644	-0.3810
41	Other transport and telecommunications	-0.2719	0.2581
42	Financial and business services	0.0877	-0.1015
43	Real estate services	-0.1831	0.1786
44	Public administration and defense; compulsory social security	0.0866	-0.0890
45	Education	-0.0134	0.0100
46	Health and social work	0.1517	-0.1590
47	Sewage and refuse disposal, sanitation and similar activities	-0.1508	0.1448
48	Other services	0.1483	-0.1551
49	Recreational, cultural and sporting activities	0.0137	-0.0270
50	New digital services	-0.1609	0.1634

Source: Input-output Tables 2020, 2025 & 2030