KAPSARC
مركز الملك عبدالله للدراسات والبحوث البترولية
King Abdullah Petroleum Studies and Research Center

Growth, Investment and the Low-Carbon Transition: A View from Saudi Arabia

Ibrahim Abdel Gelil, Nicholas Howarth and Alessandro Lanza

April 2017 / KS-2017--DP014

Background to this Study

This paper was provided to the OECD in the context of the project “Growth, Investment and the Low Carbon Transition”. The content remains the sole responsibility of the authors and of KAPSARC. The views expressed herein do not necessarily reflect the position of the OECD or its member countries. Contact: nicholas.howarth@kapsarc.org

About KAPSARC

The King Abdullah Petroleum Studies and Research Center (KAPSARC) is a non-profit global institution dedicated to independent research into energy economics, policy, technology and the environment, across all types of energy. KAPSARC’s mandate is to advance the understanding of energy challenges and opportunities facing the world today and tomorrow, through unbiased, independent, and high-caliber research for the benefit of society. KAPSARC is located in Riyadh, Saudi Arabia.

Legal Notice

Growth, Investment and the Low Carbon Transition

A common priority across G20 countries is the need to reinvigorate economies through an economic transformation that delivers a higher level of better quality growth. In Saudi Arabia, recognizing the risks posed by an economy over-reliant on oil exports and with rapidly growing domestic energy consumption, the government has brought in an ambitious whole-of-government reform program called Vision 2030.

Figure 1 shows nominal growth in GDP and its oil and non-oil components for the years 1990-2016. While non-oil GDP has been a steady and growing component of overall total GDP (Figure 2), volatility in oil revenues, reflected in oil-based GDP, has contributed to significant volatility in overall growth. Shifting towards more sustained and sustainable growth has justifiably been a priority for government.

The Kingdom's Vision 2030 is being supported and implemented through a roll out of substantive sub-programs including: the Fiscal Balance Program (2016), the National Transformation Program (NTP 2016) and the Saudi Energy Efficiency Program (http://www.seec.gov.sa/en). As part of these programs, the Kingdom has announced ambitious, public goals that have been transparently shared to create a more open, diverse economy, less reliant on hydrocarbon resources.

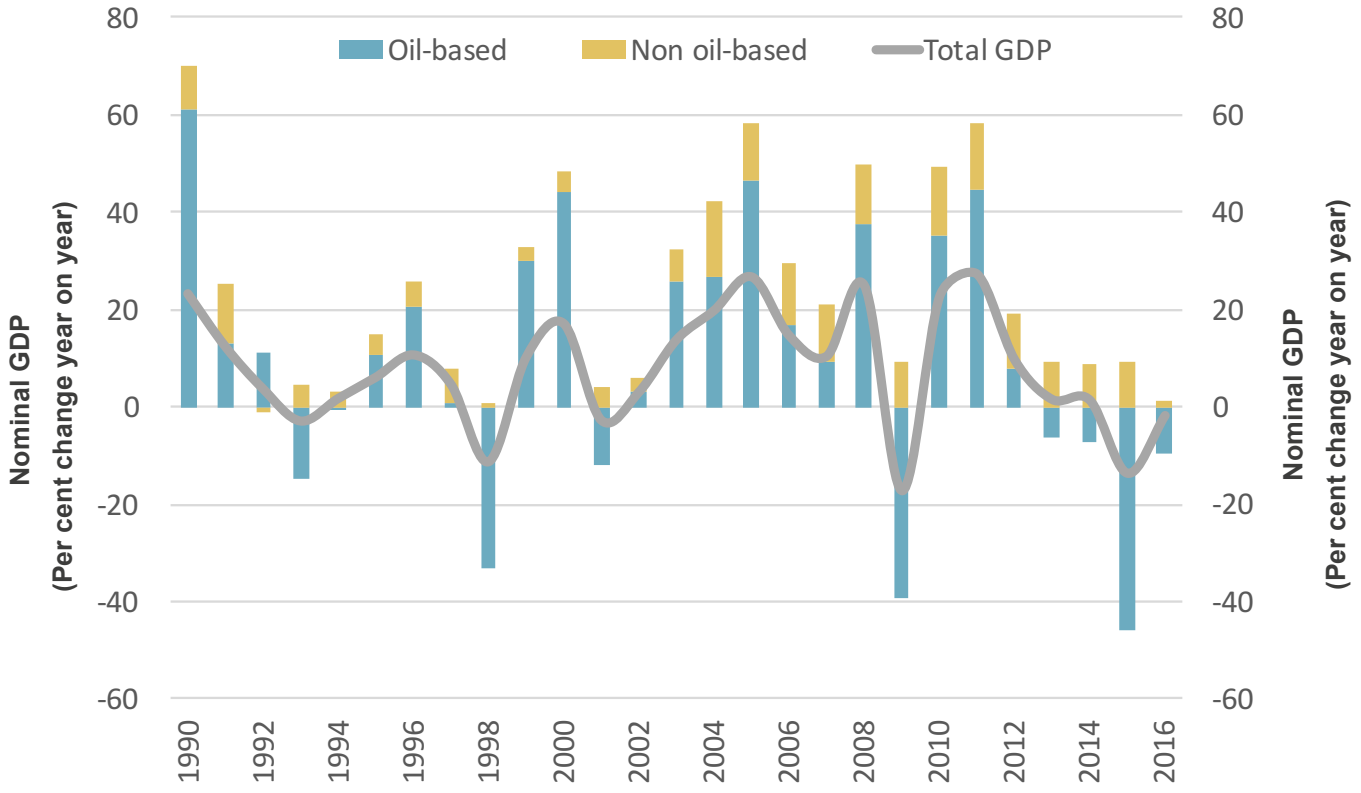

Figure 1. Nominal GDP growth 1990-2016 for Saudi Arabia (oil and non-oil).

Source: KSA General Authority for Statistics.

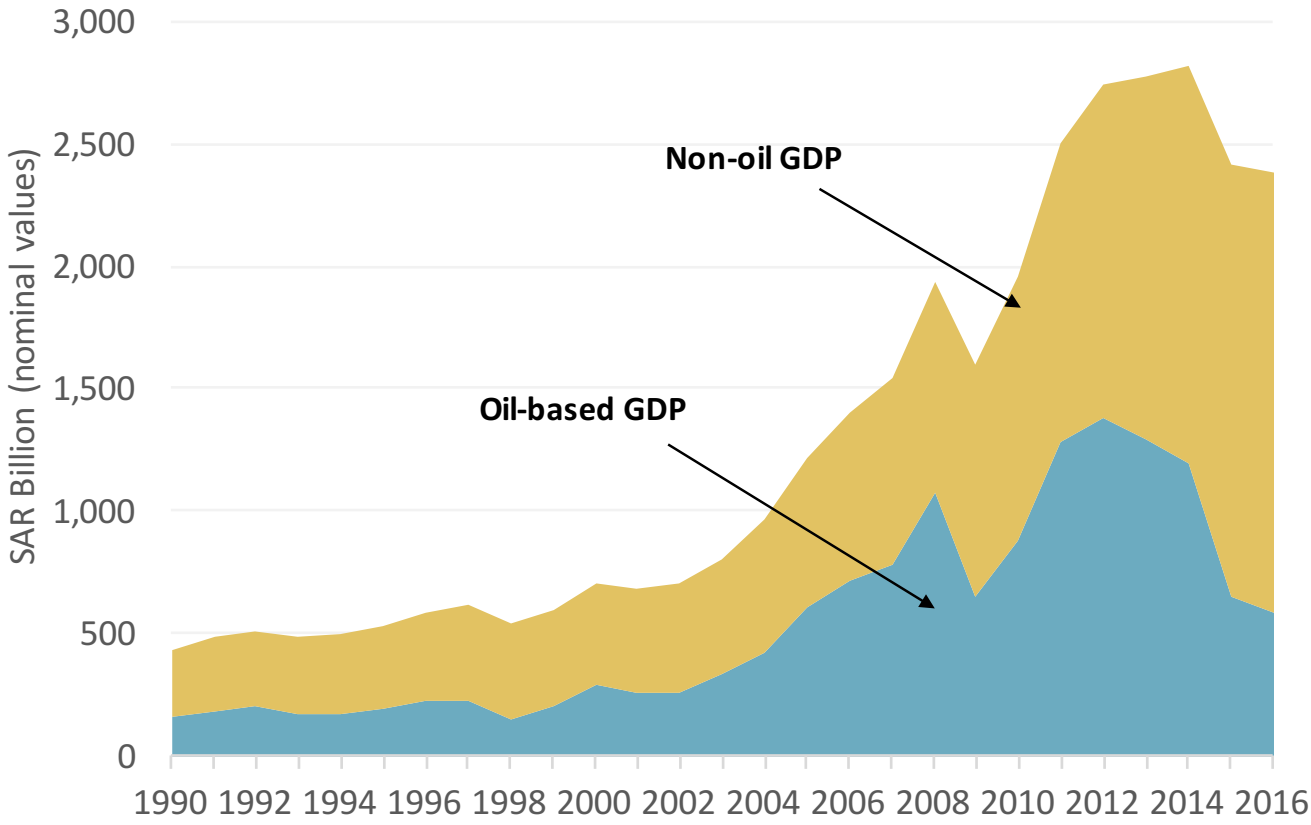

Figure 2. Oil and non-oil GDP (nominal prices).

Source: KSA General Authority for Statistics.

This includes a significant program involving the privatization of state-owned enterprises, support of the private sector, greater localization and reforms to provide an environment attractive for local and international investors.

These plans also have a strong sustainability dimension which will deliver significant greenhouse gas avoidance co-benefits through a combination of energy efficiency, structural diversification and renewable energy investments, among other measures.

For example, the Saudi Energy Efficiency Program is coordinating action across 30 government entities and engaging with enterprises in the private sector. It is expected to achieve avoided energy consumption of around 1.5 million barrels of oil equivalent per day by 2030, or around a 20 percent reduction on what energy consumption might be expected without this program.

A central element of the economic plan in Saudi Vision 2030 is to move the Kingdom up the global ranking of leading economies from currently being the 19th largest country to top 15 status by 2030 by growing the non-oil sectors of the economy (Figure 2), increasing jobs and expanding the share of private sector non-oil GDP from around 40 per cent in 2015 to 65 per cent by 2030.

While economic diversification has as its primary goal a structural shift in the economy to higher value-added sectors which deliver greater employment and

growth opportunities, it will also bring substantial greenhouse gas avoidance co-benefits by transforming the energy sector (Figure 3).

This structural shift in the economy towards or away from energy intensive industry, as well as the relative contributions of growth in the overall scale of the economy and underlying energy efficiency, can be illustrated through a Fisher decomposition of non-residential energy consumption, or in other words, a decomposition of energy demand in sectors which generate value added (Figure 4).

Here we see that the primary driver of the strong growth in non-residential energy consumption (in blue) between 1990 and 2014 has been growth in the overall size of the value added sectors of the economy (scale, in grey), combining with strong growth in energy intensive industries (composition, in yellow).

Slowing this rise in energy consumption, there has been an improvement in the energy efficiency of economy which started to gather pace from 2003 onwards, given by the 'technology' series, in green. While the scale and composition effects far outweigh the avoided energy consumption from the 'technology' effect, this analysis suggests the infrastructure investment and energy efficiency programs already implemented are having a positive effect in avoiding domestic energy consumption.

Saudi Arabia's Nationally Determined Contribution under the Paris Accord outlines a plan to avoid around 130 million tones of CO2-e per annum by

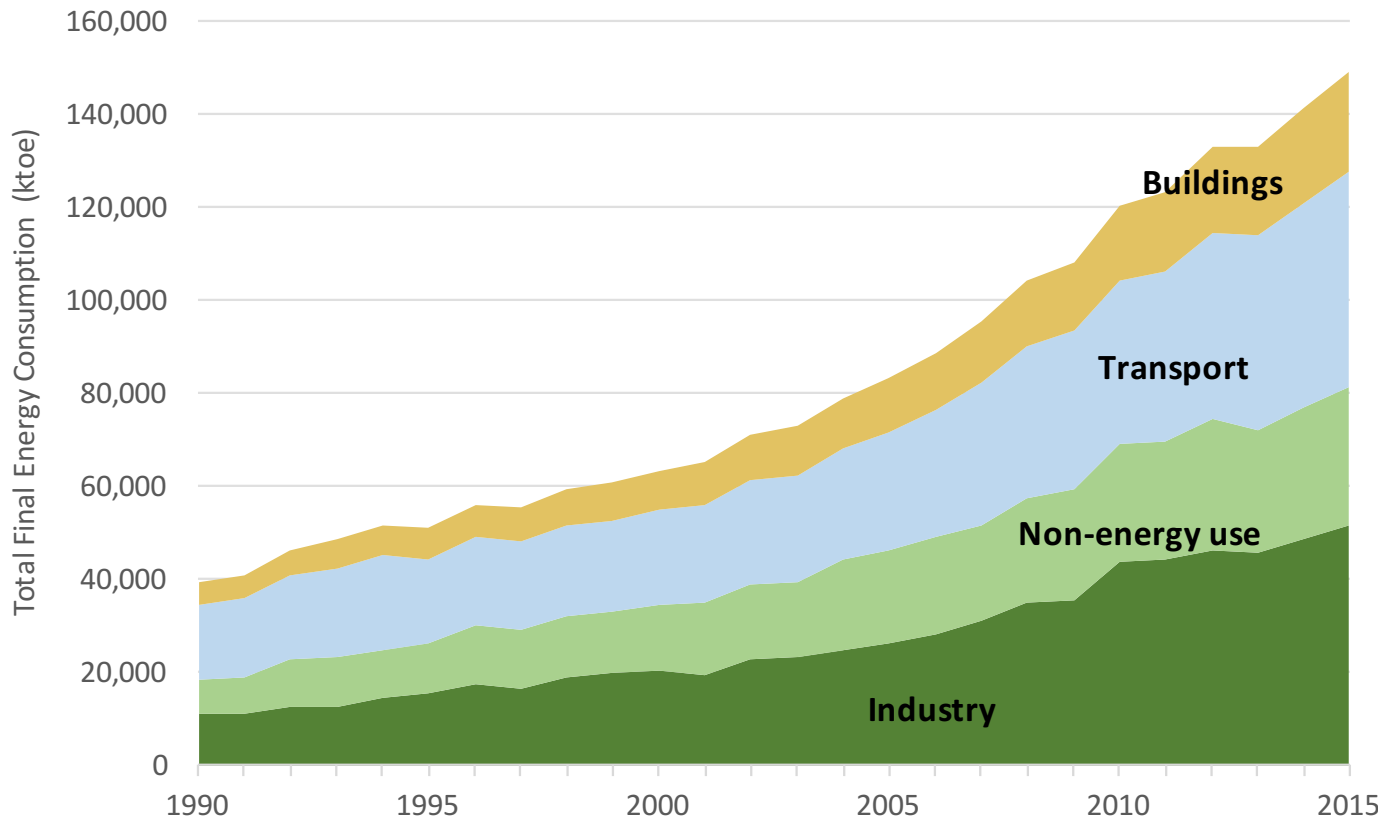

Figure 3. KSA energy consumption trends.

Source: OECD and Enerdata.

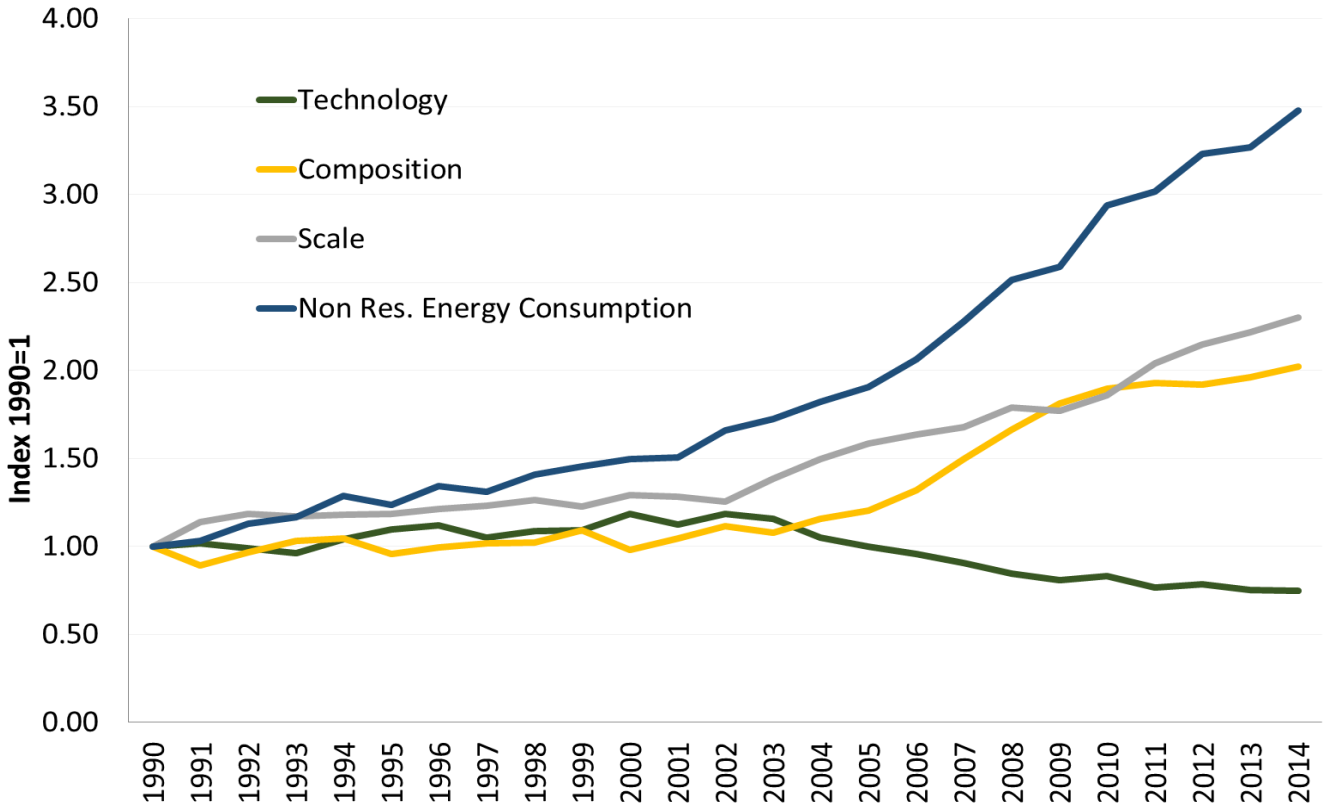

Figure 4. Fisher decomposition of non-residential energy consumption.

Source: OECD and Enerdata.

2030 compared to a dynamic baseline relative to two possible diversification pathways (Figure 5):

> A development pathway involving accelerated industrialization in energy intensive sectors, such as petrochemicals, steel, aluminum and cement, based on Saudi Arabia's comparative advantage in low-cost energy. This would bring about rising domestic energy consumption and declining oil exports.

> A development pathway involving substantial diversification into non-energy sectors, such as financial services, medical services, tourism, education, renewable energy and energy efficiency. With this model, the Kingdom would continue to export significant amounts of oil and channel export revenues into investment in these high value added sectors.

In terms of renewable energy, the Kingdom has set a 9.5GW target by 2023 with around one third of this expected before 2020. By 2023 around 10% of the Kingdom's electricity is expected to be generated from renewable energy sources (Saudi Gazette 2017). Renewable energy reform plans also include provisions to strengthen local supply chains and the development of advanced manufacturing in renewable energy to grow the private sector's contribution to investment and to provide new employment opportunities in the electricity generation sector.

As part of the Fiscal Balance Program in Vision 2030, the government has also outlined significant energy price reform measures to support this transition, as well as diversifying government revenue to improve fiscal stability (Figure 6).

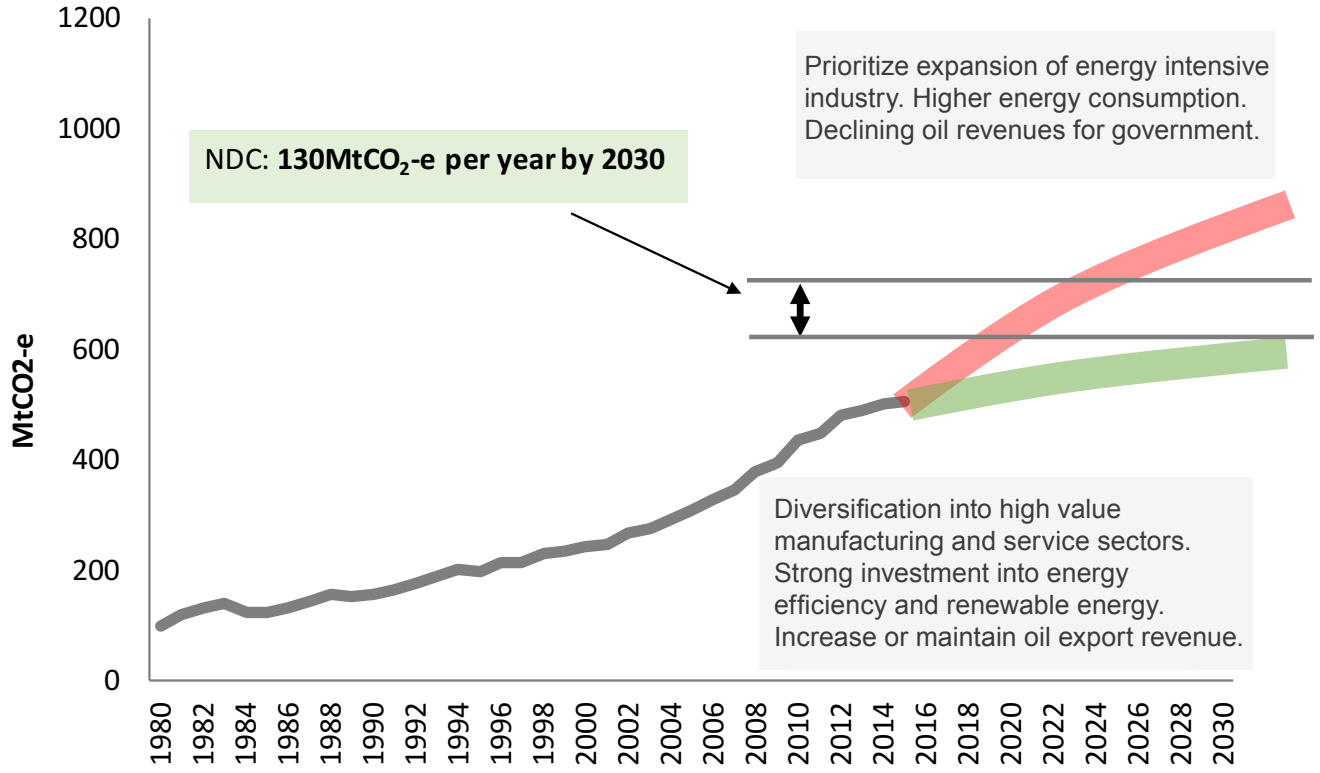

Figure 5. Saudi Arabia's greenhouse gas emissions and possible diversification pathways.

Source: KAPSARC based on IEA data and Saudi Arabia's NDC to the UNFCCC.

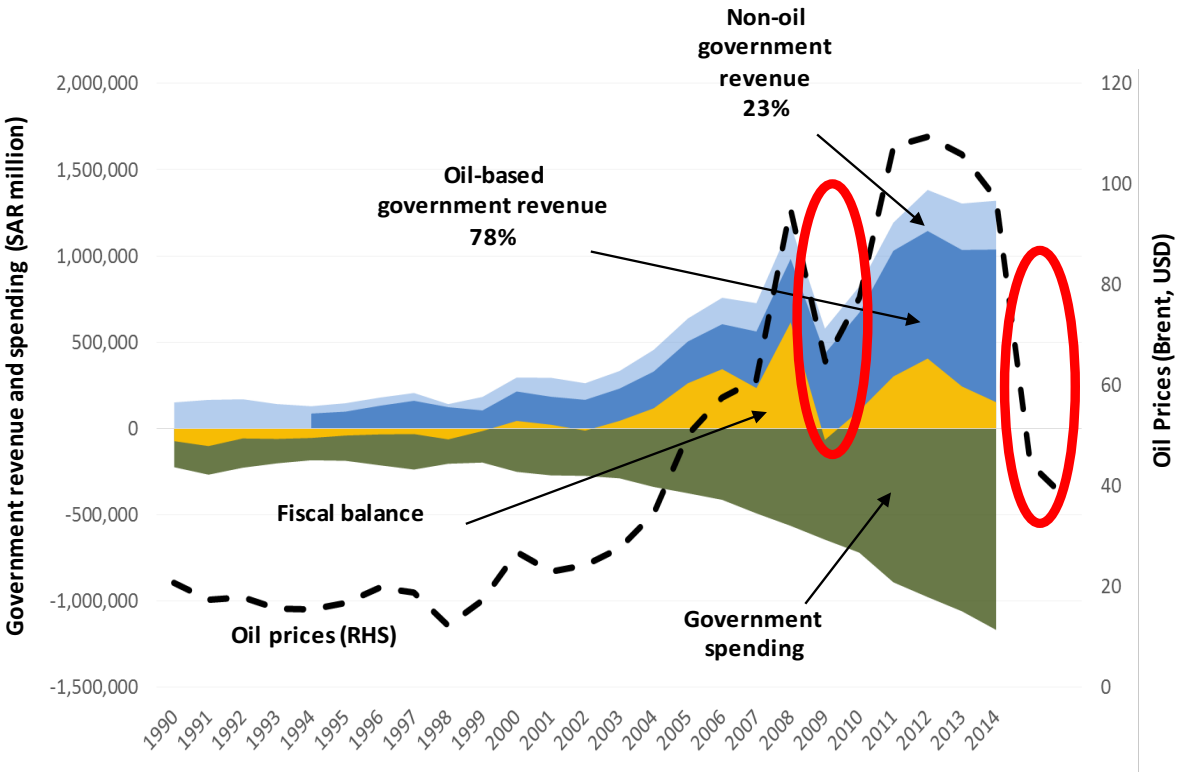

Figure 6. Fiscal balance in KSA and oil prices.

Source: KAPSARC based on IMF.

The first phase of energy and water price reform was implemented in 2016 for households and non-households (industry and others). These reforms are outlined in Table 1. Impacts of the reforms already implemented include increased revenue from fuel sales of SAR 27-29 billion in 2016 and a reduction in the annualized rate of growth of energy consumption from 3.5 per cent in the first half of 2015 to 1.7 per cent in the first half of 2016. This has been achieved while not inducing any negative impact on inflation and foreign investment (Fiscal Balance Program 2016). Indeed, the Kingdom has experienced deflation over this period driven by the stronger riyal as a result of monetary policy tightening in the United States to which the Kingdom pegs its currency, which reduces the local cost of imported consumables (Jadwa Investment 2017). This deflationary impact in food and housing has helped reduce the impact of energy price reforms on households, assisting implementation.

The proposed second phase of reform will commence in 2017 with steady change in prices from 2017 to 2020. Domestic prices of energy products will be linked as a percentage to the reference export price of the respective product, and at full implementation will fluctuate with changes in international markets (Fiscal Balance Program 2016).

Table 1. Implementation of phase 1 energy price reforms in Saudi Arabia.

Households			**Industry and others**			
	Pre 2016 prices,	**Current prices (March 2017)**			**Pre 2016 prices**	**Current prices (March 2017)**
Gasoline (SAR / litre)	0.45-0.60 (0.12-0.16)	0.75-0.90 0.2-0.24)	**Diesel USD/ barrel**	**Transport**	10.6	19.10
				Industry	9.12	14.00
Electricity (SAR/kWh)	0.05-0.26 (0.013-0.069)	0.05-0.30 (0.13-0.08)	**Industrial**		0.14 (0.03)	0.18 (0.04)
			Commercial		0.14-0.26 (0.03-0.07)	0.18-0.30 (0.04-0.08)
Water (SAR/m3)	0.10-6.00 (0.026—1.6)	0.15-9.00 (0.04-2.4)	**Governmental**		0.26 (0.07)	0.32 (0.09)
					0.1-6.0 (0.026-1.6)	0.15-9.00 (0.026-1.6)
			Gas (methane) (USD/mmBtu)		0.75	1.25
			Ethane (USD / mmBtu)		0.75	1.75
			HFO 380 (USD / barrel)		2.08	3.80

Source: Fiscal Balance Program 2016 (USD in parenthesis, unless otherwise specified in SAR).

The proposed second phase of reform will commence in 2017 with steady change in prices from 2017 to 2020. Domestic prices of energy products will be linked as a percentage to the reference export price of the respective product, and at full implementation will fluctuate with changes in international markets (Fiscal Balance Program 2016).

Three main reasons have been cited in the Fiscal Balance Program for the reforms:

1. The large opportunity cost of (or foregone revenue) calculated at SAR 300 billion in 2015 from energy prices set according to the cost of supply, rather than based on international benchmarks.

2. Concerns around wasteful and unsustainable growth in domestic energy consumption.

3. Social equity considerations, as the current system may benefit more affluent consumers compared with lower income households than arrangements after the reforms.

Phase two of reforms to energy and water prices are scheduled to be carried out from mid-2017 through to 2020 at differing times for households and non-households (Table 2).

Taken together, phase one and two of the energy price reform package is expected to generate SAR 209 billion by 2020 (Figure 7). Taking 2015 international energy prices and domestic energy consumption as a guide, this would imply that the opportunity cost of energy benefits to consumers would fall from SAR 300 billion per year in 2015 as estimated in the Fiscal Balance Program to around SAR 91 billion by 2020 under the energy price reform plan.

As part of the implementation of energy price reform, the government plans to bring in targeted assistance to households and industry.

Households will be split into five income categories, with the lowest income groups receiving full compensation for the rise in energy prices and the highest income earners no extra allowances. Individuals have been requested to register for the Household Allowance Program which will deliver direct cash payments to a special citizens' account commencing in mid-2017 in advance of the commencement of the second round of reforms. According to the Fiscal Balance Program,

Table 2. Implementation of phase 2 energy price reforms.

	Households	Industry and others
2017	Link electricity 100% to reference prices	
2018		Link electricity 100% to reference prices
2019	Based on the readiness of water infrastructure, gradually link water prices to reach reference prices	
		Gradually link all unpegged products to reach reference prices (except for butane, propane and natural gas)
2020	Bring all products to reach 100% of reference prices	

Source: Fiscal Balance Program 2016.

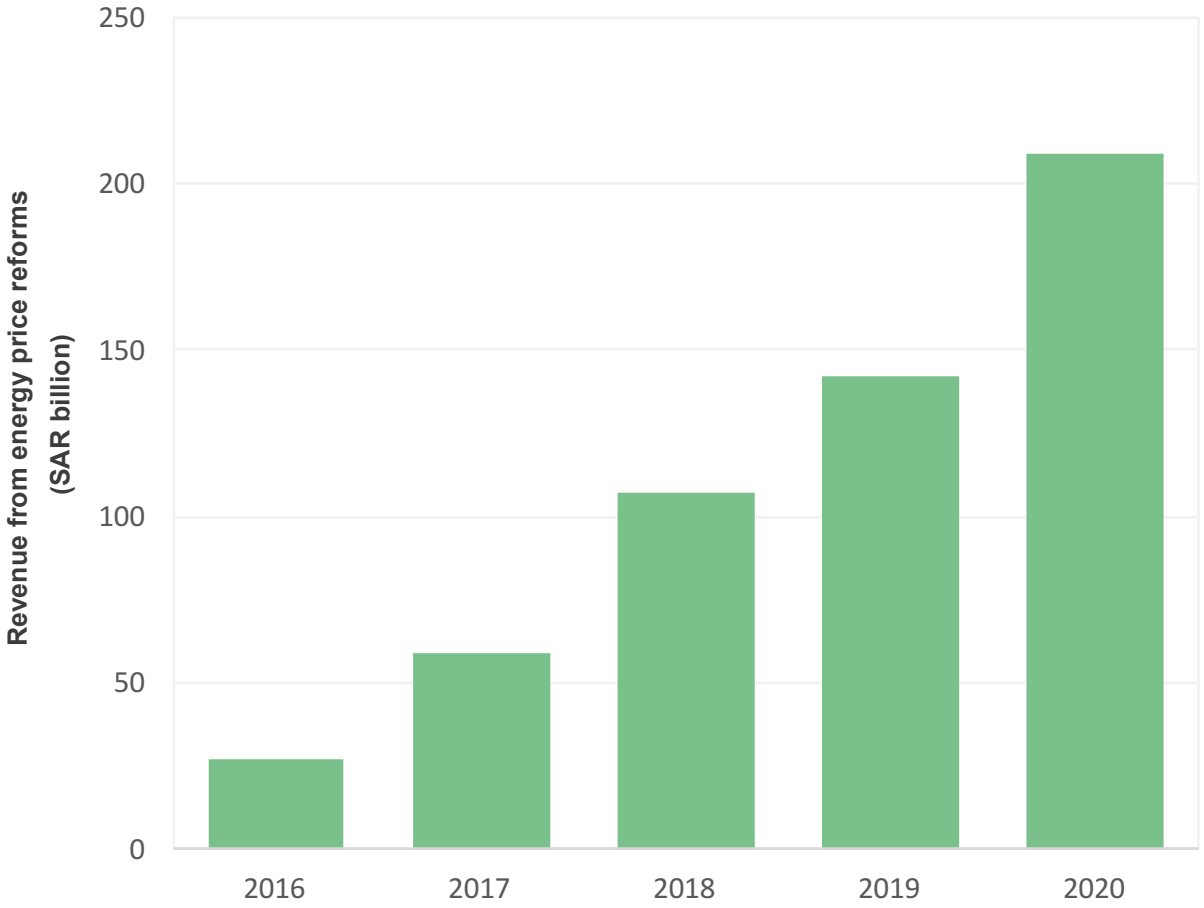

Figure 7. Gross revenue from planned energy and water price reforms.

Source: Fiscal Balance Program 2016.

disbursements will start from SAR 22.5 billion in 2017 and reach SAR 65 billion in 2020.

While care will need to be taken with implementation, the extra revenue raised for government can also play an important role in financing the broader economic transition envisaged under Vision 2030. For example, the government has also signaled that industries that have a strategic importance with a strong global export outlook which can build on the Kingdom's areas of competitive advantage will be offered support through a SAR 200 billion industry stimulus package in support of Vision 2030 objectives (Fiscal Balance Program 2016).

These reforms can be put in context by comparing current energy domestic prices to their relevant international benchmarks. Figure 8 does this for gas and Figure 9 compares prices for petrol.

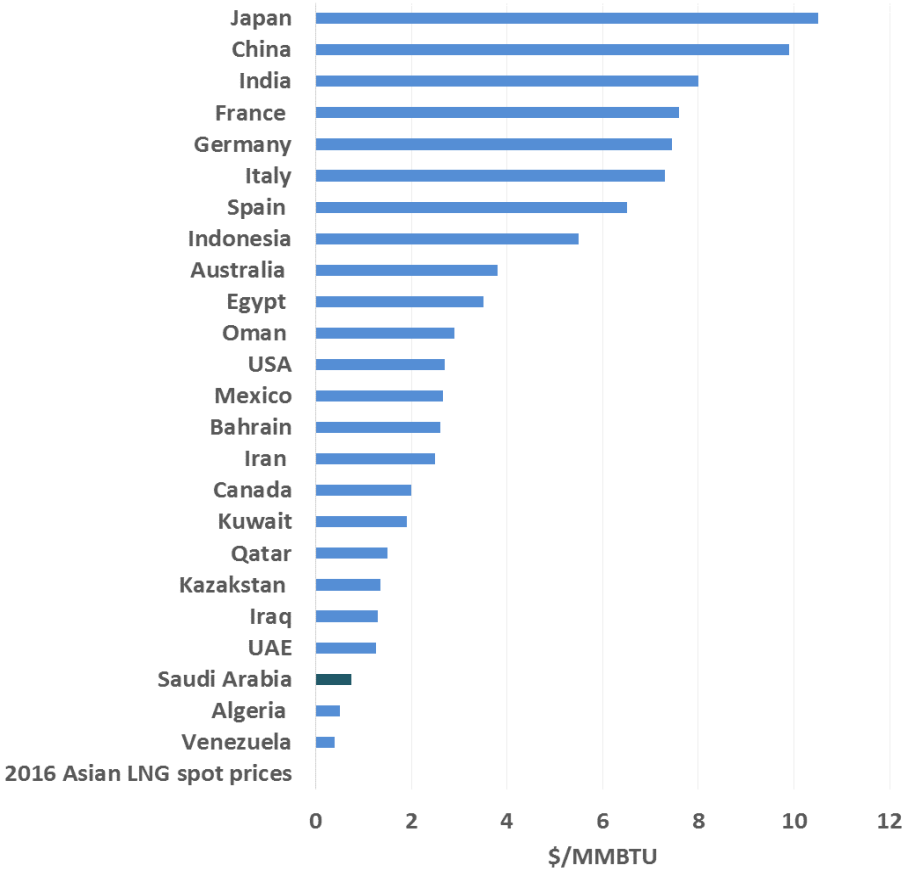

Figure 8. 2015 wholesale gas and Asian LNG spot prices.

Source: KAPSARC based on International Gas Union.

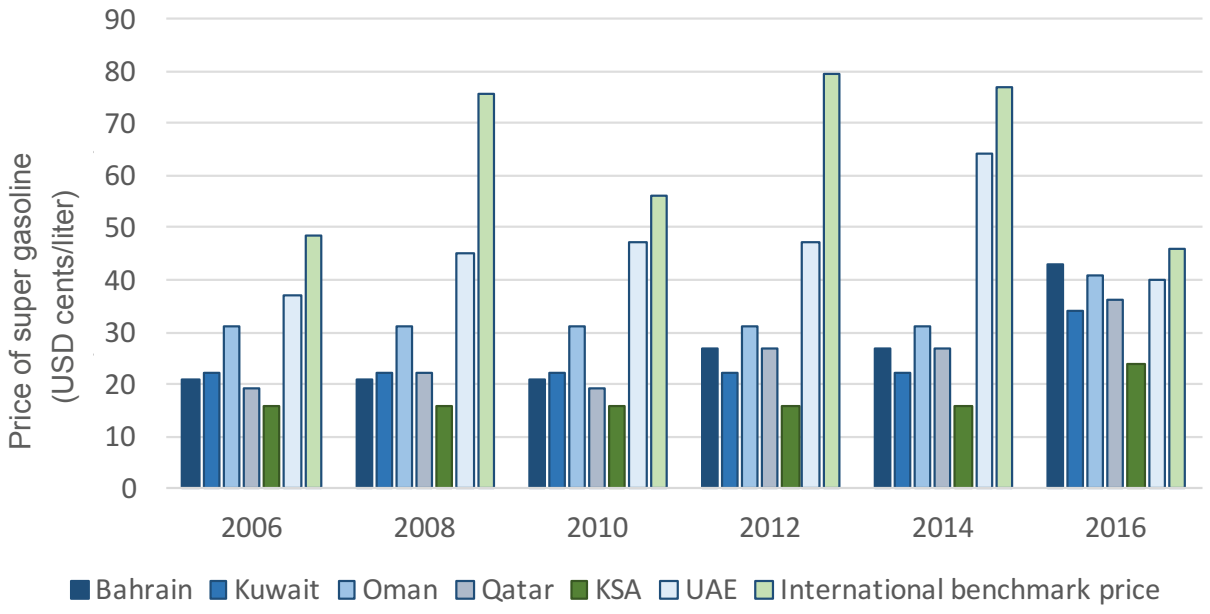

Figure 9. Regional benchmarking of petrol prices.

Source: KAPSARC based on GSI and IISD 2014; GIZ 2014 and national country authorities.

These changes to higher energy prices will increase incentives to improve energy efficiency across the economy and invest in less energy intensive sectors or, in other words, this will have the effect of moving the Kingdom onto a more energy productive growth pathway (Figure 10).

Other G20 countries including Australia and the United States have recently enacted energy productivity targets and programs. Within this context, energy productivity is both an emerging policy agenda focusing on how energy can best be used to create value in the economy, as well as an indicator which integrates economic growth with energy consumption and is a useful framework for policymakers to view economic-energy transition.

At the macroeconomic level, energy productivity describes how much GDP can be produced using an amount of energy. It is thus both a reflection of the structural make-up of the economy between energy intensive and non-energy intensive activities, as well as how efficiently energy is used in those activities across the sectors of the economy.

At the microeconomic level energy productivity focuses on how much revenue is produced from economic activities per unit of energy consumption.

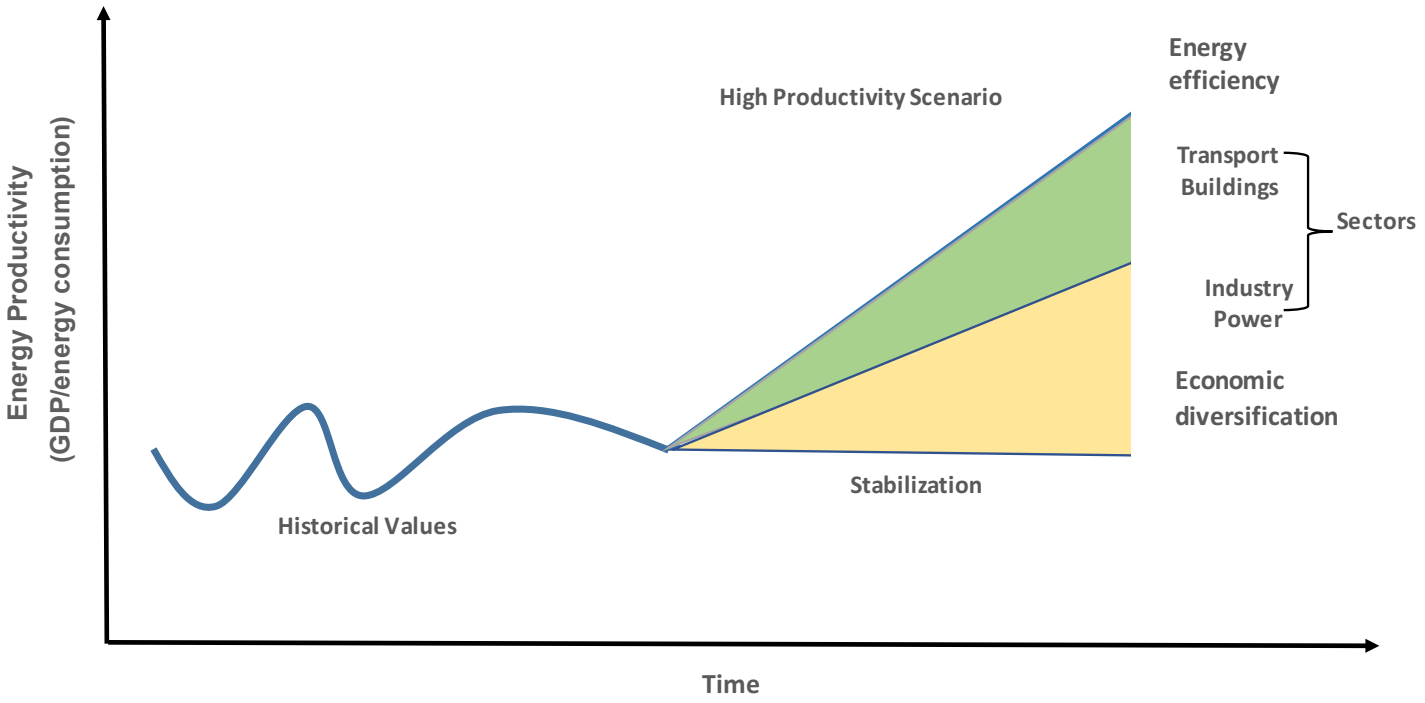

Figure 10. The key drivers of energy productivity.

Source: KAPSARC.

This is related but distinct from energy efficiency which focuses on how much physical output is produced per unit of energy consumption.

For example, in the industrial sector, measures of energy efficiency focus on total energy use per unit of output, such as GJ/ton of steel. In contrast measures of energy productivity focus on company revenue/total energy use. Thus energy intensive industries, such as petrochemicals and cement, will tend to have much lower energy productivity than sectors such as aerospace, healthcare or automotive manufacturing irrespective of how energy efficient they are within their sub-sector. An example of how energy productivity can be used to inform industrial strategy is shown in Figure 11.

Figure 12 illustrates the energy productivity of Saudi Arabia compared to several key G20 countries. Between 1990 and 2015 energy productivity rose in almost all major economies around the world, but in Saudi Arabia it fell by 29 percent. This decrease was in part due to Saudi Arabia's stage of economic development, with rising per capita energy consumption from a relatively low base.

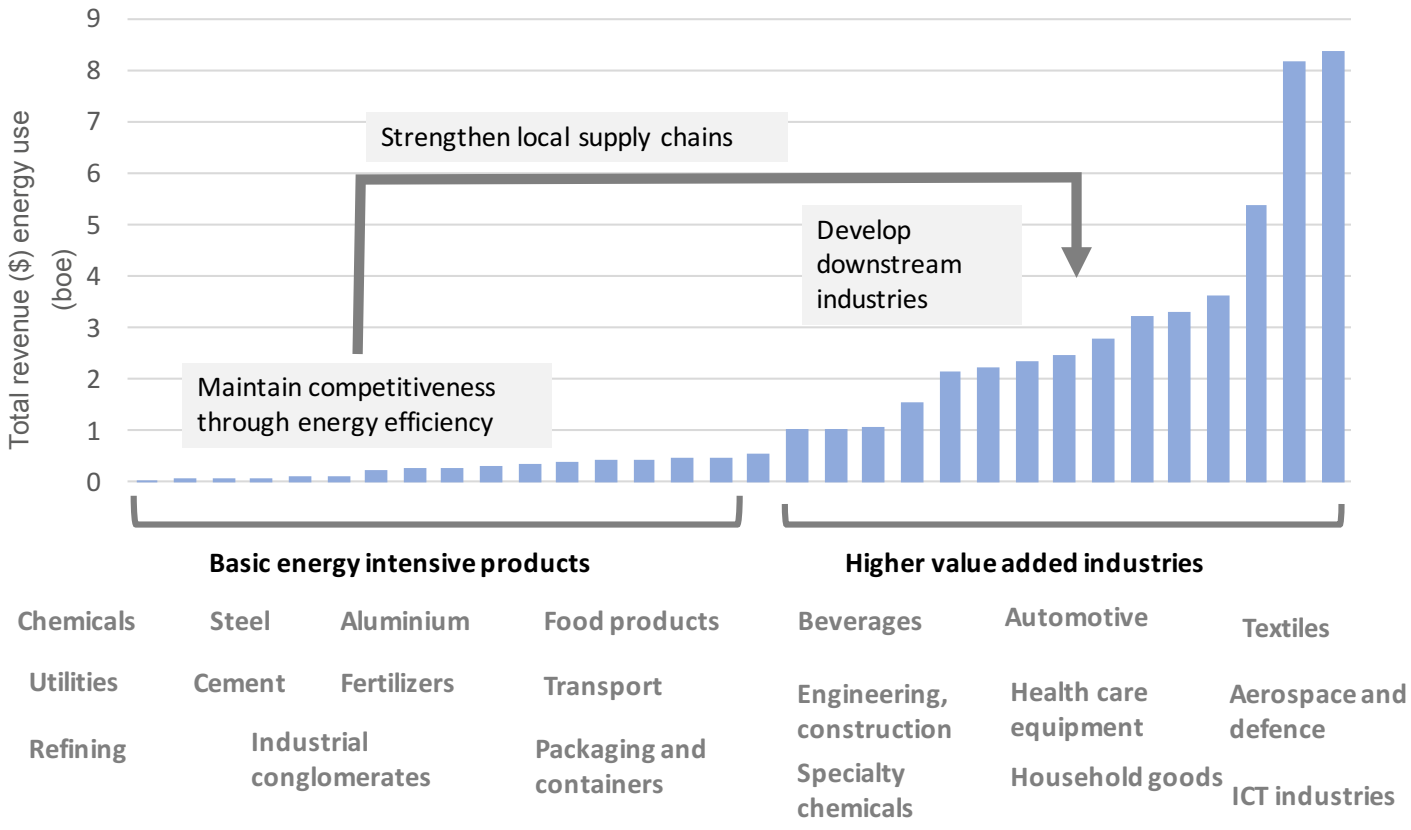

Figure 11. Energy productivity as a framework for industrial strategy.

Source: KAPSARC based on Climate Works (2016).

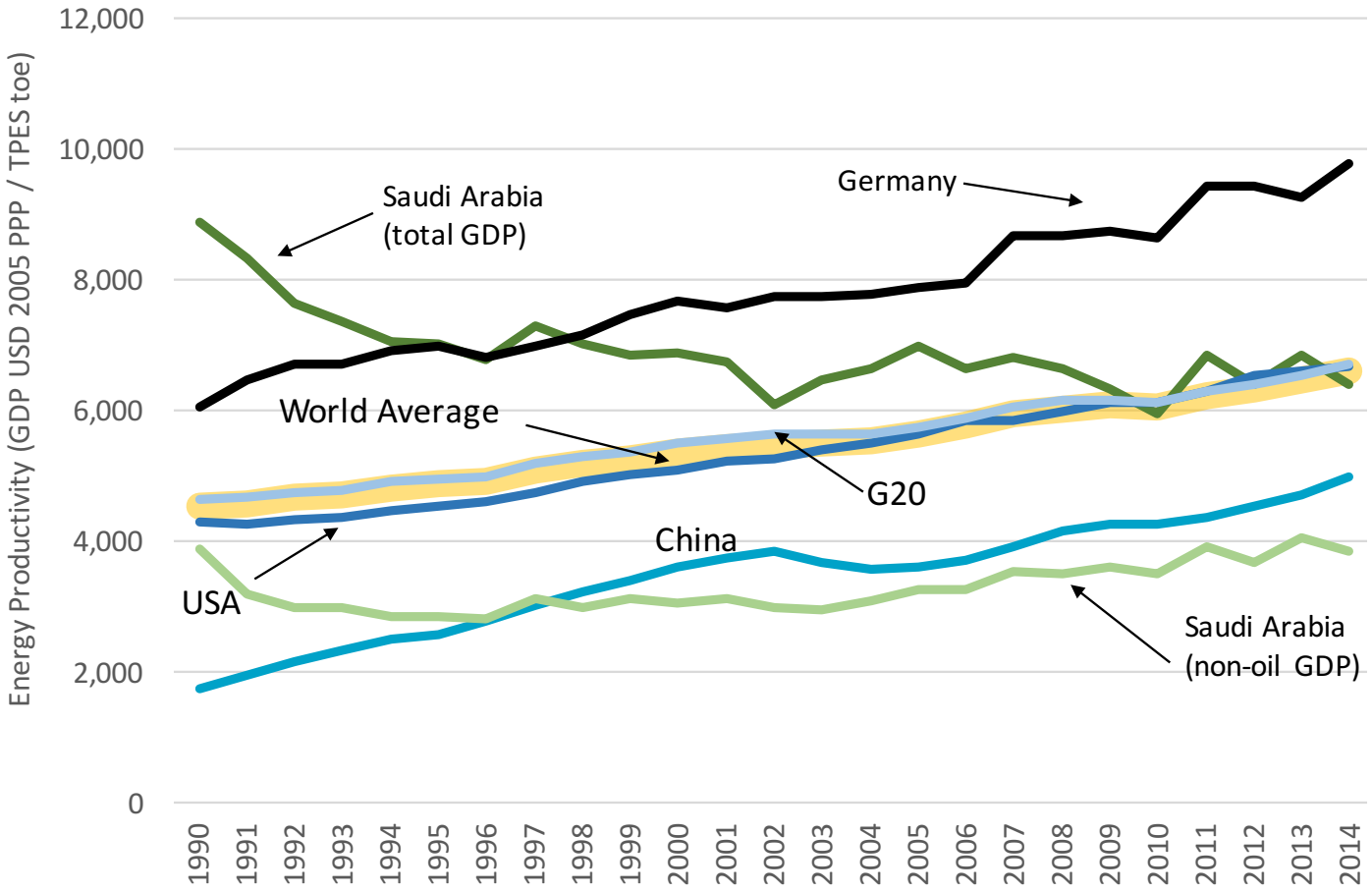

Figure 12. Energy productivity in KSA and global trends.

Source: KAPSARC based on KSA General Authority of Statistics and IEA and Enerdata databases.

Saudi Arabia also has had a historically very high energy productivity, pushed up by a high proportion of GDP from oil production. As oil extraction generates a lot of revenue for the amount of energy required to produce it, this means that energy productivity in the Kingdom was exceptionally high in the 80s and 90s by international standards. If we strip away these oil-based components, we see there has been little change in overall energy productivity in the Kingdom since 1990.

Without including oil revenues, the absolute level of energy productivity also is around 40 per cent lower and well below the United States, which has similar per capita energy consumption. This highlights the importance of distinguishing the oil and non-oil components of GDP when using energy productivity (or intensity) as a metric for major energy exporting countries as well as a clearer view of the scope for improvement in the Kingdom.

Conclusion

Saudi Vision 2030 and its supportive programs are aimed at achieving a substantive transition towards more sustainable growth – economically, socially and environmentally. Reforms which aim to diversify the economy and increase energy efficiency are closely related to the Kingdom's overall energy productivity. This is a metric which can be used to track progress against the Kingdom's sustainable development goals in addition to other measures such as greenhouse gas avoidance.

The reform pathway outlined by Vision 2030 will be a long road, and its success will be dependent on the long-term resolve of the government, the transparency and perceived fairness of the reforms and how well they are implemented and communicated to citizens. Keeping these factors in mind will influence the likelihood that an energy-rich country, such as the Kingdom, can use its resources as a foundation to diversify and grow its economy while achieving a transition to a lower carbon future.

References

Climate Works. (2016). Assessing the energy productivity of a company: A do-it-yourself benchmarking guide for investors. Sydney: Climate Works.

Fiscal Balance Program. (2016). Fiscal Balance Program. Riaydh: Government of Saudi Arabia.

Jadwa Investment. (2017). Saudi Chart Book, March 2017. Riyadh: Jadwa Investment.

NTP. (2016). National Transformation Program. Retrieved from http://vision2030.gov.sa/en/ntp.

Saudi Gazette. (2017, April 18). KSA to develop 30 solar, wind projects. Retrieved from http://saudigazette.com.sa/business/ksa-develop-30-solar-wind-projects/

Vision 2030. (2016). Vision 2030: Kingdom of Saudi Arabia. Government of Saudi Arabia.

Notes

Notes

About the Authors

Ibrahim Abdel Gelil

Ibrahim is a visiting fellow at KAPSARC and an adjunct professor of Energy and Environment at the Arabian Gulf University in Bahrain. He was previously the chairman of the Energy Planning Agency of Egypt (OEP) and the CEO of the Egyptian Environmental Affairs agency (EEAA). His current research focus is on energy and environmental policies of the GCC.

Nicholas Howarth

Nicholas is a research fellow at KAPSARC currently leading the Center's work on energy productivity. He is an applied economist with 20 years of experience working with governments and industry and holds a D.Phil in economic geography from Oxford University, specializing in energy, technological change and climate change.

Alessandro Lanza

Alessandro is a visiting researcher at KAPSARC. He is Professor of Energy and Environmental Policy at LUISS University, Rome and a member of the Board of Directors of ENEA, Italy. He holds a Ph.D in Economics from University College London.

About the project

This paper draws on KAPSARC's energy productivity work focused on how shifting to a growth model based around higher energy productivity can benefit Saudi Arabia and the countries of the Gulf Cooperation Council. Energy productivity is both a policy agenda focusing on how energy can best be used to create value in the economy, and an indicator which integrates economic growth with energy consumption. At the macroeconomic level, energy productivity describes how much GDP can be produced using an amount of energy. It is the mathematical inverse of energy intensity and is both a reflection of what activities energy is used for (the structural make-up for the economy), and how well energy is used in specific activities (the level of energy efficiency). At the microeconomic level energy productivity focuses on how much revenue is produced from economic activities per unit of energy consumption. This is related but distinct from energy efficiency which focuses on how much physical output is produced per unit of energy consumption. KAPSARC has partnered with UNESCWA to explore the energy productivity potential of Saudi Arabia and the countries of the Gulf Cooperation Council and will release a synthesis report of this work later in 2017.

www.kapsarc.org