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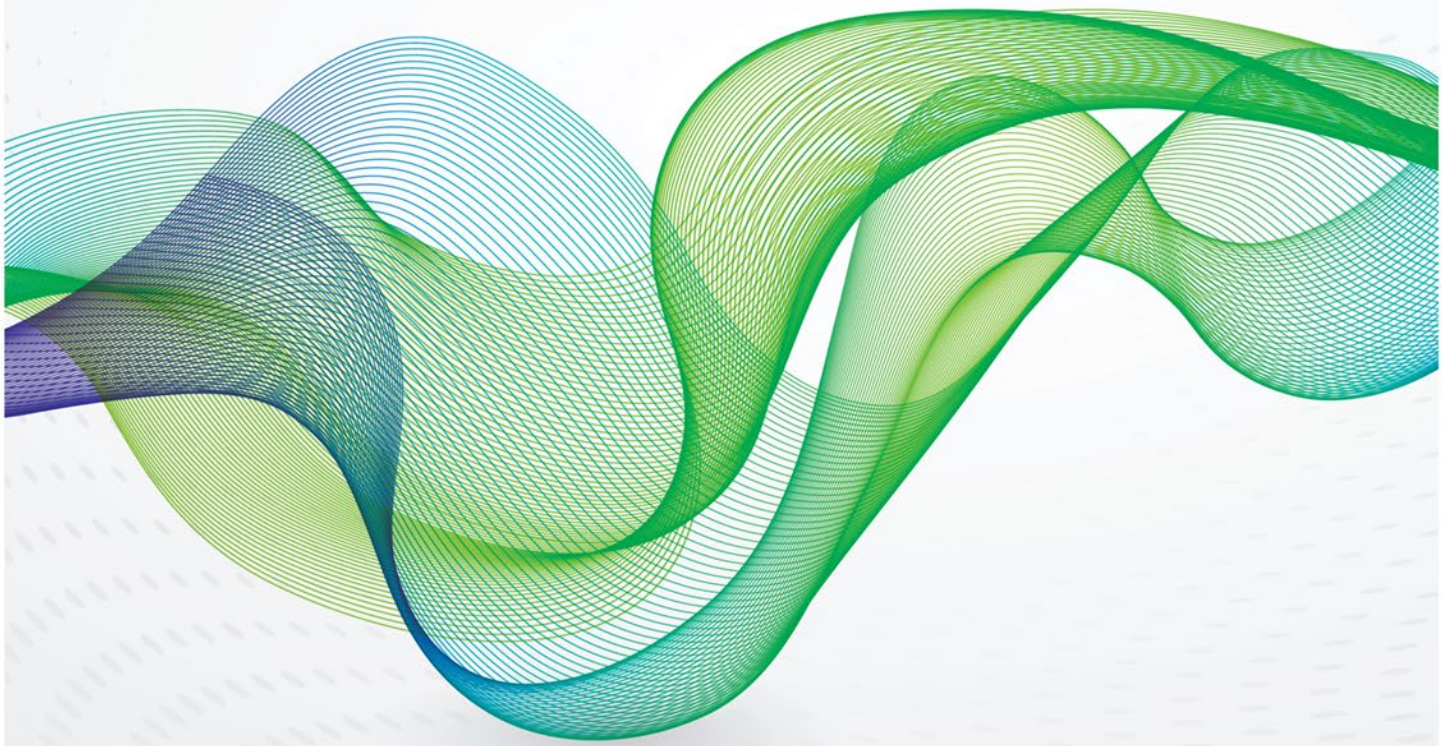
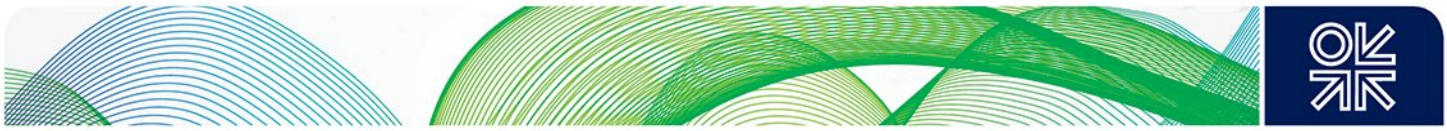
Quantifying Long-Term Impacts of COVID-19 and Oil price Shocks in a Gulf Oil Economy



OIES PAPER: MEP 25

Manal Shehabi, OIES–KFAS Supernumerary Fellow



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Keywords*:* Oil price; covid-19; coronavirus; Post-COVID economy; economy-wide modelling; CGE model; general equilibrium; oil exporter, resource exporter; Gulf, Kuwait, MENA.

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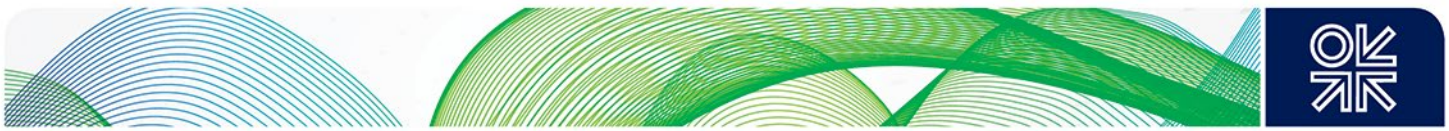


1. Introduction and research questions

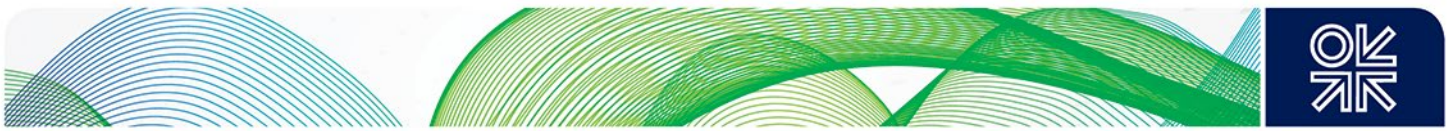
While the COVID-19 pandemic had been deleterious for the global economy, it has been particularly negative on economies that export commodities with volatile prices, due to the pandemic-triggered large commodity price shocks of unprecedented magnitude, especially hydrocarbons (Deutsche Bank, 2020; World Bank, 2020; IEA, 2020b). These effects have been especially evident in the relatively wealthy yet hydrocarbon-overdependent Gulf Cooperation Council (GCC) states—namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates (UAE). Despite their ongoing plans for economic diversification, hydrocarbons contribute at least half of gross domestic product (GDP); between 78 per cent (in the UAE) and 91 per cent (in Kuwait) of exports; and between 60 per cent (in the UAE) and 90 per cent (in Qatar and Kuwait) of government budget. Notwithstanding differences among them, GCC states share similar economic features, effects of, and responses to the pandemic. They experienced not only adverse effects of the pandemic, but also a simultaneous large drop in oil export revenue and government budgets. The pandemic and oil price shocks are problematic to the extent that they affect current economic development, and also that they become enduring and foundational if the energy transitions accelerate to meet the Paris Agreement targets. This situation raises key questions:

- What are the long-term impacts of oil price declines and COVID-19 associated shocks on Gulf economies?
- And what lessons can be drawn from the pandemic and domestic policy responses to it for the future management of the accelerating energy transitions and enhancing economic sustainability?

This paper investigates these questions using Kuwait as a case study, teasing out policy lessons applicable to the larger GCC.

The ongoing pandemic generated large oil price shocks and volatility. In turn, it caused a large drop in energy investment (IEA, 2020a) and fiscal revenue of oil exporters as well as ongoing uncertainty. A demand-side shock triggered by global and national restrictions to limit the spread of COVID-19—such as lockdown measures and travel bans—caused unprecedented decline in oil demand and higher uncertainty. A supply-side shock followed, when attempts by OPEC+ to prevent further price declines failed and the OPEC+ agreement collapsed in March 2020, triggering a temporary oil price war and overproduction. In March 2020, the Brent price and WTI dropped to a level more than 50 per cent below that of March 2019 (the lowest since 2002), to $22.4 per barrel (bl) and $19.92/bl, respectively, and collapsed further by April 2020. Indeed, the scale of this oil price shock is unprecedented, exacerbating the challenges facing GCC states domestically because of COVID-19. Partially due to OPEC+ supply cuts agreed upon in April 2020, oil prices rebounded: the Brent price reached $42.19/bl on 19 June, 2020. Since then, oil prices have increased further, reaching $67/bl in mid-March 2021, trading at about 60 per cent higher than the 2020 average and 5 per cent above the 2019 average. Nonetheless, uncertainty continues with fears of additional waves and uncertain demand in the short and long terms, especially with the rise of new virus variants and varying economic recovery levels.

The novel issues that emerged in resource exporters during the pandemic gave rise to short-term economic challenges. Notwithstanding differences among them, GCC states share similar economic features: high dependence on hydrocarbons in the economy and domestic energy consumption, similar economic structures, large public wage bill, dependence on foreign labour who are guest workers, high oligopolistic private sector, and limited energy transition projects domestically. In response to the pandemic, GCC states announced a rise in domestic expenses (especially healthcare and unemployment benefits) plus simultaneous large fiscal (tax relief) and consumption-focused macroeconomic stimulus packages. What ensued were unprecedented fiscal pressures, leading to record withdrawals from sovereign wealth fund (SWF) assets (Arabian Business, 2020; Holter &



Bloomberg, 2020)[1] and increased government debt. These policies could be alarming as GCC states have been already grappling with challenges from the 2014 oil price collapse, which caused real exchange rate volatility, comparatively high investment risk, price and production level changes, and real income decline despite the states' high-income levels. These effects were further exacerbated by the states' unique economic features which limit non-oil sectoral expansion (Shehabi, 2020b).

Some studies estimate the pandemic's short-term effects with reference to oil exporters, but not specifically to Gulf states. The deteriorating external position and currency depreciation caused by capital flight and weakened exports impose "a double whammy" for oil exporters in Asia and the Pacific (Huang & Zhao, 2020). In the MENA oil exporters, fiscal deficits are estimated to have widened to 10.1 per cent of GDP in 2020 (from 3.8 per cent of GDP in 2019) but expected to improve significantly in the medium term, reflecting expected higher oil revenue in 2021 (IMF, 2021). The OECD (2020) expects most oil-exporting developing countries will be unable to weather the current crisis and are likely to increase reliance on short-term and expensive non-concessional private borrowing backed by oil collateral. In a qualitative assessment, Shehabi (2020a) argues that for oil exporters, the pandemic increases the opportunity cost of moving to greener alternatives and that, for some regions, stimuli packages may reallocate funds away from economic diversification plans and green investments. This study also argues that short-term gains have been achieved at the expense of long-term sustainability, creating an urgent need for critical, quantitative, policy-focused research in the resource exporters-energy policy nexus. Yet this study does not quantify such long-term effects.

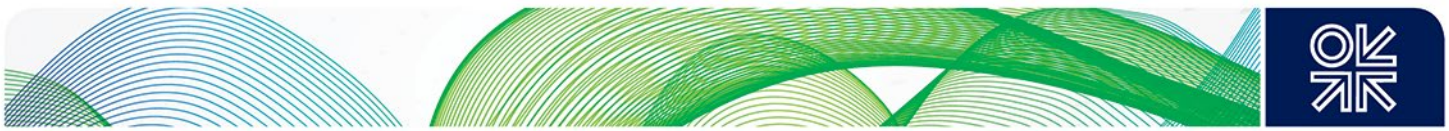
Economy-wide models in a computable general equilibrium (CGE) framework are the best approach to assess macroeconomic and sectoral impacts of outbreaks like COVID-19, but the relevant existing studies focus on short-term results and exclude hydrocarbon exporters. At the global level, Maliszewska, Mattoo and van der Mensbrugghe (2020) predict a global GDP contraction of 2.5 per cent and 4 per cent for the short and long lockdown scenarios, respectively. McKibbin and Fernando (2020) summarize the existing literature on the macroeconomic costs of outbreaks, then provide GDP losses in 2020 compared to a baseline scenario for 24 countries, excluding GCC economies.[2] Other studies apply single-country models to estimate country-specific impacts of the COVID-19 crisis,[3] but as far as can be established, none of them include any oil-dependent economy. And among the single-country CGE models of Gulf economies (such as Shehabi, 2017, 2019, 2020; Soummane, Ghersi, & Lefèvre, 2019; Roos & Adams, 2020), none examines effects of COVID-19 or of similar pandemic-type shocks.

This paper fills this significant gap in the literature. Its purpose is to quantify potential long-term impacts on oil-dependent GCC economies of the pandemic-induced shocks, such as global and domestic economic declines, together with associated global oil price decline and covid relief measures. Kuwait is an interesting case largely owing to the availability of data and its unique dynamics of policy-making processes, including the elected National Assembly. To that end, using simulations from Kuwait, this paper applies the WAFRA Applied General Equilibrium (WAFRAGE) Model for Kuwait (WAFRAGE-KWT), a multi-sectoral economy-wide model in a CGE framework. This model departs from conventional CGE models by representing oligopoly behaviour and its regulation explicitly, and embodies key features of the Kuwaiti economy and its distortions. The model is used to simulate the advent of various pandemic-triggered shocks and oil price declines together with domestic economic relief policies to contain and ease the pandemic. The paper first simulates oil price declines alone. Subsequently, given ongoing uncertainties of the pandemic, three scenarios are simulated reflecting

[1] These effects extend to other oil exporters beyond the GCC, mostly notably SWF-rich Norway.

[2] Other studies examine global impacts of COVID-19 on poverty, food security, and diets (Sumner, Hoy, & Ortiz-Juarez, 2020; Labourde, Martin, & Vos, 2021) and on emissions (Le Quéré, 2020).

[3] Examples include studies on Belgium (Lahcen et al., 2020), the UK (Keogh-Brown et al., 2020), France (Malliet et al., 2020), as well as some developing countries such as Brazil (Porsse et al., 2021), South Africa (Chitiga‐Mabugu, et al., 2020), and China (Cui et al., 2021), and Cameroon (Boukar, Mbock, Malambwe Kilolo, 2021).



assumptions of different speeds of domestic and global economic recoveries [4] and oil prices, namely: a rapid recovery, a moderate recovery, and a protracted pandemic scenario. The model embodies Kuwait's economic structure using a new database in the form of Social Accounting Matrix (SAM) constructed for this study using the most recent available data (for 2015). This is the first SAM that represents Kuwait's economy in a low oil price environment (post the 2014 oil price collapse).

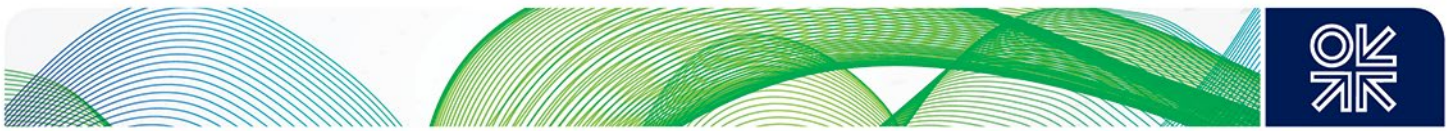
Simulation results show that, even in the rapid economic recovery scenario, given Kuwait's current economic structure and policy regimes, the effects of the pandemic and associated policy responses are the most deleterious to its economy since the Gulf War of 1990-1991. The cost of the pandemic on the economy is proportionate to the length of pandemic and dependent on the government's economic responses to it and oil market dynamics. Yet across all scenarios, fiscal cushions and savings are eroded, and all macroeconomic indicators decline: real GDP by 8-10 per cent (from base levels), real GNP by 8 to 12 per cent, and fiscal balance as a share of GDP by 8 per cent to 15 per cent. Employed labour's real wages decline significantly, with the most effects on unskilled Kuwaiti labour by as much as 9 per cent, and with opposite effects on Kuwaiti versus foreign labour. Effects on household welfare are counterintuitive: they show improvements despite the pandemic's economic effects because they are offset by the government's relief packages. Although economic stimuli packages appear counter-cyclical, they are consumption-based and prop oligopolistic large private sector players by protecting their markups. Consequently, these packages do not contribute to expanding production, efficiency, or non-oil exports from pre-COVID levels. Thus, any indirect gains of economic uptake are miniscule. Simulation results suggest that, in the existing economic structure and policy regime and foreseeable oil market dynamics, Kuwait might not be able to weather the effects of another future pandemic or accelerated energy transition and decarbonization the way it survived this pandemic.

The paper results offer five primary insights relating to the sustainability of Gulf States at large:

1. While the welfare-expanding and covid relief policies appear counter-cyclical fiscal policy in nature and in line with recommended policy prescriptions, GCC states could not realize the full potential benefits of such policy. This is due to the prevailing economic structures and to the consumption-based nature of the relief packages, which propped consumption and private sector oligopolies profits without supporting expansion in productive capacity or non-oil exports.
2. The resilience of these states' economies has significantly weakened post-COVID. This is because the pandemic hit these economies at a state of weakened resiliency and tapering growth following the 2014 oil price declines, then exacerbated economic distortions of subsidies and oligopolies.
3. Albeit to varying degrees within the GCC, the pandemic and relief packages eroded many of the historical fiscal advantages and cushions in an irreversible way. In the current economic structures and oil market dynamics, such losses cannot be replenished from future hydrocarbon or non-oil export revenue.
4. In the absence of a diversified export base, the combination of a weakened economic resiliency and eroded fiscal cushions/savings jeopardize Gulf states' ability to survive the next large shocks in oil prices and demand following accelerated energy transitions, or other crises.
5. The results confirm there is a large tradeoff between short-term economic recovery gains and long-term sustainability goals. Restoring long-term sustainability requires immediate yet phased implementation of urgent wide-scale fiscal, economic, and microeconomic reform, as well as energy transitions. These policies can reduce economic rigidities and improve economic efficiency and productivity even in the face of lower hydrocarbon export price and demand.

This paper makes three important contributions to the literature of hydrocarbon exporters, especially in distorted, highly-specialized, welfare-based small open oil economies. First, it is the first known study

[4] Speed of recovery is associated primarily with roll outs of COVID-19 vaccinations and length of the pandemic.



to quantify economy-wide impacts of the pandemic, government policy to it, and oil price declines in an oil-dependent economy in the Gulf. Second, it sheds light on how the pandemic harms Gulf economies' long-term sustainability and preparedness for the energy transitions (domestically and in response to lower hydrocarbon demand trajectory from other states' energy transitions) absent economic reforms and diversification. Third, the paper constructs a new SAM for Kuwait, being the first SAM of Kuwait's economy in a low-price environment and offering value for other researchers on Kuwait.

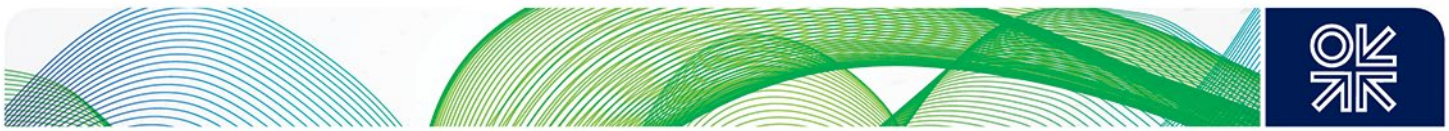
The rest of the paper is organized as follows. Section 2 summarizes Kuwait's economy with reference to details from the new constructed SAM. Section 3 summarizes COVID-19 shocks and key policy responses to them. The model is summarized in Section 4, while simulations and scenarios of empirical model applications are in Section 5, followed by simulation results in Section 6. The concluding Section 7 highlights various tradeoffs and policy implications.

2. Overview of a Gulf oil economy: Kuwait

2.1. Economic performance and features

Like the other five GCC economies, Kuwait has depended on abundant hydrocarbon resources as its main engine of economic activity, exports, and government budget. This dependence is facilitated by low production costs relative to other regions thanks to favourable geological circumstances, coupled with abundant resources. Hydrocarbon production is managed through the fully state-owned Kuwait Petroleum Company (KPC). Approximately half of the crude oil is used domestically by citizens and industries, including refining, petrochemicals, and power generation for electricity and water desalination (Al-Abdullah, Shehabi, & Sreekanth, 2020). Domestic natural gas production is all used domestically, primarily in power generation, and supplemented by imported natural gas—trends that continue despite renewable project targets for 2030 (Al-Abdullah, Shehabi, & Sreekanth, 2020). Fiscal policy is the main instrument of macroeconomic stabilization, supported by substantial foreign asset accumulation in its SWFs (managed by Kuwait Investment Authority (KIA)), which also in turn stabilize the nominal exchange rate (pegged to a basket of currencies). Key economic advantages stemmed from rapid accumulation of oil rents and very liberal trade policies for goods and services, capital, and labour. These advantages supported the distribution of very generous welfare redistributive measures (such as energy and other subsidies) to citizens and local industries as well as guaranteed public employment to Kuwaiti citizens in the public sector with generous salaries and benefits. The political economy of the welfare state has thus governed relations between the government, political representatives through the National Assembly, and a strong merchant class (Crystal, 1989; Herb, 2016)—which is a highly oligopolistic private sector (Shehabi, 2017, 2020). Negative effects of oil price shocks have historically been moderated by adjustment mechanisms that have acted as cushions to the economy. These mechanisms are the flexibility in the expatriate labour market; as well as investments in, or fiscal commitments to maintain contributions to, SWFs which sterilize oil revenue and offer savings used during busts and fiscal deficits (Shehabi, 2017). Also, like other GCC states, Kuwait has historically followed a pro-cyclical fiscal policy regime in managing oil price shocks.

Despite concerns about the economic sustainability of dependence on finite resources, oil continued to dominate Gulf economies. It was not until the unexpected collapse of the oil export price mid-2014 until 2016, from US $103/bl in January 2014 to US $30/bl in January 2016, that the sustainability of oil dependence became a pressing question. In a fundamental policy shift, Kuwait adopted various reforms and policies consistent with the New Kuwait Vision 2035, detailed in its Development Plan 2010-2014 and 2015-2020, to advance the country's economic transformation policies and plans to transform away from hydrocarbons. Chief among its announced goals are: expanding renewable projects; improving the country's business environment to attract foreign direct investment; increasing productivity and growth of the non-energy sectors; enlarging the participation of the private sector (local and foreign) in the economy from its current low level of about 25 per cent; increasing the participation



of Kuwaiti labour in the private sector; and reducing carbon emissions in line with Kuwait's National Determined Commitments (NDC) to the UNFCCC. Despite these plans, oil continued to dominate the economy, exposing it to ongoing oil price volatility challenges. In 2016, Kuwait experienced its first fiscal deficits in years, a trend that continued to deteriorate since. Owing to Kuwait's dominant pro-cyclical fiscal policy, economic busts from the deterioration in oil export revenue was matched by a reduction of non-committed expenditures on development and energy transition projects, but not in committed rigid expenditures and wages. These expenditures have expanded when oil prices increased and remained at the same level when oil prices collapsed, funded by access to foreign financing and savings for future generations and for fiscal rebalancing.

Examining the development of key economic policies, the essential key features of a highly distorted Kuwaiti economy emerge, which are taken into account in both the CGE model of Kuwait, and the SAM presented below. These features have been shown to largely constrain Kuwait's economy and its non-oil pro-export diversification potential (Shehabi 2017, 2020a). These rigidities are detailed in Shehabi (2019, 2020a, 2020c), and are summarized as follows.

- First, large structural rigidities, owing to specialisation in and dependence on hydrocarbons in the economy's output, trade, and budget, coupled with the dominance of the hydrocarbon sector of the economy. Crude and oil contributed to 84 per cent of the country's exports in 2015, and the public sector generated approximately 70 per cent of the GDP in the same year.
- Second, fiscal rigidities, owing to negligible taxes and high (energy and other) subsidies that are committed expenditures to the public, irrespective of the economic conditions.
- Third, labour market rigidities, owing to the existence of two separate labour markets based on nationality. Non-Kuwaitis comprise 83 per cent of the labour force (PACI, 2018) and represent over 90 per cent of the private sector labour employed at lower wages and flexible labour contracts linked to employers, through a strict employer-sponsorship of expatriate labour system, named kafāla. Meanwhile, 77 per cent of Kuwaitis are employed by the bloated public sector public sector which prioritizes indigenous employment and offers salaries exceeding those in the private sector for similar levels of education and technical training.
- Fourth, sovereign wealth fund savings, which represent an important institutional and financial feature of Kuwait's economy, acting as a financing alternative to oil revenue shortages and a means to smooth out short-run governmental expenditures during deficits.
- Fifth, pervasive oligopolies in all sectors of the private sector with collusive pricing behaviour and limited or no regulation, while state-owned industries operate as monopolies. This situation is problematic to the extent that oligopolies distort markets and prices, and their sustained rents engender strategic behaviours that detract from growth-enhancing innovation (Segerstrom, Anant, & Dinopoulos, 1990; Aghion & Howitt, 1992; Grossman & Helpman, 2014). They earn mark-ups that capture a large part of oil rents in both booms and busts, and largely limit the expansion of non-oil exports in Kuwait (Shehabi, 2020a, 2020c). Oligopolies' increased rents during booms and (usually subsidized) losses during busts further impair economic performance in Kuwait (Shehabi, 2020c).

2.2. Broad representation of Kuwait's economic structure

Central to economy-wide modelling is the use of an appropriate database to which models can be calibrated. This database takes the form of a social accounting (SAM) depicting all sectors in an economy and the interactions between them within a given period. The SAM displays all transactions as contributing to a circular flow of an economy's incomes and expenditures. It is a matrix presentation of the combined national income and product account, government accounts and balance of payments accounts, combined with the country's input-output table to capture inter-industry flows. There is no official SAM for Kuwait. And the SAM in Shehabi (2017) represents data from 2013 and is, therefore, dated because it represents the economic structure prior to the collapse of the oil export price mid-2014 and the subsequent lower (than pre-2014) price levels. As such, assessing the effects COVID-triggered oil price shocks requires the use of a database that reflects the Kuwaiti economy and oil price environment at the advent of COVID-19.

The aforementioned emerging features of Kuwait's economy are represented in a new model database in the form of a SAM, constructed for purposes of this study. It is constructed using the most recent complete set of data available for Kuwait for 2015, using official data obtained from Kuwait's Central Statistical Bureau (CSB) and supplemented by other satellite accounts. Details are in Appendix A.

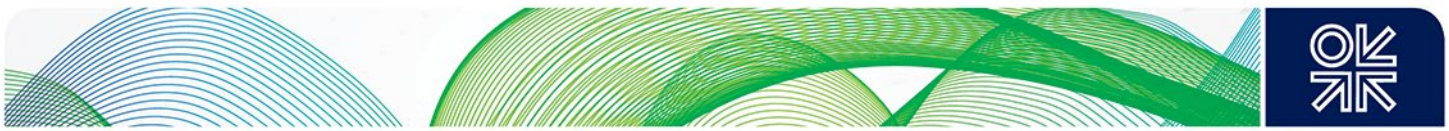
The SAM reveals key structural elements of the Kuwaiti economy, which Table 1 depicts.

Table 1. **Economic structural elements 2015**

Sector/ Percentage	Share of GDP^{FC}*	Share of total exports	Export share of output	Net exports over output
1 Agriculture	0.54	0.1	3.2	-148.2
2 Mining	0.01	0.0	43.1	-2944.7
3 Crude oil	40.97	58.9	62.0	62.0
4 Gas and petro-services	4.18	0.0	0.0	0.0
5 Oil refining	2.62	24.7	47.5	47.0
6 Chemical	1.60	4.5	40.9	-18.0
7 Light manufacturing	0.85	1.0	17.8	-208.5
8 Heavy manufacturing	1.20	0.6	6.1	-287.0
9 Electricity	0.76	0.0	0.0	0.0
10 Other network services	3.63	4.7	24.8	21.3
11 Construction	3.30	0.0	0.0	0.0
12 Transport	3.05	2.1	14.5	-2.6
13 Financial services	8.52	1.0	4.4	-1.3
14 Other services	28.77	2.5	2.3	-24.3

* GDP^{FC} is GDP at factor cost, which is the sum of value added in each industry.
Source: Model database (SAM) constructed by author for 2015.

Oil Refining, Electricity, Chemicals, and Network Services have the highest capital intensity. The tradable Manufacturing industries and the nontradeable Other Services and Construction have the



highest labour intensity. These relative intensities determine changes in factor rewards following commodity price shocks, thereby driving factor relocation and output across industries.

2.3. Economic snapshot at the advent of COVID-19

To contextualize the pandemic effects on Kuwait, the paper compares Kuwait's economic structure in the higher oil price environment (2013) with that of the lower price environment (2015). The new SAM reveals the following important observations:

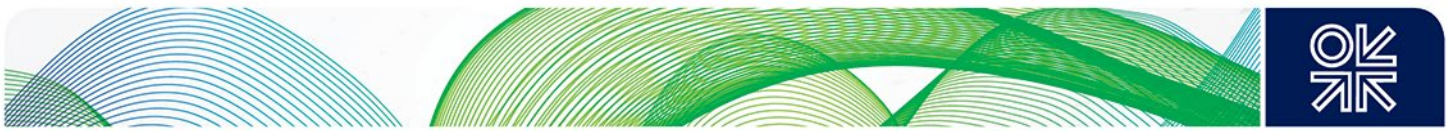
- Limited advancements in energy transition projects in power generation;
- A higher share of domestic consumption of energy in 2015;
- Worsened non-oil diversification and refined petroleum exports relative to crude exports. This trend is evidenced by higher share of crude oil exports by 17 per cent to 58 per cent of total exports; lower share of refined to total exports by 13 to 25 per cent, and lower share of non-oil exports to total exports to 16 per cent.
- Increased subsidies, despite policy goals to reduce total and energy subsidies, with total household and industry consumption subsidies increasing by 18 per cent and total energy industries' consumption subsidies increasing by 74 per cent.
- No significant change in the private sector structure, with continued oligopolistic private sector and limited regulation; and
- Decreased productivity and participation by Kuwait labour, with private sector continuing to employ largely non-Kuwaitis but paying larger salaries to Kuwaitis. For example, in the services sector, 12 per cent of labour are Kuwaiti but they earn 41 per cent of wages.

These results suggest that Kuwait's economic performance has fallen short of the goals of Kuwait 2035 Vision. The results show that, in line with results from Shehabi (2017, 2020a, 2020c), at the advent of COVID-19, the Kuwaiti economy has become more dependent on oil exports and its economic rigidities have been exacerbated by the oil price shocks between 2014-2021. Importantly, these results can have important lessons applicable to some of the other GCC states that are experiencing similar constrained conditions, because of the similarities among them.

3. COVID-19 shocks and policy responses

Kuwait's fiscal and economic challenges have been exacerbated by the COVID-19 pandemic, which generated a double fiscal blow: a simultaneous sharp rise in domestic expenditures (and stimulus packages) and a sharp decline in oil export revenue. At the early days of the pandemic, Kuwait implemented drastic measures to contain the virus, including a country-wide lockdown on March 13, 2020, becoming the first country to do so after China and Italy. Persistent lockdown, curfews, and social distancing measures reduced demand for transportation, aviation, automobiles, and a wide range of goods and services. Meanwhile, demand for some sectors—namely medical services, medical supplies, telecommunications, digital content providers, and food—has soared. While the public sector and many private businesses were forced to cease operations, which reduced output and production, they initially continued to pay salaries and other operational costs without revenue.

At the same time, very generous economic stimulus packages were passed. The Higher Steering Committee for Economic Stimulus was formed on April 1, 2020, to implement the stimulus for the local economy through a set of measures approved in the cabinet resolution on March 31, 2020, and approved by the Council of Ministers on the same day. They included various monetary and liquidity measurements for citizens and industries, such as:



- Expanding relief for citizens, including funding public sector salaries;[5]
- A mechanism was created to secure a minimum income that covers cost of living for workers affected by the current crisis;
- As increase in the budget for ministries and government departments by KD 500 million for the fiscal year 2020/2021;
- Reducing the Central Bank of Kuwait's discount rate to a historic low of 1.5 per cent;
- Kuwait Banking Association announced a moratorium period up to 6 months on bank loans including waiver of interest and charges (if any for postponement) for retail clients (citizens and expats) and for small and medium size enterprises (SMEs);
- Limit of financing increased from 90 per cent to 100 per cent and loans were provided on concessional and long-term basis to SMEs through joint financing from local banks and the Kuwait National Fund for SMEs;
- Lowering various banking standards, such as the capital adequacy ratio from 13 to 10.5 per cent; the risk weight for SMEs from 75 to 25 per cent;
- Establishing a temporary fund to receive financial contributions from locals in support of the government's efforts related to the outbreak;
- Government exemptions from some fees and dues offered to affected economic entities and institutions in the manufacturing sectors and the cooperative societies (if these exemptions are passed through to their clients); and
- Controlling inflation by maintaining stability in the price levels of food and medical commodities in local markets.

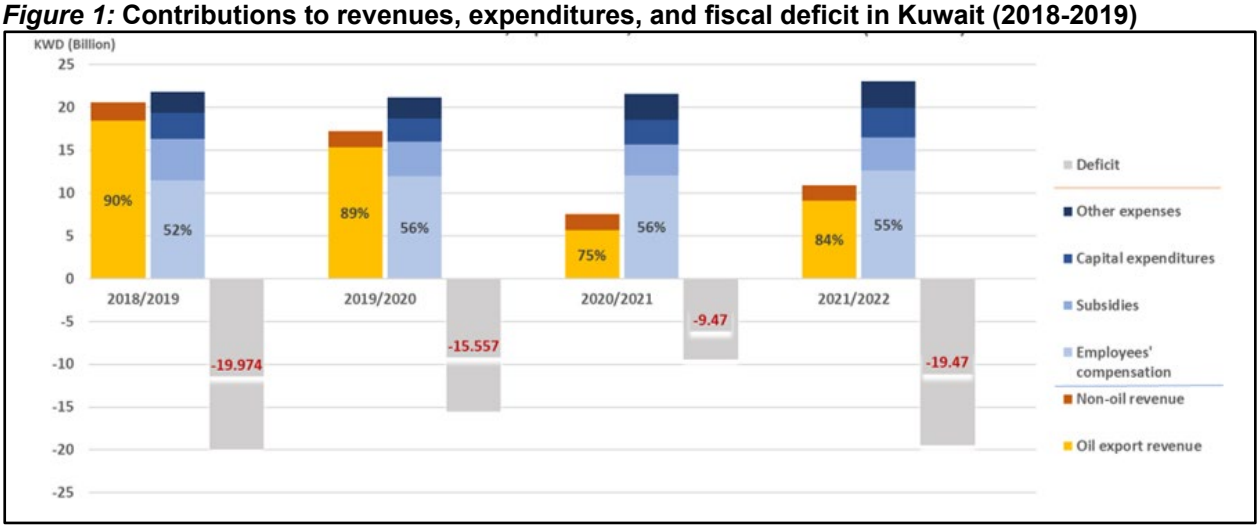
The Central Bank of Kuwait announced extending the coronavirus relief packages extending extra liquidity and regulatory flexibility until June 2021 (Arabian Business, 2021). Following new parliamentary elections in December 2020 and the creation of a new government in March 2021, Kuwait's National Assembly extended the covid relief bill by approving laws guaranteeing bank loans for businesses affected by the pandemic (Hegagy, 2021).

Although Kuwait's fiscal stimulus packages were initially considered smaller than some packages by its GCC neighbouring states (MacDonald, 2020), the ensuing fiscal deficit is the largest for Kuwait since the Gulf War in 1990-1991. The fiscal effects have been so colossal that Kuwait expected depletion of its fiscal stabilization SWF and was considering halting legally-mandated contributions to the future generations SWF to ease the strain (Al-Zo'bi, 2020b). The government also intends to extend debt laws that enable the country to tap into the international markets to cover its fiscal deficit (Hegagy, 2021).

In addition, it is expected that these measures have been also funded through relocation of committed funds for long-term diversification, energy transitions, or other environmental projects. These funds are reallocated because of Kuwait's (a) unique large dependence on oil exports to cover rigid committed expenditures that cannot be redirected; (b) the adoption of economic diversification with more flexible spending and long-term targets; and (c) welfare-based political economy which centres on welfare distributive measures with immediate effects.

[5] Including salaries of those registered under Chapter Five of Social Security in the affected sectors.

Figure 1: **Contributions to revenues, expenditures, and fiscal deficit in Kuwait (2018-2019)**



Note: 2021/2022 figures are from draft budget of the Kuwaiti Ministry of Finance based on an estimated average oil price of US$45/bl.
Source: Author's representation based on date from Kuwaiti Ministry of Finance.

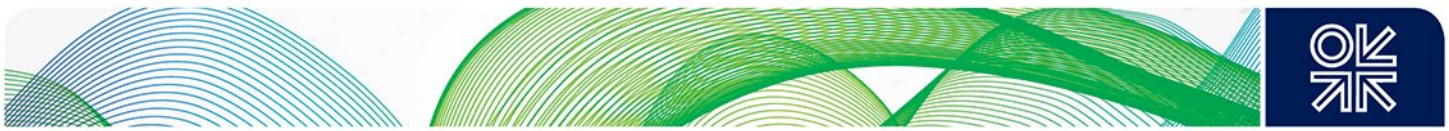
As evidence of the size of the double fiscal blow, the Kuwaiti Ministry of Finance estimated a fiscal deficit of over KWD 19 billion (US$65 billion) in 2021/2022 year, as shown in Figure 1. Effects on businesses and labour have also been large. By mid-May 2020 (data are lacking for 2021), an estimated 89 Kuwaiti private released their employees and another 350 reduced salaries by 30-50 per cent (Al-Zo'bi, 2020a). Consequently, an estimated 48 thousand citizens and 350 expatriate labour lost their jobs (Al-Zo'bi, 2020a). In addition to these effects, these economic stimuli had other impacts on sustainability, as they expanded consumption and welfare redistributive measures, which increase greenhouse gas (GHG) emissions (Helm 2020) and exacerbate existing distortions that have been shown to prevent economic and energy diversification (Shehabi 2020a).

4. Modelling framework

4.1. Model description

This paper uses an economy-wide model in a CGE framework. CGE models are large-scale models calibrate data of an economy in the structure of a SAM to a set of equations that represent economic interactions in the economy, the inter-industry interactions, and the behaviour of the different agents. As the equations are grounded in economic theory of general equilibrium, model simulations allow insights into the economy's underlying mechanisms and the economic channels through which shocks or policies transmit to the economy. The traditional economic or health economics analysis is ill-equipped to estimate the full effects of the pandemic and government interventions on an economy. The reason is that such analysis has an implicit assumption of partial equilibrium, which ignores behavioural changes and policy effects on the economy that are either direct or second-best effects. CGE models, by contrast, enable assessing both direct and second-best effects of economic shocks or policies, making them the ideal structure for evaluating policy options or large-scale shocks such as COVID-19.

This study employs the WAFRAGE Model for Kuwait, WAFRAGE-KWT Model. This model is described in Shehabi (2019, 2020b, 2020c) and builds upon much of the work done in Shehabi (2017) and Asano and Tyers (2015, 2019) which represents oligopoly behaviour and its regulation explicitly, and embodies key features of the Kuwaiti economy as described in Section 2.1.



The employed model is a single-country, two regions (Kuwait and the Rest of the World) CGE model incorporated in a comparative static framework, employing different closures to mimic the economy's long-run responses to external or policy shocks. It compares economic outcomes of endogenous variables (such as real prices and fiscal deficit or wages at different equilibrium states) that result from changes in exogenous variables (such as external economic conditions following COVID-19 and oil prices) or policy instruments that can be shocked in model simulations.

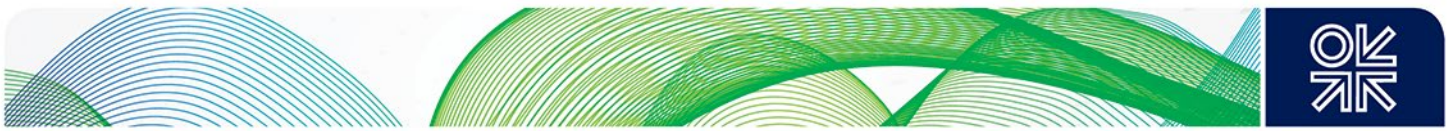
The model incorporates various core features. The Kuwaiti economy is characterized as an 'almost small' open economy (following Harris (1984)), a feature common in economy-wide national modelling. An 'almost small' open economy characterization entails that the economy has a price-taking behaviour for imports along with constant elasticity downward-sloping foreign demand curves for exports, which are differentiated from competing products (Harris, 1984). These assumptions are essential in the case of Kuwait, which has a small economy that is highly dependent on trade (including imports in markets where it is a price taker) and on international financial flows. As modelled, the economy is open in trade and has a price-taking behaviour for imports, along with constant elasticity downward-sloping foreign demand curves for exports which are differentiated from competing products. Openness extends to financial markets via endogenous saving and investment and open capital and current accounts. The model makes conventional assumptions about the consumption of home products in each sector, whereby domestic products are differentiated by variety via constant elasticity of substitution (CES) nests. These local products are further differentiated from imported foreign varieties through the Armington (1969) assumption of national product differentiation, a standard feature in trade policy applications. The model, like that of Balistreri and Markusen (2009), includes the standard Armington [6] CES nesting structures at the sub-national (firm) level that imply product differentiation between home and foreign products. Similar differentiation applies between common home products supplied by oligopolistic firms, though elasticities of substitution are larger in this case. The model breaks away from traditional frameworks through its representation of oligopoly behaviour, detailed in Shehabi (2017, 2020c) and following Asano and Tyers (2019). While oligopolies in general reduce competition and innovation, in resource exporters they play an additional role in affecting efficiency. Shehabi (2017) was the first model to consider the role of oligopoly and resulting efficiency in the context of economies in Kuwait and the MENA region.

Important to modelling long-term effects of COVID-19 and policy shocks in response, the model offers a full representation of government accounts and macroeconomic elements, including endogenous saving and investment, open capital and current accounts and a complete system expanded consumption subsidies and of taxes (both direct on capital, labour income, land, and resource rents, and from indirect taxes on trade and consumption expenditures). Government transfers are not set constant relative to the consumer price level. While ever the fiscal deficit is endogenous, the government saving varies, driving the current account deficit.

On the demand side, firms in 14 industries rent capital and hire workers, supplying products and services to meet five demand sources: final, intermediate, investment, government, and foreign demands.

On the supply side, the production technology is Cobb-Douglas in variable factors and intermediate inputs, the latter being composites (CES nests) of home and imported products and services. Intermediate inputs, in turn, are composites (CES nests) of home and imported products and services. To capture the pervasiveness of oligopolies in Kuwait, firms in all economic sectors, private and state-owned firms, are modelled as oligopolistic (or monopolistic), and their price collusions and targeted

[6] According to Armington's (1969) theory, home and foreign goods (imports) are imperfect substitutes in the aggregate production of a given industry. Thus, tariff reduction or exchange rate appreciations will make home goods relatively less expensive, thus shifting the composition of the aggregate output towards imports. The Armington specification in the model allows the economy to produce, import, and export products with the same sectoral classification.



regulatory surveillance are also modelled. The representation of oligopolistic behavioural structure in the model is incorporated from Shehabi (2017, 2020a, 2020b, 2020c), based on Asano and Tyers (2019), which is based on earlier work done by Tyers (2015), Gunasekera and Tyers (1990), Harris (1984), Horridge (1987), and Tyers (2005), and is similar to that of Devarajan and Rodrik (1991). This representation also emphasizes oligopoly rents in the spirit of Blanchard and Giavazzi (2003). As oligopolists or monopolists, firm's optimal sale price depends on the varietal elasticity of demand is incorporated. This elasticity of collective demand then a weighted average of the elasticities of demand in these five markets it supplies.

The model has seven primary factors of production: physical capital, Kuwaiti unskilled labour, Kuwaiti skilled labour, expatriate unskilled labour, expatriate skilled labour, arable land, and natural resources. To capture the labour market, the model expands industries' production functions to include four labour types that are differentiated by nationality and skill. To reflect the Kuwaiti labour market's segmentation, wage and mobility rigidities in the labour market are assumed, especially pertaining to public sector employment and low-skill wages. Employment contracts are flexible for expatriates.

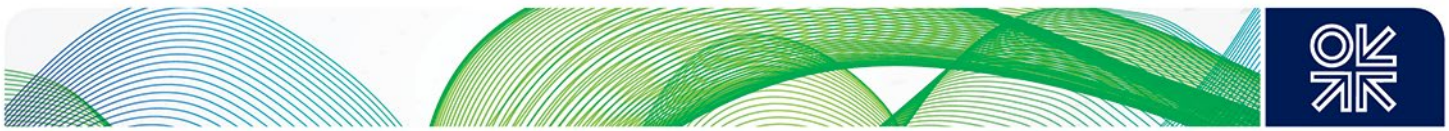
The household saving rate is fixed, and firms retain net earnings at corporate savings rates that are also fixed and industry-specific. The model represents financial agents who manage portfolios of domestic and foreign assets impacting the inflow and outflow of financial investments. The model also takes into account Kuwait's external financial flows, primarily flows to and from the KIA. These mimic, to the extent possible, the KIA's role as a source of government funds following oil price shocks.

The long-run version of the model is naturally Walrasian in that prices and interest rates all adjust to ensure that product, factor, and financial markets all clear. External flows are constrained by the balance of payments (which is implied by domestic agents satisfying their budget constraints), which drives adjustments in the real exchange rate in response to shocks. The total capital stock of the economy is endogenous, as is the level of capital use in each industry. The open economy capital market has a market clearing identity that accounts for inward and outward financial flows. Inward and outward financial flows follow changes in interest rate parity, being the difference between the home and foreign real bond yields and expectations of real exchange rate. In accordance with realistic changes in the long-run capital use within an economy, and consistent with Kuwait's considerable external holdings, the model's long-run closures allow changes through investment flows. Additional details are in Shehabi (2019).

Financial flows and real exchange rate changes are endogenous, while external economic conditions, such as yields on investments abroad and global oil market trends, are exogenous and can be shocked in model simulations. The real exchange rate represents the common currency ratio of the home price of a bundle of traded and non-traded goods and services at home relative to that abroad, and is modelled accordingly. Therefore, it is sensitive to both the performance of the traded industries as well as non-traded services sector. The model adopts neoclassical features in characterizing consumption preferences and the variable costs of production, including optimizing representative agent behaviour, full input substitutability, and flexible product and factor prices. The aggregate household's expenditure function is used to derive the consumer price index (CPI), which is a Cobb-Douglas-CES index of after-tax prices of both home products and imports. Collective utility is also defined as a Cobb-Douglas combination of consumption volumes by generic products, so CPI-deflated GNP is a measure of overall economic welfare.

4.2. A note on links to epidemiological demographic models

While it is common for pandemics and outbreaks models to link economic data to a population-wide epidemiological demographic model, this analysis in the context of Gulf States and Kuwait does not necessitate such linkage, as follows. In assessing long-term macroeconomic and sectoral effects of the pandemic, such linkage would be necessary to the extent that the COVID-19 crisis affects labour



supply. Yet in Kuwait, it is reasonable to assume that the pandemic will have very limited effects on future labour supply, for three main reasons. First, COVID-19's mortality rate in Kuwait has been very low and much lower than world average: 0.6 per cent of infected, 0.02 per cent of the population (compared with world average of 2.1 per cent and 0.05 per cent, respectively (ECDC, 2021)). Second, vaccination efforts for the population have been underway by late 2020 and early 2021, and the government has demonstrated the financial capability and willingness to continue securing vaccinations to achieve herd immunity. Third, and most importantly, under Kuwait's current labour policies, shortage of labour can be supplied via highly elastic expatriate labour from abroad, enabling access to ongoing labour supply. These reasons are applicable to the other GCC states also. As such, the model is calibrated only with the new SAM (2015 data) for Kuwait, described in Section 2.2.

4.3. Model closures

Model closures dictate the length of run to be analysed and represent market clearance assumptions and other assumptions about which variables are free to change in response to shocks and which variables can adjust in responses to shocks. The length of the long-run analysis is the time (or number of years) required for the capital market (capital levels and interest rates) to adjust and firms to enter/exit the market once the shock is fully achieved, absent any other shocks. The closures critical to this study are as follows. The standard labour closure fixes the employment of Kuwaiti labour and enables endogenous movement of both skilled and unskilled expatriates. The real expatriate skilled and unskilled production wage rates (relative to an index of producer prices) are held fixed, while the real Kuwaiti skilled and unskilled production wages are endogenous.[7] To represent more realistically the changes in either the fiscal deficit and/or transfer payments, the adopted fiscal closure has an endogenous fiscal deficit and welfare payments with exogenous government spending on goods and services, and exogenous consumption subsidy rate and corporate tax rates (both of which are shocked). The capital market closures are discussed in Section 4.1. In the long run, the capital stock of the entire economy is mobile, so it adjusts (rises or falls) to maintain a fixed rate of return in all industries, with implications for financial flows on the balance of payments. Payments to the KIA, and withdrawals from it, remain endogenous in the model. Finally, the oligopoly sub-closure in the long run allows free entry and exit of firms at a given profitability level.

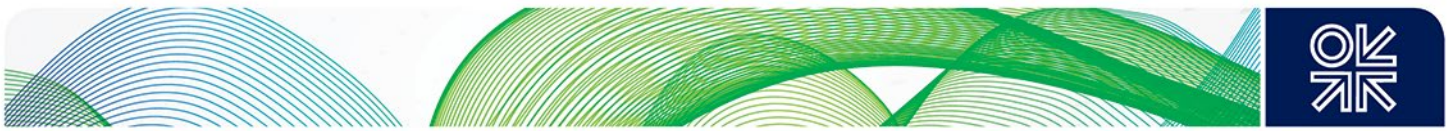
5. Model simulations

5.1. Channels through which COVID-19 affected the economy

Like any health outbreak, COVID-19 is first and foremost a health crisis that can affect any economy domestically through both health/epidemiological shocks as well as economic shocks to supply, demand, production, equity, and policies. In Kuwait, the pandemic caused the following effects on the economy:

- Oil and other products' price, such as:
    - Decreased oil price export revenue for Kuwait
    - Rising costs for consumers and producers

[7] This closure is set this way, first, to represent the inflexibility of the majority of Kuwaiti workers, who are likely to remain employed in the public sector, yet are sectorally mobile. Second, it accounts for the long-run flexibility of expatriate worker contracts, given that the stock of expatriate workers can fall with a decline in labour demand in both the short and long runs.



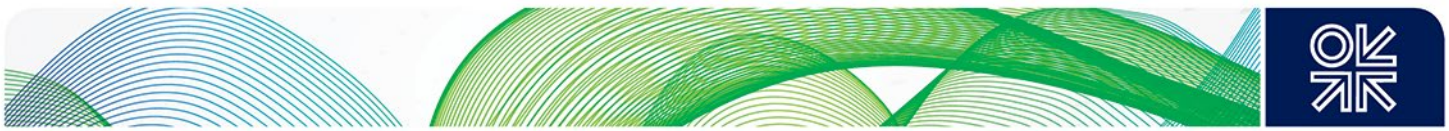
- Disease effects, such as:
    - Rise in infections and mortality
    - Rise in pressures on the health care system
    - Reduction in travel and demand for Kuwaiti oil, oil products, and other goods
- Associated behaviours, such as:
    - Decreased domestic demand for some industries, including travel
    - Decreased international demand for Kuwait's oil exports
    - Increased consumption demand and government expenditures on healthcare and other services
- Mitigation and policy responses, such as:
    - Closures of businesses, schools, and quarantines
    - Provision of wide-spread testing and health-related measures
    - Expansion of welfare support payments and economic stimuli.

Importantly, the domestic effects of the pandemic in Kuwait largely depend on the government's mitigation measures, such as length of lockdowns and closures, as well as the availability and spread of administering vaccines globally in a manner that enables the return of air transportation, movement, and the world economy to pre-pandemic levels.

Simulation design is important for purposes of investigating potential long-term impacts of the pandemic on Kuwait's economy. As many of the aforementioned COVID-19 shocks are or can be very short term in nature, model simulations include shocks that can have only long-term effects, simulated in a long-run model closure (see Section 4.3), for the following reasons. Shocks of immediate or short-term nature are washed out over a brief period and, therefore, are insufficient to move an economy to a new equilibrium. Further, immediate and short-term effects of shocks tend to be more visible or tangible for economic agents and policy makers alike, rendering policy response relatively easy. By contrast, policy making tends to be more intricate and requires quantified assessments if made in response to shocks of long-term nature that have effects visible only after an economy had adjusted in long-term dynamics. The ongoing evolution of COVID-19 virus mutations and the different speed of vaccination efforts globally render the economic outlook continuously uncertain until end of 2021, and possibly into 2022. This paper aims to provide evidence-based assessment to aid policy solutions to this challenge.

An economic closure of a few months only would be short term in nature and would not inform on the macroeconomic or sectoral effects in a general equilibrium setting. Similarly, in Kuwait shocks to Kuwaiti labour supply and mortality of the population are likely to have short-term effects only as explained in Section 4.2. As such, the simulations exclude epidemiological and economic shocks to Kuwaiti labour supply and economic closures of businesses.

On the other hand, oil price drops are considered as having long-term effects in this paper. Indeed, oil prices increased from unprecedented sub $20/bl levels in 2020 to $64/bl early May 2021—trends that reflect increased economic activity following successful vaccine production in November-December 2020 and positive market expectations for an expedited economic recovery. Nevertheless, optimism was subsequently countered by April 2021 (a year since lockdown commenced in Kuwait and numerous other countries) owing to the advent of new virus mutations (especially the British, South African, and the Indian variants) and the catastrophic spread of the disease in India. Moreover, oil demand is threatened by accelerated efforts to achieve the European Green Deal of 2020 and by efforts of US President Biden's administration to advance efforts to combat climate change (including pledges to



reduce US greenhouse gas emissions by 50 per cent by 2030). As such, there remains ongoing uncertainty about the recovery of the global economy and the recovery of oil demand.

As such, the channels through which COVID-19 transmitted to Kuwait's economy in the long-run are:

a) Oil exports prices;

b) Oil export demand;

c) Domestic consumption demand;

d) Costs of businesses production and labour; and

e) Government expenditures.

These channels inform the selection of exogenous factors to shock in model simulation.

5.2. Scenarios and assumptions

To quantify long-term effects of the COVID-19 crisis on Kuwait's economy, the model simulations presented herein include four simulations, all analysed in the long term only due to the nature of the shocks of the COVID-19 crisis and policy responses to them. The first simulates effects of oil price declines alone. The following three simulations combine oil prices and pandemic triggered shocks together, simulated in three scenarios reflecting different assumptions of the speed of domestic and global economy recovery, and the length of domestic movement restrictions and government relief/stimuli packages. These assumptions inform the choice and values of shocks in each scenario. Table 2 details the various assumptions underlying each model.

The first scenario (Scenario A) concerns a rapid recovery of the domestic and global economies and oil prices. This outlook is reflected through shocks reflecting a conservative 4 per cent decrease in global crude oil export prices and 6 per cent declines in oil and oil refining demand; along with supply shocks to private sector industries (construction, transportation, finance, light and heavy manufacturing) and a rise in services sector (driven by rising demand for health, IT, and relevant services) and a rise in government expenditures.

The second scenario (Scenario B) reflects moderate assumptions of the moderate recovery, combining industry supply and government expenditure shocks with larger declines in oil export prices of 6 per cent and demand (for crude and refined products) of 8 per cent, plus increases in government subsidies to all industries to compensate for longer business closures.

The last scenario (Scenario C) concerns a protracted pandemic outlook whereby both the domestic and the globally economies' recovery are significantly slower than in Scenarios A and B, extending to larger losses for local businesses. This outlook is reflected through industry supply and government expenditure shocks of higher magnitudes than in A and B, combined with larger declines in oil export prices of 7 per cent and demand (for crude and refined products) of 10 per cent, larger increases in government expenditures. In addition, simulated are forced release of expatriate labour (double for unskilled than skilled), larger increases in government support to businesses in the affected sectors, funded by withdrawals from savings abroad.

In all scenarios, the adopted fiscal closure has endogenous fiscal deficit with exogenous government spending on goods and services, as well as exogenous consumption subsidy rate and corporate tax rates. Capital is mobile across sectors, with prices and interest rates adjusting to ensure that product, factor, and financial markets all clear. Non-Kuwaiti labour are mobile and have flexible labour contracts.

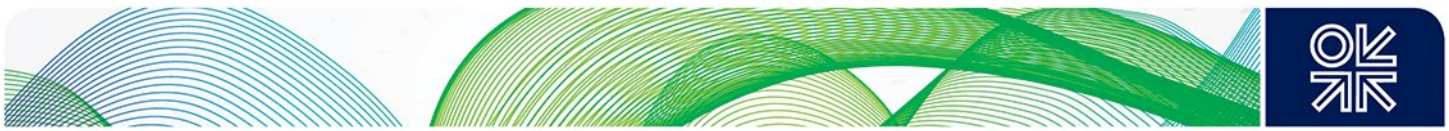


Table **3** depicts the shocks implemented in each scenario. Notably, in determining the value of oil price shocks, and given ongoing oil price volatility and uncertainty in predictions, the simulations use as an oil price rely on (a) $41/bl as the average oil price in 2020; and (b) $45/bl benchmark being the estimate of the Kuwaiti Ministry of Finance in estimating its budget for 2021/2022. Although lower than rebound in oil prices by May 2021, such average low oil price is consistent with future uncertainty facing oil markets and uncertain forecasts of low oil prices in the immediate to near future (IEA, 2021).

Table 2. **Simulation assumptions**

Scenario/Shock	Assumptions					
	Oil prices will remain low	Vaccines roll out domestically	Domestic restrictions on movement and business	Vaccines roll out globally	Global restrictions on travel and movement, and demand for refined products	Kuwait government's support
Scenario A: Rapid recovery						
Quick recovery of domestic, global economy, and oil prices	Average recovery **$45-50/b**	In 2021 to most of the population	Eased in first half of 2021	Wide scale in 2021	Some lifted in 2021 and largely lifted in 2022	Health care services
Scenario B: Moderate recovery						
Quick recovery of the domestic economy; partial recovery of the global economy and oil prices	Average recovery **$40/b**	In 2021 to most of the population	Eased in first half of 2021	Partial adoption in 2021; ongoing in 2022	Partially lifted in 2021-2022	Health care services; household support
Scenario C: Prolonged pandemic						
Slow recovery of the domestic economy, of the global economy, and oil prices	Average recovery **below $40/bl**	In 2021 to most of the population	Strict in 2021 as in 2020	Limited in 2021; largely in 2022	Restricted in 2021, lifting in 2022	Health care; extensive household and business support

Source: Author.

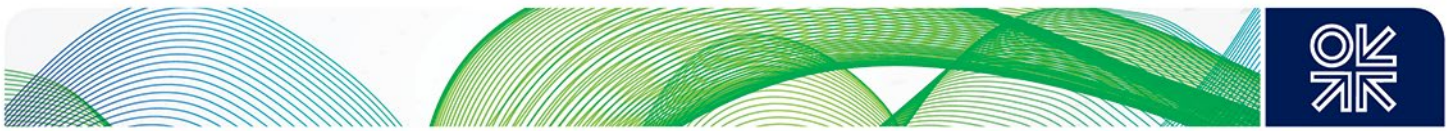


Table 3. **COVID-19 shocks in the selected scenarios**

Scenario/Shock	Scenario A: Rapid recovery	Scenario B: Moderate recovery	Scenario C: Prolonged pandemic	Comments
Decline in oil export price	√	√	√ *	Shock values A < B < C * -7 per cent; preliminary average annual OPEC oil price US $45/b vs. US$49.5/b in 2015
Decline world export demand	√	√ *	√	**Shock values A < B < C** * -8 per cent; IEA's estimates of global demand of oil and liquid fuels ~ 92.4 mb/d for all of 2020, down by 8.8 mb/d from 2019
Increase in government health expenditures	√	√	√	Shock values A = B < C
Household support increase		√	√	
Domestic demand decline		√	√	Shock values B < C ; longer restrictions
Supply shocks for domestic sectors	√	√	√	Shock values A = B < C; Except services, energy sectors, & Network services
Loss of expatriate labour in private sector			√	With longer domestic restrictions
Higher business support			√	
Decline in transfer to and earnings from abroad			√	

Source: Author.

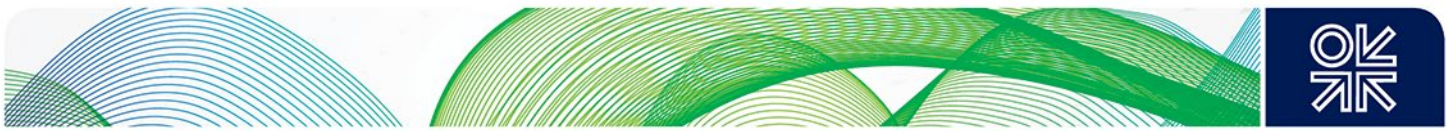
6. Simulation results

Below is the pertinent summary of the results.

6.1. Oil price declines alone

To assess the state of the Kuwaiti economy's resilience and structure at the advent of the pandemic (post the 2014 oil price shocks), the model is shocked with a 5 per cent decline in the oil export price in the current model and SAM (an economic structure following the oil price decline in 2014) [8] and in the economic structure prior to it (as in Shehabi 2017, 2020). In lower oil price environment, the effect of

[8] For details on the results of this shock, contact the author.



an equiproportionate decline in the oil price is 50 per cent worse than that in a high oil price environment (2013). This result is driven by four main things:

a) the lower price environment post-2015 which had already reduced the fiscal cushion;

b) the economic structure and weaking economic role of the private sector;

c) widening economic constraints, with higher subsidies; and

d) the increasing reliance on the oil sector.

This result confirms that the pandemic hit the economy at a state of weakened resiliency following the 2014 oil price declines which witnessed tapering growth in Kuwait since then. As the economy has faced these novel pandemic shocks at a lower resilience level, the effects of the shocks, in the scenarios below, are potentially larger than otherwise and more lasting.

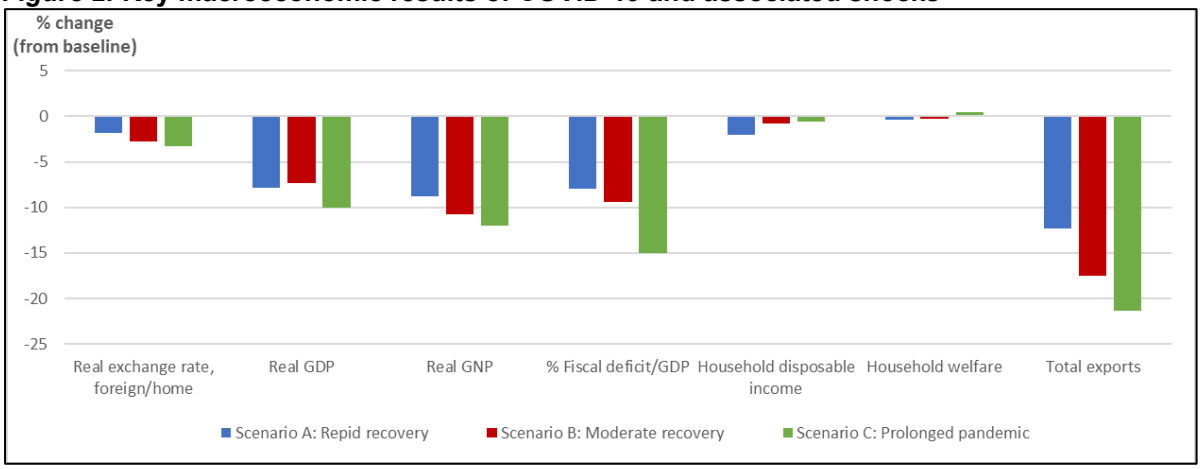
6.2. Combined scenarios: Macroeconomic results

The negative effects on the oil industry and other industries affected by the COVID-19 closures are contractionary throughout the economy. Simulating the previous shocks in the three scenarios, and assuming no other changes in the economy, shows that real GDP is expected to contract by 8-10 per cent, mediated by government's economic support. A depreciation in the real exchange rate occurs in all scenarios, which increases with the severity of the scenario. Such depreciation renders imported final goods relatively more expensive, raising the cost of domestically-sold products. As the majority of intermediate demand is met by imports, a depreciating exchange rate also raises the prices of imported intermediates, raising the overall cost of domestic production and, consequently, their price in the domestic market. At the same time, the rise of domestically produced intermediates (owing to the pandemic) appreciates the real exchange rate, which could by itself render imported goods relatively less expensive, but the appreciation is not large enough to offset the depreciation caused by the decline in the oil export price. The net effect is a depreciation and net rising costs of products and initial inflationary responses.

Yet these increases in prices do not translate to inflation, owing to the government's policy to maintain prices of goods and services in the market fixed. This policy together with increased government support to Kuwaiti families during the pandemic, yield welfare improvements which are, counterintuitively, larger with the severity of the COVID shocks scenario.

On trade, the overall Kuwaiti exports decrease between 12 to 20 per cent, primarily due to decreases in exports of the oil industry and some refined products. The reduction in exports is larger when domestic restrictions are longer, and the global economic recovery is slower. In the three scenarios, domestic output of all sectors decreases largely, but the largest impact occurs in the private sector, which can mediate the hit by releasing labour, mostly expatriates. This effect triggers further declines in economic output, mediated by government support to businesses. Non-oil exports' share of GDP is almost non-affected in all scenarios (Table 4), because it is the net effect of different factors in opposite directions. The depreciating real exchange rate makes non-oil exports relatively more affordable internationally, but any potential expansion is counteracted by global economic recession post-pandemic coupled with reduced output and oligopolistic markups (Section 6.4). Finally, in all scenarios, oil export price declines cause a substantial increase in the fiscal deficit, exacerbated by public economic stimuli and support. The fiscal deficit as a share of GDP declines by 8-15 per cent.

Figure 2: **Key macroeconomic results of COVID-19 and associated shocks**



Source: Simulation results.

6.3. Combined scenarios: Wages, household welfare, and consumption

An important part of evaluating effects of the pandemic on households is the effect on welfare and consumption. The negative effects on most industries directly transmit to households through labour (wages) and output prices. The model results reveal important messages on the effects of the pandemic on both households and Kuwaiti and non-Kuwaiti labour.[9]

While employed labour continue to earn wages, their real wages decline significantly, but with opposite effects on Kuwaiti versus non-Kuwaiti labour. Among Kuwaitis, unskilled labour who earn lower wages than skilled and are employed in the affected private sector firms take the largest hit in their real wages, by as much as triple that of skilled Kuwaiti labour in Scenario A and double in Scenarios B and C. As the economic conditions worsen in Scenario B and Scenario C, the increased government support of businesses improves employment conditions for Kuwaiti unskilled labour, thereby reducing the decline of real wages of unskilled Kuwaiti labour as economic conditions worsen. Meanwhile, the decline in real wages for skilled Kuwaiti labour decline is almost consistent across the three scenarios. For non-Kuwaiti labour, however, the effects on real wages are similar across skill level, and are significantly less than those of Kuwaiti labour in Scenario A because of expatriate labour exit.

Expatriate labour are all of working age and are also mostly employed by the private sector with flexible labour contracts. As such, the affected industries adjust employment levels of non-Kuwaiti labour in response to the shocks, so expatriate labour exit absorbs large parts of the shocks.[10] Across all scenarios, the concentration of unskilled non-Kuwaiti labour in low-wage jobs in industries negatively affected by the pandemic, such as non-traded services and construction, entails that largest loss in employment occurs among unskilled expatriate labour. As economic conditions worsen (Scenarios B and C), real wages of non-Kuwait labour decline (opposite to that of Kuwaiti labour) because most of the government's support for businesses is allocated disproportionately to Kuwaiti labour.

The effects of these dynamics on welfare are counterintuitive and particularly interesting. Contrary to expected negative welfare effects of oil price shocks (such as those in Shehabi, 2017, 2020c), the aggregate welfare measure here drops by only negligible levels in Scenarios A and B. This is because

[9] Ideally, effects are assessed on different groups separated by different workers (or households) with different working-age, employment type, and even health and other digital vulnerabilities. Yet given limitations in the available data, the model does not include such household details or health vulnerabilities.

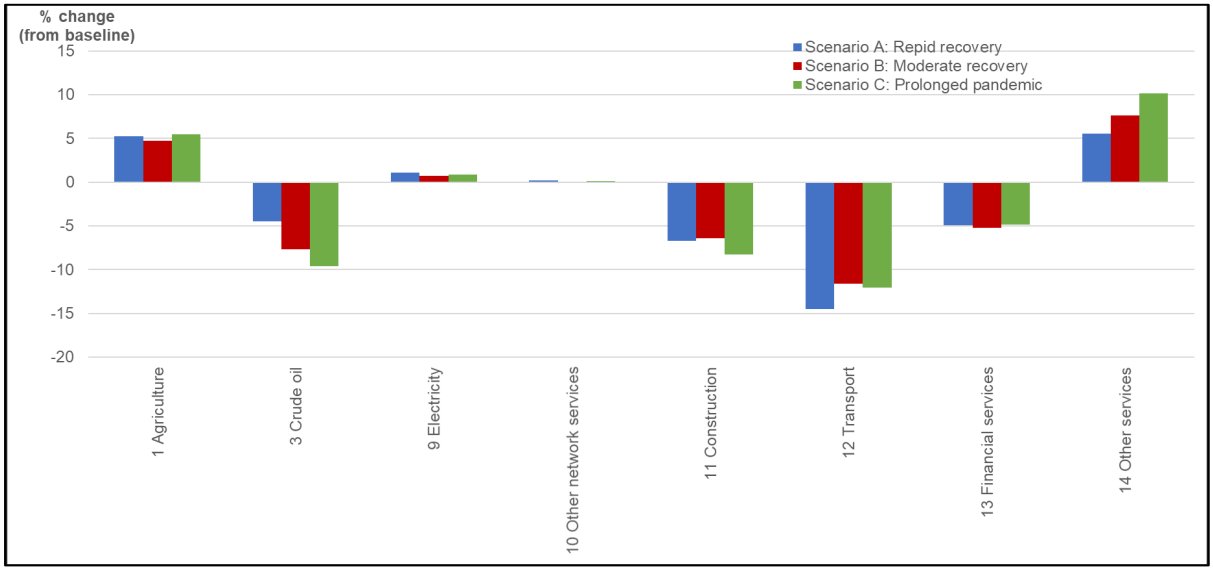
[10] The exit of foreign labour has also been happening since the advent of the pandemic.

declines in real disposable income are minimal (while savings remains constant), and households are thus not required to adjust their consumption of energy and other products. In Scenario C, as the government increases welfare payments to Kuwaiti citizens to ease economic effects of a protracted economic recovery, the aggregate response measures in fact improves. Importantly, however, while these welfare payments offset household welfare declines, they require additional resources from the already-strained fiscal balance, necessitating large withdrawals from the KIA funds to finance committed government expenditures and the increase in welfare payments.

In terms of income and consumption, normally households adjust their demand in response to the rising costs, and their welfare, measured by real disposable income deflated by the CPI, drops. Yet this decline in household welfare is offset by the large expansion of government support (by way of welfare payments) and its policy to maintain inflation stable, the lion's share of which goes to Kuwaiti labour and citizens. As such, welfare losses are mitigated through expanding payments, but more so for Kuwaiti than non-Kuwaiti labour.

In terms of consumption (Figure 3), overall final demand for home-produced goods increases for non-traded services (healthcare, education, other), with larger increases in the moderate recovery and prolonged pandemic scenarios, owing to the longer pandemic. Demand also increases for agricultural goods by around 5 per cent, substituting for imported agricultural goods which have become relatively more expensive. Similarly, demand for electricity and network services (water and gas) remains stable, and unaffected by the severity of the economic conditions. Demand for other construction and financial services decline by 5 to 8 per cent, driven by income effects and closures. Finally, demand for transport sector takes the longer hit, reducing by 10 to 15 per cent, and is largely driven by the length of economic closures and curfews rather than the income effects.

Figure 3: **Percentage change in household demand for local products of selective industries**



Source: Simulation results.

6.4. Combined scenarios: Sectoral effects

Rising costs of domestic intermediates and imported intermediates (through real exchange rate effects) raise costs for industries domestically. Across all industries, with the exception of the sectors demanded increasingly during the pandemic, output for most industries decrease and there are limited effects on pro-export trade. This occurs largely owing to the depreciating real exchange rate coupled with the elasticity of substitution between imports and locally produced goods. These dynamics are very important to sectoral effects and output.

The decline in oil prices across all scenarios depreciates the real exchange rate. At the same time, the increasing cost of domestic prices has the opposing effects on the real exchange rate, but not sufficiently, leading to a net depreciation in the real exchange rate. Yet the demand for intermediate goods is inelastic, and the low real exchange rate renders imported intermediate relatively more expensive and, consequently, raises production costs for sectors with imported intermediates. Meanwhile, the affected industries adjust their production accordingly, first through labour. The contracting industries, especially in the private sector, are forced to reduce costs, with labour costs being the first to be cut from unskilled and unskilled expatriate labour. Yet given the flexibility of their labour contracts, non-Kuwaiti workers are the first to be let go, and their exit offers a minimal cushion to the economy in all three scenarios. The rise of production costs leads to lower output, which raises the relative price of produced goods for the same demand level.

In these economic conditions, the elasticity of demand shifts from the least inelastic to the most elastic, with the share of final demand increasing relative to intermediate demand. As such, sectors expand output to satisfy final demand as well as meet the increasing government demand for goods and services during the pandemic.

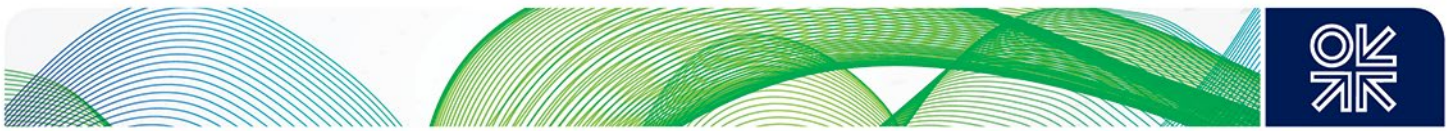
Overall, the sectoral results of the implemented shocks show clear winners and losers of the pandemic (Figure 4). Across all three scenarios, the hydrocarbon industry has the largest declines (in percentage terms). The industries that are affected the most are those with some (albeit minimal to date) exporting capacity (such as manufacturing) as well as both non-tradable sectors for non-urgent services (such as construction and transport) and financial services. In addition to the real exchange rate dynamics, the decline in these industries' output is driven by demand pulls and longer restrictions. The contraction of these industries entails losses of employment for private sector employees, some Kuwaitis and mostly non-Kuwaitis. Also, the rising costs further decrease industrial outputs, causing changes equal to or larger than that in oil sector (Scenario A).

Yet, in the more realistic and pessimistic scenarios where the COVID-19 crisis deteriorates and economic recovery is slow in Scenarios B, the government's support to the affected industries mediates the large negative effects on them from Scenario A. The additional domestic demand in Scenario C (owing to larger financial government financial support to households and industries) is met by a rise in production levels, thereby either stabilizing or reducing the output cuts on the affects industries.

On the other hand, some industries emerge as less affected or even "winners." In Scenario A, output of some services increases largely due to rising domestic demand in COVID-19 related services (primarily health). The two primary non-crude oil sectors with export capacity, namely Refined products and chemicals, also show improvement, driven mostly by the depreciating exchange rate.

The effects on electricity and network services (gas and water) sectors are limited, as those sectors are highly subsidized, thus shielded from negative effects of the pandemic. Further, household and industrial demand for those sectors is rather inelastic and robust in the face of economic downturn, thus requiring ongoing production to meet the demand. As domestic closures persist and the global economic recovers slowly, production increases to meet increasing demand.

The longer the domestic closures, the larger the magnitude of negative effects of affected sectors. Nevertheless, the expanding government support in Scenarios B and C mitigate some of the losses



from the shocks, therefore reducing the overall negative effects on the affected sectors in Scenarios B and C.

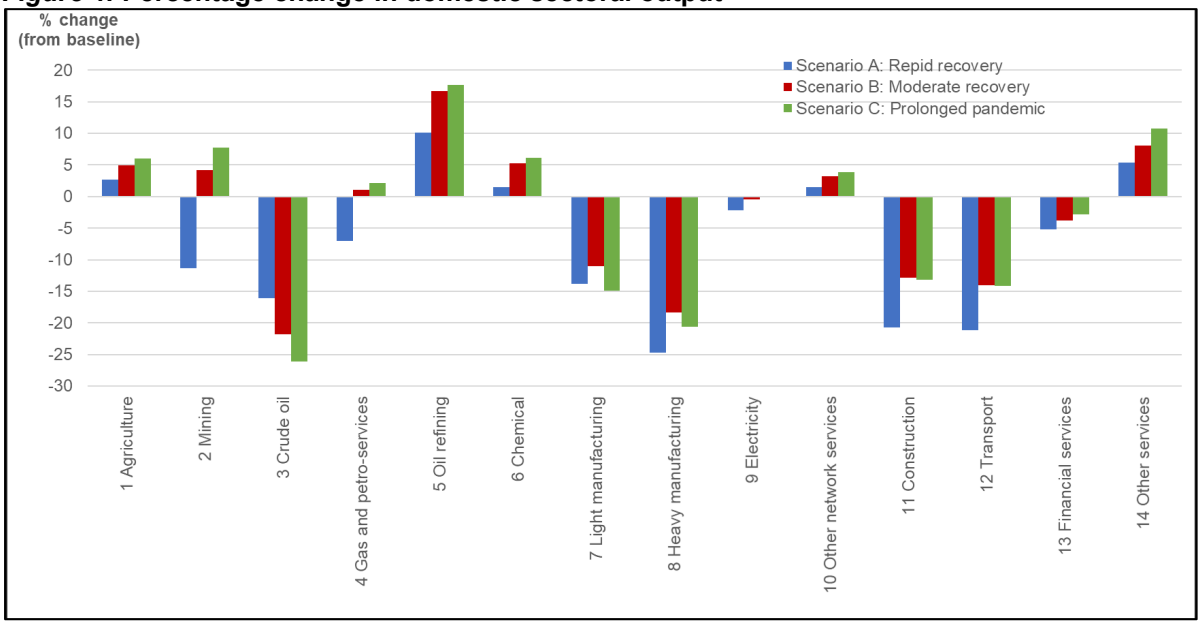
While COVID-19 shocks transmit to an economy through various supply and demand shocks, in Kuwait the demand shocks were mitigated through the distribution of welfare payments that eased consumption. Yet the rise in consumption along with government expenditures were both insufficient to improve GDP, indicating that business closures and the decline in production in most industries are detrimental to the economy and harm its capacity to increase non-oil exports.

The markups of private sector oligopolies offer another important and potentially counterintuitive insight on the industrial effects of the pandemic. Normally, busts reduce oligopolies' markups and pure profits, creating large efficiencies and economic improvements that transmit economy wide. In the model results, however, oligopolists' markups decline but only minimally, by less than 1%, with the magnitude of declines decreasing with the severity of the scenario. These results owe to the increase in government support for businesses. While small firms that are hit by the pandemic are forced to shut down, large oligopolies weather the crisis by, first, letting go of foreign labour and, to a much lesser extent, unskilled Kuwaiti labour; and, second, by accessing expanding government support. Rather than using the relief funds to expand output, oligopolies prop their pre-pandemic profits and markups. As such, despite expanding measures to businesses, oligopolists are able to maintain their markups and, consequently, there are no improvements in economic efficiency that could expand economy-wide to cushion the adverse effects of the pandemic and oil price shocks.

Importantly, the expansion of output towards the export market is significantly lower than that expected in a normal bust following oil price declines (such as the relatively low pro-export expansion in Shehabi (2020a, 2020b). In addition to real exchange rate and weakening global economy effects, the limit in pro-export output is due to the ability of oligopolistic industries to support their markups in the domestic market. These markups do not change post-pandemic from base levels, and most of the increases in output are met in the domestic market only where oligopolistic firms can charge prices that are significantly higher than competitive pricing internationally.

Finally, the support of ongoing wages and expansion of government (welfare) support to households and businesses appear counter-cyclical fiscal policy, but they are consumption-based and therefore do not enable the full realization of benefits of such a policy. These measures eased the consumption shocks without an increase in supply throughout the economy. The expansion in welfare is met with neither an expansion in production and efficiency nor a reduction in oligopolies' markups.

Figure 4: **Percentage change in domestic sectoral output**



Source: Simulation results.

Table 4. **Impact of COVID-19 and associated shocks on selected economic variables in the long run**

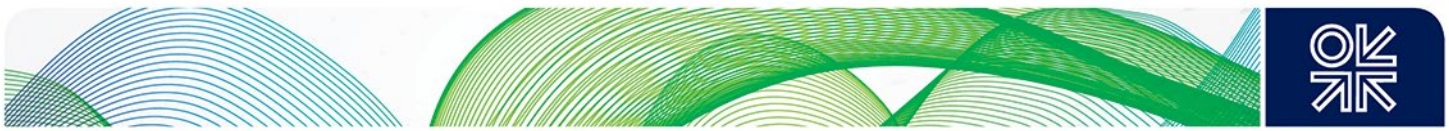
Variable	Percentage change (departure from baseline)		
	(a) Scenario A: Rapid recovery	(b) Scenario B: Moderate recovery	(c) Scenario C: Prolonged pandemic
Macroeconomic indicators			
Real GDP	-7.80	-7.30	-10.00
Real GNP	-8.80	-10.80	-12.00
Non-petroleum exports/GDP	-0.16	0.17	0.25
Government			
Fiscal deficit/GDP	-7.93	-9.43	-15.00
Investment expenditure/GDP	-3.60	-3.45	-5.99
Welfare			
Welfare (Real disposable income, CPI deflated)	-0.4	-0.3	0.5
Labour			
Real Kuwaiti unskilled wage, PC deflated	-9.13	-6.58	-6.94
Real Kuwaiti skilled wage, PC deflated	-3.99	-3.54	-3.68
Real expatriate unskilled wage, PC deflated	-1.82	-2.81	-3.37
Real expatriate skilled wage, PC deflated	-1.82	-2.81	-3.37
Industry/ oligopoly			
Average markup	-0.80	-0.53	-0.40
Average markup, non-oil tradables	0.78	1.56	1.59
Average markup, nontradable services	0.66	0.49	0.47
Average industry scale	37.70	35.92	35.61

Source: Simulation results.

7. Conclusions and policy implications

Hydrocarbon-exporting economies have been negatively impacted by three novel major shock sources, namely COVID-19 (which triggered supply and demand shocks); oil export price declines; and the government's policy responses to the pandemic. This paper examines the long-term effects of the combination of these shocks on Gulf hydrocarbon economies using simulations from Kuwait in the WAFRAGE-KWT Model.

Model simulations find that the combination of COVID-19 shocks, its mitigation measures, and oil price declines largely harms the economy's GDP and causes a fiscal deficit. Increased government's response to those shocks in the form of household support and economic stimulus packages can relieve effects on households and industries, but it does not expand productive capacity and further exacerbate the fiscal response. While managing the spread of the virus is definitely important, the CGE analysis clearly suggests that the longer business closures and movement restrictions continue, the larger

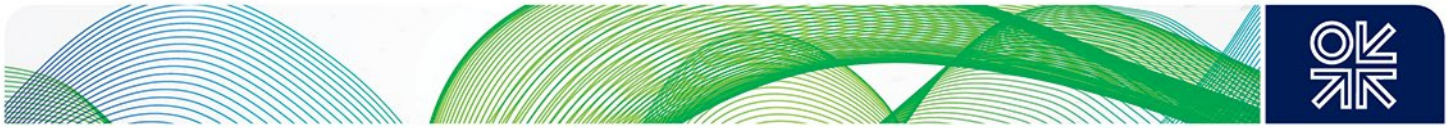


economic impact is caused in terms of economic activity, output, and fiscal effects even if household welfare effects were moderated. Longer closures also entail larger government stimulus packages, which the analysis shows help companies stay in business but support their oligopolistic profits (rather than increase their production) and cause a large drain on the fiscal balance and savings. They can also cause delays in launching non-governmental funds that could support development projects in line with Kuwait's Vision 2035. In summary, the economy faces larger impairments in the long run caused by the combinations of the shocks post-pandemic.

An important contribution in this paper is examining the effectiveness of a change in Kuwait's government economic policies towards a seemingly counter-cyclical fiscal policy. This policy has been offered as a solution to the government historic pro-cyclical fiscal policy, as the latter has been shown to be ineffective in expanding economic diversification and reducing economic rigidities (Shehabi, 2020c). Yet during the COVID-19 pandemic, the expansion of government's relief payments appears in form to be a counter-cyclical fiscal policy, yet model results show that this policy could not achieve its potential pro-export expansion and economic stabilization benefits. The continued expansion of welfare support payments and supporting rigid expenditures (such as the public wage bill) offsets the large declines in household and stabilize some of the negative effects on industries in the economy. Nevertheless, they supported consumption and oligopolist private sector markups, and did not contribute to increased productive capacity, output (in part owing to the ongoing closure and reduced working hours), non-oil exports, or economic efficiency. As such, in sum, they resulted in a negative net effect on exports and GDP as well as an unsustainably enlarging fiscal deficit with depleted SWF resources.

This study offers important contributions to the understanding of the effects of the pandemic on the long-term economic sustainability of Kuwait and Gulf economies. Model simulations indicate that **the resilience of the Kuwaiti economy has significantly weakened** post-COVID, primarily because the pandemic hit the economy at a state of weakened resiliency following the 2014 oil price declines and ensuing tapering growth. The already-weakened economic resilience was exacerbated by the sharp decline of oil prices and demand in the post-COVID world. COVID-19 shocks (such as closures and expansion of large government relief) further exacerbate existing rigidities and challenges, further harming economic resilience and threatening long-term economic sustainability. As the economy faces these novel pandemic shocks at a lower resilience level, the effects of the shocks are potentially larger than otherwise and more lasting and can impede further progress towards long-term development goals. These results suggest that, in the existing economic structure and policy regime and foreseeable oil market dynamics, Kuwait will not be able to weather the effects of another future pandemic or accelerated energy transitions and decarbonization the way it survived this pandemic.

Although alarming, this conclusion represents a golden opportunity to undertake urgent reform, the implementation of which can be done strategically and incrementally. While the results point to the urgent need for structural and fiscal reforms, such reforms have been politically contentious and difficult in Kuwait. As such, during and post the pandemic, there is an opportunity for implementing other reforms that can achieve large economic efficiency and productivity gains even in the current economic and fiscal structures. Such reform would be in key areas, primarily economic productivity, private sector reform, energy efficiency, decarbonization, human capital development, and others. In time, these policies will contribute to improving the economic outlook, and the implementation of fiscal (particularly tax and subsidies) reform would be easier if implemented in better economic conditions. The conclusions offer a strong reminder of the importance of the country's long-standing economic reform agenda, including economic diversification, energy transition, regulatory reforms, and other measures. Absent government reform on fiscal, private sector, productivity and energy strategy, the current long-standing rigidities and economic reliance on hydrocarbon will continue to impede economic adjustment and sustainability to the protracted COVID-19 recovery. In the absence of a diversified export base, this effect together with pandemic-triggered erosion of fiscal cushions and savings jeopardize Kuwait's



ability, and possibly that of some of the other GCC states, to survive the next large shocks in oil prices and demand following accelerated energy transitions or other crises.

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Appendix A: Representation of broad economic structure and data sources

This appendix offers information on the construction of the SAM database with which the model is calibrated in this paper.

Primary data for the SAM were obtained from the Central Statistical Bureau (CSB), including:

- 2015 Input-Output table by commodity;
- 2015 Imports matrix by commodity;
- 2015 Supply-Use table;
- 2015 Producer's Matrix; and
- National accounts for 2015.

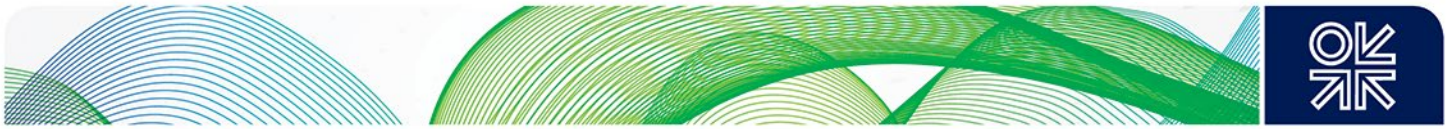
Other satellite accounts were used for the SAM and model calibration, including:

- Trade and import information 2015;
- Labour concentration information from the Public Authority for Civil Information (PACI);
- Firm capital level data from firm surveys from the CSB;
- Firm capital and concentration level from the Kuwait Stock Exchange (KSE);
- Energy information from Kuwait's Ministry of Electricity and Water; and
- Trade and production data for the Rest of the World from the Global Trade Analysis Project (GTAP) database.

The constructed SAM aggregates official CSB data from 57 economic sectors to 14, of which 6 are energy or energy-intensive industries. It also disaggregates factor rewards to seven primary factors: physical capital, skilled Kuwaiti labour, skilled non-Kuwaiti labour, unskilled Kuwaiti labour, unskilled non-Kuwaiti labour, arable land, and energy resources (petroleum in the ground). Factor shares and input-output coefficients from these 2017 data are then combined with detailed bilateral trade, transport, and trade protection data (such as tariffs), as well as country-specific data such as national accounts and balance of payments. A top-down approach is used in aggregating the data to 14 economic sectors, which were then matched to those in the GTAP database for trade data with the rest of the world.

Due to data limitations, the SAM database cannot address the public-private contrast directly; rather, it offers some representation of this contrast in the analysis. The database and the model represent the dominance of the public sector in the Kuwaiti economy through representing the energy (petroleum and electricity and water sectors) as large and nominally independent corporations, acting as separate monopoly firms with their own factor demand and output. For publicly owned firms, the government is treated as the residual owner of additional rent payments (profits) after payments to fixed and variable capital and labour. In completing the SAM, direct tax components from workers and labour are identified. Fiscal rigidities are included in the model through a full representation of government accounts and expanded consumption subsidies and taxes (both direct and indirect). Deriving the database's rows and columns associated with household and government incomes and expenditures relied on data from the balance of payments, transfers between government and households, direct tax and household saving. These data also enable the completion of the column entries for saving.

Finally, the pervasiveness of oligopolistic industries is represented in the model explicitly. There is no complete dataset available in the public domain on the structure and conduct of Kuwaiti energy and non-energy (especially services) industries. As such, constructing the SAM relied on various, primarily namely, the Stock Exchange and the CSB Annual Establishment Surveys, to gather data for individual sectors and industries, where possible, and to extrapolate patterns to undocumented industries as needed. Specifically, pre-tax capital payments are reduced by tax liabilities to arrive at after-tax corporate profits. Profits (after tax and depreciation) are subsequently allocated between retained



earnings and dividends. In addition, these information sources are used to determine rough estimates of the number of “effective” (strategically interacting) firms in each industry and corresponding parameters governing competitive behaviour. The determination of these parameters depends on firm concentration as measured by revenue and market capitalization.

Appendix B: Key modelling specifications

This appendix complements the brief description of the model offered in the main text of the paper. It emphasizes important parts relevant to the analysis in this paper, primarily the final, intermediate, and government demand built into the model as well as government revenue and the real exchange rate.

B.1. Demand and demand elasticities

The elasticity of demand (ε_i) facing firms in a given industry *i* is a downward-sloping demand curve that depends on the weighted average of the elasticities of demand in the above-mentioned five markets, namely final, intermediate, investment, government, and export. Calculating this average depends on the initial shares S_i^j of the demand facing each industry. Table A.1 calculates the shares drawing upon the SAM data.

Table B.1: **Demand shares per industry 2015**

Industry/ Percentage	Final	Government	Investment	Intermediate	Export
1 Agriculture	36.4	0.0	19.6	40.8	3.2
2 Mining	0.0	0.0	-10.8	67.7	43.1
3 Crude oil	0.0	0.0	9.2	28.8	62.0
4 Gas and petro-services	0.0	0.0	65.9	34.1	0.0
5 Oil refining	6.5	0.0	2.0	44.1	47.5
6 Chemical	2.0	0.0	1.6	55.6	40.9
7 Light manufacturing	51.6	0.0	-5.4	36.0	17.8
8 Heavy manufacturing	3.2	0.0	45.8	45.0	6.1
9 Electricity	66.4	0.0	18.8	14.8	0.0
10 Other network services	38.4	0.0	6.5	30.3	24.8
11 Construction	0.0	0.0	91.4	8.6	0.0
12 Transport	17.7	0.0	0.3	67.6	14.5
13 Financial services	13.9	0.0	-1.0	82.7	4.4
14 Other services	33.5	44.6	4.0	15.5	2.3

Source: Author's CGE model database (SAM) constructed for 2015.

In addition, the elasticity depends on component elasticities of substitution, firm numbers (which are assumed exogenous in analysis in this article), and the conjectural variation parameters in industry *i* (μ_i), described below.

The demand elasticities depend on the structure of the model. They are essential to the capture of oligopoly behaviour.

For example, the final demand elasticity is expressed as follows:

$$\varepsilon_i^F = -\eta_i^F + \frac{1}{n_i}\left\{(\sigma_i^F - 1)\,\delta_i^F\left(\frac{\hat{P}_{iH}}{\hat{P}_i^F}\right)^{(1-\sigma_i^F)} + (\eta_i^F - \sigma_i^F)(1+(n_i-1)\mu_i)\right\}, \qquad \text{(B.1)}$$

where η_i^F is the elasticity of substitution of final demand across home varieties in sector *i*; n_i is the number of firms in industry *i*; δ_i^F is the home share in final demand for product *i*; σ_i^F is the elasticity of substitution of final demand for good *i* between domestic and foreign countries; n_i is the number of domestic firms in industry *i*; $\hat{P}_{iH}$ is the CES composite price of all home varieties of product *i*; and $\hat{P}_i^F$ is the CES composite of home and foreign final product prices in the domestic market, weighted by domestic consumption shares.

B.2. Intermediate demand and elasticity

Intermediate demands for home-produced varieties for home-produced varieties of the intermediate good in industry *i* (T_i) and for the imported goods (T_i^*), respectively, are:

$$T_i = \sum_{j=1}^{N} A_{ij} Q_j \quad \text{and} \quad T_i^* = \sum_{j=1}^{N} A_{ij}^* Q_j \quad \forall\, j. \qquad \text{(B.2)}$$

The elasticity of intermediate demand is as follows:

$$\varepsilon_i^T = \sum_{j=1}^{n_i} S_{ij}^T \left[-\eta_i^T + \frac{1}{n_i}\left(\gamma_{ij} + \sigma_i^T - 1\right)\phi_{ij} \left(\frac{\hat{P}_{iH}}{\hat{P}_i^T}\right)^{(1-\sigma_i^T)} + (\eta_i^T - \sigma_i^T)(1 + (n_i - 1)\mu_i) \right],$$

(B.3)

where S_{ij}^T is the share of industry *j* in the total intermediate demand for input *i* and $\hat{P}_i^I$ is the CES composite of home and foreign intermediate product prices in the domestic market, weighted by domestic intermediate consumption shares.

B.3. Government expenditures and demand elasticity

Government demand (subscript *G*) is formulated similarly to final demand. Government expenditure on goods and services *G* reflects its demand for both locally produced and imported goods and services. Demand for home produced goods of variety *j* in industry *i* is as follows:

$$G_{iH_j} = \frac{a_i^G \delta_i^G}{n_i} \left(\frac{G}{\hat{P}_i^G}\right) \left(\frac{\hat{P}_{iH}}{\hat{P}_i^G}\right)^{-\sigma_i^G} \left(\frac{p_{iH_j}}{\hat{P}_{iH}}\right)^{-\eta_i^G} \quad . \tag{B.4}$$

While government demand for imported goods in industry *i* is:

$$G_i^* = (1 - \delta_i^G)\, a_i^G \left(\frac{G}{\hat{P}_i^G}\right) \left(\frac{p_i^*}{\hat{P}_i^G}\right)^{-\sigma_i^G}. \tag{B.5}$$

$\hat{P}_i^G$ is the average composite price for government purchases of both home and imported goods of industry *I,* formulated as follows:

$$\hat{P}_i^G = \left[\delta_i^G (p_i)^{(1-\sigma_i^G)} + (1 - \delta_i^G)(p_i^*)^{(1-\sigma_i^G)}\right]^{\frac{1}{(1-\sigma_i^G)}} \quad . \tag{B.6}$$

In its expenditure on home and foreign products, the government pays no import duties or consumption tax.

Lastly, the elasticity of government demand is obtained in a similar fashion to that of final demand, and is expressed similarly as follows:

$$\varepsilon_i^G = -\eta_i^G + \frac{1}{n_i}\left\{(\sigma_i^G - 1)\delta_i^G \left(\frac{\hat{P}_{iH}}{\hat{P}_i^G}\right)^{(1-\sigma_i^G)} + (\eta_i^G - \sigma_i^G)(1 + (n_i - 1)\mu_i)\right\}. \tag{B.7}$$

B.4. Government revenue

In the model, the government collects revenue from direct taxes on capital, labour income, land, and resource rents, and from indirect taxes on trade and consumption expenditures. Total government expenditure is GT = G + GP, where G is expenditure on goods and services described in (B.4) and (B.5), and GP, is expenditure on transfers (pensions). To account for government interventions at the firm level corporate taxes are separated from subsidies and charged through industry specific rates. The government also makes direct transfers to the collective household, which can be set as exogenous in real terms and can be shocked, in which case one other fiscal variable must be made endogenous: the fiscal deficit, one of the tax rates, or government expenditure on goods and services. The government transfer variable is therefore exploited beyond the applications by Asano and Tyers (2015) by not setting GP constant relative to the consumer price level. While in reality, Kuwait has limited taxation institutions, this representation facilitates the examination of tradeoffs between welfare payments and between fiscal balance and cost of living stability following local or export price changes. It also enables the examination of possible fiscal policy changes in the future.

B.5. GNP and GDP

The model calculates national income, GNP, as the sum of payments made to domestically owned factors of production. It also accounts for the home share of any net profits (or losses) made; net income from indirect taxation; revenue from direct (income) taxation T_Y; and net inflows from abroad denoted as B. The formulation is, thus, as follows.

$$Y = rK_D + \sum_{k=1}^{K} w_k L_k + \left(\frac{K_D}{K_T}\right)\sum_{i=1}^{N}\pi_i + \left(T - T_Y\right) + \frac{B}{e} + \left(1 - \frac{K_D}{K_T}\right)\tau_K^*\left(r\left(K_T - K_D\right) + \sum_{i=1}^{N}\pi_i\right). \quad \text{(B.8)}$$

In effect, B is the net income component of the current account and unrequited transfers.

GDP measures only income from production in the domestic economy. Therefore, in the model its calculation excludes factor payments as well as other flows to and from abroad, as follows:

$$GDP = rK_T + \sum_{k=1}^{K} w_k L_k + \sum_{i=1}^{N}\pi_i + \left(T - T_Y\right). \quad \text{(B.9)}$$

B.6. Real exchange rate

The model allows measuring variable economic variables in real terms. The real exchange rate measured the home and foreign GDP price levels expressed in a common currency. The model, thus, calculates the real exchange rate as the ratio of the home price (P_Y) of a bundle of (traded and non-traded) goods and services at home relative to that abroad (P^*_Y), as follows,

$$e_R = \frac{P_Y}{\left(\frac{P_Y^*}{E}\right)} = E\frac{P_Y}{P_Y^*}\ , \quad \text{(B.10)}$$

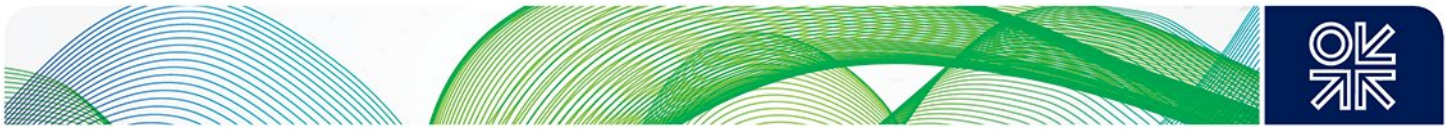
where e_R is the real exchange rate and E *is the* nominal exchange rate, *both* expressed according to the financial convention.

B.7. Model closures

Model closures dictate the length of run to be analyzed and represent market clearance assumptions and other assumptions about which variables are free to change in response to shocks and which variables can adjust in responses to shocks. The short-run period spans the period during which capital stocks are unable to adjust. In the long-run simulations, prices and interest rates adjust to ensure that product, factor, and financial markets all clear. The length of the long-run analysis is the time (or number of years) required for the capital market (capital levels and interest rates) to adjust and firms to enter/exit the market once the shock is fully achieved, absent any other shocks. The closures critical to this study are as follows.

The labour market closures [11] are structured to represent the flexibility of expatriate worker contracts and the inflexibility of the majority of national workers—who are likely to remain employed in the public sector in current government policies, yet are sectorally mobile. As such, expatriate employment of both skilled and unskilled labour is endogenous in both the short- and long-run analyses, while Kuwaiti

[11] Labour market closures distinguish between the effects of shocks that either yield changes in real wages combined with full employment, or hold real wages fixed with changes in employment. The adopted closure accounts for the long-run flexibility of expatriate worker contracts, given that the stock of expatriate workers can fall with a decline in labour demand in both the short and long runs. Notably, assuming such rigidity in Kuwaiti worker supply is important: although in reality national workers' mobility can be achieved if needed through labour policy changes, the rigidity reflects actual labour market rigidities caused by the dynamics of the Kuwaitisation and public sector employment policies (See Shehabi, 2018).



employment is fixed in both. The real expatriate skilled and unskilled production wage rates (relative to an index of producer prices) are held fixed, while the real Kuwaiti skilled and unskilled production wages are endogenous. Notably, assuming rigidity in national worker supply is important, but may constrain model solutions.

Fiscal closures determine the elements of government revenue or expenditure that are held constant and the ones that adjust. The adopted closure allows the government deficit and welfare payments to adjust, while government spending on goods and services is held constant. Government saving varies, driving the current account deficit. There are exogenous consumption subsidy rates and corporate tax rates.

The financial capital market closures determine whether capital use adjusts with exogenous required rates of return or is fixed at the industry level. In the short run, capital is fixed at the industry level, while rates of return vary across industries and are changeable in response to various shocks. In the long-run simulations, total capital stock of the economy is mobile, as is the level of capital use in each industry, so it adjusts (rises or falls) to maintain a fixed rate of return in all industries, with implications for financial flows on the balance of payments.[12] Payments to the KIA, and withdrawals from it, are endogenous.

The market structure (oligopoly) closure, which either requires a fixed number of firms and endogenous profitability, or adjusts by allowing firms to enter and exit to sustain constant profitability as per Chamberlinian monopolistic competition. The oligopoly sub-closure retains constant firm numbers and endogenous profitability in the short run. This setting is occasionally reversed in long-run applications.

[12] The total stock of physical capital varies in the long run and the home-owned share of it depends on corresponding long-run changes in domestic real income and on the share of wealth held abroad. The home-owned share of domestic capital is important because it affects the level of factor income outflow associated with profit repatriation.