THE DOUBLE WHAMMY ON THE KUWAITI ECONOMY
Macroeconomic Effects of the Coronavirus and Oil Price Shocks

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INTRODUCTION

During the first quarter of 2020, the Kuwaiti economy began to receive two major concurrent shocks – the COVID-19 and the sharp fall in the price of oil in the world market. These were powerful events with double whammy effects on the country's economic fabric. This paper focusses on quantifying the macroeconomic effects of the combined exogenous shocks.

A CGE model was formulated to undertake simulation experiments and scenario analysis. Each of these two events were a substantial shock in its own right, let alone when occurring concurrently to the same economy and in the same year. Economic models are often implemented by measuring changes at margins; that is applying relatively small changes to simulate and understand big real world events.

In such cases, CGE models come handy, best suited to conduct simulations, experimenting with marginal or relatively small changes. This would be used to fine tune policy options, focusing on feedback effects of changes between different components in the economy, on the one hand, and synergies between different policy instruments on the other hand. It is possible to obtain some sense of magnitude for large shocks, by experimenting with small changes and then getting a sense of direction (positive or negative) as well as sense of magnitude. The effects obtained from relatively smaller changes can give direction regarding the likelihood in magnitude of larger changes. This logic has been pursued in this study.

The remaining parts of this paper is structured as follows. A brief literature review is presented in the next section. This is followed by a brief description of the model and the baseline database applied in this study. A summary of simulation results is presented and this is followed by concluding remarks (further details will be presented in the full version of the paper).

LITERATURE REVIEW

Boissay and Rungcharoenkitkul (2020) reviewed the literature on macroeconomic impacts of pandemics throughout human history. Among their key findings were that

> "past epidemics had long-lasting effects on economies through illness and the loss of lives, while Covid-19 is marked by widespread containment measures and relatively lower fatalities among young people. The short-term costs of Covid-19 will probably dwarf those of past epidemics, due to the unprecedented and synchronized global sudden

> stop in economic activity induced by containment measures. The current estimated impact on global GDP growth for 2020 is around –4%, with substantial downside risks if containment policies are prolonged. Output losses are larger for major economies."

Findings from CGE applications on cases of previous pandemics have indicated that macroeconomic impacts depended on extents of disruptions they caused to economic activities and fatality rates. Lee and McKibbin (2004) estimated a 0.1% global GDP loss due to the SARS epidemic in 2003. World Bank (2014) quantified impacts of Ebola epidemic during 2014-2016 on specific countries in Wester African, including declines in GDP of 2.1% for Guinea, 3.4% for Liberia, and 3.3% for Sierra Leone. Keogh-Brown et al (2010) estimated GDP effects of hypothetical influenza, an H1N1 pandemic, on the economies on selected European economies. The GDP loss ranged from 1.4% to 6%, of which 0.5% to 2% were attributed to mortality and 0.9% to 4% from school closures and absenteeism.

Previous studies have identified that the Corona Pandemic affects the economy through a series of supply and demand side shocks. Maliszewska et al. (2020) and PwC (2020) provide a summary of such shocks: temporary input shock (absence from work because of either illness or containment measures) and permanent labor force reduction (due to mortality). The supply side shocks emanate primarily from labor market effects. This is classified into two. The first one is transitory and it is related to absenteeism or loss of workdays and reduction in labor input; either due to sickness and hence inability to work or lockdown requires people to stay at home for reasons to do with social distance. The second one is permanent loss, related to reduction in the size of the work force due to mortality; capital productivity reduction due to idleness; increase in government spending; increase in international trade costs; and reduction in household consumption (or increase in household savings

Restrictiveness of curtailment measures has often varied across economic sectors. Therefore, in a multi-sector modelling framework there is a need to consider these variations. Using an input-output modelling approach, Haddad et al (2020) devised a mechanism through which the shocks can be applied across different sector in a flexible manner. This was done by introducing an industry (A) by shock scenario(S) matrix, with the values of elements in the matrix ranging between zero and unity ($0 < f(A,S) < 1$). The closer the values of these elements, the less restrictive the curtailments measure in the corresponding industry and vice versa.

Maliszewska et al. (2020) and Cakmakli et al (2020) applied proximity requirements to impose sectorally differentiated supply and shocks. Cakmakli et al (2020) applied an epidemiological multi-sector model to Turkey and using a small open economy. The results indicated, "economic costs are much larger for an open economy as the shocks are amplified through the international production network. A decline in foreign demand leads to losses in domestic sectors through international input-output linkages, accounting for a third of the total output loss. In addition, the reduction in capital flows deprives the network from its trade financing needs, where sectors with larger external finance needs experience larger losses."

The pandemic causes supply and demand shocks more directly to restricted sectors but policy simulation models need to be specified aiming at capturing indirect economy-wide effects as well. However, short time interval frame with which the pandemic causes shocks means that producers and institutions would not have time to adjust to the shock. This requires specifying models with elements of structural rigidities, particularly by imposing low elasticity of substitutions in production and demand functions, as suggested by Maliszewska et al. (2020).

Production elasticities have been reduced to near zero, so there is little substitution possibility across inputs in production. In order to capture the typically durable relationship within global value chains, trade elasticities for goods have been reduced from their standard values to represent the short-run inability to replace imported components and final goods with products from other countries. The elasticity between domestic and imported goods has been set to 0.4. The elasticity of substitution across import sources has been set to 0.8. Labor supply is exogenous, while wages adjust to equate demand and supply of labor. The return to capital is fixed, while supply of capital is endogenous.

DESCRIPTION OF THE MODEL AND THE BASELINE DATA

A computable general equilibrium (CGE) modelling approach was used in this task. The development of this model has passed through a number of stages. A comparative static version of the model was developed earlier through another KFAS financed project (Gelan et al 2018b). The results from earlier version of the model were reported in previous studies (Gelan, 2018a; Gelan, 2018b). Given the focus of the current and previous studies have been on energy policy, the specification of the Kuwaiti CGE model has progressively departed from standard CGE models

commonly applied to developing economies, capturing specific structural features and unique policy mixes that characterize the Kuwaiti economy.

The Kuwaiti model has evolved into a recursive dynamic version. Results from Kuwait's recursive dynamic CGE model was reported in Gelan and Atkinson (2020) which was developed through a recently completed project which was conducted collaboratively with the London School of Economics, School of Geography and Environment (Gelan, Atkinson and Alawadhi 2020). The model was calibrated to the Kuwaiti comprehensive and consistent database, that is the social accounting matrix (SAM) which was constructed through a large project which financed by the Kuwait Foundation for the Advancement of sciences (KFAS). Further details of the Kuwaiti SAM is available in Gelan et al (2018a, 2018b).

The Kuwaiti SAM was originally developed with 2013 as a base year. It was essential to transform the SAM to fit to the purpose of this model. The double whammy shock this study is concerned with is a recent phenomenon. This required that the SAM be updated to 2019, the latest full baseline year, since the shock started early 2020. Accordingly, the Kuwaiti SAM was updated to 2019 using GDP and labor force growth rates between 2013 and 2019. It should be noted that this is an ad hoc procedure; otherwise, fully updating the SAM to 2019 requires a large data processing exercise. The implicit assumption in this is that there was not any fundamental change in the structure of the Kuwaiti economic; particularly the input-output structure has remained during the six-year period between 2013 and 2019. The SAM updated in such a manner gave the baseline condition in the Kuwaiti economy during the fourth quarter of 2019. It is starting from this baseline that simulation experiments were conducted, progressing in quarterly time intervals during the 2020 and 2021 years, a total of nine quarters, that is the fourth quarter of 2019 and then the four quarters of the subsequent two years.

SIMULATION SCENARIOS

The literature review conducted in earlier section provided us information to frame the simulation scenarios. The experiments were conducted through eleven simulation scenarios (see Table 1). Each shock is labelled with a three letter codes to simplify data presentation in chart at a later stage, using the codes as legends and avoiding cluttering of the charts with long descriptive texts.

- RLF1: Reduction in the size of the labor force due to mortality

- RLI2: Reduction in labor input due to lockdown
- RKP3: Reduction in capital productivity due to idleness caused by the curtailment lockdown
- RHC4: Reduction in household spending or increase in household savings
- ITC5: increase in export trade costs
- OPS6: decrease in oil price in the world market
- IGS7: increase in government spending through transfers
- TFP8: recovery measures introduced through improvements in total factor productivity Improvements
- ALL1-6: Combined double whammy shocks with no policy responses
- ALL1-7: Combined double whammy shocks with increases in government spending as the only policy response
- ALL1-8: Combined double whammy shocks with government spending being accompanied with improvements in total factor productivity

Table 1. Simulation scenarios (percentage changes)

		2019Q4	2020Q1	2020Q2	2020Q3	2020Q4	2021Q1	2021Q2	2021Q3	2021Q4
BASELINE PROJECTION										
Labor		0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Capital		0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
COVID-19 Shocks										
1	RLF1	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01
2	RLI2	0.00	-3.33	-10.00	-7.50	-3.75	-1.25	-0.75	-0.50	-0.25
3	RKP3	0.00	-0.10	-1.04	-3.13	-2.34	-1.17	-0.39	-0.23	-0.16
4	RHC4	0.00	1.91	7.64	6.43	5.22	4.01	2.80	1.59	0.38
5	ITC5	0.00	1.00	10.00	10.00	5.00	4.00	3.00	2.00	1.00
Oil price shock										
6	OPS6	0.00	-1.31	-3.03	-1.95	-2.00	-1.88	-1.75	-1.62	-1.46
Policy responses										
7	IGS7	0.00	1.50	6.00	6.00	4.50	4.50	3.00	3.00	1.50
8	TFP8	0.00	0.50	0.50	1.00	1.00	1.75	1.75	1.75	1.75
Combined shocks										
9	ALL1-6 (RLF1, RLI2, RKP3, RHC4, ITC5, OPS6)									
10	ALL1-7 (RLF1, RLI2, RKP3, RHC4, ITC5, OPS6, **IGS7**)									
11	ALL1-8 (RLF1, RLI2, RKP3, RHC4, ITC5, OPS6, **IGS7, TFP8**)									

These shocks outlined above were identified based on literature review. Five separate COVID-19 related shocks were identified. The oil price fall represents the sixth shock. This means the double whammy was represented by six isolated shocks. The policy responses were classified into two – one specific policy measure implemented through government stimulus package through increases in spending (IGS7) and another diffused policy response, overall measures to enhance economic recovery by implementing a host of measures by changing ways of doing things, including improvements in governance (TFP8). The remaining three shocks are different sets of combining the isolate shocks with policy response measures.

SIMULATION RESULTS

Business as Usual Scenario Forecast

The baseline forecast serves as a yardstick against which to measures all other changes in the simulation analysis. The impacts of each of the 11 separate and combinations of shocks will be measured by the extent to which they cause economic variables to deviate from the baseline or business as usual or BAU scenario. The BAU scenario represents a normal situation in which the Kuwaiti economy would have progressed through time if the double whammy shock has not happened.

The BAU scenario forecast started with time series data obtained from Kuwait's annual establishment surveys. It gives time trends for key economic variables, such as stock variables such as employment and fixed assets and flow variables such as gross value-added. Since impacts of various shocks are ultimately measured by differences of each impacts relative to the BAU scenario, it does not matter whether trends obtained from stock or flow variables are used to conduct the baseline forecast.

For the purpose of this study, the baseline forecast was conducted using stock variables, employment and capital stock. The annual growth rates for these stock variables were converted to quarterly rates.

The CGE model was allowed to run through the simulation time intervals. That means replicating the SAM nine times (the baseline scenario plus eight simulation scenarios), the number of simulation periods used in this simulation exercise (2019Q4 – 2021Q4). The choice of the time-period is influenced by the expected persistence of the shocks, for instance, even if the lockdown

is lifted much earlier, the negative shocks coming through many of the channels will remain and then fizzling out over several quarters.

The Baseline Scenario

The baseline projection (labelled as **Base** in Table 1) indicates that Kuwait's GDP at basic prices would grow by 3.6% between 2019Q4 and 2021Q4, that is to say, average annual growth rate of 1.8% (see Figure 1). This is equivalent to 1.8% per annum. Whether or not this projection would accurately reflect what would actually happened to the Kuwaiti economy would not have any influence on the simulation results obtained and reported in this study. This is not a an econometric forecast as such but a projection for the purpose of establishing a yardstick against which to measure the rest of the simulation results of other scenarios. The difference between the baseline and the simulation scenarios matters. If the baseline forecast were altered, then the other scenarios would be run with that different data input for the baseline, hence the difference between the baseline and the simulation scenario would remain intact.

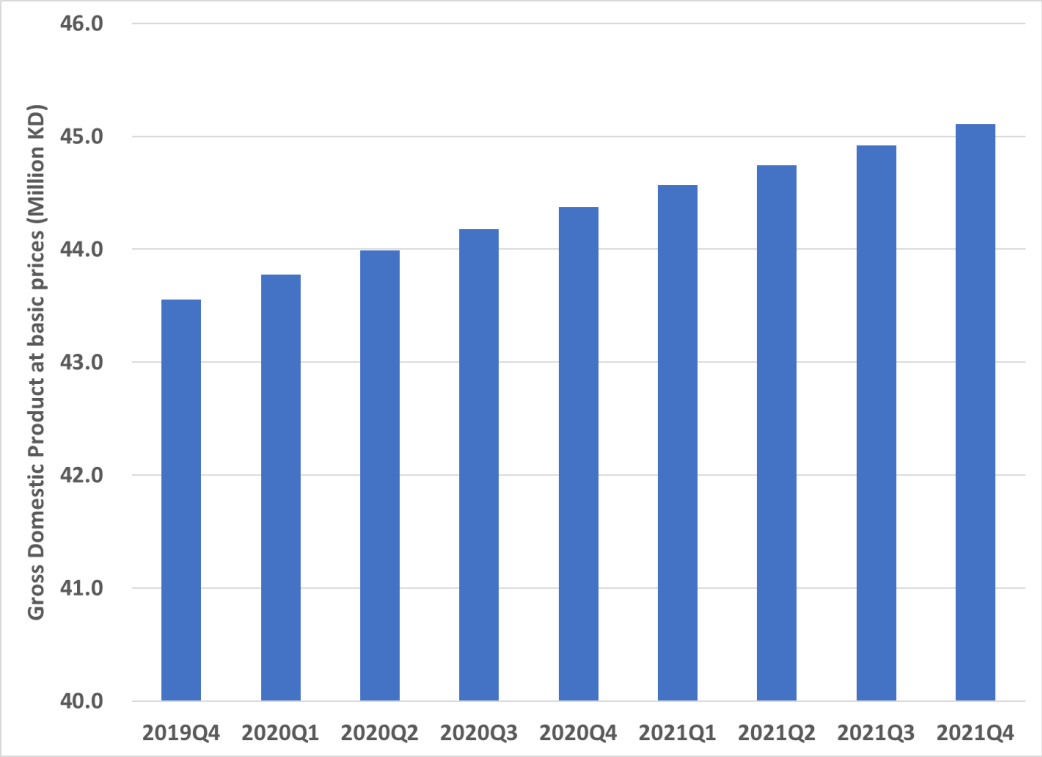

Figure 1. Baseline Projection

The Combined Shocks Scenario (ALL1-6)

The full paper will present scenario by scenario presentations of results obtained by applying the individual simulation shocks listed in Table 1 (*1 to *6, where * stands for scenario descriptive acronyms for the separate shocks).

For the sake of brevity, we present only results obtained from the policy responses and the combined shocks. This scenario was intended to quantify a combined shock, the maximum damage that can happen to the economy before any government policy response was considered. In Figure 2, the red line (ALL1-6) represents the full-scale double whammy effect, which was calculated by simultaneously shocking the model.

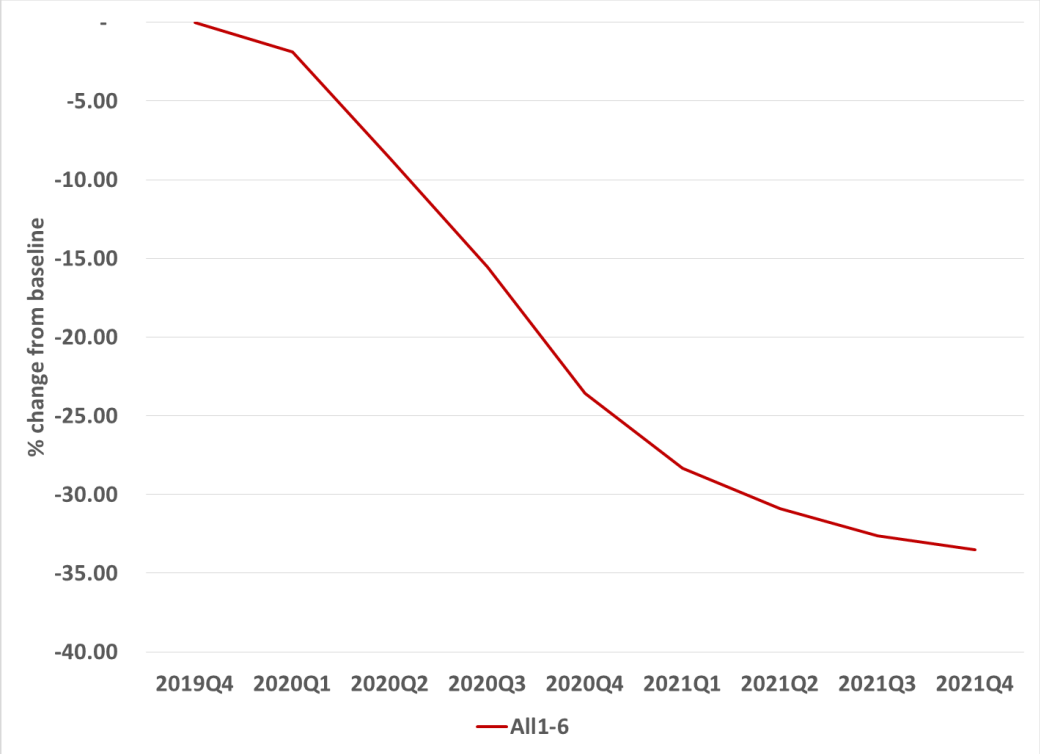

Figure 2. Impacts of COVID-19 and oil price shocks on Kuwaiti GDP without policy responses
Notes: ALL1-6 – double whammy with no policy responses (*1 to *6)

In other words, the simulation here considers what happens if the five COVID-19 related shocks and the oil price shock were left switched on and the model was allowed to run for the number of simulation periods. Government policy responses were excluded from this run, because the

intention here is to see the maximum potential damage that can happen to the economy if there is no government policy response.

This shows the full-scale double whammy shock would cause the Kuwaiti economy to shrink by 33.5% if there is no policy response.

Policy Responses (IGS7, TFP8)

In this simulation experiment, two rounds of shocks were applied to capture effectiveness of policy responses to the double whammy shocks. These are increase in financial support to businesses through transfer payments and more diffused policy measures to enhance economic recovery.

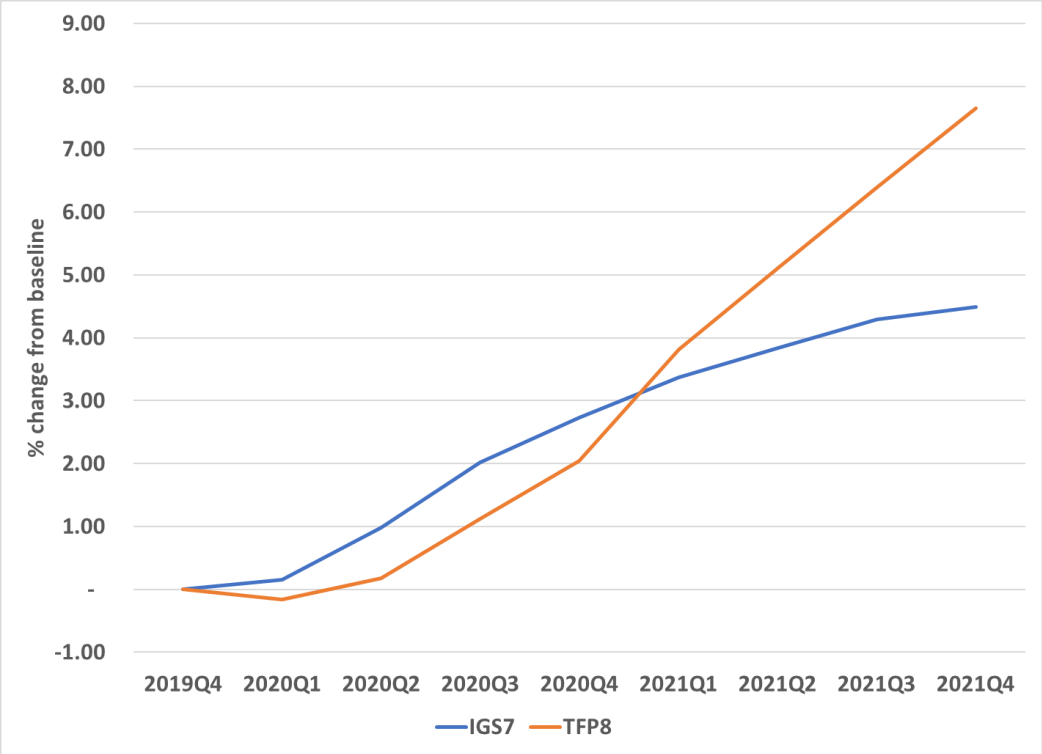

Figure 3. Impacts of increases in government spending and improvements in TFP on Kuwaiti GDP

Notes: IGS7 – increase in government spending; TFP8 – improvements in factor productivities

In CGE modelling context, changes to government spending takes place through two mechanisms. First, the stimulus packages, a policy response to the double shocks, COVID-19 and fall in the oil price. Second, there is an inbuilt mechanism, the automatic stabilizer, through which government spending happens to compensate falls in endogenous incomes and spending by domestic

institutions, businesses, and households. The rates displayed against IGS7 in table 1 are related to the first kind, deliberate policy response through transfers.

The simulation experiment was conducted by raising transfers to businesses, increasing transfers related to production and products. The rates indicated applied to both categories of transfers, production and product subsidies each increased by 30% (the sum of figures across the eight quarters, about 15% per annum equivalent).

The other element of a government stimulus package encompasses hosts of interventions to enable the economy to recover from the massive shocks. These are diffused policy interventions, ranging from specific supports to enhance innovations at business premises to a while gamut of institutional and governance improvements to enable the economy recover during the post COVID-19 period. Total factor productivity improvement is related to changes in ways of doing or managing businesses to enhance productivity. This shock was applied to the model by increasing the efficiency parameter in the production function.

Given that government and the businesses do frantically engage in coping with the pandemic shock at early periods, it is unrealistic to implement the kinds of policy measures related to TFP improvements during the early quarters. However, as the pandemic eases away, then policy makers and the business community will have time to rethink hence the rates of TFP related shocks have increased throughout the period. A 10% cumulative TFP improvement was assumed for the whole simulation period, at the rate of 5% per annum equivalent.

Results from separately applying the stimulus packages are plotted in Figure 2. The government financial support measures assumed in this policy experiment yields an increase in GDP by 4.5% from the baseline scenario, that is to say, if there were no shocks to the economy. Similarly, if total factor productivity were enhanced by 5% per annum then the economy would grow by about 4% above its baseline forecast in a typical year.

The shape of the curves indicate the manner in which the rates of changes to the two elements were arranged as input in the model, that is, TFP coming at the latter quarters and the government financial support being more intensively happening concurrently with the lockdown periods.

Having separately presented the difference that policy measures would do to economic growth rates during normal periods, we now turn our attention their roles in economic recovery when they accompany the double whammy shocks. These are presented in the subsequent chart.

Combined Shocks (ALL1-6, ALL1-7, ALL1-8)

Figure 3 displays combined shocks. The red line (ALL1-6) represents the full-scale double whammy effects (already presented in Figure 2), which were calculated by simultaneously shocking the model. As shown earlier, this shows the full-scale double whammy shock would cause the Kuwaiti economy to shrink by 33.5% if there is no policy response.

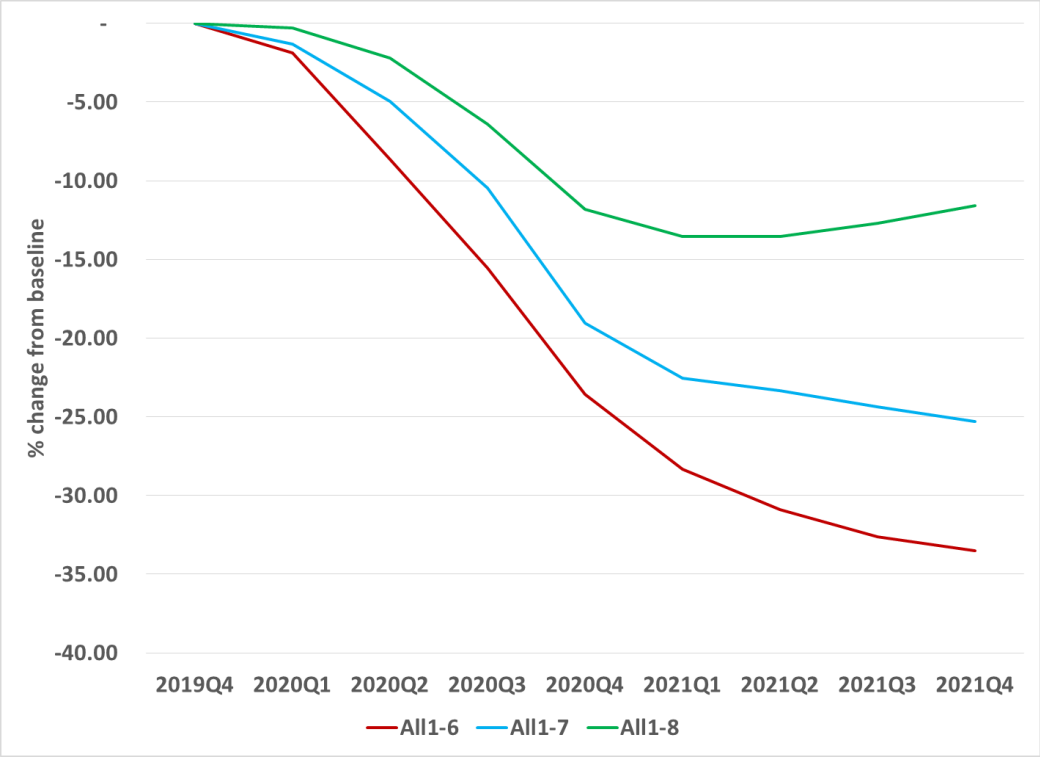

Figure 4. Impacts of COVID-19 and oil price shocks on Kuwaiti GDP with or without policy responses

Notes: ALL1-6 – double whammy with no policy response; ALL1-7 – double whammy with government spending as the only response; ALL1-8 – double whammy with increase in government spending and improvements in TFP

The blue line in Figure 3 represents a partial policy response. This is implemented by shocking the model as in ALL1-6 scenario but this time allowing government financial support but no other policy measures. In other words, total factor productivity improvements is excluded from the ALL1-7 scenario run. In the context of this simulation set up, government financial support can reduce the adverse economic shock from nearly 34% contraction in GDP to a 25% contraction.

The green line displays the outcome when all shocks discussed so far are concurrently applied to the model. The difference between ALL1-7 and ALL1-8 scenario runs was that in the latter the policy response is no more restricted to financial support but includes a range of policy measures that would contribute to total factor productivity improvements. In other worlds, ALL1-8 includes the double whammy shocks as well as the two components of the policy shocks, increase in government financial support (IGS7) and enabling policy measures through improvements in total factor productivity (TFP8).

The fully combined shock (ALL1-8) yields results that considerably differ from the cases of shocks with no policy response (ALL1-6) and shocks with partial policy response (ALL1-7). If the two elements of policy responses are implemented during and in the aftermath of the double whammy shocks, then the damage to the economy can be reduced from maximum of nearly 34% contraction to 11% contraction in GDP.

The differences between ALL1-7 and ALL1-8 indicate the importance of policy synergy in dealing with complex economic shocks. When the two policy measures happen simultaneously, then the negative impacts are reduced by greater percentage points than the sum of the individual measures.

Concluding Remarks

This study has conducted a series of simulation experiments to examine the combined effects of two concurrent exogenous shocks, the coronavirus and falls in the oil shock, on the Kuwaiti economy. In this paper, we presented an abridged version of the simulation results, focusing on GDP effects of the combined shocks and differences a combination policy response would make in minimizing the damages to the economy. The results indicated that, by the end of 2021, the cumulative effect of the double whammy might push the Kuwaiti economy down from its baseline trajectory by as much as large as 34%. This represents the worst possible scenario that is what may happen if there is no policy response.

Since government is already intervening, the worst-case scenario is unlikely to be materialized. The possible government interventions were categorized into two. The first one was implemented by increasing government financial supports to businesses, as production or product subsidies. A cumulative increment by up to 30% of the financial support would minimize the GDP contraction by nearly 10% that is a drop from 34% contraction to 25%. We then applied government intervention targeting positive supply side shocks through improvement in total factor productivity (TFP). With a cumulative 10% TFP improvement over two years, GDP contraction would be reduced to 11% by the end of the fourth quarter of 2021. This indicates that policy responses targeting supply side would a great deal more effective than policy packages that target demand stimulus.

In the full paper, details of the simulations results will be presented together with sensitivity analysis, which were conducted by varying the sizes of the individual exogenous shocks.

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