

Impact of COVID-19 on Saudi Arabia's economy: evidence from macro-micro modelling

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COVID-19 in
KSA economy

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Abstract

Purpose – Even with the Saudi Arabian Government's discretionary measures to mitigate the spread of the coronavirus disease 2019 (COVID-19), the economic sectors were not spared from the damage. Thus, the paper aims to use a computable general equilibrium (CGE) model to evaluate the impact of COVID-19 on the Kingdom of Saudi Arabia's (KSA) economy, with a special focus on small and medium enterprises (SMEs) and production. These influence the level of poverty.

Design/methodology/approach – The paper adopted the social accounting matrix (SAM) for Saudi Arabia built in 2021 by Imtithal Althumairi from Saudi Arabia's 2017 SAM. The model represents a snapshot of the economy and different flows that exist within the tasks and institutions. Two simulations (mild and severe) were conducted because of the focus on the distributional outcomes.

Findings – Decrease in job creation and economic growth were significant evidence from the study's findings. Findings show that more families hit below the poverty line because the negative impacts of the pandemic have shifted the income allocation curve. Findings show that the weakest of the poor are mitigated by government social grants during the pandemic.

Research limitations/implications – The paper is restricted to the relevant literature relating to the impact of COVID-19 on Saudi Arabia's economy and evaluated using the SAM model. Moreover, the COVID-19 is still an ongoing scenario; thus, the model should be updated as data utilised for the operationalisation are made available.

Practical implications – The information from the suggested model can be suitable to measure the degree of the harm, and thus, the likely extent of the desirable policy feedback. Also, the model can be updated, as data are made available and formulated policies based on the updated data implemented by the policymakers.

Originality/value – Apart from the recovery planning of SMEs during the pandemic, the paper intends to stir up Saudi Arabia's policymakers through the macro-micro model to recovery planning and resilience of the economy with emphasis on mitigating unemployment.

Keywords Computable general equilibrium model, COVID-19, National accounts, Saudi Arabian economy, Social accounting matrix, SME

Paper type Research paper

1. Introduction

On the 30th January 2020, the World Health Organisation (WHO) declared the COVID-19 as a Public Health Emergency of International Concern (WHO, 2020). Many never anticipated that this global pandemic will still be ravaging the world after more than one and a half years. This has caused the world great disasters, affecting the social, economic and cultural values, especially the high rate of death victims. The high spread of the virus from human to human transmission via direct contact or by droplets may have contributed. As at the time of revising this manuscript (19/10/2021), over 242,069,845 COVID-19 cases have been reported, death recorded is over 4,924,213 and recovered is over 219,375,730 across the world.

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Similarly, in Saudi Arabia, over 548,018 COVID-19 cases have been reported, death recorded is over 8,767 and recovered is over 537,037 (Worldometer, 2021). It is possible that the WHO foreseen this coming and hence declared COVID-19 as a global pandemic on 11th March 2020 (Ebekoziem and Aigbavboa, 2021). Despite the preventive and control measures put in place by WHO and several governments organisations to mitigate the spread of the pandemic, the short- and long-term catastrophic caused by this pandemic on human lives and the economy are unimagined as affirmed by the latter authors.

Nicola *et al.* (2020) affirmed that the primary sectors (agriculture, petroleum and associated products), secondary sectors (manufacturing firms) and tertiary sectors (education, hospitality, tourism and aviation, housing sector, sports industry, information technology, food sector, etc.) were all affected. Several countries' governments attempted to mitigate the spread through preventive and control measures such as compulsory border shutdowns, travel restrictions, physical distancing, regular hygiene and quarantine, yet the damage to some developed countries (Spain, the United Kingdom and the USA) and developing countries (India and South Africa) is unquantifiable. Buck *et al.* (2020) acknowledged that the pandemic sparks fear of an impending economic crisis and recession because some of the world's largest economies were affected badly. The COVID-19 hit did not spare Saudi Arabia's economy. This paper's research is about the impacts with emphasis on challenges being faced by SME operators. Nurunnabi (2020) reported that the initiative [Global SME Policy Network (GSPN)] was created and sponsored by the KSA's Government through Prince Sultan University in collaboration with the World Economic Forum Strategic Intelligence. They offer feasible and pragmatic data on SME policies to public policymakers and global organisations from G20 nations to manage the hindrances created by the COVID-19 crisis.

As the COVID-19 pandemic hit every sector across the globe, the negative impact on the global economy is geometrically increasing. There may be a depression of world growth rate below 2% in 2020 if this pandemic is not curbed as warned by the United Nation's Trade and Development Agency (UNCTAD). In the opinion of Bagchi *et al.* (2020), this is projected to cost about US\$1 trillion off the total worth of the world economy. This is of concern to many policymakers, economists and scholars. In China, McKibbin and Fernando (2021) found that the economy of the Chinese was disrupted and highlighted seven possible scenarios of the pandemic using the general equilibrium model. Bagchi *et al.* (2020) affirmed that the global economy supply-chain interruptions commenced from China and there is evidence of uncertainty concerning production and prices of crude oil, including major stock indices collapsing. In India, Ghosh *et al.* (2020), Poddar (2020) and Das and Patnaik (2020) found that COVID-19 has caused severe damage to the Indian economy and may lead to a 4% loss to real Indian gross domestic product. In Malta, Grima *et al.* (2020) found that the pandemic scenario has led to new measures being taken by stakeholders across the globe to change their business. Many of the stakeholders have engaged themselves in information and communications technology (ICT) business operations in compliance with the international organisation regarding physical distancing and group gathering. In Nigeria, Ebekoziem *et al.* (2021a, b) and Ebekoziem and Aigbavboa (2021) found that the construction sector was the worst hit by the pandemic. Kim and Jung (2021) discovered an isolation–distress link to be greater in nations with more COVID-19 cases. The authors covered 62 nations across the globe, including KSA. The authors found that psychological distress is positively connected with social isolation but varies from country to country. Shrestha *et al.* (2020) and Sarkodie and Owusu (2021) addressed the impact of COVID-19 from the global perspective of the environment, health and economic issues. The authors discovered that the pandemic has led to the enhancement and upgrading of healthcare facilities across the globe but the economic development seems deteriorating. Several governments across the globe have attempted to cushion the economic impact resulting from the COVID-19.

The COVID-19 crisis strikes the KSA economy at a period the economy was attempting to overcome considerable strain. At the end of April 2020, revenue generated from airlines was expected to decline by US\$7.2bn, which was about 35% below their 2019 rates (Parveen, 2020). The author affirmed that the impact and recovery from the pandemic will be unprecedented. The SMEs contribute not less than 20% to the gross domestic product (GDP) of Saudi Arabia and create job opportunities through promoting growth and encouraging innovation. This accounts for about 99.41% of the private sector in the country. In line with the vision for the Kingdom Vision 2030, the GDP contribution from SMEs is expected to hit 35%. How feasible is this will be determined by how long the COVID will face-off and policies put in place for fast recovery approach of the SMEs. General Authority of Small and Medium enterprises, Monshaat (2020) found that works and management and finance markets are adversely affected by the pandemic. This cut across the business owners with pessimistic perceptions of more harm in the coming months if the Government does not intervene. Thus, leading to an employment cut.

In all these, the KSA Governments at various levels responded and still responding. The proactive response of the KSA Government aided many expatriates to remain in KSA instead of travelling back to their home nation during the crisis. The Government ensures there were food supply, emergency services, medical services, etc. (Arab News, 2020a). The KSA Government allocated US\$133m to fund helpless citizens during the crisis period (Arab News, 2020b). Also, business owners were asked to request up to the one-quarter year of compensation. This may amount to 60% of the workers' income and US\$20bn stimuli for tax freedoms and US\$15bn reserved for financial organisations such as banks to support private SMEs across KSA (Arabian Business, 2020). The intention was to mitigate unemployment and stimulate the economy. Havrlant *et al.* (2021) found that the negative impact of the pandemic on GDP in 2020 is projected within -4.8 to -9.8%. For the Government's fiscal countermeasures, the outcome will be a positive impact of around 2.5% in real GDP. Tracing the transmission channels of the disturbing impacts of this pandemic on the KSA economy has become inevitable. This is because, given the background and the bleak picture from the COVID-19 crisis, it is pertinent to recognise the extent to which this pandemic if not mitigated locally and internationally, may push the economy into a threatening state. This will assist in communicating the negative impact of the pandemic to aid the Government regarding regulations and guidelines in response to the COVID-19 crisis on the economy. This is one of the justifications for the study. This will offer an insight into the possible economy-wide effect of the COVID-19 crisis and proffer feasible economy-related solutions within the KSA and by extension to other Gulf regions with similar challenges.

Modelling the negative impacts of COVID-19 on the KSA economy is with enormous encumbrances. Apart from the uniqueness of the virus with the consequence, literature is scarce regarding modelling. Also, the ravaging impact of the pandemic is still ongoing, and one cannot predict the fate of Saudi Arabia with this new variant known as Delta Plus. Evidence shows that there are other possible ways through which the pandemic feeds into other parts of the economy (Chitiga-Mabugu *et al.*, 2021). This makes economic modelling activities difficult. Scenario analysis engaging a CGE framework may be efficient since the COVID-19 institutes a large national-scale outrage across the sectors. This, directly and indirectly, will spill out unprecedented impacts across the KSA economy. This research, therefore, utilise a CGE model to examine the impact of the pandemic and instant policy answers on the Saudi Arabian economy. This paper concentrates on the impact of COVID-19 on production and poverty. The evaluation will not capture the effects of the medical side effect of the COVID-19. The focus of this paper will emphasise the outcomes of the COVID-19 on the economy and households of the KSA people. Though there are few papers in this direction of recent, such as Maliszewska *et al.* (2020), Laborde *et al.* (2020) and Chitiga-Mabugu *et al.* (2021), but not in KSA. The authors traced the effects of the COVID-19 on the

economy through some selected outlets. The outlets were the reduction in employment because of the entire sectors lockdown guideline, the decrease in the request of goods non-essential, the decrease in movement from one city end to another and international transaction and the rise in transportation costs. Recent past papers, especially by the latter authors, are relevant to Saudi Arabia and will be used, but some degree of the decision will be unavoidable in interpreting answers of the health crisis into the KSA economy.

Parveen (2020), Nurunnabi (2020) and Havrlant *et al.* (2021) findings are amongst the few recent studies that identified the impacts of the pandemic on the various sections of the Saudi Arabian economy and categorised in line with their level of threat to the shock as modified and presented in Table 1. Referring to Table 1, it shows the most and least affected sectors in the three scenarios. For example, the health and social work sector is considered as severely affected, whilst recreation, cultural, sporting activities and air transport sectors are considered as very severely affected. The latter are negatively affected given the national and international restrictions of movement within and outside KSA. Table 1 is based on some assumptions the paper made for the different sectors. The other part of this paper is organised as the next section will discuss the model utilised, Section 3 is followed and the findings and discussion captured there, whilst Section 4 is the final section and contains conclusions and policy implications.

2. Research method

2.1 Model

A CGE model was adopted to examine the impacts of the pandemic-induced shutdown on the Saudi Arabian economy. This is related to a micro-model. This is to enable the CGE model to evaluate the redistributive impacts on production and poverty. For this paper, CGE models represented the financial system of KSA. They enhance seizing the various effects of the pandemic (local and international effects) on the diverse organisations. The CGE model has been demonstrated in previous pandemics, such as various types of influenza (McKibbin and Sidorenko, 2006; Brahmabhatt and Datta, 2008), acquired immunodeficiency syndrome (AIDS) (Dixon *et al.*, 2002) and Ebola (Evans *et al.*, 2014). Findings from these past papers proffer some lessons but the medium and transmission channels to economic impacts differ. Previous studies may aid partially, but in the context of KSA, it cannot be trusted to account for the distinctive characteristics. Thus, modelling the impact of the pandemic has posed some challenges. In the context of the history of the KSA, apart from the few details regarding the pandemic, there is no evidence of economic framework or modelling that can be adopted in

	Moderately affected	Severely affected	Very severely affected
Initial magnitude	Zero-impact shock and other shocks ranging from -10 to -80%	Zero-impact shock and other shocks ranging from -10 to -80%	Zero-impact shock and other shocks ranging from -15 to -85%
Covid-19 sectoral impact	Agriculture Wholesale retail trade Food products, beverages, and tobacco Public administration; social security	Crude oil and natural gas Health and social work Road transport Refined petroleum products Motor vehicles, trailers, and semi-trailers	Recreation, cultural, sporting activities Aircraft manufacturing Air transport

Table 1. Categorisation of sectors concerning the COVID-19 shock

Source(s): Adapted from Parveen (2020), Nurunnabi (2020), and Havrlant *et al.* (2021)

this scenario. Thus, this paper intends to model the shutdown from the supply line-up restriction as presented in the findings section with emphasis on productivity and poverty.

The paper adopted the SAM for Saudi Arabia built in 2021 by Imtithal Althumairi from Saudi Arabia's 2017 SAM (Althumairi, 2021). The model represents a snapshot of the economy and different flows that exist within the tasks and institutions. Also, previous studies such as Althumairi (2021) found that SAM offers a dependable model for socio-economic accounting of the KSA's economy. Two simulations (mild and severe) were conducted because of the focus on the distributional outcomes. It is separated into two sections. First, a vastly aggregated macro-SAM is built. In the second phase, the macro-SAM is disaggregated into a micro-SAM with the macro-SAM entries functioning as monitor sums for sub-matrices of the micro-SAM. This is in line with Chitiga-Mabugu (2021). The findings show balance and consistency. The paper modified Althumairi (2021) SAM arrangement pattern, i.e. a respectable stage of disaggregation for sectors through 54 accounts that are appropriate for strategy evaluation, 18 production tasks, 18 commodities accounts, 4 aspects of production and 10 institutions. At the first level, for each task, production is a Leontief function of value-added and intermediary utilisation. During the next phase, it is presumed that composite labour can be replaced with capital after a constant elasticity of substitution (CES) function. During the third phase, composite labour is a CES function amid employees. Those with tertiary education backgrounds are highly trained and trained employees for the secondary education employees. The latter group should have successfully finished their secondary education. Unskilled and semi-skilled employees included workers with primary education and an average secondary school education, respectively. At the last phase, higher education such as tertiary education and completed higher education function amid a CES. This is a presumption. The components/houses in the framework are disaggregated per decile of salary via the SAM.

Table 2 summarises the assumptions of the simulated scenarios. For this paper, two scenarios were adopted. In the scenarios, there is a paucity of data on the magnitude of the shocks regarding the COVID-19, the study design and the scenarios that adopt hypotheses from previous research (Laborde *et al.*, 2020; Havrland *et al.*, 2021). It was adjusted to Saudi Arabia's context for this paper. The study is aware that the scenario research designs are in line with "guesstimates". First, it is necessary to note that new variant emerges within a short period. This was in line with the economic state globally. Referring to Table 2, the persistence of the pandemic in some countries such as China and the USA and the lockdown slow down the oil demand and this continues to be low until recently when there seems to be a recovery in some countries. The decrease in production in the various sectors will negatively impact homes. One

	Mild scenario	Severe scenario
<i>International channels</i>		
Decrease in exports	10% for all commodities	15% for all commodities
Decrease in world prices for oil and minerals	20% decrease for oil price 10% decrease for minerals	20% decrease for oil price 10% decrease for minerals
Decrease in remittance	10%	10%
Decrease in productivity for the sectors	3% for mildly affected 5% for moderate 10% for largely affected 15% for severely affected	4% for mildly affected 8% for moderate 13% for largely affected 18% for severely affected
Increase in transportation cost	2%	2%

Source(s): Own compilation based on modified works from Parveen (2020), Havrland *et al.* (2021) and Chitiga-Mabugu *et al.* (2021) as well as informed by government lockdown regulations and guidelines

Table 2.
Assumptions of the
simulated scenarios

of the outcomes possibly will be to sack employees or cut down employees' wages (Chitiga-Mabugu *et al.*, 2021). Based on the cut on households' source of income, the study anticipates a cut in households' expenditure. This may enhance the decrease in production across the sectors in KSA. Also, it may amplify poverty, particularly with the already poor of the poorest.

3. Findings

The findings of this paper will be presented in three sub-sections. This includes macro-results, sectoral and distributional results and micro-economic results.

3.1 Macro findings

The effects of the ravaged COVID-19 are severe on the economy across the sectors in the KSA. Findings show that the economy is instantaneously impacted by the demand and supply surprise. First, regarding the necessity side impact, there is a reduction in the necessity of goods and services as the other parts of the world are plummeting their expenditure. Concerning the supply, the lockdown and movement restrictions lead to a reduction in production. This has affected the capital usage and a large number of employees are at home. The impact is in decrease by 5.3% in GDP of the mild scenario and 10.14% in the severe scenario as presented in Table 3. Referring to Table 3, these figures emerged from the study's computation based on model simulations. Findings slightly agree with Harvlant *et al.* (2021) and it was found that the negative effect on headline GDP in 2020 is projected within -4.8 to -9.8% , as against the baseline level, whilst the Government's fiscal countermeasures result in a positive impact of about 2.5% in real GDP. The persistence in the COVID-19 to subside may have contributed to the rise in the negative impact within the range of -5.30 to -10.14 . Thus, the decrease in the whole production may lead to a cut in the whole employee demand from the sectors. This enhances the harsh increase of the unemployment rate across the employees' categories. Findings show that for mild and severe scenarios, the rise in job loss rate is higher for untrained and semi-trained employees than for trained/skilled employees. This increase calls for concern. Households that depend on only income from employees with lower education background may feel the hard economic income because of the employment income reduction. In the year 2020, Saudi Arabia was ranked 20th with a GDP of US\$700,118m amongst the 206 economies evaluated as reflected in Table 3 (World Bank, 2021).

3.2 Sectoral and distributional results

For this section, some variables influence the degree of impacts on sectors, such as if the sector is export-oriented or characterised as an essential sector. Thus, sectors are affected differently.

	Mild (%)	Severe (%)
Real GDP	-5.30	-10.14
Consumer index price	-0.44	-0.29
Total investment	-20.75	-30.60
Total labour demand	-3.20	-5.45
Unemployment rate unskilled	5.60	8.05
Unemployment rate semi-skilled	5.08	7.01
Unemployment rate skilled	3.01	5.54
Unemployment rate highly skilled	2.45	3.43

Note(s): In the year 2020, Saudi Arabia was ranked 20th with a GDP of US\$700,118m amongst the 206 economies evaluated (World Bank, 2021)

Table 3.
Impacts of negative COVID-19 on macro-economic variables (2020)

Findings show that the sectors that are negatively impacted will cut down their production. This leads to employees cut down and reduction their intermediate expenditure. This will lead to impacting other sectors of the economy negatively. Findings reveal that the indirect impacts have made sectors that were previously not acknowledged as being harshly impacted will find themselves severely affected by the outcome in other sectors. A good example is the food and beverages sector. This sector was not acknowledged as a heavily impacted sector (See [Table 1](#)). The production declined by 2.01 and 5.06% in the mild and severe scenarios, respectively. Findings reveal that a larger portion of this decline was triggered by the closure of eatery and motels. The export-related sectors are the worse hit and have been reflected in the drop of oil prices during the first and second waves of the pandemic. For example, the oil and gas sector experienced a drop to as low as US\$22.39 per barrel in March 2020 during the first peak of the pandemic wave ([Arezki and Nguyen, 2020](#)) and experienced a fall in global prices and a decrease in export request. The lockdown of many industrial outfits across the globe may have contributed. Findings differ from [Havrlant et al. \(2021\)](#) and it was found that though there was a radical decrease in world requests for oil because of the pandemic economic recession, Saudi Arabia's oil exports may have shown some toughness, thus, leading to a decrease in production. The consequences of a decrease in production on the households of the low-income earners are severe. This includes an increase in unemployment rates as mentioned above and less purchasing power amongst others. The Government intervention via policies to cushion the effect of the pandemic on the lives of the households of the low-income earners cannot be over-emphasised. This is because the main source of income for this category of people comes from either government transfers or salary earned for work done, whilst wealthy households rely on dividends, labour income and other sources such as inheritance.

Because of the household worsening situation, this paper evaluates the household income-distributional moves from the CGE model before receiving more granular detail utilising micro-simulation assessment. Findings show that each of the indices is decreasing from the top (Decile 9) to the bottom (Decile 1) using De Palma index. Details from the mild scenario show that the De Palma index declines by 0.10 points and the inter-decile index declines by 1.0 points. This result shows that the least skilled employees' situation deteriorates regarding welfare and feeding. Concerning total household income, Saudi Arabia's Government intervention lessens the shock for the vulnerable low-income earners. Second, the Government's sources of income are narrowed during the COVID-19 crisis. The shut down of factories and services may have contributed to the reduction in taxes that emanate from direct and indirect taxes.

3.3 Micro-economic findings

Because the CGE models rely on household incomes, it cannot satisfactorily evaluate the distributional effects of COVID-19. Thus, a micro-simulation model was adopted to evaluate the distributional effects of the COVID-19 simulations on the poor households' level for the mild and the severe scenarios in the KSA. The changes regarding the percentage of households' earnings and customer price indices from the macro-model are communicated onto the micro household's data obtained from the V2030. The Gini index was adopted to evaluate the resulting poverty of the low-income earners. The Vision 2030 (IOT) shows in principle KSA System of National Accounts and is based on yearly data ([Havrlant et al., 2021](#)). As presented in [Table 4](#), the annual adjustment shock of the pandemic and persuaded shutdown raises the number of poor-income earners especially in the second quota of 2020. The outcome is the increase in the severity of poverty. This validates what was discovered in the macro-findings. Referring to [Table 4](#), the key shock of -10% leads to an annual shock of -3.9% . Findings agree with [Havrlant et al. \(2021\)](#) and it was discovered that there is a connection amid the quarterly dynamics and yearly adjustment.

4. Policy implications for the paper

Evidence from the findings show that a multi-approach range of policy responses will be required in the short and long terms by all stakeholders. The KSA Government should be ready to sustain and improve the momentum of leadership in this direction. One of the outcomes will be the recovery of the KSA economy through a multi-tasks approach whilst mitigating the spread of the pandemic and increasing the vaccinations of citizens and non-citizens residents in KSA. One of the multi-tasks approaches is to explore and optimise the Sharia economy based on social such as the Zakat, Infaq, Sadaqah and Waqaf as suggested by [Arfah et al. \(2020\)](#) to Islamic countries to enhance development and sustainability. Regarding vaccination of Saudi Arabia's people, the KSA Government needs to sustain vaccination awareness. Records from [World in Data \(2021\)](#) revealed that Saudi Arabia has vaccinated 58.78 and 8.91% fully against COVID-19 and partly vaccinated, respectively as of 19th October 2021. This is impressive when compared to many other developed countries such as Canada (72.96%), USA (56.28%), Italy (70.15%) and Australia

Table 4.
Negative shock leading
to yearly adjustment

Date	Deviation from baseline (in %)	Level of final demand	Quarterly change (QoQ in %)	Annual shock (YoY in %)
Q1 2020	-0.5	99.5	-0.5	
Q2 2020	-10.0	90.0	-9.5	
Q3 2020	-5.0	95.0	5.6	
Q4 2020	0.0	100.0	5.3	-3.9

Table 5.
Criteria of wage
subsidy
programme (WSP)

Size of company	Not more than 75 employees (EE)	76–200 EE	201 EE and above
Subsidy amount	First 3 months: RM1,200/ EE/month Subsequent 3 months: RM600/EE/month	First 3 months: RM800/ EE/month Subsequent 3 months: RM600/EE/month	First 3 months: RM600/ EE/month Subsequent 3 months: RM600/EE/month
Number of eligible employees	Max 75 EE	Max 200 EE	Max 200 EE
Duration of subsidy	3 months + 3 months	3 months + 3 months	3 months + 3 months
<i>Eligibility conditions</i>			
Percentage of decline of revenue	Not applicable	50% or more decline in revenue or income by compared to January 2020 or the subsequent months	
Employed registration	1. Registered with or contributing to Socso or Employment Insurance System (EIS), before 1st April 2020 2. Registered with Companies Commission of Malaysia (SSM) or relevant local authorities (PBT) before 1 January 2020 3. Operational before 1 January 2020		
Employee's salary month	Employees earning RM4,000 and below		
Other conditions	Employer must retain employees under WSP, no pay cut, retrenchment or unpaid leave for a period of 6 months		
Effective date	01 April 2020		
How to apply	Apply through Prihatin.perkeso.gov.my from 9th April 2020		
Deadline	30th September 2020 or subject to fund availability and government decision		
Payment method	Payment of WPS will bank into employer's bank account within 7–14 days upon approval of applications		
Note(s):	US\$1/RM4.3		

(56.45%) that are fully vaccinated, respectively. The KSA economic policymakers need to persistently appraise the impact of the pandemic on the economy and revitalise its mechanisms initiatives for supporting the economy towards recovery and progressive production. This intends to mitigate poverty and becomes a good example for other nations.

As part of this paper's implications, stakeholders, especially the business owners, should create a planned alliance with their supply chains, customers and government through enhanced digital technology should maintain their operations and safeguarding a sustainable business in the face of the pandemic via feasible policy-driven approach. Also, the KSA's Government needs to extend support for salary subsidies to non-citizen employees to protect the poor of the poorest. Table 5 shows a summary of the criteria of wage subsidy programme implemented in Malaysia to assist the employees and employers irrespective of the nationality. The paper suggests that KSA should modify and consider this approach. Majority of the low-income earners doing the cleaning, security, labour jobs, etc. are non-citizens of the kingdom. Though this paper has some limitations, the present study makes contributions to the literature by evaluating the impact of the pandemic on the KSA economy using CGE model. Also, the use of SAM via two simulations is a contribution to the body of knowledge.

5. Conclusion

This research adopted a CGE model and supported it with a micro-simulation model in a top-down approach to examine the effect of the pandemic on the KSA economy. This was achieved by testing dual simulations (severe and mild). They were designed concerning the available literature and government regulations. Since the virus (COVID-19) is continuing at the time of reporting this manuscript, some of the scenarios could be revisited as new data emerge from KSA. Thus, making some assumptions was unavoidable because of the paucity of data on the ongoing pandemic. The accuracy of this paper's estimates should be subject to further national, regional and global developments as new data emerge. In the KSA context, some of the assumptions (pathways simulated) to the magnitude of the shockwave are masked by doubt and thus notified by "guesstimates" in this paper. The severe scenario presumes that the duration of the lockdown restrictions and guidelines, including the slowdown in global commercial trade, is beyond the mild scenario.

The effect of the pandemic on the KSA economy is quite severe as revealed in the macro-micro modelling approach adopted. The severe scenario leads to a GDP of -10.14 , whilst a mild case develops a decrease in GDP of -5.30% . Looking at the scenario, there were increased lower-trained employees, withstanding majority of the economic downturn, and unemployment increases sharply because of the shutdown of many economic activities. The KSA's Government intervention through financial stimulus packages distributed to sustain the economy assisted the poor of the poorest. The Government needs to do more to mitigate poverty. This is because poverty can enhance the spread of the pandemic. There are some social ills, such as poor access to public health and overcrowding amongst others associated with the environment of the poor. These packages could not mitigate the household poverty increases, though the richer-income earners tend to lose suspiciously more.

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