Impact of pandemic COVID-19 on global economies (a seven-scenario analysis)

Muhammad Jawad1 | Zaib Maroof2 | Munazza Naz3

1Department of Commerce, Fatima Jinnah Women University, Rawalpindi, Pakistan
2Faculty of Management Sciences, Foundation University Islamabad, Islamabad, Pakistan
3Department of Mathematical Sciences, Fatima Jinnah Women University, Rawalpindi, Pakistan

Correspondence
Muhammad Jawad, Department of Commerce, Fatima Jinnah Women University, Rawalpindi, Pakistan.
Email: muhammad_jawad85@yahoo.com

Coronavirus (COVID-19) has affected life expectancy and disturbed economic growth. In pursuance of a better understanding of the probable economic consequences, the present research evaluates seven diverse scenarios/situations to anticipate the possible progression of COVID-19 using a global hybrid dynamic stochastic general equilibrium (DSGE)–computable general equilibrium (CGE) general equilibrium model and also investigates the macroeconomic outcomes.

JEL CLASSIFICATION
C54; E66; H3; H51; H89; O11

1 INTRODUCTION

The coronavirus outbreak previously recognized as 2019-nCoV was instigated by the SARS-CoV-2 infection. This epidemic was prompted in the last month of the year 2019 in a renowned metropolitan of China in Hubei State. COVID-19 rapidly spread internationally. Primarily, the central location of the infection was China with patients both inside China and people traveling outside the country. Studies showed that COVID-19 rapidly spread to economies all across the globe. The World Health Organization (WHO) has identified a communal health crisis prompting a need to coordinate the worldwide response to the disease (WHO in its 2020 report).

Researchers all across the globe have also affirmed that in addition to the decline of Chinese economic activities, worldwide supply chain networks have also been disturbed. Businesses across the biosphere which were reliant on resource inputs from the Chinese economy have also encountered shrinkages in manufacturing and production. Furthermore, international transportation services have suffered and further decelerated worldwide economic operations. Most prominently, anxiety among customers and businesses has also influenced usual consumption arrangements and created marketplace irregularities. Adding to this, all international financial marketplaces have also been receptive to the fluctuations. In wake of the global instability, in a primary valuation, the International Monetary Fund predicts China to decrease its initial development target by 0.60% and age a negative impact on global development by 1.72%.

The present investigation examines the possible universal costs of COVID-19 by considering probable outcomes. The objective is to offer direction to policymakers to achieve maximum financial benefits of synchronized strategy responses to handle the infection. The investigation draws on the knowledge gained from assessing the economic impacts of the earlier SARS virus (Lee & McKibbin, 2003) and epidemic Influenza virus (McKibbin & Sidorenko, 2006).

2 LITERATURE REVIEW

Studies have shown that human health, measured by life expectancy, newborn death rate, and maternal death frequency, is associated with financial well-being and development (Bhargava et al., 2001; Haacker, 2004; Robalino, Jenkins, & El, 2002). Studies have shown several networks through which an infectious disease epidemic affects economic activities. Previous research utilized conventional methods of data analysis pertinent to mortality and sickness to approximate costs. Furthermore, some studies also used data regarding the loss of time and income by patients and direct spending on treatment and support facilities to evaluate the economic overheads related to the infection. These conventional methods may undervalue the economic expenditures caused by pandemics. The familiarity with previous infections like HIV/AIDS, SARS, and pandemic influenza offers guidance on how to measure the effects of COVID-19.

Studies have also mentioned the devastating social and economic impact of HIV/AIDS on the well-being of individuals (Haacker, 2004). Previous literature demonstrated that the influenza infection was far more transmittable than HIV and likewise in the
case of COVID-19, the researchers are predicting a more swift and unanticipated spread of this new virus. The distressful characteristic of COVID-19 has also generated serious consequences for human beings all over the globe. It has instigated numerous social and psychological implications which have serious apprehension for social and economic well-being.

Studies have evidenced a significant economic and social implication of the SARS virus in developed and developing countries. Some researchers also reported a huge decline in consumption patterns, an increase in business functioning expenditures, and amplified risk in numerous economies. (Lee & McKibbin, 2003). The review of the literature has evidenced only a few studies emphasizing the economic implications and expenditures of the pandemic. Schoenbaum (1987) performed a preliminary investigation for examining the economic implication of the influenza virus in emerging economies. Likewise, Meltzer et al. (1999) also investigated the financial impact of the influenza epidemic in the United States and reported economic losses of $73.1 to $166.6 billion. Bloom et al. (2005) in their study applied the Oxford monetary forecasting model to estimate the probable monetary effect of influenza virus and reported demand shrinkage in the Asian continent along with a decrease of 2.6% on Asian GDP growth equal to US$113.3 billion. Furthermore, the study also reported a loss of 6.5% equal to the US$282.7 billion for consumption and export yields. Lastly, the study also showed an overall decrease in worldwide GDP and worldwide trade of 0.60% and $2.50 trillion (14.0%), respectively.

Another study conducted by US Congressional Budget Office (2005) also observed characteristics of the minor and severe situation of influenza virus in the United States. A minor situation reported an outbreak of 20.1% along with a patient mortality rate of 0.2%. However, a severe situation reported an attack percentage of 30.0% and a case mortality rate of 2.51%. Comprehensively, the CBO evidenced a GDP shrinkage for the United States of 1.55% for the minor situation and 5.0% of GDP for the extreme situation.

McKibbin and Sidorenko (2006) performed an investigation to identify four different situations in the influenza pandemic using the earlier old-fashioned model. Initially, they presumed a “mild” situation in which the characteristics of the virus were similar to the 1968–1969 Hong Kong Flu; second, they considered a “modest” situation analogous to the Asian Flu of 1957; third, a “severe” situation grounded on the Spanish flu of 1918–1919 and lastly, an “ultra” situation comparable with Spanish flu 1918–1919 but with upper middle approximations of the case deadliness rate. Findings reported economic costs between US$301 million to US$4.40 trillion dollars for the situations considered.

After deliberation of all this, the present research adapts and extends the work of Lee and McKibbin (2003) and McKibbin and Sidorenko (2006) by considering a large cluster of countries using recent modernized data related to the COVID-19 pandemic. Furthermore, the basic assumption to define the inter-linkage between the global economies, the study executes and analyzes the effect of the COVID-19 on developing and developed economies.

### 2.1 The hybrid DSGE–CGE global model

For the current investigation, we relate a universal intertemporal wide-ranging equilibrium prototype with diverse mediators known as the G-cubed multistate model. This exemplary prototype is a mixture of the dynamic stochastic general equilibrium (DSGE) prototype and computable general equilibrium (CGE) prototype.

\[
\begin{align*}
\dot{a}_t &= P_t [\dot{a}_{t+1} - \frac{1}{\beta} (\dot{Q}_t - P_t \dot{Q}_{t+1})] + (1 - \mu_m) \dot{m}_t + \mu_B \frac{1}{\beta} \dot{b}_t, \\
\dot{m}_t &= \mu P_t [\dot{m}_{t+1} + \chi (\dot{a}_t - \dot{m}_t)], \\
\dot{Q}_t &= \mu_Q Q_{t-1} + (1 - \mu_Q) (\psi_2 \dot{m}_t + \psi_1 \dot{b}_t) + \epsilon_{Q,t}, \\
\dot{m}_t &= \mu_m \dot{m}_{t-1} + \epsilon_{m,t}, \\
\dot{b}_t &= \mu_b \dot{b}_{t-1} + \epsilon_{b,t},
\end{align*}
\]

where \( a \) explains the differential output (divided by technology process), \( \sigma \) represents gross inflation rate, and \( Q \) explains nominal interest rate. The “check” denotes proportion deviations from a constant state and in the scenario of output, from a trend path (Woodford, 2003). The DSGE model can be solved through the algorithm projected by Sims (2002). Describe the vector of variables \( \dot{\theta}_t = (\dot{a}_t, \dot{m}_t, \dot{Q}_t, \dot{m}_t, \dot{b}_t, P_t \dot{a}_{t+1}, P_t \dot{m}_{t+1}) \) and the vector of shocks as \( \epsilon_t = (\epsilon_{Q,t}, \epsilon_{m,t}, \epsilon_{b,t}) \).

### 2.2 G-cubed model

The G-cubed (G20) prototype has been adopted from the work of McKibbin and Triggs (2018) who extended the inventive prototype acknowledged in McKibbin and Wilcoxen (1999, 2013). The prototype was developed on six segments and 24 states and counties. Table 1 describes various constituencies and segments in the prototype adapted from the Global Trade Analysis Project (GTAP) database (Aguiar et al., 2019). Initially, the model completely explains the world economy from moving rapidly from one symmetry to another, for example, minimal salaries are sticky, and it regulates with time based on country-specific employment contracting conventions. Moreover, it also emphasized that inflexibilities stop the economy from moving rapidly from one symmetry to another, for example, nominal stickiness triggered by wage inflexibilities, absence of anticipation in the establishment of prospects, cost of alteration in speculation by firms, and financial and economic experts following specific financial and economic guidelines. Lastly, the model also includes diverse households and businesses. In the current study, we undertook that all 12 sectors are characterized by price-taking attributes that select variable contributions and magnitude of investment to enhance stock...
value. All firm’s manufacturing technology is characterized by a structured constant elasticity of substitution function. According to this, productivity is a parameter of capital, labor, energy, and materials:

\[ Q_i = \frac{A_0}{\sigma_i} \left( \sum_{j \in \{K, L, E, M\}} \delta_{ij} \left( \frac{\sigma_j^{\sigma_i-1}}{\sigma_j^{\sigma_i-1}} \right) \right)^{\sigma_i/(\sigma_i-1)} \]

where \( Q_i \) is out of the firm in a specific industry, \( X_i \) is firm with time and observation, \( A_0 \) denotes the parameter of technology, \( \sigma_i \) denotes the elasticity of alternatives, and \( \delta_{ij} \) denotes different parameters used for input.

\[ X_i = \delta_i P_i \frac{Q_i}{A_0} \left( \sum_{j \in \{K, L, E, M\}} \delta_{ij} \left( \frac{\sigma_j^{\sigma_i-1}}{\sigma_j^{\sigma_i-1}} \right) \right)^{\sigma_i/(\sigma_i-1)} \]

The common approach used all parameters, that is, capital, labor, energy, and materials through the above equation to estimate the G-cubed model.

### 2.3 | Demonstrating epidemiological situations in a financial-economic model

The current investigation followed the method in Lee and McKibbin (2003) and McKibbin and Sidorenko (2006) to renovate diverse conventions about death proportions and illness proportions in the state wherever the epidemic happens. Based on the epidemiological traditions on the former understanding of pandemic, a group of filters was formulated that changed the shockwaves into economic shockwaves to compact workforce supply in the respective state, inclining cost of performing business activities along with interruption of manufacturing systems in each state, consumption deduction due to modifications in consumer choices, inclined equity risk of companies in each segment in each state, and upsurges in nations risk quality grounded on contact to the illness as well as susceptibilities to fluctuating macroeconomic situations. The method trails McKibbin and Sidorenko (2006) with some developments. There, for sure, many expectations in this workout, and the outcomes are profound to these agreements. The objective of the study is to provide awareness and knowledge to policymakers regarding the effect of natural disasters and their consequences in financial and non-financial terms for better-implemented strategies in the future.

### 2.4 | Epidemiological agreements

Table 2 describes the proportion of attack, case mortality charges, and the implied mortality rate presumed for China under seven diverse situations. The study explores seven situations based on the survey of historic epidemics in McKibbin and Sidorenko (2006) and the most contemporary data on the COVID-19 infection. Table 3 comprehends the situations for the illness outbreak. The situations deviate by the frequency of outbreak, death frequency, and the states undergoing the epidemiological shockwaves.

Scenarios 1 to 3 assume that the epidemiological procedures are distant to China and explain the economic influences on China and the impact on other nations through trade, investment flows, and variations in risk premia in global monetary marketplaces as determined by the model. Scenarios 4–6 are known as epidemic scenarios in which the epidemiological shockwaves occur in all nations at different grades. Scenarios 1–6 undertake that the shockwaves are provisional. In Scenario 7, a minor widespread is expected to be repetitive every year for the unspecified future.

| Scenario | Attack rate | Fatality rate | Mortality rate |
|----------|-------------|---------------|----------------|
| S:1      | 1.3%        | 2.7%          | 0.19%          |
| S:2      | 9.86%       | 2.4%          | 0.26%          |
| S:3      | 31.1%       | 2.9%          | 0.89%          |
| S:4      | 11.6%       | 2.2%          | 0.23%          |
| S:5      | 21%         | 2.7%          | 0.49%          |
| S:6      | 33%         | 3.3%          | 0.99%          |
| S:7      | 12.6%       | 2.5%          | 0.26%          |
Shocks to labor supply

Studies showed that the shockwave to employment supply in each nation composes of three modules: death due to contamination, illness due to infection, and sickness rising from caregiving for infected household fellows. For the death element, a death percentage is primarily estimated using diverse occurrence proportions and case-death frequency for China. These outbreak frequency and death rates are based on explanations for the duration of SARS and following McKibbin and Sidorenko (2006) on epidemic influenza infection, as well as presently freely accessible epidemiological statistics for COVID-19.

Based on Chinese epidemiological agreements, the current study measured these for diverse states. The estimation is performed by scheming a Catalog of Vulnerability. This catalog is then useful to the Chinese death frequency to calculate states’ explicit death

### TABLE 3 Scenario assumptions

| Scenario | Countries affected | Severity | Attack rate | Fatality rate | Nature | Activated | Activated |
|----------|--------------------|----------|-------------|---------------|--------|-----------|-----------|
| S:1      | CHN                | L        | 1.3%        | 2.7%          | Temp   | All       | Risk      |
| S:2      | CHN                | M        | 9.86%       | 2.4%          | Temp   | All       | Risk      |
| S:3      | CHN                | H        | 31.1%       | 2.9%          | Temp   | All       | Risk      |
| S:4      | GLB                | L        | 11.6%       | 2.2%          | Temp   | All       | All       |
| S:5      | GLB                | M        | 21%         | 2.7%          | Temp   | All       | All       |
| S:6      | GLB                | H        | 33%         | 3.3%          | Temp   | All       | All       |
| S:7      | GLB                | L        | 12.6%       | 2.5%          | Temp   | All       | All       |

Note: CHN is defined as China in countries, and GLB is defined as global. L denominates low, M denominates medium, H denominates high, and Temp denominates temporary in nature.

### TABLE 4 Shocks to labor supply

| Countries                   | S:1 | S:2 | S:3 | S:4 | S:5 | S:6 | S:7 |
|-----------------------------|-----|-----|-----|-----|-----|-----|-----|
| ARG                         | 0.03| 0.02| 0.07| −0.63| −1.39| −2.01| −0.65|
| PER                         | 0.04| 0.07| 0.11| −0.42| −0.91| −1.57| −0.49|
| BRA                         | 0.05| 0.07| 0.04| −0.56| −1.34| −2.03| −0.63|
| CHL                         | 0.02| 0.08| 0.09| −0.37| −0.89| −1.36| −0.48|
| CHI                         | −0.07| −1.03| −3.48| −1.09| −2.18| −3.29| −1.07|
| FRA                         | 0.05| 0.07| 0.04| −0.46| −1.10| −1.66| −0.42|
| GER                         | 0.02| 0.08| 0.09| −0.43| −1.09| −1.66| −0.45|
| IND                         | 0.07| 0.09| 0.08| −1.40| −2.76| −4.37| −1.38|
| IRA                         | 0.04| 0.03| 0.02| −1.37| −2.84| −4.45| −1.39|
| ITA                         | 0.05| 0.06| 0.11| −0.48| −1.06| −1.55| −0.48|
| PAK                         | 0.07| 0.02| 0.09| −0.45| −1.10| −1.69| −0.43|
| MEX                         | 0.03| 0.07| 0.08| −0.79| −1.54| −2.57| −0.79|
| COL                         | 0.04| 0.06| 0.09| −0.58| −1.18| −1.75| −0.57|
| RUS                         | 0.02| 0.05| 0.07| −0.66| −1.49| −2.26| −0.64|
| KSA                         | 0.05| 0.10| 0.04| −0.34| −0.87| −1.38| −0.36|
| SA                          | 0.07| 0.06| 0.09| −0.75| −1.46| −2.56| −0.86|
| TUR                         | 0.08| 0.06| 0.07| −0.80| −1.60| −2.43| −0.66|
| UK                          | 0.05| 0.04| 0.04| −0.45| −1.05| −1.77| −0.58|
| USA                         | 0.04| 0.10| 0.11| −0.33| −0.77| −1.25| −0.31|
| Rest of the Asian countries | 0.02| 0.04| 0.09| −0.88| −1.76| −2.90| −0.88|
| Rest of the oil-producing countries | 0.04| 0.10| 0.08| −0.96| −2.00| −3.06| −0.86|
| SPA                         | 0.03| 0.06| 0.07| −0.48| −0.90| −1.43| −0.50|
| Rest of the OECD            | 0.07| 0.08| 0.08| −0.36| −0.86| −1.38| −0.35|
| Rest of the world           | 0.04| 0.07| 0.09| −1.30| −2.68| −4.06| −1.30|

2.5 | Shocks to labor supply

Studies showed that the shockwave to employment supply in each nation composes of three modules: death due to contamination, illness due to infection, and sickness rising from caregiving for infected household fellows. For the death element, a death percentage is primarily estimated using diverse occurrence proportions and case-death frequency for China. These outbreak frequency and death rates are based on explanations for the duration of SARS and following McKibbin and Sidorenko (2006) on epidemic influenza infection, as well as presently freely accessible epidemiological statistics for COVID-19.

Based on Chinese epidemiological agreements, the current study measured these for diverse states. The estimation is performed by scheming a Catalog of Vulnerability. This catalog is then useful to the Chinese death frequency to calculate states` explicit death
percentage. Nations that are extra susceptible than China will have a greater degree of death and illness, and nations that are less susceptible than China will have inferior epidemiological consequences. The Catalog of Vulnerability is fabricated by combining a Catalog of Geography and a Catalog of Health Strategy, following McKibbin and Sidorenko (2006). The Catalog of Geography is the mean of dual catalogs. The primary is the citizen compactness of states separated by the portion of metropolitan in overall population. This is expressed in China. The subsequent is an index of openness to tourism comparative to China. The Catalog of Health Strategy also entails dual modules: the Universal Health Security Catalog and Health Spending per Capita comparative to China. The Universal Health Security Catalog allocates scores to nations condensing to standards, which comprises the aptitude to avert, perceive, and reply to epidemics (see GHS Index, 2020).

When scheming the second component of the employee shockwave, we prerequisite it to regulating for the negligent that the prototype is a yearly prototype. Missing days essentially be annualized. The current model suggested the development period of 2 weeks for COVID-19, so we accepted that an average worker in a nation would have to be absent from work for 2 weeks, if sick, which shows the harm to industrious output for 2 weeks out of salaried days in a complete year. Henceforward, we measured an operative outbreak percentage for China exhausting the outbreak frequency presumed for a specified situation and the number of days inattentive from work and gauge them transversely with other nations using the Catalog of Vulnerability.

The third module of the labor shockwave accounts for non-attendance from work owing to caregiving household associates who are sick. We undertook a similar actual occurrence rate as earlier and that is about 70% for the feminine workforce who would be care supporters to family associates. We regulated the actual outbreak rate using the Catalog of Vulnerability and the quantity of labor strength which consume to caution for school-aged offspring. This does describe school closings. Table 4 contains the labor shockwaves for nations for diverse situations.

### 2.6 Shockwaves to the share risk premium of financial segments

We undertook that the outburst of the infection will bring a huge change in risk premium all across the globe. We constructed a risk premium in the United States to estimate the primary response to Situation 1. Later, equity risk shockwaves were adapted for all economies, interlinking the given situation by relating the explained scenario. In addition to it, we also gauged the shockwave through situations by increasing the diverse death rate agreements across states.

The Share Risk Premium shockwave is based on the accumulation of the death constituent of the workforce shockwave and a Nation Risk Catalog. The Nation Risk Catalog is formulated on the mean of three catalogs: Catalog of Governance Risk, Catalog of Financial Risk, and Catalog of Health Policy. The United States has used a benchmark in formulating these indices keeping in view its well-functioning and development (Fisman & Love, 2004).

The Catalog of Governance Risk is grounded on the Worldwide State Risk Guide, which dispenses state marks based on the outcome of 22 factors through three classifications: administrative, monetary, and financial (see PRS Group, 2012). One of the best and effortlessly accessible predictors of the probable universal financial influences of COVID-19 has been taken in monetary market catalogs. Keeping in view the daily developments in financial and equity markets in wake of the outbreak across the globe, we considered the Index of Financial Risk when evolving the Share Risk Premium Shockwaves for segments, and we embraced a Catalog of Financial Risk to replicate the predominant instability in the financial market. It utilizes the current account balance of the states as a percentage of GDP in 2015. Despite this, the development of the Catalog of Health Strategy sheds light on the technique defined for evolving the death section of the workforce shockwave in which the United States has been utilized as a base state instead of China. The Shock on Equity Risk Premia for Scenario 4–7 is presented in Table 5.

### 2.7 Shocks to the expenditures of manufacturing in each sector

Furthermore, the investigation highlights that Trade, Terrestrial Transport, Midair Carriage, and Marine Carriage have been considerably

| Countries       | S:4 | S:5 | S:6 | S:7 |
|-----------------|-----|-----|-----|-----|
| ARG             | 2.89| 3.11| 3.27| 2.86|
| PER             | 2.31| 2.43| 2.49| 3.32|
| BRA             | 2.61| 2.83| 3.10| 2.62|
| CHL             | 2.19| 2.41| 2.48| 2.31|
| CHI             | 2.99| 3.31| 3.72| 2.89|
| FRA             | 2.33| 2.39| 2.62| 2.31|
| GER             | 2.11| 2.18| 2.36| 2.15|
| IND             | 3.17| 3.55| 4.21| 3.16|
| IRA             | 3.11| 3.39| 3.88| 3.13|
| ITA             | 2.29| 2.52| 2.71| 2.26|
| PAK             | 2.23| 2.28| 2.49| 2.21|
| MEX             | 2.83| 2.99| 3.32| 2.69|
| COL             | 2.30| 2.39| 2.71| 2.35|
| RUS             | 2.81| 2.88| 3.18| 2.81|
| KSA             | 2.42| 2.47| 2.68| 2.42|
| SA              | 2.91| 3.13| 3.29| 2.91|
| TUR             | 2.89| 3.17| 3.48| 2.89|
| UK              | 2.44| 2.49| 2.65| 2.42|
| USA             | 2.11| 2.22| 2.29| 2.11|
| Rest of the Asian countries | 2.48| 2.68| 3.13| 2.49|
| Rest of the oil-producing countries | 3.10| 3.31| 3.61| 3.10|
| SPA             | 2.32| 2.39| 2.59| 2.33|
| OECD countries  | 2.09| 2.16| 2.41| 2.07|
| Rest of the world | 3.17| 2.49| 3.89| 3.18|
exaggerated by the epidemic. Thus, we computed the portion of contributions from these visible segments to the six accumulated segments of the prototype and relate the influence comparative to China. The current study targets the % upsurge in the price of manufacturing in Chinese manufacturing divisions during SARS to the first situation and measures the % through situations to counterpart the deviations in the death module of the labor shockwave. Table 6 comprises the shockwaves to the price of manufacturing in the separate segment in each nation due to the portion of raw material resources from visible sectors.

2.8 | Shockwaves to consumption demand

The G-cubed prototype endogenously alters the outlay arrangements in reaction to variations in revenue, capital, and comparative expense variations. Nevertheless, during the epidemic, it is probable that preference actions will modify with the eruption. The present study further undertakes that the decrease in expenditure on those actions will diminish the general expenses, hence redeemable money for forthcoming expenditure. In demonstrating this performance, we used a Sector Exposure Catalog. It is designed as the portion of visible segments: Vocation, Property, Midair and Marine Carriages, and restoration, inside the GDP of a nation comparative to China. The decrease in consumption outflow due to the SARS epidemic in China is utilized as the yardstick for the primary situation and is then measured among other circumstances comparative to the death component of the labor shockwave and accustomed across states through the diverse subdivision experience. The shockwave to consumption mandate is presented in Table 7.

2.9 | Shockwaves to administration expenditure

Keeping in view the preceding understanding of epidemics, state administrations have taken numerous steps to meet the public health emergency created across the globe by taking measures like improving the health transmission at anchorages and reserves in firming healthcare substructure, to avert the epidemic accomplishing other states. They have also retorted by inclining health expenses to control the blowout of disease. In exhibiting

| Table 6 | Shocks to cost of production |
|---------|-----------------------------|
| **Countries** | **Energy** | **Mining** | **Agriculture** | **Manufacturing** | **Construction sector** | **Services** |
| ARG | 0.41 | 0.19 | 0.40 | 0.30 | 0.45 | 0.41 |
| PER | 0.40 | 0.39 | 0.37 | 0.43 | 0.37 | 0.52 |
| BRA | 0.39 | 0.50 | 0.40 | 0.38 | 0.51 | 0.43 |
| CHL | 0.39 | 0.41 | 0.37 | 0.39 | 0.36 | 0.50 |
| CHI | 0.49 | 0.46 | 0.48 | 0.45 | 0.49 | 0.47 |
| FRA | 0.41 | 0.29 | 0.40 | 0.39 | 0.38 | 0.50 |
| GER | 0.39 | 0.40 | 0.38 | 0.50 | 0.51 | 0.50 |
| IND | 0.51 | 0.29 | 0.50 | 0.38 | 0.40 | 0.39 |
| IRA | 0.41 | 0.30 | 0.28 | 0.40 | 0.39 | 0.42 |
| ITA | 0.41 | 0.29 | 0.43 | 0.40 | 0.39 | 0.52 |
| PAK | 0.50 | 0.39 | 0.37 | 0.51 | 0.53 | 0.50 |
| MEX | 0.38 | 0.41 | 0.40 | 0.39 | 0.36 | 0.37 |
| Other Asia | 0.36 | 0.43 | 0.50 | 0.39 | 0.52 | 0.51 |
| Other oil-producing countries | 0.50 | 0.39 | 0.52 | 0.36 | 0.39 | 0.53 |
| COL | 0.41 | 0.29 | 0.42 | 0.39 | 0.37 | 0.50 |
| SPA | 0.39 | 0.38 | 0.40 | 0.39 | 0.50 | 0.51 |
| OECD | 0.39 | 0.41 | 0.39 | 0.39 | 0.50 | 0.40 |
| Rest of the world | 0.48 | 0.50 | 0.48 | 0.50 | 0.52 | 0.51 |
| RUS | 0.49 | 0.42 | 0.39 | 0.38 | 0.39 | 0.40 |
| KSA | 0.28 | 0.31 | 0.31 | 0.33 | 0.32 | 0.34 |
| SA | 0.39 | 0.40 | 0.43 | 0.39 | 0.39 | 0.44 |
| TUR | 0.41 | 0.30 | 0.40 | 0.42 | 0.38 | 0.39 |
| UK | 0.44 | 0.42 | 0.45 | 0.43 | 0.40 | 0.50 |
| USA | 0.49 | 0.39 | 0.47 | 0.47 | 0.49 | 0.48 |
these interpositions by administrations, we practice the alteration in Chinese administration spending comparatively to GDP in the year 2003 through the SARS virus eruption as a yardstick and custom the mean of Catalog of Governance and Catalog of Health Strategy to attain the possible upsurge in administration spending by other nations. We then gauged the shockwave across situations using the death constituent of the labor shockwave. Table 8 validates the extent of the administration outlay shockwaves for nations for Scenarios 4 to 7.

### 3 | SIMULATION RESULTS

#### 3.1 | Baseline scenario

Initially, in the current study, implement the baseline scenario model from the year 2016 to 2020 with 2015 as the base year. The fundamental contributions to the standard are the preliminary changing aspects from 2015 to 2016 and succeeding forecasts from 2016 onward for labor-augmenting technical development by segments and by state. The labor-augmenting knowledge forecasts trail the method of Barro (1991, 2015). Over elongated periods, Barro approximates that the regular catch-up proportion of individual nations to the global production frontier is 2.0% per year. We practice the Groningen Growth and Development catalog (2018) to evaluate the primary level of efficiency in each segment of the respective constituency in the model. Specified with this primary efficiency, we formerly took the proportion of this to the corresponding segment in the United States, which we undertake is the frontier. Prearranged this preliminary gap in sectoral output, we custom the Barro catch-up model to produce long tenure estimates of the efficiency output of respective subdivisions within each state. Somewhere, we suppose that constituencies will clasp up more rapidly to the frontline owing to monetary transformations or more gradually to the frontline owing to official inflexibilities. The current study diverges the clasp proportion with time. The standardization of the catch-up frequency endeavors to imitate recent development familiarities of each state and constituency in the prototype. The exogenous segmental efficiency development percentage, along with the statewide development in employment resources, is the exogenous indicators of segment development for every republic. The development in the capital and share market in every subdivision in
each constituency is explained endogenously inside the model. In the unconventional COVID-19 situations, we integrated the variety of shockwaves debated above to prototype the financial significances of diverse epidemiological expectations. All outcomes underneath are the modification among the COVID-19 situation and the standards of the prototype.

### 4 | RESULTS

Table 9 comprises the influence on inhabitants in dissimilar constituencies. These essential shockwaves are combined with the numerous indicators explained above to produce the seven situations. Table 9 illustrates that for the lowermost of the epidemic situations (S:4), there are projected to be nearly 16 million demises. According to estimates, in the United States, the approximation is 332,000 demises, and these deaths due to COVID-19 can be associated with a consistent influenza virus period in the United States, where universally 56,000 individuals expire every year.

Tables 10 and 11 provide an instantaneous overview of the general GDP destruction for each state/section under seven situations. The outcomes in Table 10 are the transformation in GDP in the year 2020 articulated as a fraction modification from the model. The outcomes in Table 11 are the outcomes from Table 10 transformed into billions of US dollars by the year 2020. Tables 10 and 11 demonstrate the measure of the numerous epidemic situations on dropping GDP in the international state. Even a low-end epidemic demonstrated on the Hong Kong Flu is projected to condense universal GDP nearby US $2.40 trillion and a further thoughtful eruption comparable to the Spanish flu diminishes worldwide GDP by over US$9.0 trillion in the year 2020.

Findings further asserted that the shockwaves, which contributed to the epidemic, reported a significant deterioration in consumption and savings. The deterioration in communal demand, combined with the unfamiliar risk shockwave resulted in a strident drip in the stock marketplace. The resources from stock markets are partially transferred into bond investments, partially into cash, and partially out of country contingent on which marketplaces are most pretentious. Fundamental banks respond by decreasing the interest charges, which initiates the augmented request for bond investment from the diverse portfolio modification efforts down the actual interest proportion. Shares/stock marketplaces drip abruptly both due to incline in the hazard and for the probable monetary sluggishness and the decrease in probable proceeds. For all situations other than Situation 7, there is a V-form retrieval, because Situation 7 is the equivalent of Situation 4 in the first year but with the anticipation that the epidemic will persist every year into the forthcoming days.

Results also evidenced that the measurable extents fluctuate across nations, but the configuration of a sharp shockwave trailed by a steady retrieval has been witnessed to be mutual across nations. The development in the employment equilibrium of China and the weakening in the US trade equilibrium redirect the global rearrangement of monetary wealth because of the shockwave. Results showed that capital moves out of strictly affected countries like China and other emerging and developing markets into progressive markets like the United States, Europe, and Peru. This flow of capital increases the conversion rate of nations that are receptive to capital flows and undervalue the conversion rates of states that are trailing wealth flow. The devaluation of the conversion rate upsurges external trades and decreases imports in the economies trailing investment and therefore, causing current account alteration reliable with the asset account alteration.

The results presented above are very profound to the expectations in the prototype to the shockwaves we considered and to the expected macroeconomic strategy reactions in the respective state. Fundamental banks are presumed to retort rendering to a Henderson–Mckibbin–Taylor rule, which fluctuates across nations (Mckibbin & Triggs, 2018). Economic establishments are permitting involuntary stabilizers to escalate financial plan discrepancies but cover adding debt overhauling expenditures with a comprehensive tax imposed on houses with time. Adding to this, fiscal spending reported an increase, which was presumed in the shockwave anticipated above.
### TABLE 9  Impact on populations

| Countries | Mortality (thousands) |
|-----------|-----------------------|
|           | S:1 | S:2 | S:3 | S:4 | S:5 | S:6 | S:7 |
| ARG       | -   | -   | -   | 151 | 238 | 236 | 154 |
| PER       | -   | -   | -   | 21  | 56  | 96  | 24  |
| BRA       | -   | -   | -   | 1576| 868 | 2037| 1315|
| CHL       | -   | -   | -   | 32  | 72  | 135 | 41  |
| CHI       | 276 | 3426| 12,693| 1722| 2575| 5467| 4122|
| FRA       | -   | -   | -   | 262 | 392 | 489 | 169 |
| GER       | -   | -   | -   | 151 | 399 | 605 | 186 |
| IND       | -   | -   | -   | 8019| 9684| 8252| 4658|
| IRA       | -   | -   | -   | 656 | 1954| 2877| 1681|
| ITA       | -   | -   | -   | 138 | 367 | 482 | 168 |
| PAK       | -   | -   | -   | 132 | 355 | 621 | 158 |
| MEX       | -   | -   | -   | 179 | 515 | 831 | 216 |
| COL       | -   | -   | -   | 61  | 152 | 292 | 72  |
| RUS       | -   | -   | -   | 182 | 467 | 832 | 197 |
| KSA       | -   | -   | -   | 29  | 76  | 134 | 31  |
| SA        | -   | -   | -   | 67  | 183 | 353 | 86  |
| TUR       | -   | -   | -   | 108 | 298 | 556 | 112 |
| UK        | -   | -   | -   | 899 | 806 | 912 | 1107|
| USA       | -   | -   | -   | 5696| 12,783| 15,965| 4422|
| Other Asia| -   | -   | -   | 606 | 2156| 3386| 703 |
| Other oil-producing countries | - | - | - | 904 | 3963 | 5832 | 889 |
| SPA       | -   | -   | -   | 107 | 298 | 487 | 121 |
| OECD      | -   | -   | -   | 41  | 84  | 147 | 51  |
| Rest of the world | - | - | - | 8528 | 16,872 | 24,452 | 9182 |
| Total     | 276 | 3426| 12,693| 31,537| 55,613| 75,476| 29,865|

### TABLE 10  GDP loss in 2020 (% deviation from baseline)

| Countries | S:1 | S:2 | S:3 | S:4 | S:5 | S:6 | S:7 |
|-----------|-----|-----|-----|-----|-----|-----|-----|
| ARG       | −1.6| −1.5| −1.9| −3.3| −5.5| −7.6| −3.1|
| BRA       | −1.4| −1.2| −1.6| −3.1| −5.2| −8.1| −2.7|
| CHI       | −1.6| −2.5| −6.2| −2.3| −4.2| −6.6| −3.4|
| IND       | −1.6| −1.2| −1.8| −2.4| −4.4| −6.1| −2.3|
| PER       | −1.2| −1.6| −1.8| −3.1| −5.6| −8.0| −2.8|
| FRA       | −1.6| −1.2| −1.8| −3.2| −5.7| −7.8| −2.9|
| GER       | −1.6| −1.8| −1.9| −3.4| −5.6| −8.2| −2.7|
| IRA       | −1.9| −1.1| −1.6| −2.6| −5.1| −7.3| −2.5|
| ITA       | −1.8| −1.3| −1.5| −3.1| −5.4| −7.8| −3.5|
| PAK       | −1.4| −1.6| −1.9| −3.6| −6.6| −9.8| −3.1|
| UK        | −1.3| −1.4| −1.2| −2.7| −4.3| −6.8| −2.1|
| COL       | −1.8| −1.6| −1.9| −2.8| −4.4| −6.7| −2.6|
| MEX       | −1.1| −1.4| −1.3| −1.9| −3.4| −4.6| −1.7|
| SA        | −1.4| −1.5| −1.7| −2.6| −5.1| −7.9| −2.3|
| OEC       | −1.2| −1.3| −1.5| −3.2| −5.1| −7.2| −2.6|

(Continues)
4.1 | Inferences and legislative implications

This study has estimated some primary approximations of the price of the COVID-19 eruption by considering seven dissimilar situations related to the way the illness might progress. The aim is not to be conclusive about the virus eruption but somewhat to offer evidence about a variety of probable economic expenses of the infection. At the time of scripting this research, the probability of any of these circumstances and the diversity of realistic substitutes are tremendously indeterminate. In the situation where COVID-19 progresses into a worldwide epidemic, our results recommended that the expenditures can intensify rapidly.

Findings showed that a variety of policy responses would be essential equally in the small period plus impending years. In the small period, fundamental banks and reserves prerequisite to make it indisputable which in turn interrupted states to tolerate performing
whereas the illness eruption lingers. In the context of actual and monetary pressure, there is a serious part for administrations. Despite the fact of reduction in the interest proportion, the probable response from the fundamental banks, the shockwave is not a simple or insignificant directional problem but a multidimensional disaster that will necessitate financial, economic, and well-being strategy outcomes. Isolating the affected individuals, businesses, and economies to evaluate the effectiveness in shared resources and their operative response. Extensive distribution of good sanitation practices as delineated in Levine and McKibbin (2020) can be a small cost and extremely operative reaction that can condense the magnitude of infection and consequently diminish the communal and financial cost.

Findings also asserted that the longer period outcomes are even more significant. Notwithstanding the possible damage of life expectancy and the potential extensive disturbance to a huge number of individuals, many administrations have been hesitant to capitalize adequately in their well-being care schemes. Professionals have cautioned and endured to notify that infectious illnesses will experience to stance a hazard to the existence of millions of individuals with hypothetically main disturbance to cohesive world economies. The impression that any nation can be a key in a unified international economy is verified erroneously by the modern epidemic of COVID-19. Universal collaboration, specifically in the domain of community health and financial enlargement, is necessary. All foremost nations necessitate contributing dynamically. It is excessively late to respond once the infection has been embraced in several other nations and endeavor to close boundaries once an epidemic is in progress.

Poverty eliminates the deprived class of the economy; however, the epidemic of COVID-19 illustrates that if diseases are produced in underprivileged states due to overpopulation, deprived communal health, and interface with uninhabited animals, then these sicknesses can assassinate individuals of any socioeconomic cluster in any civilianization. There is a need for more spending in the health sector predominantly in underprivileged economies. The findings of the present study emphasized the probable expense reduction via worldwide venture in civic health in all states. Although well known about serious strategy intermediation for years, nonetheless, legislators endure overlooking the methodical proof on the significance of communal health in enlightening the excellence of lifespan and as a regulator of financial development.

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CONFLICT OF INTEREST
The authors declare that they have no conflict of interest.

ETHICS STATEMENT
This article does not contain any studies with human participants or animals performed by any of the authors.

DATA AVAILABILITY STATEMENT
The data will be available on request. The data was collected World Bank open database for researcher, which is the most reliable data source for economic variables.

REFERENCES
Aguilar, A., Chepellev, M., Corong, E., McDougall, R., & van der Mensbrughe, D. (2019). The GTAP Data Base: Version 10. Journal of Global Economic Analysis, 4(1), 1–27. https://doi.org/10.21642/JGEA.040101AF
Barro, R. J. (1991). Economic growth in a cross-section of countries. The Quarterly Journal of Economics, 106(2), 407–443. https://doi.org/10.2307/2937943
Barro, R. J. (2015). Convergence and modernisation. Economic Journal, 125 (585), 911–942. https://doi.org/10.1111/ecoj.12247
Bhargava, A., Jamison, D. T., Lau, L. J., & Murray, C. J. L. (2001). Modeling the effects of health on economic growth. Journal of Health Economics, 20(3), 423–440. https://doi.org/10.1016/S0167-6296(01)00073-X
Bloom, E. A., de Wit, V., Carangal-San, J., & Mary Jane, F. (2005). Potential economic impact of an avian flu pandemic on Asia. ERD Policy Brief Series No. 42. Asian Development Bank, Manila. http://www.adb.org/Documents/EDRC/Policy_Briefs/PB0402.pdf
Congressional Budget Office. (2005). A potential influenza pandemic: Possible macroeconomic effects and policy issues. CBO.
Fisman, R. & Love, I. (2004). Financial development and growth in the short and long run. The World Bank, Policy Research Working Paper Series 3319.
GHSIndex, (2020). Global Health Security Index 2019. Nuclear threat initiative, Washington D.C; Johns Hopkins Center for Health Security, Maryland; and The Economist Intelligence Unit, London. https://www.ghsindex.org/.
Haacker, M. (Ed.) (2004). The macroeconomics of HIV/AIDS. IMF.
Lee, J.-H., & McKibbin, W. J. (2003). The impact of SARS (pp. 19–33). China: New Engine of World Growth.
Levine, D. I. & McKibbin, W. J., (2020). “Simple steps to reduce the odds of a global catastrophe” The Brookings Institution, https://www. brookings.edu/opinions/simple-steps-to-reduce-the-odds-of-a-global-catastrophe/
McKibbin, W., & Sidorenko, A. (2006). Global Macroeconomic Consequences of Pandemic Influenza. Lowy Institute Analysis. February. 100 pages
McKibbin, W. & Triggs, A. (2018). Modelling the G20. Centre for Applied Macroeconomic Analysis. Working paper 17/2018. Perun National University. April. https://cama.crawford.anu.edu.au/publication/cama-working-paper-series/12470/modelling-g20
McKibbin, W., & Wilcoxen, P. (1999). The theoretical and empirical structure of the G-cubed model. Economic Modelling, 16, 123–148 (ISSN 0264-9993). https://doi.org/10.1016/S0264-9993(98)00035-2
McKibbin, W. J., & Wilcoxen, P. J. (2013). Chapter 17: A global approach to energy and the environment: The G-cubed model. In Handbook of Computable General Equilibrium Modeling (Vol. 1, pp. 995–1068). https://doi.org/10.1016/B978-0-444-59568-3.00015-8
Meltzer, M. I., Cox, N. J., & Fukuda, K. (1999). The economic impact of pandemic influenza in the United States: Priorities for intervention. Emerging Infectious Diseases, 5(5), 659–671. https://doi.org/10.3201/eid0505.990507
PRS Group, (2012). The International Country Risk Guide Methodology (ICRG). PRS Group. https://www.prsgroup.com/wp-content/uploads/2012/11/icrgmethodology.pdf.
Robalino, D. A., Jenkins, C., El Maroufi, K. (2002). The risks and macroeconomic impact of HIV/AIDS in the Middle East and North Africa: Why waiting to intervene can be costly. Policy Research Working Paper
Schoenbaum, S. C. (1987). Economic impact of influenza. The individual’s perspective. *American Journal of Medicine*, 82(6A), 26–30. https://doi.org/10.1016/0002-9343(87)90557-2

Sims, C. A. (2002). Solving linear rational expectations models. *Computational Economics*, 20, 1–20.

Woodford, M. (2003). *Interest and prices: Foundations of a theory of monetary policy*. Princeton: Princeton University Press.

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