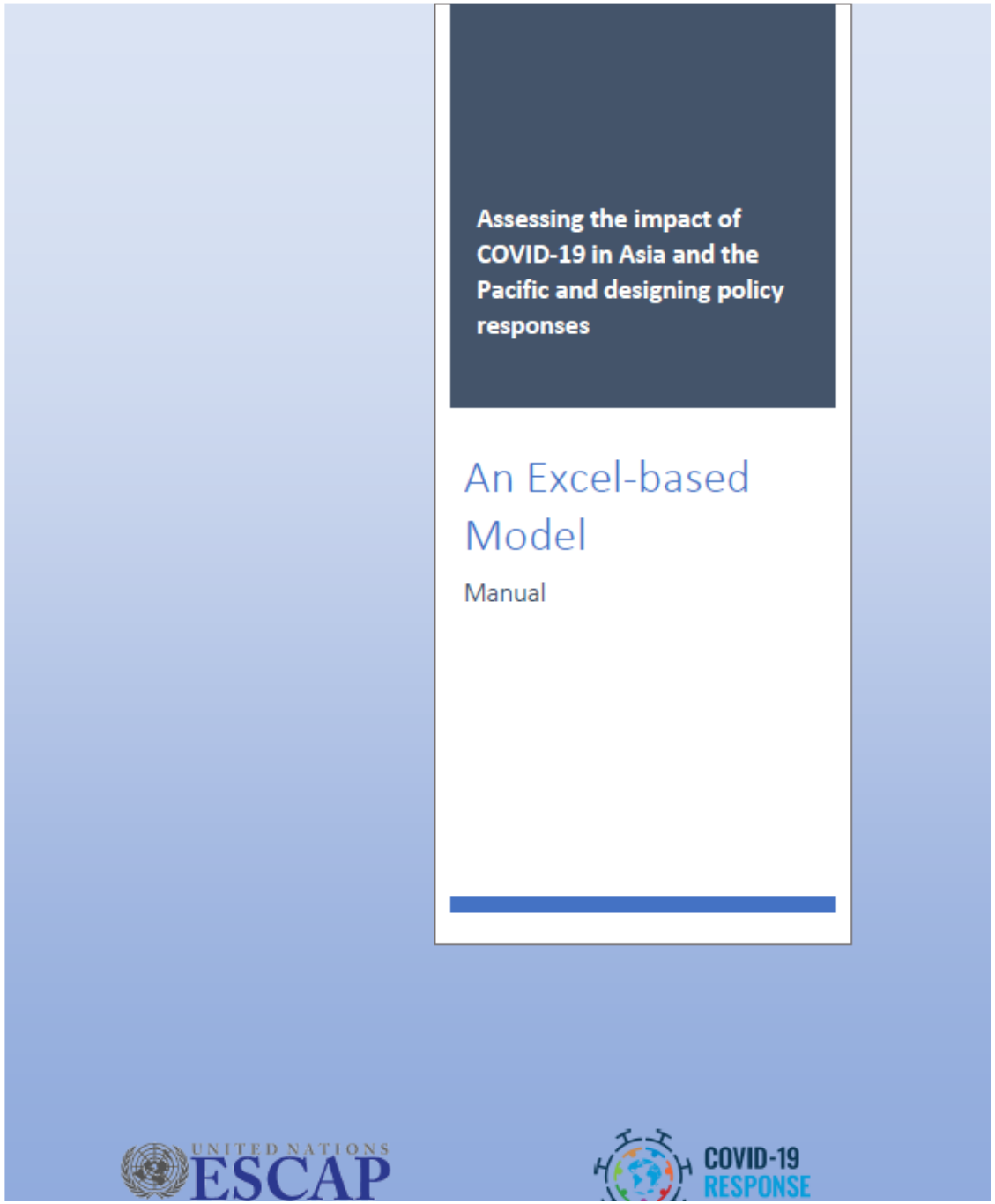
INTRODUCING AN EXCEL-BASED MODEL TO DESIGN POLICY RESPONSES TO COVID-19

Dawn Holland

National Institute of Economic and Social Research

UNESCAP Virtual Event

17 August 2020



HOW TO ACCESS THE MODEL

The model is fully open source and can be downloaded from ESCAP's website here:

www.unescap.org/resources/assessing-impact-covid-19-asia-and-pacific-and-designing-policy-responses-excel-based

The user's manual details the purpose, use and underlying structure of the model simulation tool

WHAT IS THE MODEL DESIGNED TO DO?

- The purpose of the model is to inform economists and policymakers of the likely impact of the Covid-19 crisis on key indicators, and to allow simple scenarios to be undertaken.
- The "country overview" illustrates a subset of key factors that will determine the impact of the crisis on the economy, putting this into a regional and global context.
- These factors are then integrated into an economic model to estimate their impact on key socio-economic variables. Scenarios can be developed by modifying policy options; the stringency of lockdown measures at home and abroad; and the oil price.

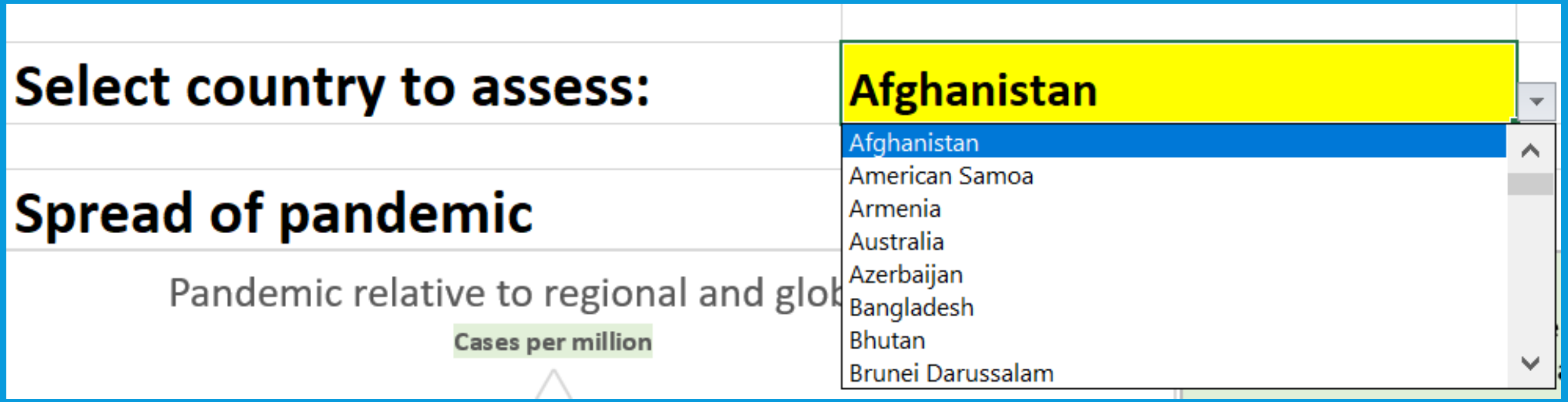
WHAT IS BEYOND THE SCOPE OF THIS MODEL?

- The model is ***not*** designed to deliver a complete forecast for any country or territory. All forecasts are assessed relative to a pre-COVID baseline, and ***only*** the COVID shock is explicitly modelled. Individual economies may face many other country-specific shocks that are not captured here.
- The model is parameterized to capture average expected behaviour across the region, and so is ***not*** tailored to individual countries or territories. Advanced users can modify all parameters in the model to finetune it for an individual country, although there is often little information on which to base country-specific values.
- The model is ***only*** designed to look at the short-term (2020 and 2021).
- The model is ***not*** designed to assess health consequences of COVID-19.

HOW TO APPLY THE MODEL?

STEP 1: SELECT COUNTRY TO ASSESS

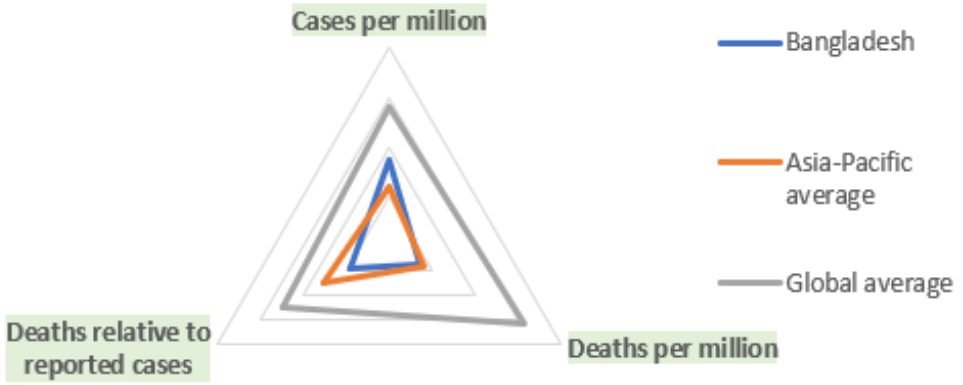
From the dropdown menu on the "Country Overview" page, select the country of interest:



STEP 2: REVIEW THE SPREAD OF PANDEMIC

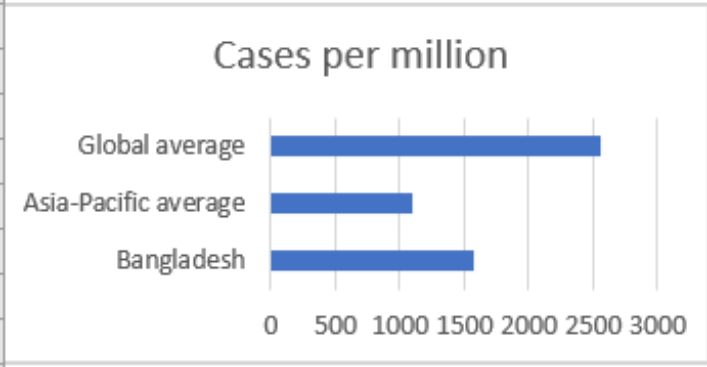
- Cases
- Deaths

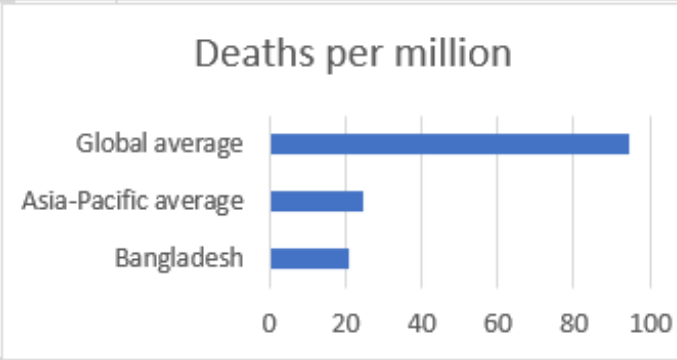
Spread of pandemic

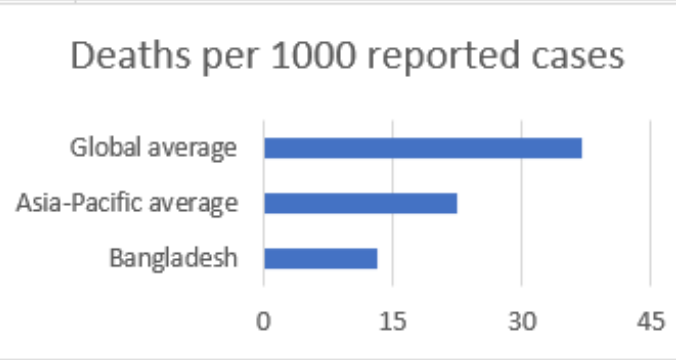


The figure illustrates the reach of the Covid-19 virus in the selected country, relative to the global extent of the pandemic and relative to the Asia-Pacific region. If a point of the blue triangle extends beyond the orange/grey triangle, this indicates that the country has suffered a higher rate of cases or deaths, or a higher death rate per identified case, relative to the regional/global average. In general, the Asia-Pacific region has suffered fewer cases per capita than the rest of the world, and a lower death rate.

Note: Units differ along the 3 axes, and are normalized to the global and regional averages.





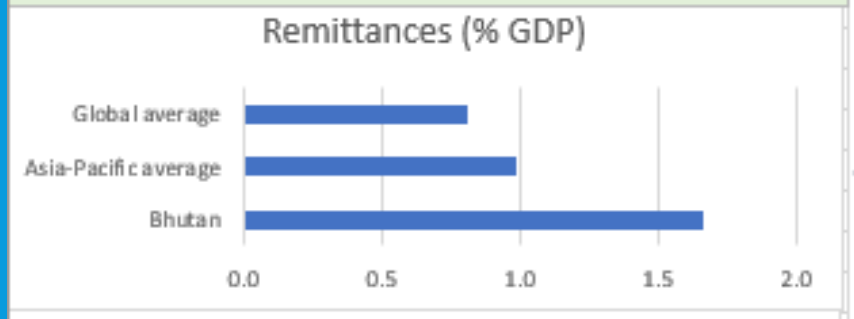


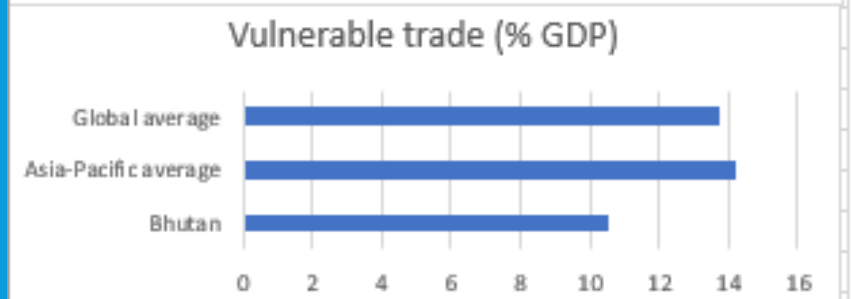
STEP 3: REVIEW THE VULNERABILITY TO EXTERNAL SHOCKS

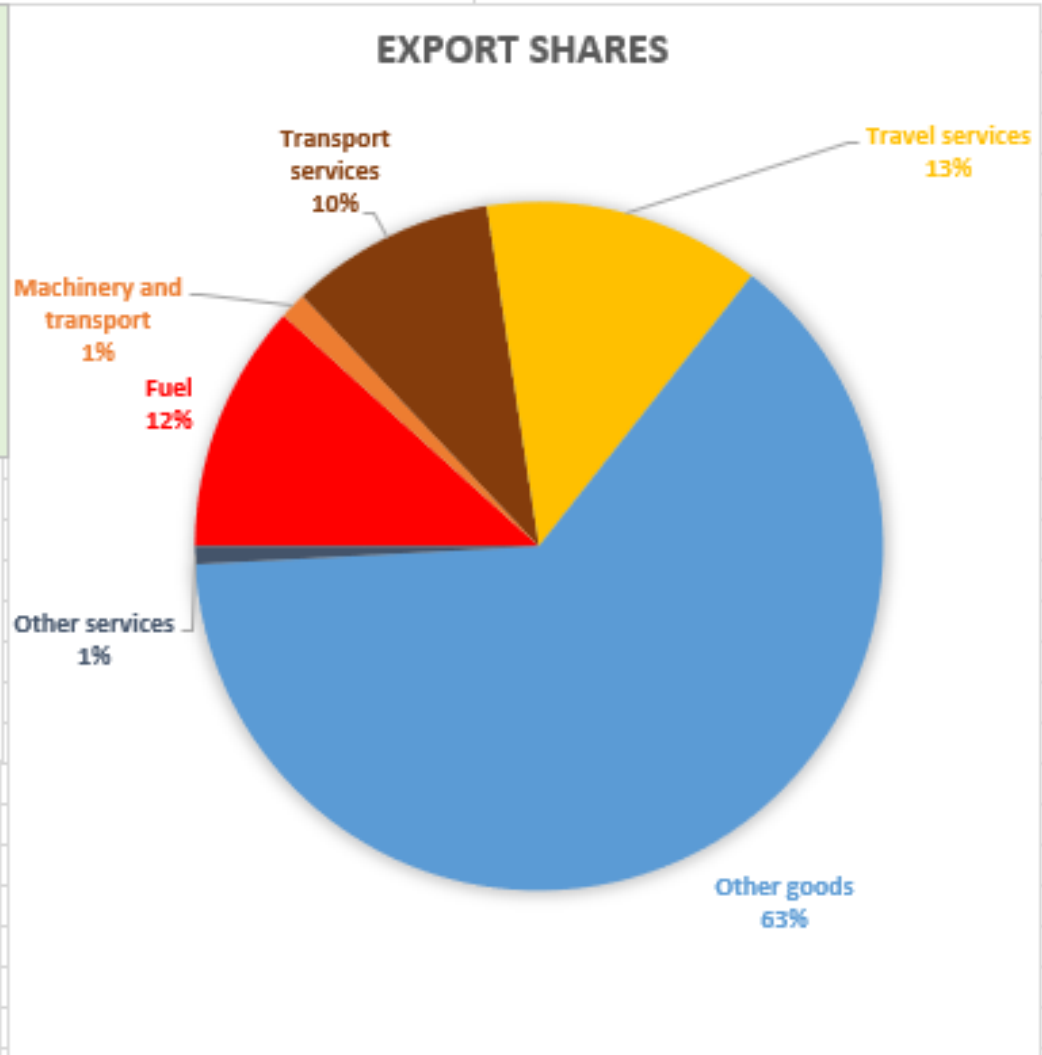
- Structure of exports
- Reliance on remittances

Vulnerability to external shocks

Countries that rely heavily on remittances or on export revenue from sectors that have been particularly hard hit by the global pandemic, are exposed to a sharp drop in external revenue, which will exacerbate the domestic shocks. Particularly vulnerable trade sectors include transport and travel services, which are heavily impacted by travel bans, and transport and electrical equipment, which are deeply embedded in global value chains. Countries reliant on fuel exports are exposed to the sharp drop in the oil price. Below, "vulnerable trade" is defined as sectors illustrated in the pie chart, excluding "other services" and "other goods".

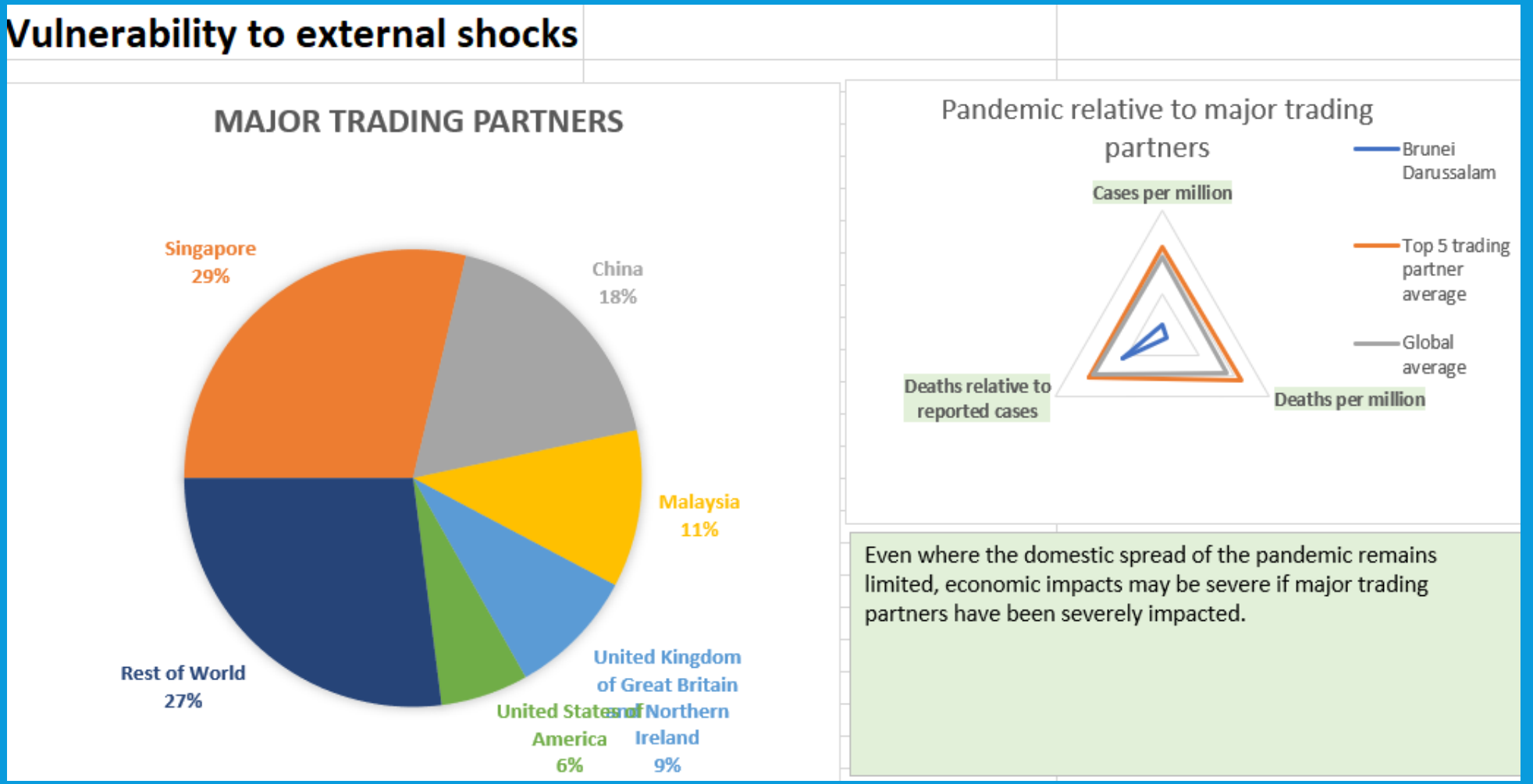






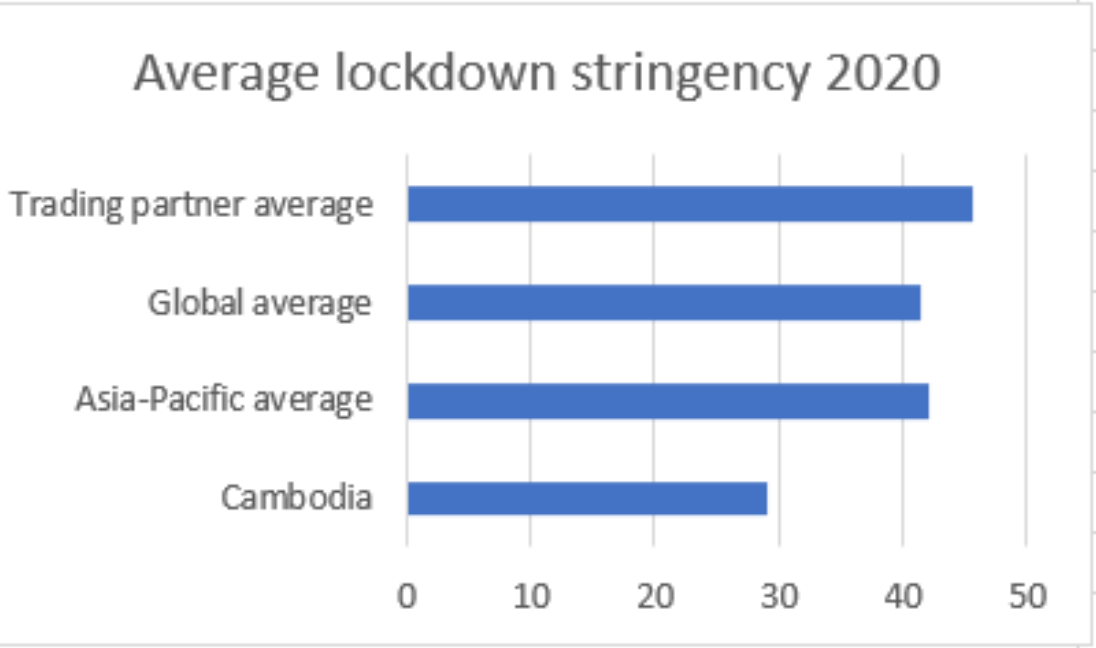
STEP 3: … VULNERABILITY TO EXTERNAL SHOCKS

- Export partners



STEP 4: REVIEW THE STRINGENCY OF CONTAINMENT MEASURES

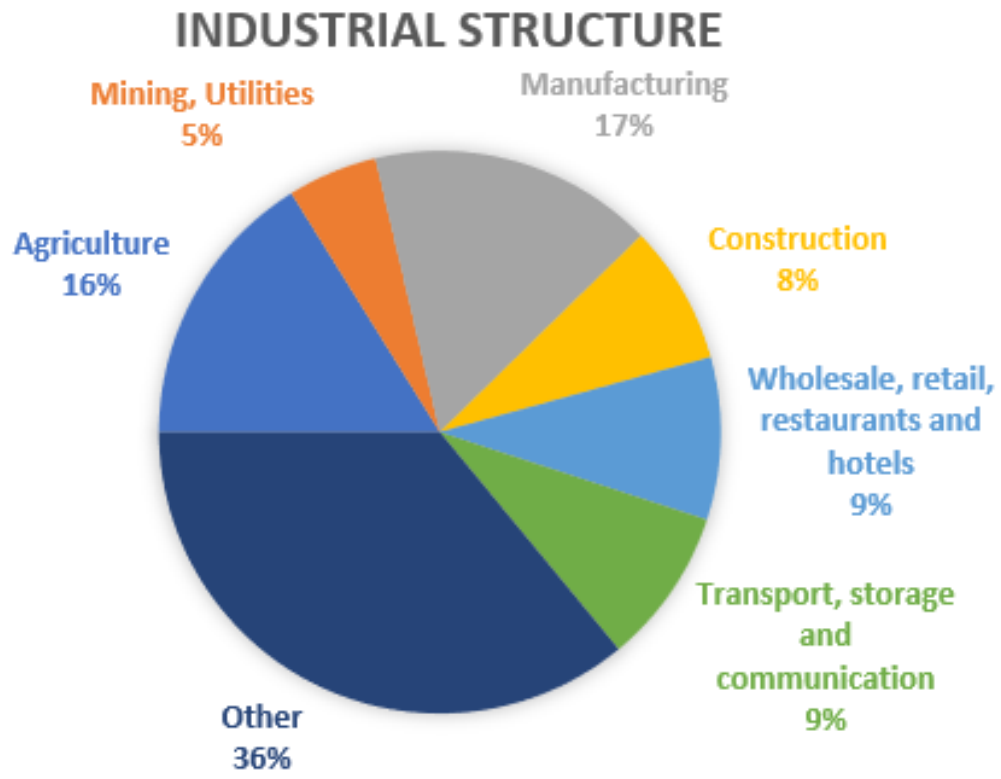
Stringency of measures required to contain pandemic



Based on the index compiled by the Oxford COVID-19 Government Response Tracker, which assesses school closures, workplace closures, cancellation of public events, restrictions on gatherings, closure of public transport, "stay at home" requirements, restrictions on domestic travel, and restrictions on international travel. For the baseline, policy is assumed to stay constant during the month of August, with restrictions declining gradually thereafter (at a rate of 20% in September, and 30% in October-December).

STEP 5: REVIEW THE INDUSTRIAL STRUCTURE

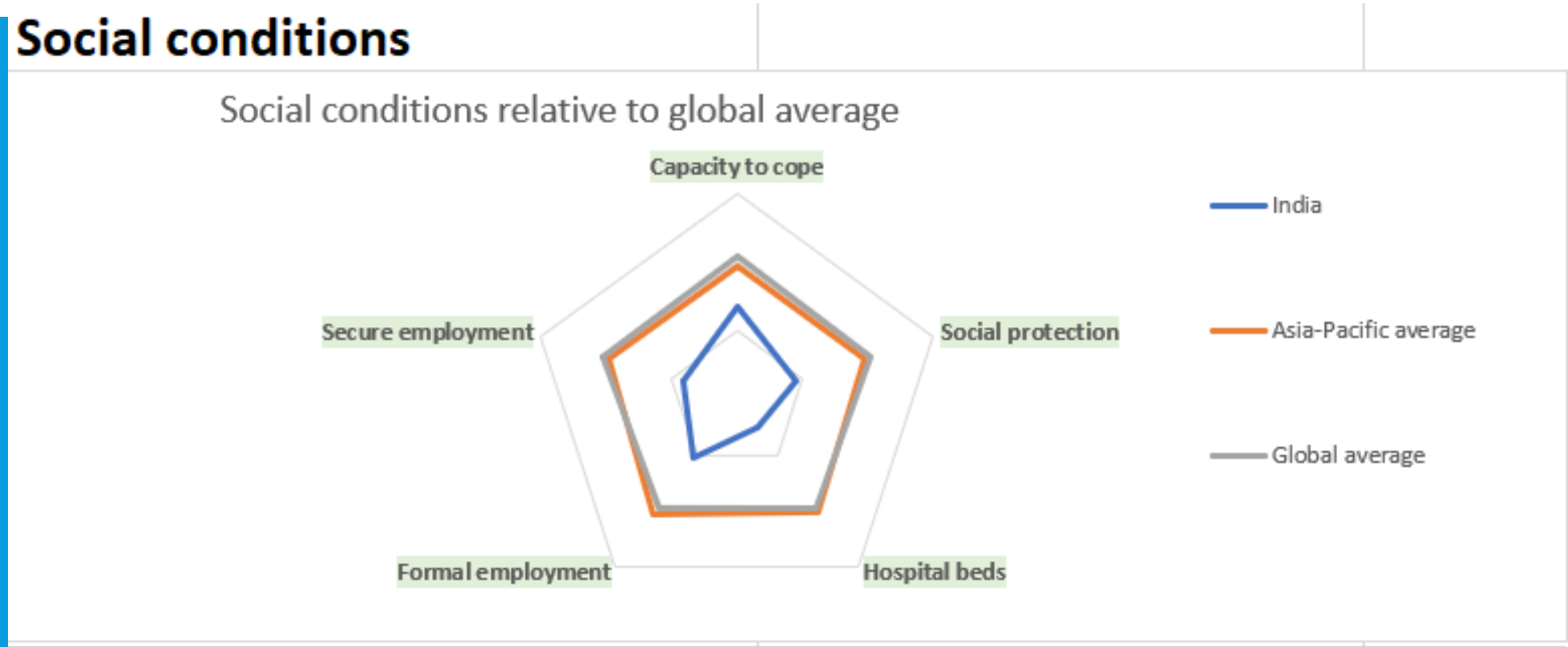
Industrial structure



Wholesale, retail, restaurants and hotels; construction; and some manufacturing and transport, storage and communication sectors are particularly exposed to domestic and global lockdown measures. Investment and employment in these sectors have been particularly hard hit.

STEP 6: REVIEW UNDERLYING SOCIAL CONDITIONS

- Medical capacities
- Social protection
- Job security
- Governance



Underlying social conditions will play an important role in determining the duration of the crisis and speed of recovery from the shock. "Capacity to cope" from the World Risk Index measures governance, medical capacities and insurance coverage. Social protection is benchmarked against the share of older persons covered by social protection. Secure employment is the share of employment that is not self-employed. Informal workers and the self-employed are at high risk of a severe drop in income, and are less likely to be covered by social protection measures.

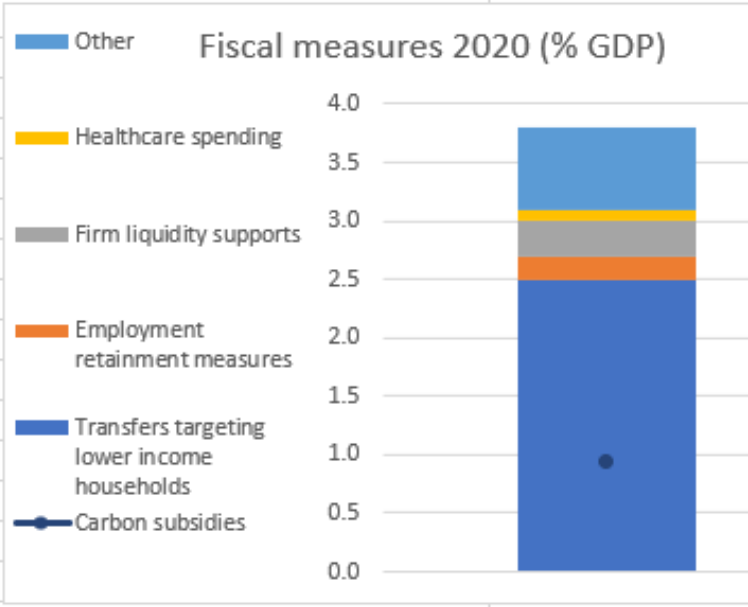
STEP 7: REVIEW THE MACRO POLICY BACKDROP

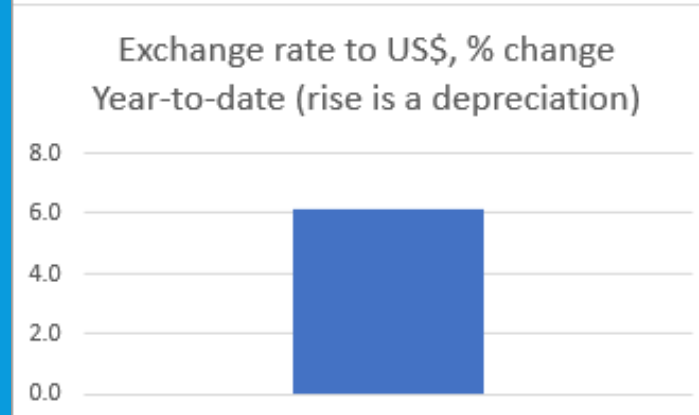
- Fiscal measures
- Interest rates
- Exchange rate

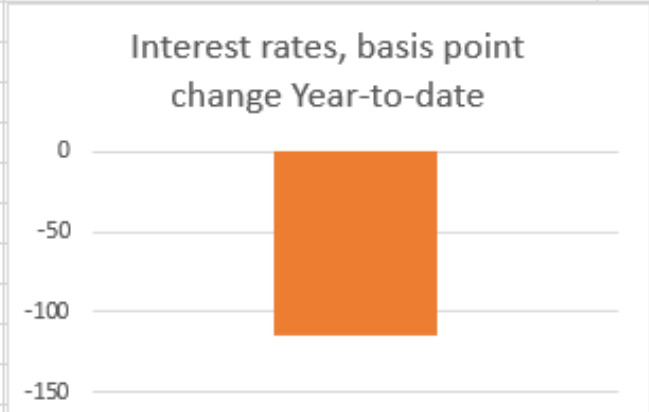
Policy backdrop

Many countries have introduce fiscal support measures to help households and firms weather the shock caused by the global pandemic. We disaggregate announced policy measures into income support measures that will accrue primarily to lower income households (which support consumption and alleviate poverty), employment retainment measures (which reduce the rise in unemployment and speed the recovery), firm liquidity supports (which prevent bankruptcy and speed the recovery), healthcare spending (which improve health outcomes and stimulate the economy) and other measures.

Carbon subsidies remain in place in many countries. Reducing these subsidies can create fiscal space for other measures and accelerate the transition towards cleaner energy use.





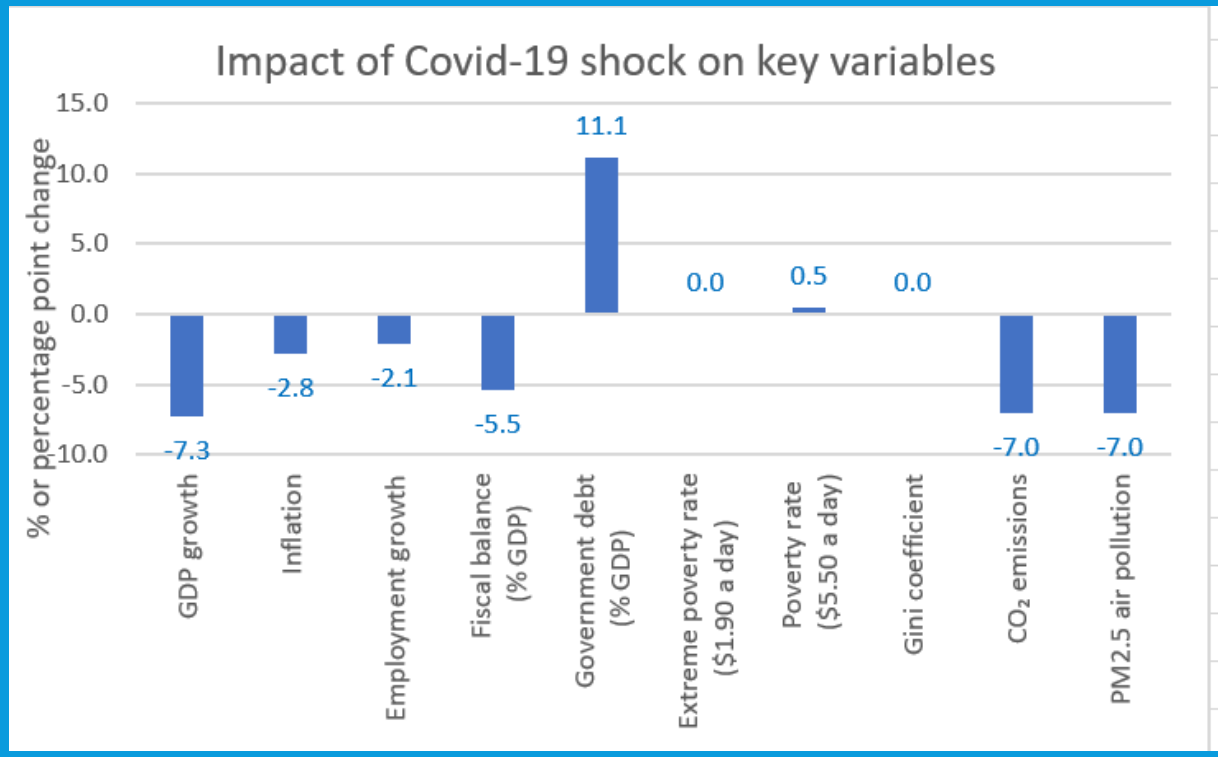


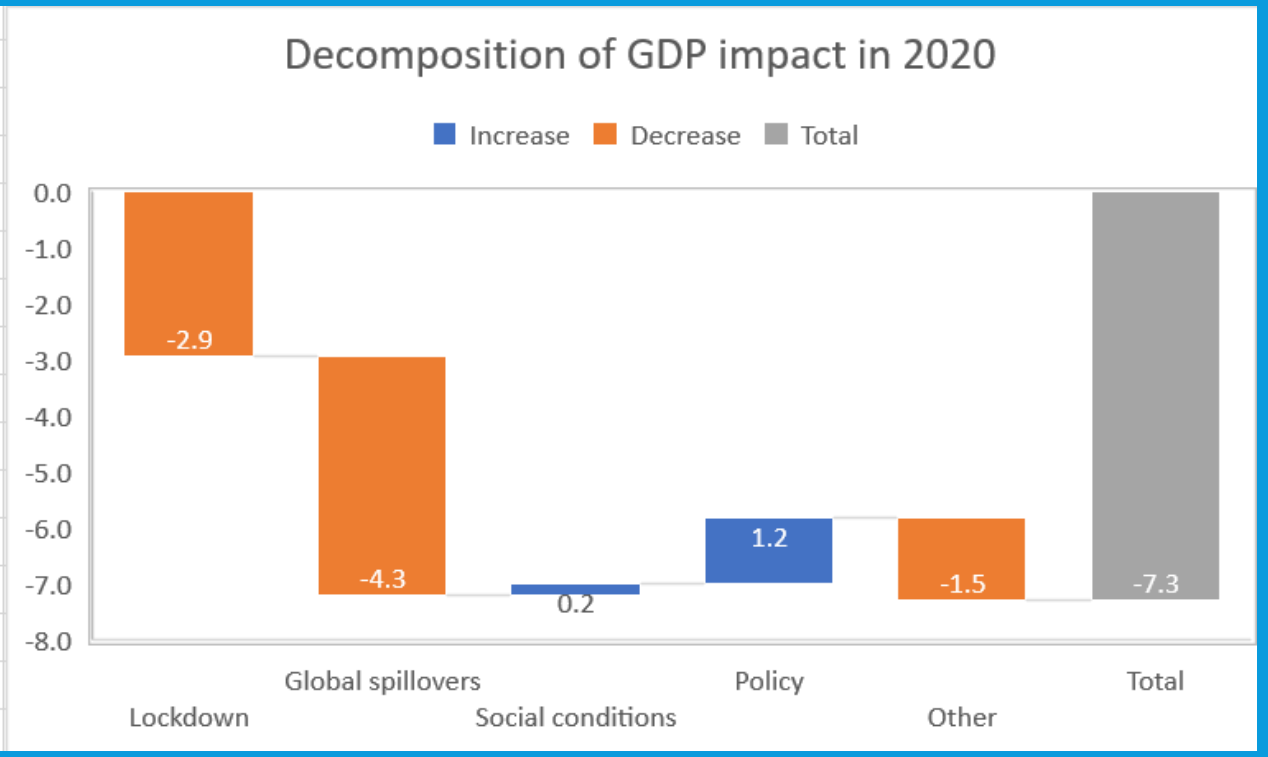
SELECT "SCENARIOS" WORKSHEET: TWO FORECASTS ARE PRESENTED, PRE- AND POST-COVID

Malaysia	To modify country under analysis, please select new county on the "Country overview" worksheet		
Post-Covid-19 baseline estimates			
	2019	2020	2021
Real GDP growth	4.3	-3.0	8.2
Inflation	0.7	-1.0	4.8
Employment	1.9	-0.4	4.3
General government net lending/borrowing	-3.2	-8.2	-4.7
General government gross debt	56.3	67.7	64.6
Poverty headcount ratio at $1.90 a day (2011 PPP)	0.0	0.0	0.0
Poverty headcount ratio at $5.50 a day (2011 PPP)	1.1	1.4	1.0
Gini coefficient	41.0	41.0	41.0
CO_2 emissions	258.9	244.9	258.3
PM2.5 air pollution, mean annual exposure	16.4	15.3	16.0

Pre-Covid-19 estimates			
	2019	2020	2021
Real GDP growth	4.3	4.3	4.5
Inflation	0.7	1.8	2.0
Employment	1.9	1.7	1.6
General government net lending/borrowing	-3.2	-2.8	-2.7
General government gross debt	56.3	56.5	56.0
Poverty headcount ratio at $1.90 a day (2011 PPP)	0.0	0.0	0.0
Poverty headcount ratio at $5.50 a day (2011 PPP)	1.1	0.9	0.7
Gini coefficient	41.0	41.0	41.0
CO_2 emissions	258.9	263.3	268.3
PM2.5 air pollution, mean annual exposure	16.4	16.5	16.7

FIGURES SHOW EXPECTED IMPACT ON KEY VARIABLES, AND DECOMPOSE MODELLED IMPACT ON GDP IN 2020





SCENARIO ANALYSIS CAN BE CARRIED OUT ON THE FOLLOWING VARIABLES…

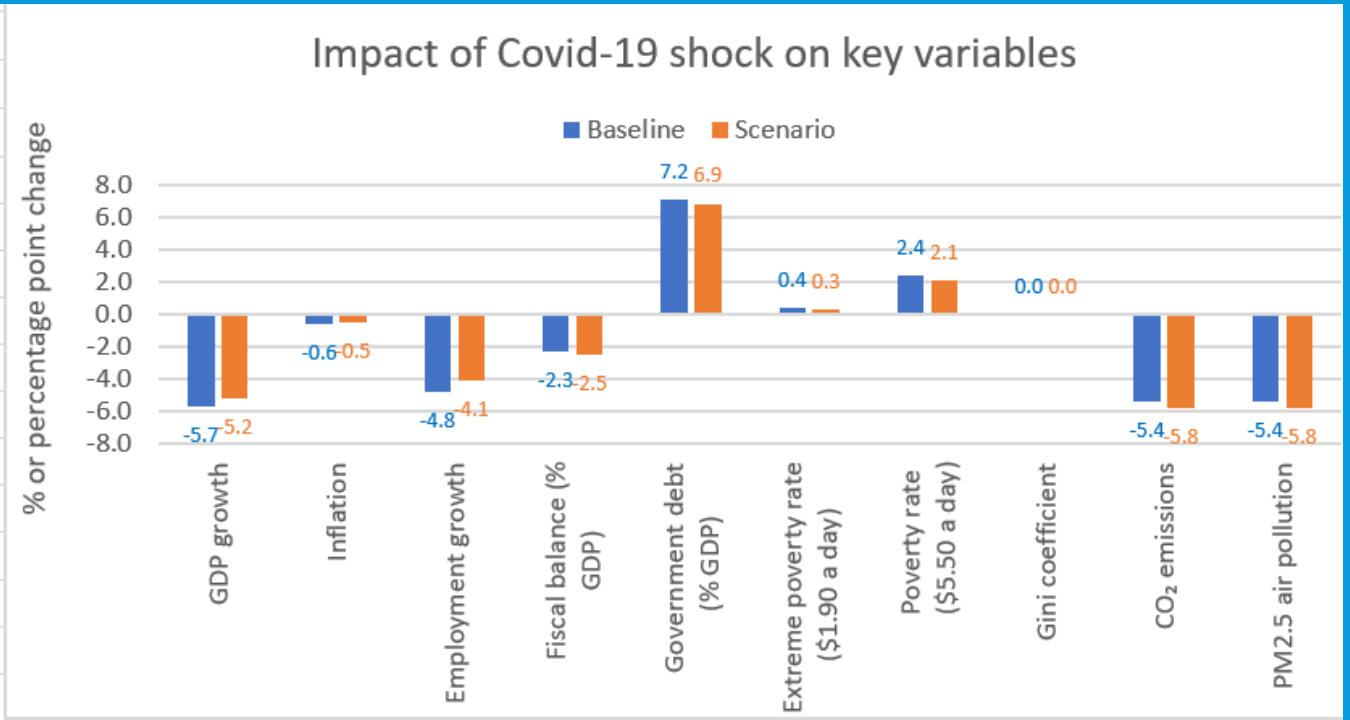
Baseline forecasts can be modified by amending the key assumptions below

Cells highlighted in yellow can be modified as needed

Baseline assumptions	2020	2021	Scenario assumptions	2020	2021
Total fiscal measures (% GDP)	4.2	-2.1	Total fiscal measures (% GDP)	4.4	-3.1
Transfers targeting lower income households (%	1.3	-0.6	Transfers targeting lower income households (% (	1.0	-0.5
Employment retainment measures (%GDP)	1.3	-0.6	Employment retainment measures (%GDP)	1.0	-0.5
Firm liquidity supports (%GDP)	0.0	0.0	Firm liquidity supports (%GDP)	1.0	-0.5
Healthcare spending (%GDP)	0.4	-0.2	Healthcare spending (%GDP)	1.0	-0.5
Other (% GDP)	1.3	-0.6	Other (% GDP)	1.0	-0.5
Carbon subsidies (%GDP)	0.6	0.6	Carbon subsidies (%GDP)	0.0	0.0
Interest rates (basis point change)	-125	0	Interest rates (basis point change)	-100.0	0.0
Average national lockdown stringency	39.8	6.9	Average national lockdown stringency	40.0	7.0
Average lockdown stringency in trading partners	44.3	8.1	Average lockdown stringency in trading partners	40.0	7.0
Oil price	41.8	49.7	Oil price	41.8	49.7
"Other" impacts on GDP growth (percentage point)	-1.5	0.0	"Other" impacts on GDP growth (percentage point)	0.0	0.0

…TO CREATE ALTERNATIVE FORECASTS

Post-Covid-19 scenario			
	2019	2020	2021
Real GDP growth	5.0	1.5	6.9
Inflation	4.8	3.4	4.3
Employment	1.3	-2.8	1.3
General government net lending/borrowing	-7.4	-9.6	-5.7
General government gross debt	69.0	75.4	73.3
Poverty headcount ratio at $1.90 a day (2011 PPP) (	10.1	9.9	8.3
Poverty headcount ratio at $5.50 a day (2011 PPP) (	65.5	64.9	58.7
Gini coefficient	37.8	37.8	37.8
CO_2 emissions	2776.2	2777.7	2928.3
PM2.5 air pollution, mean annual exposure	92.2	88.1	87.7



REVIEW THE UNDERLYING MODEL

All data, parameters and assumptions underlying the model are available within the workfile and detailed in the User's Manual.

Go to ***"Working baseline"*** sheet to view model structure. Select "Show all notes" to view key notes on parameters.

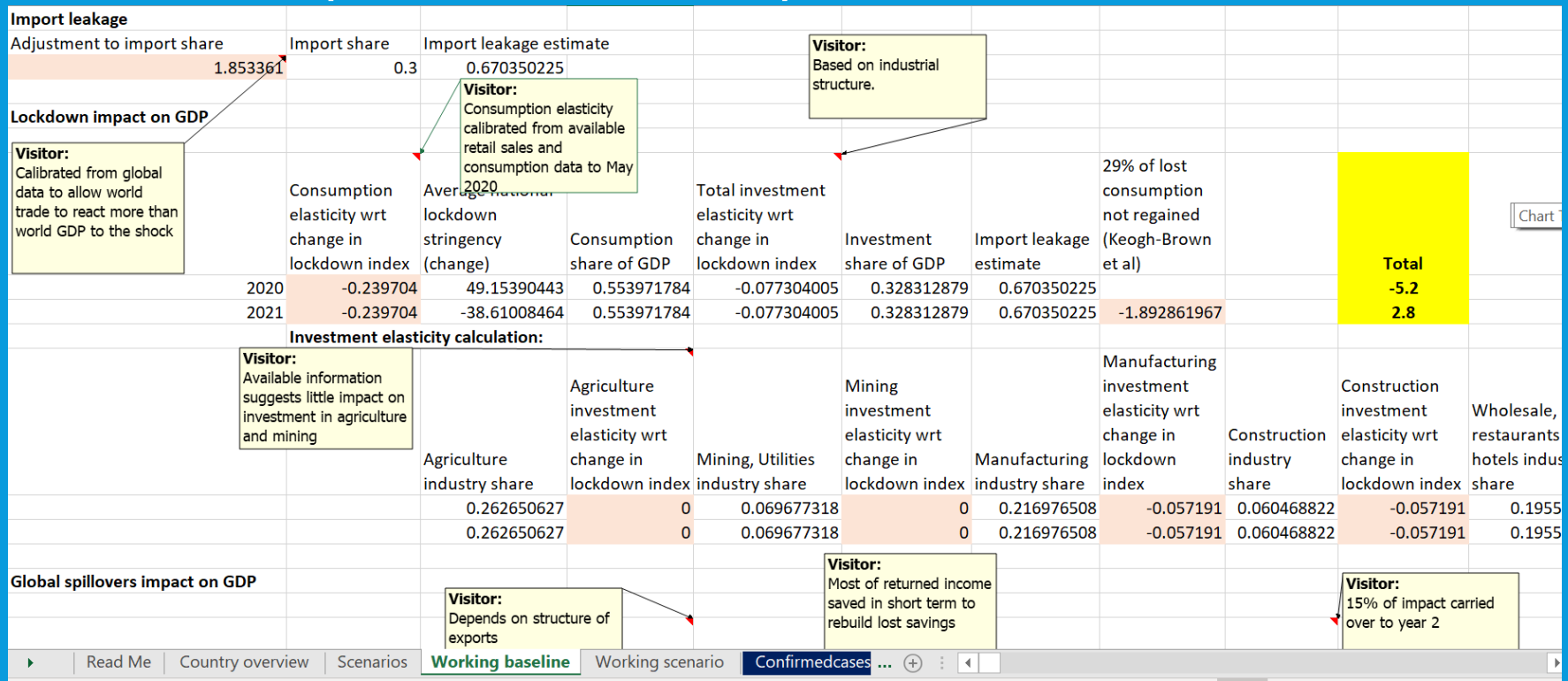
Parameters have been estimated and calibrated based on available information, which is necessarily scant in many cases. Expert judgement is applied where no solid information is available.

The same elasticities and parameters are applied for all countries, although the impacts differ depending on the country-specific data that enters the model.

Users can modify any of these parameters.

MODIFY THE UNDERLYING MODEL

On the "Working baseline" and "Working scenario" worksheets, all cells highlighted in orange contain editable parameters. These can all be reset as required to finetune for a particular country.



Import leakage

Adjustment to import share	Import share	Import leakage estimate
1.853361	0.3	0.670350225

Visitor: Consumption elasticity calibrated from available retail sales and consumption data to May 2020

Visitor: Based on industrial structure.

Lockdown impact on GDP

Visitor: Calibrated from global data to allow world trade to react more than world GDP to the shock

	Consumption elasticity wrt change in lockdown index	Average additional lockdown stringency (change)	Consumption share of GDP	Total investment elasticity wrt change in lockdown index	Investment share of GDP	Import leakage estimate	29% of lost consumption not regained (Keogh-Brown et al)		Total
2020	-0.239704	49.15390443	0.553971784	-0.077304005	0.328312879	0.670350225			**-5.2**
2021	-0.239704	-38.61008464	0.553971784	-0.077304005	0.328312879	0.670350225	-1.892861967		**2.8**

Investment elasticity calculation:

Visitor: Available information suggests little impact on investment in agriculture and mining

	Agriculture industry share	Agriculture investment elasticity wrt change in lockdown index	Mining, Utilities industry share	Mining investment elasticity wrt change in lockdown index	Manufacturing industry share	Manufacturing investment elasticity wrt change in lockdown index	Construction industry share	Construction investment elasticity wrt change in lockdown index	Wholesale, restaurants hotels indus share
	0.262650627	0	0.069677318	0	0.216976508	-0.057191	0.060468822	-0.057191	0.1955
	0.262650627	0	0.069677318	0	0.216976508	-0.057191	0.060468822	-0.057191	0.1955

Global spillovers impact on GDP

Visitor: Depends on structure of exports

Visitor: Most of returned income saved in short term to rebuild lost savings

Visitor: 15% of impact carried over to year 2

Read Me | Country overview | Scenarios | **Working baseline** | Working scenario | Confirmedcases ...

USER'S MANUAL DETAILS STRUCTURE IN EQUATION FORM

Domestic lockdown impact on GDP

Domestic lockdown measures have impacted both consumption and investment decisions, and is modelled as follows:

For 2020:

$$\Delta GDP = \Delta Lock[\boldsymbol{\varepsilon^{C}} Cshare + \boldsymbol{\varepsilon^{I}} Ishare]Leak$$

Where:

ΔGDP is the percentage point impact on GDP growth;

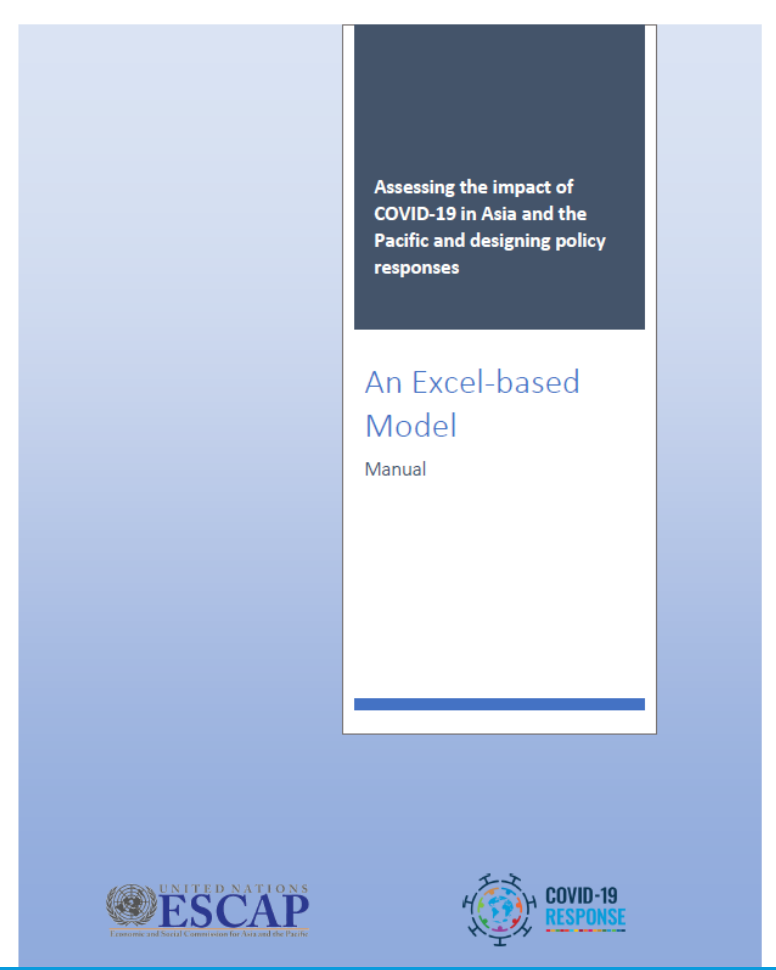
ΔLock is the change in the lockdown stringency index;

$\boldsymbol{\varepsilon^{C}}$ is **-0.24** (the estimated private consumption elasticity with respect to lockdown stringency, calibrated from available retail sales and consumption data to May 2020. See Holland, 2020);

Cshare is the consumption share of GDP (benchmark 2018);

$\boldsymbol{\varepsilon^{I}}$ is the estimated investment elasticity with respect to lockdown stringency. This depends on the

THANK YOU!



To download a copy of the Excel-based Model and user's manual visit ESCAP's website:

www.unescap.org/resources/assessing-impact-covid-19-asia-and-pacific-and-designing-policy-responses-excel-based