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COVID-19 ECONOMIC IMPACT ASSESSMENT MODEL

Trial run of the model based on the Indonesian economy

May 2020

Fiscal Accountability and Sustainable Trade (FAST) Final Report

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Contents

Acknowledgments	iv
Introduction	I
Review by the Economist Intelligence Unit	I
Part One: Indonesia	I
Summary	I
Results and scenarios	2
Assumptions	3
Macroeconomic Resilience	3
Part Two: COVID-19 Economic Impact Assessment Model Technical Note	4
Concept	5
Methods and Sources	5
GDP	5
GDP Scenarios	5
GDP Sources	6
Autonomous Spending Multiplier	6
Employment Data	6
Poverty	7
Timing the Shutdown	7
Demand and Supply Sectoral Impacts	8
Creating Scenarios by Modifying Second-Round Impacts	9
Annex: External Review	I



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COVID-19 Economic Impact Model

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Introduction

This report is in two parts. The first part reviews the immediate impact of COVID-19-related shutdowns in Indonesia in terms of overall output, employment, and poverty. It also includes information about Indonesia's macroeconomic resilience and its ability to respond to the crisis without running very high risks of creating macroeconomic instability such as rapid inflation, unsustainable fiscal deficits, or rapid depreciation of currency. This information will inform leaders in the U.S. Agency for International Development (USAID) and enable them to anticipate major events that may affect the welfare and development of this partner country. The methodological information for the calculations and meaning of macroeconomic resilience is the subject of a different document. The second part of this report explains the concepts, methods, and sources for the COVID-19 Economic Impact Model and the accompanying indicators of macroeconomic resilience.

COVID-19 is both a health crisis and an economic crisis. The best way to mitigate the economic impact of the crisis is to halt the disease in its tracks. Nonetheless, there are economic issues which can be acted upon almost immediately, to “protect” or “shield” the economy from longer-term disaster and to devise and implement as a recovery plan. Paul Krugman sees the current economic crisis as a “medically induced economic coma.” The COVID-19 Economic Impact Model will help to visualize this immediate economic problem.

Review by the Economist Intelligence Unit

The Economist Intelligence Unit (EIU) correspondent for Indonesia reviewed this report and its assumptions. In short, the correspondent considers the assumptions reasonable, but EIU's own reading of the impact on poverty is less optimistic than the results in this report. The EIU suggests that other data available in Indonesia might be used to enrich the analysis of poverty. The EIU did not suggest an alternative calculation of the impact on poverty.

The EIU also made two suggestions for the section on macroeconomic resilience. USAID's Financial Assistance for Sustainable Trade (FAST) is reviewing these suggestions for possible inclusion into the FAST Macroeconomic Resilience Tool. The EIU remarks are attached as an Annex.

Part One: Indonesia

Summary

Using the COVID-19 Economic Impact Model, the authors calculate that the Indonesian economy will experience \$44 billion—equal to about five percent of gross domestic product (GDP)—in lost overall GDP and that this will largely occur between beginning of March 2020 and end of July 2020. This could result in between 9.4 and 12.5 million lost jobs and between 7.2 and 9.5 million persons falling into poverty. Proportionally, women are more adversely affected than are men.



Responding to the economic impact of COVID-19 (either during the crisis or afterward) will require a great mobilization of both domestic and international resources. However, while the economic impact is great, Indonesia manifests considerable macroeconomic resilience and thus its ability to respond is less likely to lead to economic instability, unsustainable fiscal balances, inflation, or balance of payments shortfalls.

Results and scenarios

Table I presents the overall results of the Model in terms of lost GDP for the year, for the COVID-19 Economic Impact period, and immediate losses in employment and rises in poverty. The results include three scenarios: high, moderate, and optimistic impact.

Table I Economic Impact Model Results

Overall COVID-19 Immediate Economic Impacts			
Indonesia – Annual (dates of projections)	10/2019	4/2020	
2020 growth projected by IMF in Oct 2019 and Apr 2020	5%	0.5%	
COVID-19 Shutdown Period Impacts on GDP and Scenarios	USD billions	IDR trillions*	
COVID-19 Impact on GDP for 2020 – Full Year	-44	-694	
COVID-19 Impact on GDP in Shutdown Period - High	-44	-694	
COVID 19 Impact on GDP in Shutdown Period - Moderate	-42	-659	
COVID-19 Impact on GDP in Shutdown Period - Optimistic	-33	-521	
* 2019 IDR			
Shutdown period impacts and scenarios	TOTAL	Female	Male
High Impact			
Change in employment, full-time equivalent (FTE) (000,000)	-12.5	-6.0	-6.5
Employment change, % total employment	-9.9%	-10.6%	-9.5%
Change in # persons in poverty (000,000)	9.5	4.9	4.7
Moderate Impact			
Change in employment, FTE (000,000)	-11.8	-4.5	-4.9
Employment change, % total employment	-9.5%	-10.0%	-9.0%
Change in # persons in poverty (000,000)	9.1	4.6	4.4
Optimistic Impact			
Change in employment, FTE (000,000)	-9.4	-4.5	-4.9
Employment change, % total employment	-7.5%	-7.9%	-7.1%
Change in # persons in poverty (000,000)	7.2	3.7	3.5

The loss of employment, expressed in FTEs, is the amount of work that will be reduced due to both reduced demand and supply-chain disruption, namely, the individual's inability to go to work or to move goods to market. Jobs may not always be fully eliminated; some workers may work reduced hours.

Although in numbers more men lose jobs than women, the percentage of employed women losing their jobs is slightly greater, primarily because there are fewer women in the workforce and the fields in which they work are more vulnerable to job loss. For instance, 55 percent of women work in service sectors, which are heavily affected by demand reductions, while only 47 percent of men are in the service sectors. Of note is that 30 percent of men work in agriculture, a sector experiencing low COVID-19 impact, versus only 8.5 percent of women.

With the loss in employment comes a rise in poverty. The COVID-19 Economic Impact Model forecasts that the crisis period will lead to between 7.2 million (optimistic) and 9.5 million Indonesians falling into poverty.

Assumptions

Specific assumptions that drive these results relate either to loss in output due to shutdown-induced declines in demand, or interruptions in value chains—namely, the inability for workers to get to work. These assumptions are:

- Consumer demand for specific items just prior to shutdown (namely for agricultural products), other food items, and general retail-store purchases (can include online retailing) increases by 30 percent over baseline. This is consistent with Baker et al. (2020),¹ which finds this pre-crisis hoarding effect. Baseline is what would have been produced without COVID-19 shutdown.
- In the subsequent three months, consumer demand for these products will decline about 20 percent over baseline.
- Consumer demand for automotive-sector sales and repairs will decline in the shutdown period by about 10 percent in one month and 20 percent in the next, then start to recover.
- Hospitality businesses such as hotels and restaurants will experience extreme demand drops. In the first full month of shutdown, demand may drop by 80 percent. In the final month of shutdown, demand will start to recover but will still be lower than baseline.
- Demand for health care services will rise in months two, three, and four, but the sector may not be able to fully keep up with this demand. Effectively, the authors posit increases in demand compared to baseline to be 20 percent, 20 percent, and 10 percent in months two, three, and four.
- Due to limitations of transport, workers unable to travel to workplaces, and technological constraints on working from home, labor supply shortages will result in moderate losses of production of in agricultural, industry, and mining.

Macroeconomic Resilience

Macroeconomic resilience is defined as a country's ability to weather economic shocks. It is difficult to measure but using a set of indicators in a comparative framework can help in making a judgment. This system of comparative indicators represents a starting point and would require deeper, country-specific investigation to assess the ability of any particular country.

Table 2 presents indicators of monetary and fiscal resilience. USAID first used these indicators in 2009 in the broad assessment of macroeconomic resilience in the face of the Global Financial Crisis (GFC), and they are discussed in more detail in Gallagher and Heredia-Ortiz, 2014.² The more resilience a macroeconomy enjoys, the more likely it may be able to withstand severe shocks without creating extensive imbalances, runaway inflation, an inability to meet budget requirements, shortages of foreign exchange, and international disequilibria. The indicators are color-coded, where green means Indonesia's

¹ Baker, Scott, R.A. Farrokhnia, Steffen Meyer, Michaela Pagel, and Constantine Yannelis. *How Does Household Spending Respond to an Epidemic? Consumption during the 2020 COVID-19 Pandemic*. NBER working paper no. 26949. April 2020. <http://www.nber.org/papers/w26949>

² Gallagher, Mark and Eunice Heredia-Ortiz. "The Macroeconomic Resilience of Nations," *Developing Alternatives*. September 23, 2014. <https://dai-global-developments.com/articles/macro-economic-resilience-of-nations>



position is relatively favorable relative to most other low- and middle-income countries; yellow means its position is neither favorable nor unfavorable; and red means there may be substantial challenges.

While the economic shock caused by COVID-19 is very severe, with sharp drops in output, losses in jobs, and a surge in poverty, proper post-crisis adjustment in Indonesia is tenable. Debt is not too high, debt service with respect to exports is high, but the overall government budget balance seems manageable. The country does not depend heavily on foreign grants. National saving at 31% of GDP is high. And, with a seriousness of purpose, the country could raise additional tax revenues while maintaining competitiveness and still encouraging private enterprise. Most of these indicators are green, meaning that Indonesia has a considerable degree of macroeconomic resilience.

Although fiscal balance is negative the overall debt-to-GDP ratio is quite low. Tax effort is quite low, which although it reflects that the country does not seem to tax its economy much, it does indicate that should the need arise, say to generate more domestic revenue in the future for debt incurred today to cover COVID-19 emergency spending, increased taxation could be implemented without unduly burdening the private sector and citizens. Similarly, national savings is rather high and could be tapped in the future to offset rising public obligations. Monetary policy has space to accommodate expansionary fiscal policy without setting off price inflation or international balance of payments crises. The credit rating is high compared to almost all low- and middle-income countries, so combined with the low debt-to-GDP ratio, the country is in a good position to tap foreign financing for current needs.

Table 2 Indicators of Fiscal and Monetary Space

Fiscal Space							
Debt to GDP %	Debt service to export %	Budget balance to GDP %	Grants to GDP %	Tax to GDP %	Tax effort*	Savings to GDP	
30.1	29.4	-1.8	2%	11.1	0.3	31.4	
Monetary Space							
Inflation rate %	M2 growth rate %	M2 Velocity*	REER*	Currency dependency	International Reserves	GDP Growth rate	Credit Rating
3.2	6	2.6	106.8	0	5.7	5.2%	BBB
*Tax Effort is the ratio of actual tax collections to tax capacity. *M2 Velocity is the speed at which money, in this case M2, circulates. *REER is the real effective exchange rate. *Currency dependency is a binary indicator (1,0) where 1 means the country's currency is either linked directly to another country's or that a foreign currency circulates as the country's de fact and de jure currency.							

Part Two: COVID-19 Economic Impact Assessment Model Technical Note

This technical note explains the methods and sources used to develop the COVID-19 Economic Impact Assessment Model Case of Indonesia. The technical aspects of the model and how they are applied to data from Indonesia are explained. This note does not state nor justify the assumptions in terms of reductions in demand or supply-chain changes, as these are easily variable within the model.

The COVID-19 Economic Impact Assessment Model is a set of methodologies for assessing the immediate impact of shutdowns and related measures on the economy of any country. The primary outputs of the Model are projections of the losses in total output and employment by men and women



and the overall rise in poverty that may occur during the period immediately following the onset and response to COVID-19, which is referred to as the “crisis period.”

The Model provides an estimate of the magnitude of the immediate economic impact of COVID-19 during the crisis period. People, institutions, and economies can take measures now to ameliorate the situation and ready themselves for post-crisis rebound; having an idea of the problem’s magnitude is essential to inform policy making, national response, and USAID programming.

Concept

The immediate economic effects of COVID-19 social distancing causes the shutdown of many businesses where interpersonal contact is critical, such as retail, hospitality, and entertainment. Shutdowns may be mandated by law-makers or government leaders; they may also be a result of personal decisions people make not to leave their homes to go to the office, farm, store, or to meet others for social occasions. Such shutdowns are happening all around the world. This analysis does not rely on *required* shutdowns or lockdowns but rather *effective* shutdowns. Various measures of peoples’ activities are available from sources such as Google and Apple Inc. showing individual behavior with respect to visiting groceries, retail stores, parks, taking public transportation, driving cars, walking, and not leaving their homes. These give a very clear picture of the extent to which people are actually practicing shutdowns.

Countries experiencing these shutdowns will see immediate impacts in all sectors resulting in losses in productive employment. Consumers, including international visitors, may drastically reduce their demand for hospitality services, such as going to restaurants, hotels, shows, and other forms of entertainment. This will leave many businesses shuttered, at least for an abbreviated period, while others may shutter permanently. Either reduces the demand for labor or may more permanently eliminate jobs. In addition to demand impacts, workers may not be able to go to their factories or other places of employment where tele-working is not feasible. Economies may experience reductions in the demand for their exports due to how the COVID-19 affects trading partners.

Methods and Sources

GDP

The International Monetary Fund projected GDP growth rates for most countries in October 2019 and April 2020.³ This model assumes that the change in the expected growth rate is entirely due to COVID-19-related shutdowns. The overall loss in GDP attributable to COVID-19 is calculated by taking the difference in GDP growth rates and multiplied by the GDP for 2019. Table I presents this result in both local currency (IDR of 2019) and USD (current).

The Model's case calculation, based on the two IMF projections, is that all the change in GDP is entirely incurred during the four-month shutdown period.

GDP Scenarios

The model generates three scenarios.

1. The first, or highest-impact scenario, is that GDP impact is incurred in the shutdown period, including all subsequent rounds implicit in an Autonomous Spending Multiplier.
2. A moderate scenario applies a lower Autonomous Spending Multiplier than that calculated. This multiplier is created by using a lower or smaller value for the marginal propensity to consume parameter.

³ International Monetary Fund. *World Economic Outlook. Chapter 1: The great lockdown.* April 2020.



3. The optimistic scenario assumes that all impact is first-round only and is calculated by dividing the base GDP decline by the estimated Autonomous Spending Multiplier.

GDP Sources

GDP_{fc}: GDP at factor cost by productive sector or industrial sector data are from Statistics Indonesia (Badan Pusat Statistik). These data present GDP_{fc} by value-added for each of 50 sectors and subsectors. Changes in demand and supply are attributed to proportional changes in value-added by each of these fifty sectors and subsectors.

GDP_{mp}: GDP at market prices are by use or by demand, such as household and government consumption, imports, and taxation. These data are from the World Bank's World Development Indicators and they are used to calculate the Autonomous Spending Multiplier.

Autonomous Spending Multiplier

The Autonomous Spending Multiplier derives from the Hicksian structure of macroeconomic demand, where certain exogenous changes in demand, such as shutdowns, affect (for example) demand for hospitality services, and second- and third-round impacts on overall demand. The calculation uses the marginal propensity to consume, to import, and to tax as denominators under the unit I. The Model makes the simplifying and reasonable assumption that for the short term, the average values of consumption, importation, and taxation are equal to their marginal values.

Employment Data

Employment data are from Statistics Indonesia. These include data on nine subsectors of the economy, as well as data on employed persons by level of education. The data are average values for February and August each year from 2008 to 2017. To represent full-year employment levels and their allocation across the nine subsectors, the average of the allocations for February and August combined are used to represent the structure for future years.

The first major requirement is to allocate employment data to fifty sectors and subsectors when actual data from prior years are only allocated to 6 subsectors. The next requirement is to allocate jobs among these sectors to women and men. The first requirement was met in an iterative process, where the average value-added per employee from a given sector or subsector is available to be the average for the entire sector. However, this is not always useful or balanced. Further iterations were run to adjust value-added by worker in sectors to meet the overall sector target and to account for certain industries, such as mining, where higher value-added per worker is anticipated.

The third requirement is to allocate workers by sex to each sector and subsector. World Development Indicators information includes percentage of women working in each sector, but not by subsector. Statistics Indonesia provided limited information on employment by sex. To the extent possible, then, labor was distributed by sex according to the overall sector shares occupying women and men, and overall numbers were generated to balance out the entire sector or subsector. Again, this is an iterative process.

To operate the COVID-19 Economic Impact Assessment Model requires total employment numbers for 2019. The growth rate in total employment for each of the years 2015 to 2017 is averaged; that average growth rate is then applied to project employment in 2018. Subsequently, the growth rates for 2016, 2017, and projected 2018 are then applied to calculate total employment in 2019.

Poverty

Poverty data are based on head-count methodology and are from the World Bank's World Development Indicators, which are consistent with poverty data from Badan Pusat Statistik. The data are through 2019. They are presented as the percentage of population living in poverty, broken down by male and female, with female poverty being slightly greater than male poverty.

The poverty rates and numbers of persons living in poverty are projected to 2020 using the Exponential Time Series (ETS) method applied in Excel's Data/Forecast Sheet add-in. ETS is used to forecast what poverty might have been in 2020 were this a "normal" year, i.e., one where the economy and employment were growing at rates similar to the recent past. This method creates a "baseline poverty" for 2020.

To forecast poverty, the change in poverty was calculated with respect to the change in employment, using data from 2013 to 2019. The average of this calculation was taken and multiplied by the change in employment already forecasted.

Timing the Shutdown

The COVID-19 Economic Impact Model attributes all the loss in GDP as being incurred in the four-month period starting with the weeks leading up to initial shutdowns, whether officially imposed or voluntarily applied. In Indonesia, based on various indicators the shutdown is pinpointed to have begun the week of March 10, 2020. One indicator is Apple's mobility report on people driving, presented in Figure 1.⁴ Other indicators, such as Apple's pedestrian mobility, and Google's mobility reports on visits to grocery stores, retail, and recreation locations, parks, transportation stations, and other locations are all consistent with Figure 1.⁵

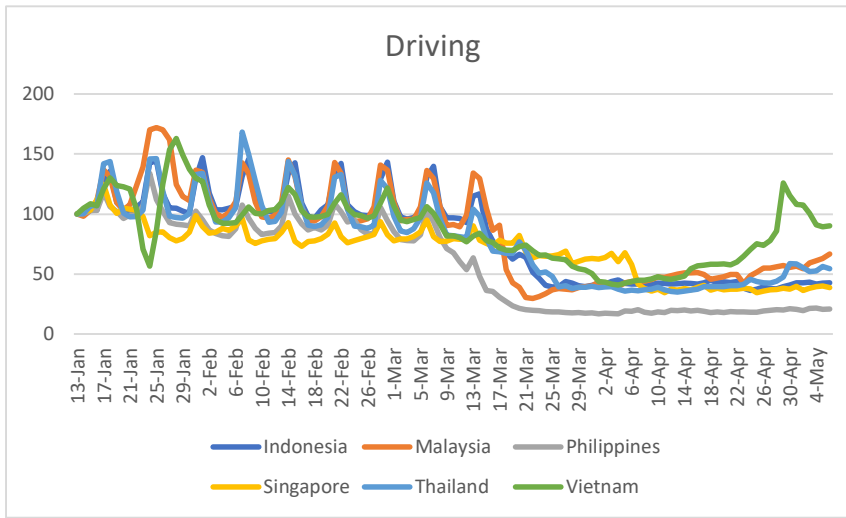
Figure 2 presents the Purchasing Managers Index through April of this year. Indeed, according to Markit, "The IHS Markit Indonesia Manufacturing PMI plunged to 27.5 in April 2020 from 45.3 in March, pointing to the steepest contraction on record, as measures to contain the coronavirus pandemic led to factory closures and slumping demand. Output, new orders and employment all fell the most since the survey began in April 2011, with export sales dropping severely."

⁴ <https://www.apple.com/covid19/mobility>

⁵ Google. *COVID-19 Community Mobility Reports*. <https://www.google.com/covid19/mobility/>

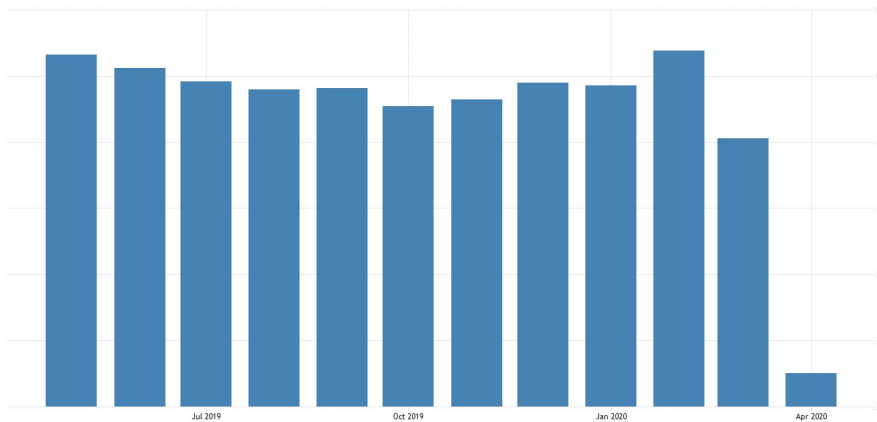


Figure 1 Trends in Automobile Driving in the ASEAN - 5



Source: Apple Maps. <https://www.apple.com/covid19/mobility>

Figure 2 Purchasing for Industry Spikes in February and Plummet in March and April



Source: IHS Markit

Demand and Supply Sectoral Impacts

In the Indonesia trial case, national accounts information of value-added by productive sectors were taken from Statistics Indonesia (Badan Pusat Statistik) for 2019. This includes fifty sectors and subsectors under the broader classifications of agriculture, industry, and services.

The COVID-19 Economic Impact Model facilitates customized input on expected declines or increases in demand for the product of these sectors. Based on the assumed sectoral change in demand and value-chain constraints, the Model automatically calculates the associated change over baseline in employment, disaggregated by gender. This calculation is based on historical sectoral value-added per person and statistics on the gender composition of each sector of the economy. The Model requires constraining

the sectoral changes, in aggregate, in an iterative process to be consistent with the IMF projected growth rate changes discussed earlier.

Creating Scenarios by Modifying Second-Round Impacts

Macroeconometric models calculate GDP growth in a simultaneous-equations framework based on autonomous-spending or Keynesian multipliers. These multipliers capture the immediate impact of shocks or other exogenous changes to an economy, such as fiscal or monetary policy or COVID-19-induced shutdowns, as well as its second-round impacts. The Model yields a multiplier of 1.33 for Indonesia, based on consumption, importation, and taxation.

The COVID-19 Economic Impact Model generates three scenarios: high, moderate, and optimistic impact. High impact assumes that the entire annual impact, including second-round impacts, are all experienced during the crisis period. Moderate impact assumes that second-round impacts are moderated by a declining autonomous-spending multiplier that occurs due to increased savings of households worried about the future. This causes the impact to be spread over more months of the year. The optimistic scenario assumes that little or no second-round impacts are experienced during the crisis period, but instead are all spread over all the months of the year. This is calculated by dividing the high-impact value by the implicit autonomous-spending multiplier.⁶

To generate the optimistic scenario, the COVID-19 Economic Impact Model was limited to the immediate impact period; the overall reductions in GDP were reached by dividing by the autonomous spending multiplier, and the same with estimates of overall job losses. Dividing total GDP loss by the autonomous spending multiplier is the optimistic scenario since it implies that all second-round effects only occur after the crisis period. The moderate scenario reduces the applied autonomous spending multiplier. The reasoning behind this is that, in a crisis situation where demand drops before income, people earning income are likely to hoard their cash. In this way, they increase saving because they are unsure what will happen next and with a higher savings rate, the autonomous spending multiplier decreases. The following excerpt illustrates this point.

At the beginning of the first stage, which started a few days ago, economic activity drops because individuals cannot go out shopping, not because of lack of income, and because workers are impeded to go to their workplaces, not because firms lack sales. Nonetheless, this situation will soon evolve: as lack of economic activity reduces firms' sales, layoffs will start and workers' incomes will drop; the income of the self-employed will also drop, even if they keep on carrying out their regular activities (assuming sanitary restrictions allow). Towards the end of the first stage, what started as a crisis due to the need to isolate individuals, will evolve into a "traditional" economic crisis, in the sense that economic activity will be depressed because of lack of demand and income, not because people cannot be together.

UNDP LAC C19 PDS N°. 1 A Conceptual Model for Analyzing the Economic Impact of COVID-19 and its Policy Implications Suggestions for the Emergency, by Constantino Hevia and Andy Neumeyer - UNDP LAC C19 PDS N°. 2

⁶ This is a handy way to generate scenarios, but it is not meant as policy guidance.

Annex: External Review

EIU Input on Devtech Macroeconomic Scenarios for Indonesia

Prepared by Tom Rafferty, EIU Asia Regional Director

John Marrett, EIU Indonesia Country Analyst

May 15, 2020

Background introduction from DevTech: “Attached is our report on using the COVID-19 Economic Impact Model. The model has its own, already decided structure, and the overall GDP impacts are taken from an exogenous source, i.e., the IMF. What we need from the EIU is to give us your response to our Assumptions on page 3. The EIU should understand that BASELINE means what would have been the value had there been no COVID-19 crisis.”

1. **Questions:** Do the assumptions overall generally look reasonable? Do you suggest alterations in the assumptions, but within the framework of the assumptions – must all relate to supply and demand of the productive sector?
 - a. *EIU Response:* The assumptions look reasonable based on the EIU’s forecasted outlook for Indonesia, no changes to suggest from our side. We have included ~4 pages of excerpts from our Indonesia Country Forecast that you are welcome to incorporate into your report though you will note that our forecasts don’t go down to the granular sector-specific level that you note in your assumptions.
 - b. The alterations that we have to suggest relate not to your sector-based assumptions but rather to detail within the subsequent Macroeconomic Resilience section. More specifically, we recommend that DevTech add into this section:
 - i. Mention of the sensitivity of the exchange rate to changes in fiscal position in Indonesia. This could be a limiting factor - i.e. rising deficit provokes further depreciation, raising the external burden.
 - ii. Mention of the incipient use of quantitative easing by the central bank, which will ease the constraints implied by the traditional indicators highlighted, via holding down/lowering public domestic borrowing costs and sustaining/raising money supply growth in the short term.
2. **Question:** Overall, do you think the results are too pessimistic, optimistic, or in line with your current understanding of what is happening in Indonesia?
 - a. *EIU Response:* We have a comment indicating that the impact results that you’ve presented may be too optimistic. More specifically, on page 12, DevTech writes, “to forecast poverty, we calculate the change in poverty with respect to the change in employment using data from 2013-2019.” In the experience of the EIU’s Indonesia country team, unemployment statistics for Indonesia tend to be unreliable because they do not take full account of informal employment and losses that may be incurred on the informal side of the labor market. You could account for the informal labor market –and thus present a more comprehensive picture of unemployment- by taking the Indonesian statistical agency’s (BPS) data on poverty per sector (excluding industries dominated by formal employment/skilled labor) and back testing a simple model using employment per sector against income per sector (with some basic assumptions about growth in the



capital stock to estimate change in returns to labor). Alternatively, failing this, you could just use a crude productivity per capita measure (using total working age population) and extrapolate this based on the relationship with previous years poverty rate statistics. This would assume a fairly consistent capital stock but would probably be a more valid method than the change in poverty-to-employment one given still high employment in agriculture and the 'surplus' labour in that sector in Indonesia.