Impact of Covid-19 on Agriculture and Food Insecurity in Asia: A Keynote Speech

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Question and key message

- How does the covid-19 pandemic affect agriculture sector and food security in Asia?
- I'll argue that the pandemic impact on world agricultural production and trade is not so serious as that on the other sectors.
- Moreover the decreased employment and income, and food supply disruption, caused by the government's measures to constrain the pandemic, have posed a serious threat of food insecurity and malnourishment among the vulnerables in the low and middle income countries.
- The paper also discusses some policy debates and argued for global free trade in food and agricultural products, and increasing investment to improve agricultural productivity and food supply chain to deal with the increasing threats of climate change and pandemic.
- Resilience of the food system should be the means, not the end, towards sustainability

Outline

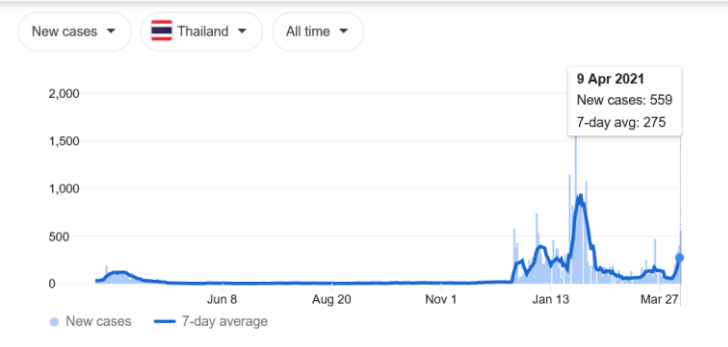
- Three waves of coronavirus pandemic and governments' responses
- The impact of covid-19 on global economy and agricultural production and trade : a macro perspective
- The impact on poverty and food insecurity
- The policy debate and recommendation

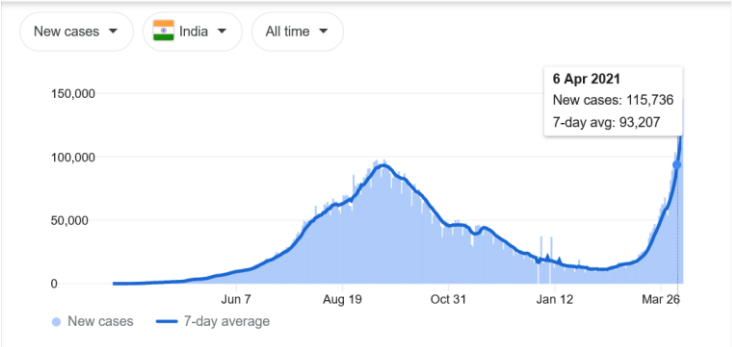
1. Three waves of the Covid-19 pandemic and government responses

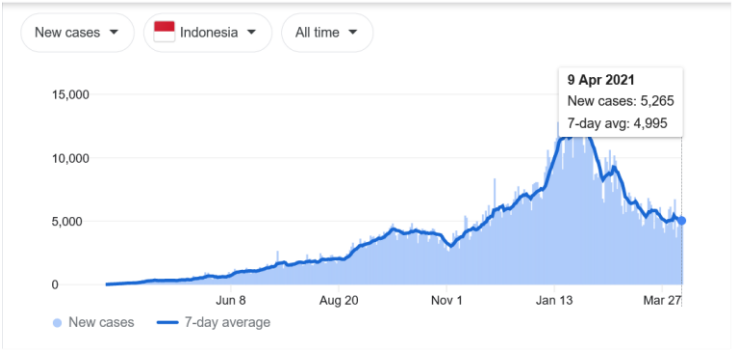
1.1 Coronavirus World Map

- Map of new cases in selected Asian countries
- World Covid Vaccinations map and chart

COVID-19: New Cases (1)

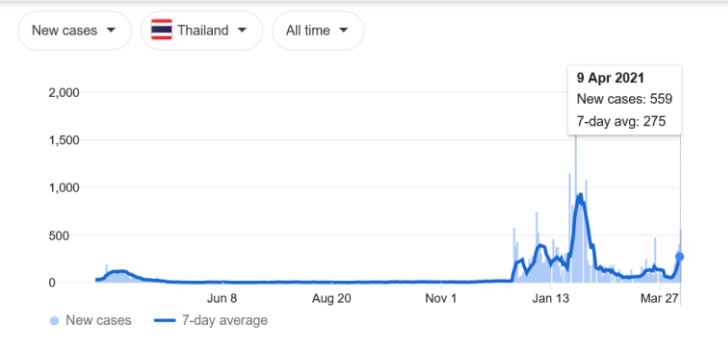


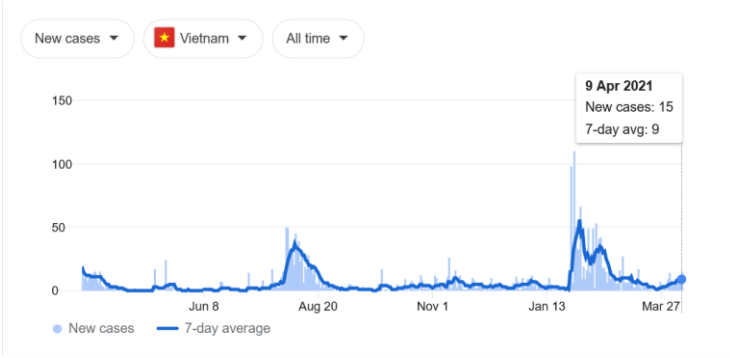


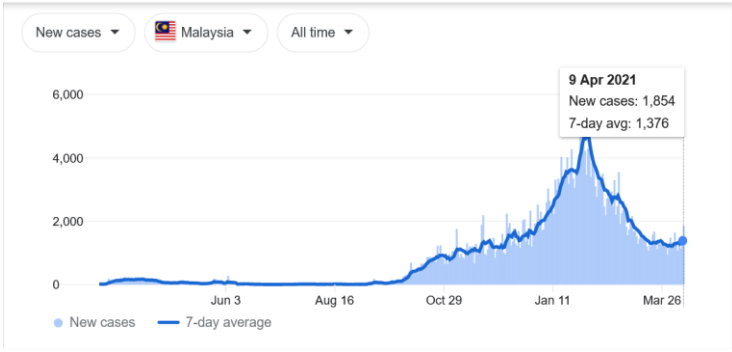


Source:JHU CSSE COVID-19 Data

COVID-19: New Cases (2)

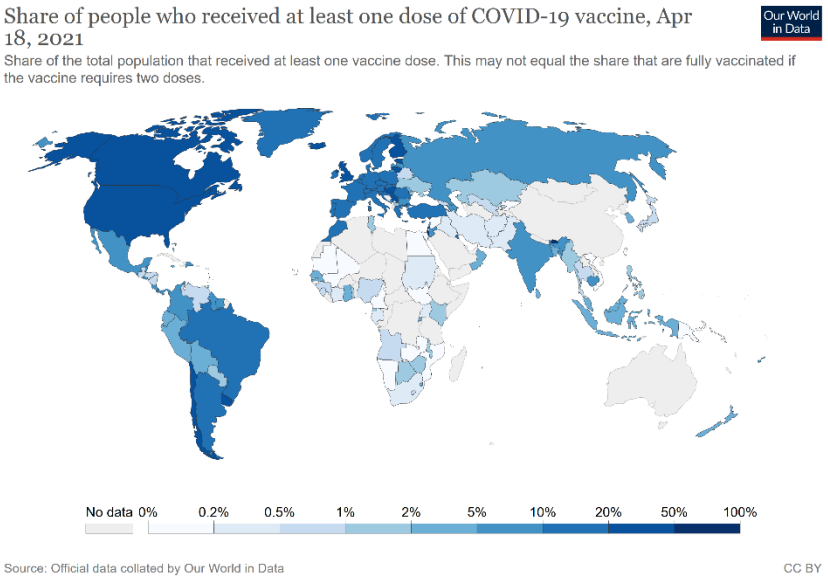


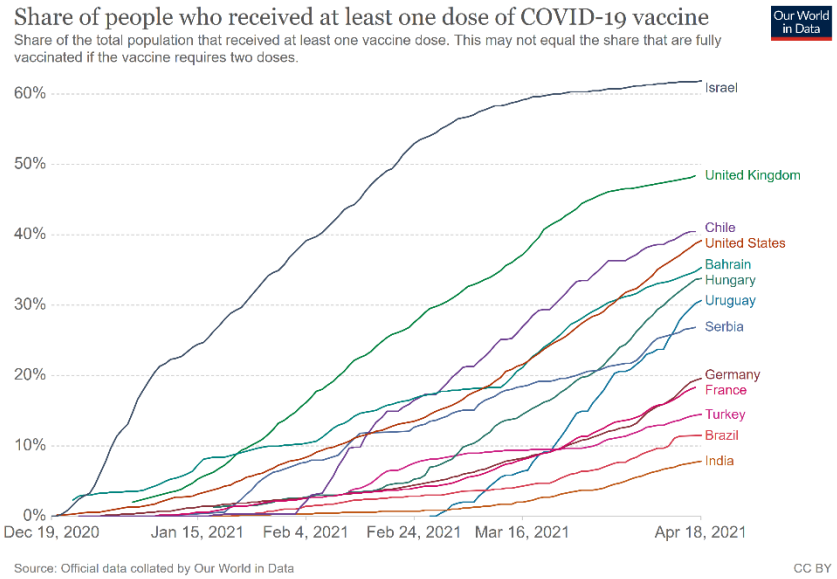




Source:JHU CSSE COVID-19 Data

Vaccinations





Source: Our World in Data, Global Change Data Lab.

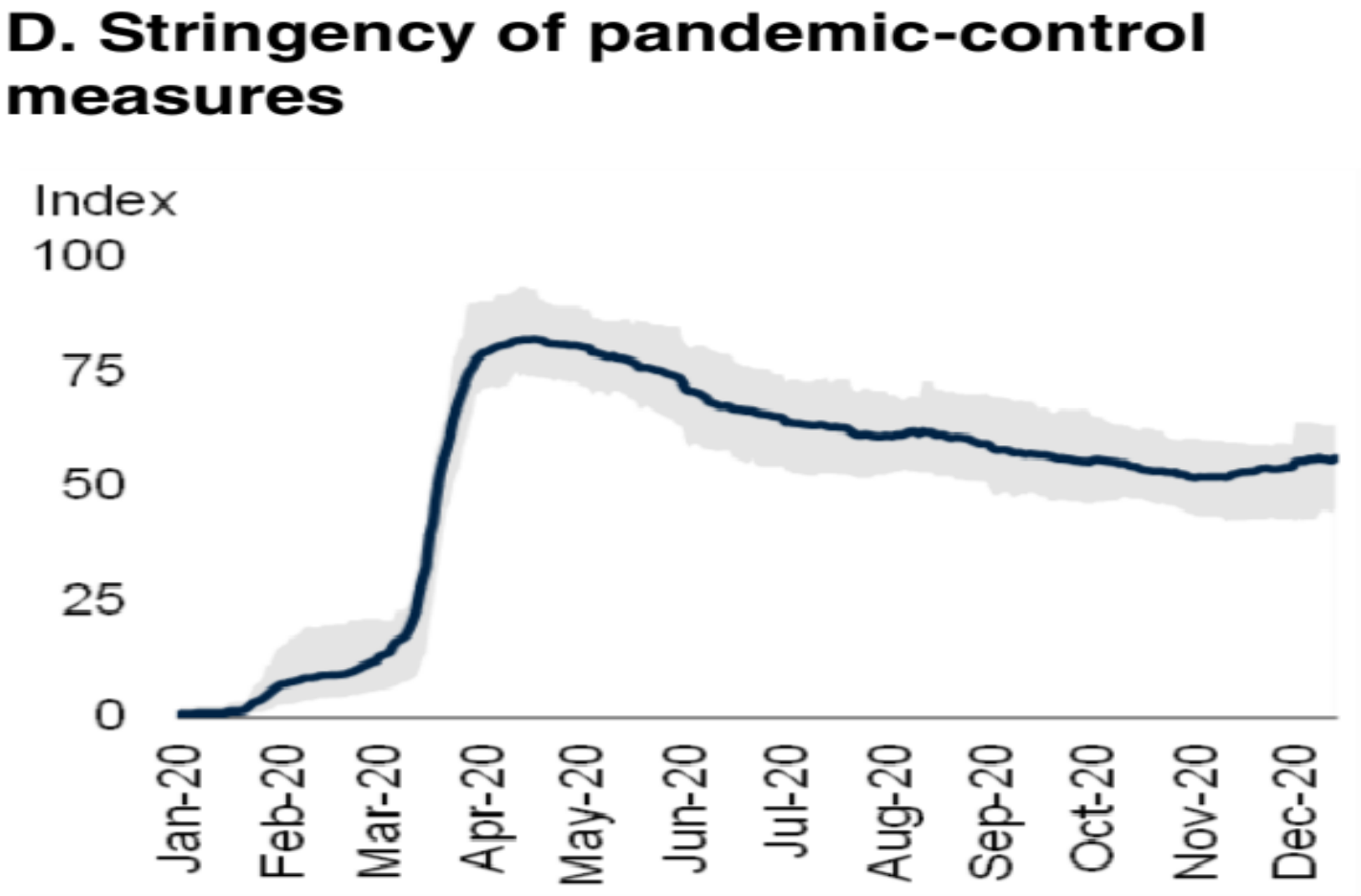
1.2 Most South East Asian countries have managed to keep Covid-19 infection rate lower than other regions, thanks to early and decisive actions, despite weak public health system in many countries

- But poor early governance has been a key driver in high infection rates in Indonesia and the Philippines
- Yet many Asian countries have experienced 2-3 waves of pandemic, e.g., India, Thailand, Vietnam, due to
  - Virus mutation and double mutants (e.g., India, Cambodia, Thailand)
    - There are illegal movements of people across the border, e.g., Thailand which has border with Myanmar and Cambodia
  - Human behavior : false sense of normalcy and thus not wearing masks, attending mass gatherings, etc.
  - Weakness in or lax testing and tracing, e.g., carriers are not getting isolated

1.3 Governments' measures in response to Covid-19

- Sources of data
  - Oxford Stringency Index : 21 indicators under 4 classifications, i.e., containment and closure, health system, economic response, and others
  - Tableau Public, the Covid-19 Data Hub: 5groups of indicators

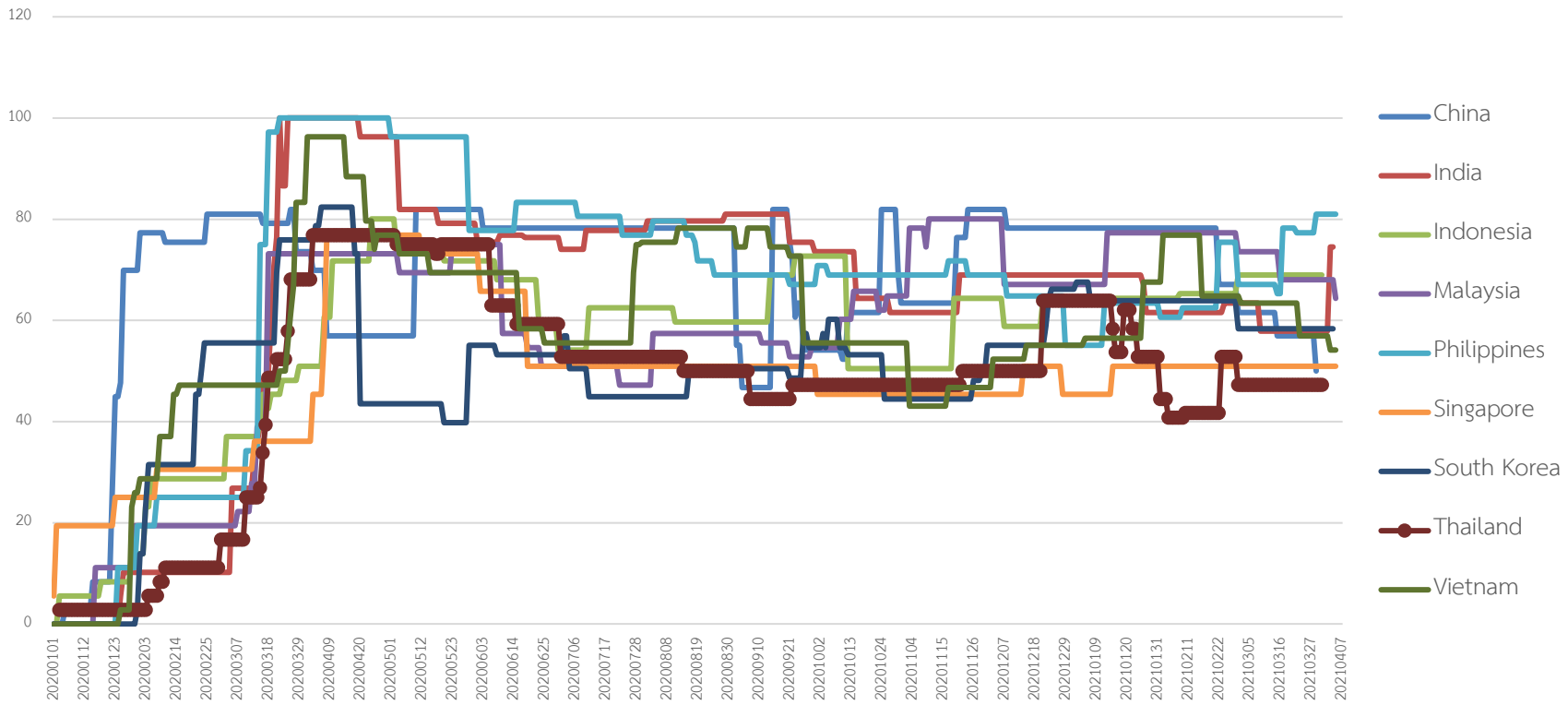
Simple Average Stringency Index for EMDEs



Note: Average sub-indexes of 9 mitigation measures.

Source: World Bank, Global Economic Prospects, Jan 2021.

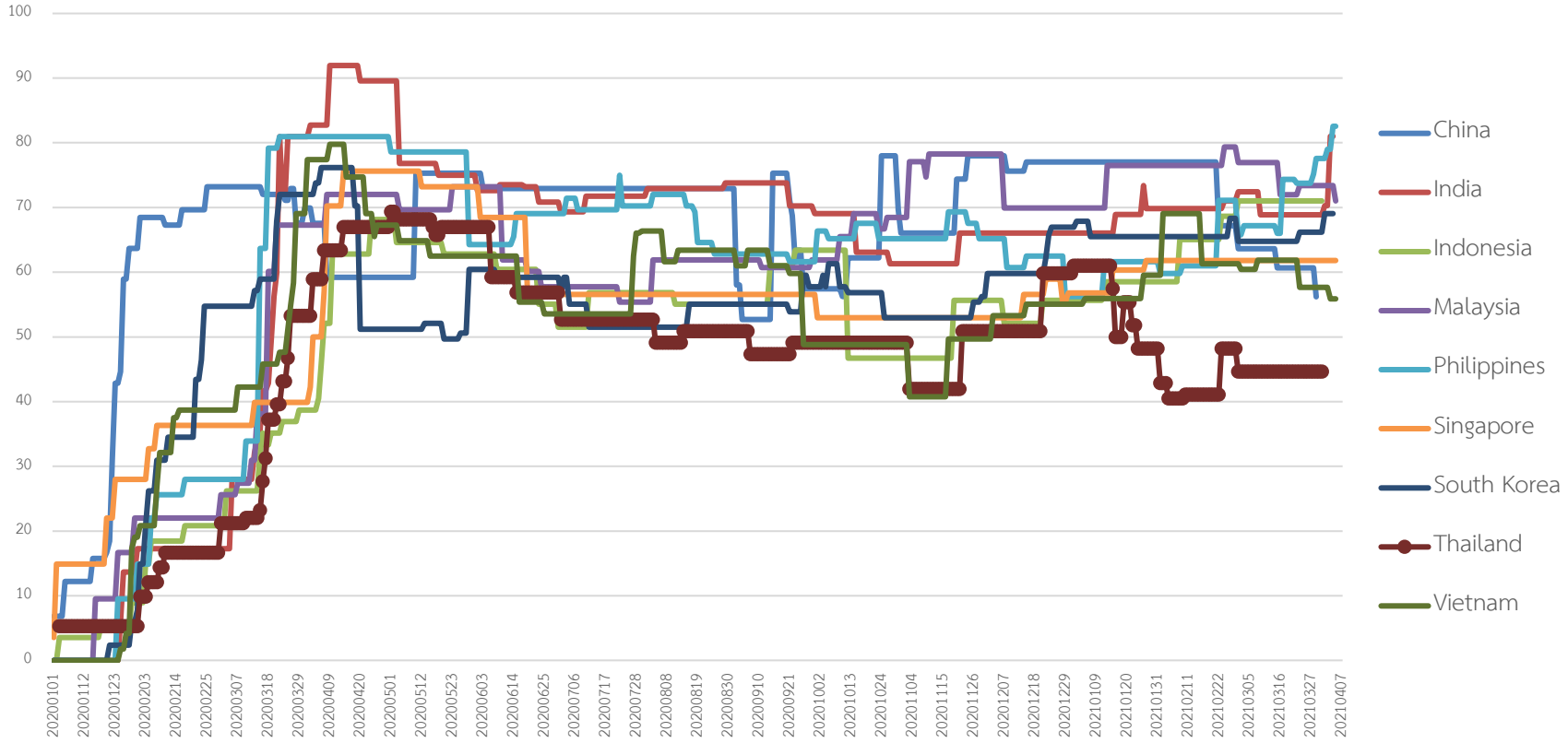
Stringency Index in selected Asian countries



Note: see details in Appendix

Source: COVID-19 Government Response Tracker, OxCGRT.

Containment Health Index in selected Asian countries

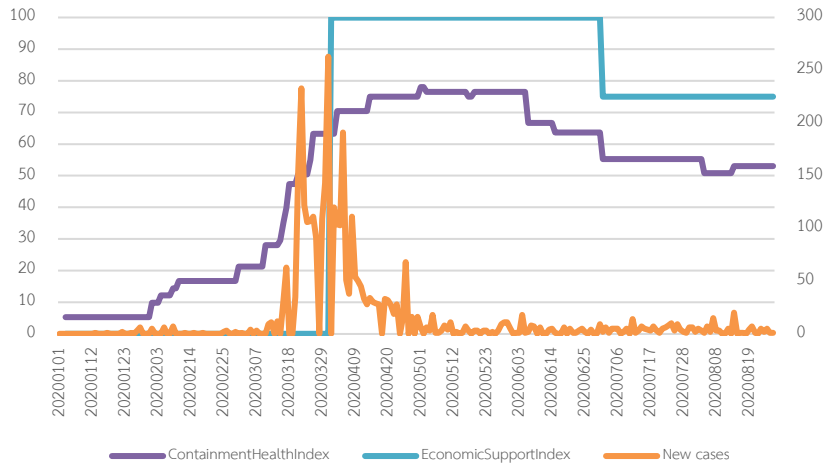


Note: see details in Appendix

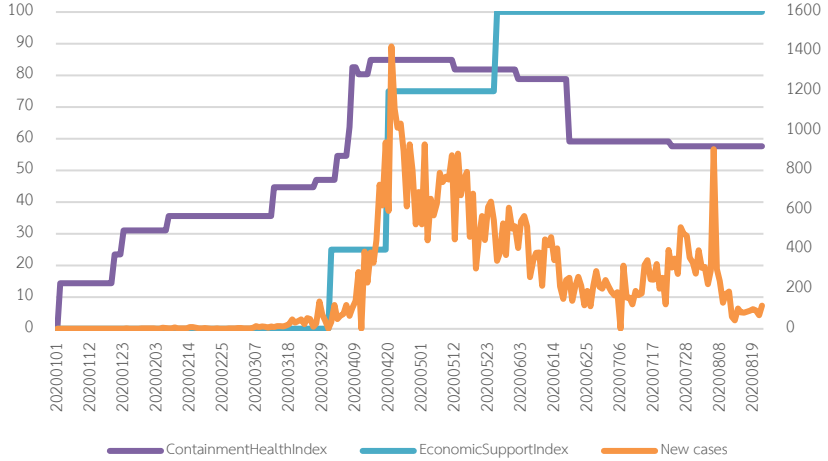
Source: COVID-19 Government Response Tracker, OxCGRT.

Containment Health and Economic Indices vs new coronavirus infected cases

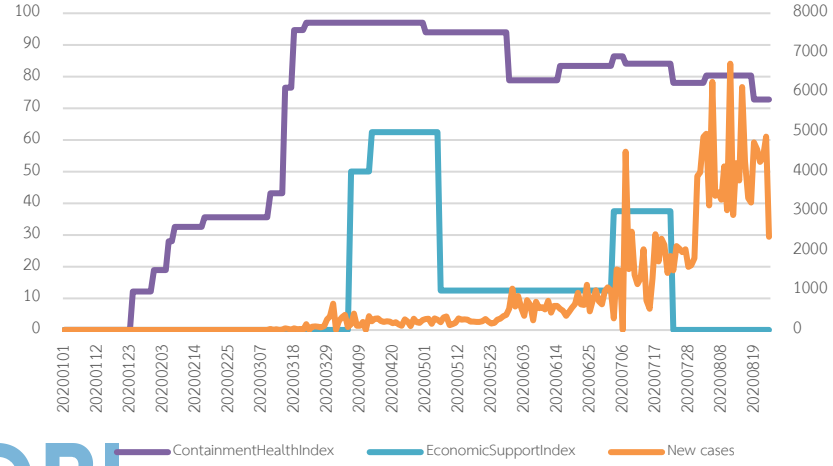
Thailand



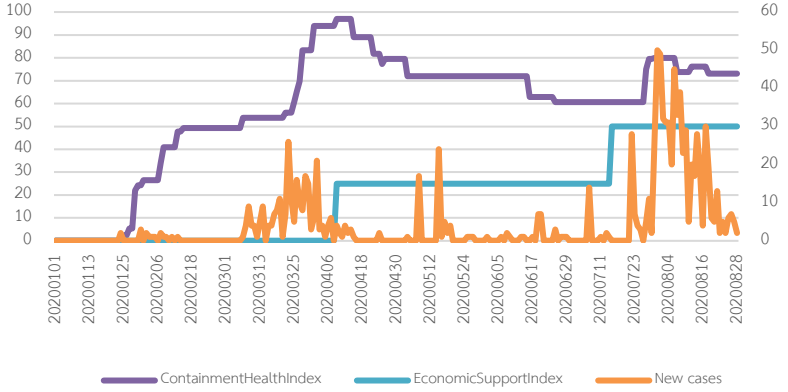
Singapore



Philippines



Vietnam



Source: OxCGRT.

Government Measures in Response to Covid-19 (As of 12/8/2020)

	World	Asia	Pacific	Africa	Europe	America
Governance & Socid economic	4,010	550	401	599	1,399	950
Humanitarian exemption	25	-	2	5	1	14
Lock down	841	151	38	189	130	217
Movement restrictions	4,891	819	395	950	1,065	1,070
Public Hedth meames	7,345	1,030	546	1,123	2,656	1,519
Social Distancing	2,215	459	309	971	2,038	774

Note : (1) Governance & socio-econ measure are
- Emergency administration structure
- Limit imports / exports
- State of emergency
- Econ measures

(2) Lock down
- Partial lock down
- Border checks
- Border closure

(3) Movement restrictions
- Domestic transport restrictions
- International flights suspension
- Surveillance & monitoring
- Awareness campaigns
- General recommendation
- Health screening in airports & border crossing
- Isolation & quarantine policies

(4) Public Health
- Other public heath measures enforced
- Strengthening the public health system

(5) Social distancing
- Limit public gathering
- School closure

Source : Tableau Public

See measures by countries in ASEAN, East Asia and South Asia In Appendix

2. The coronavirus impact on global economy, agricultural production and trade : a macro perspective

- Lock down and public health measures taken to control the pandemic have led to economic contraction
- Lock down measures and economic troubles in turn, have translated into poorer food and nutrition security in SEA and South Asia (to be discussed impart 3).
- The IMF (April 2021) forecasts that the global economy contract by -3.3% in 2020, comparing to 2.8% in 2019.
- In Asia, the economies that suffered the largest counteraction are Philippines (-9.5%) India (-8%), Thailand (-6.1%) and Malaysia (-5.6%)
  - The degree of economic contraction largest the economic structure and lock down measures
- The best performing economies are Bangladesh (3.8%), Myanmar (3.2%, but will sharply worsen to -8.4% in 2021), China (2.3%), and Vietnam (2.9%)
  - Table GDP growth

Table 1 : World Production, Consumption, Stock and Export of Agricultural Products

2018	2018/19	2019/20	2020/21
Wheat (MMY)			
Production	731.0	763.9	776.5
Consumption	732.4	741.1	773.9
Ending stocks	283.4	300.0	295.5
Export	175.5	191.4	196.3
Corn			
Production	1,1249	1,116.5	1,137.1
Consumption	1,127.5	1,128.2	1,148.9
Ending stocks	321.1	303.0	283.9
Export	172.6	175.6	185.1
Rice			
Production	497.3	497.7	504.2
Consumption	484.7	495.6	502.0
Ending stocks	176.5	177.9	177.7
Swine (carcass w), 1,000 mt	2018	2019	2020
Production	102,025	96,698	101,481
Consumption	100,992	96,169	100,853
Export	9,332	11,603	11,544
Chicken meat (1,000 mt)	2018	2019	2020
Production	99,540	100,587	102,060
Consumption	97,433	98,675	100,002
Export	11,831	11,852	16,953
Beef and Veal (mmt)	2018	2019	2020
Production	61,522	60,572	61,543
Consumption	59,466	59,068	60,040
Export	10,900	10,805	11,057

Note: see details by selected countries In Appendix

Source: FAS-USDA, (April 2021).

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- The hardest hit economic sectors are the service (particularly tourism, entertainment and transport), and industry.
- Agricultural and food sector suffered the least
- Agricultural output in South East Asia was, at first, forecasted to decline by 3 percent in 2020 because of the decline in farm employment of 1.4 percent (Sleet, 2020 ; Erigorio and Ancog, AJAD 2020)
  - The output impact is large in low income countries with high share of farm labor, e.g., Lao (62%) Myanmar (49%, Timor are Leste (44%), and Vietnam (37%)
  - Thailand's agricultural GDP growth is forecasted at -3% in 2020, (NESDB, 2021)
  - Indonesia is and exception with positive growth of 2% in Q2-Q3/2020 (World Bank, December 2020).

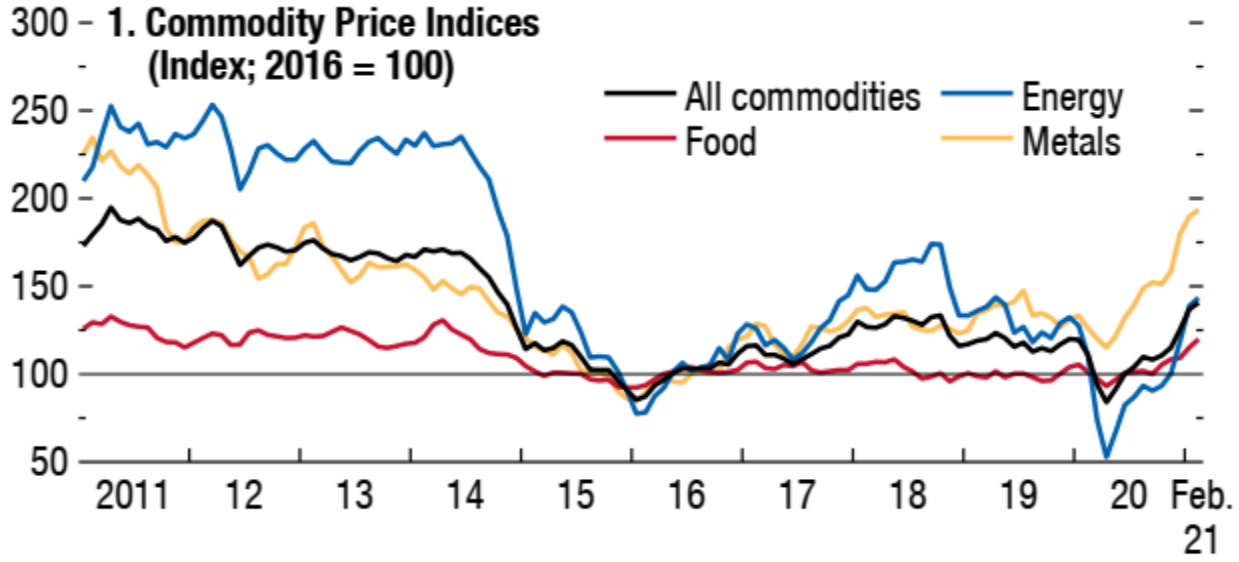
- In India, agricultural GDP was first forecasted to decline because of the lockdown measures which restricted the labor movement during the harvesting season (WBCDS, Vital Supply Chains Project, 2021).
  - But latest data show that agricultural GDP grew at 3.4% in 2020 (Cariappa, et al. 2021, Outlook on Agriculture)
- Agricultural GDP in China was also forecasted to suffer negative growth (-3.2% in Q1/2020) but rebound to 3.3% in Q2 and +3.9% in Q3/2020 (J. Huang 2020)
- However global agricultural production and trade, particularly the main staple cereals (rice, wheat) increased, according to FAS-USDA (April 2021)
  - Coase grain production increased by 12 million tons from 1,399 mt in 2018/19 to 1,411.7 m t in 2019/20 (USDA-FAS)
  - Stock to utilization ratio also increased (see Table) (Table)

- Unlike the food crisis in 1970s and 2007 / 08, there was no serious world food supply shock in 2000, except
  - The African Swine fever in China and Vietnam in 2018-19
  - But the pork shortage in China was offsetted by increased pork import from USA, increased domestic chicken production, higher chicken meat import from Brazil and Thailand, as well as increased beef import
  - The decreased production of oil seeds (particularly soybean in USA, and palm oil in Malaysia) was made up by increased production and export of soybean oil, and reduced ending stock of oil seeds.

- Export restrictions have been less common during the lock downs than during the 1970 commodity price crisis and the 2007/08 world food crisis because
  - Production of rice and wheat were close to record high
  - Stocks of three main staple grains are ample
  - Oil price was historically low, resulting in lower demand for bio-fuel from sugar come and maize, and put additional pressure on prices of those products.
    - Lower oil price also helped keep nitrogen fertilizer affordable
  - The minor exceptions are the temporary ban on rice export in Vietnam, Cambodia (non-fragrant rice) and Myanmar,
    - but not India, Thailand and Pakistan, the world largest, second, and fourth largest exporters
  - Thailand also temporarily ban egg export, but it did not have any impact on global market as its export is only 1% of world trade

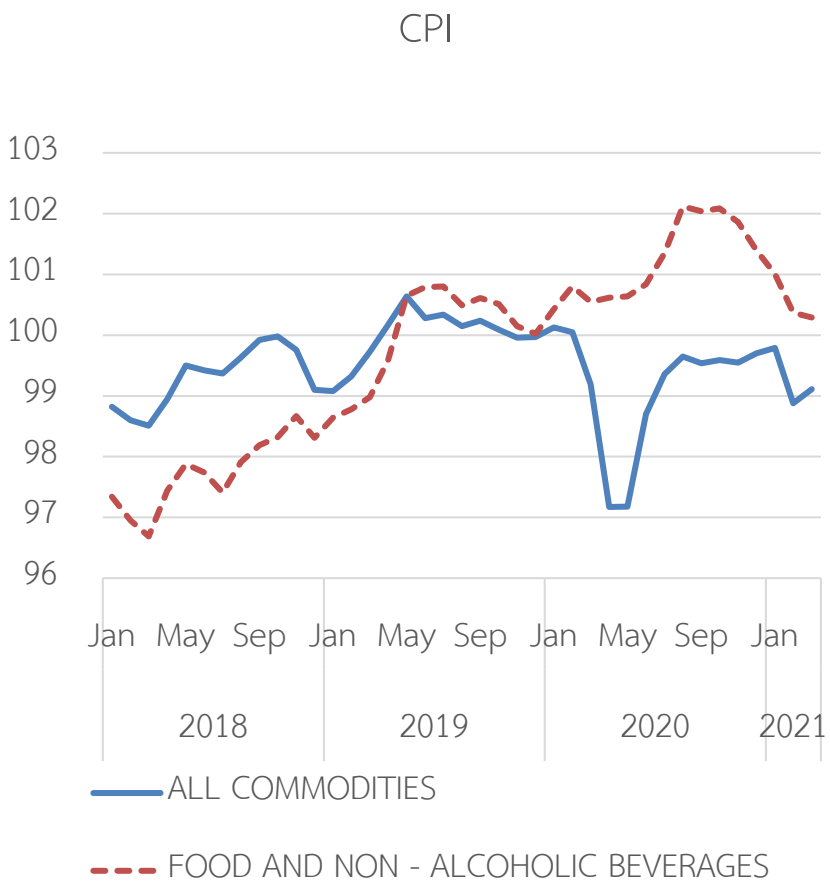
- Yet the world food price has been on a rise, thanks to the logistic disruption and speculation
  - Many countries have also experienced higher domestic food price

Figure 1.SF.1. Commodity Market Developments



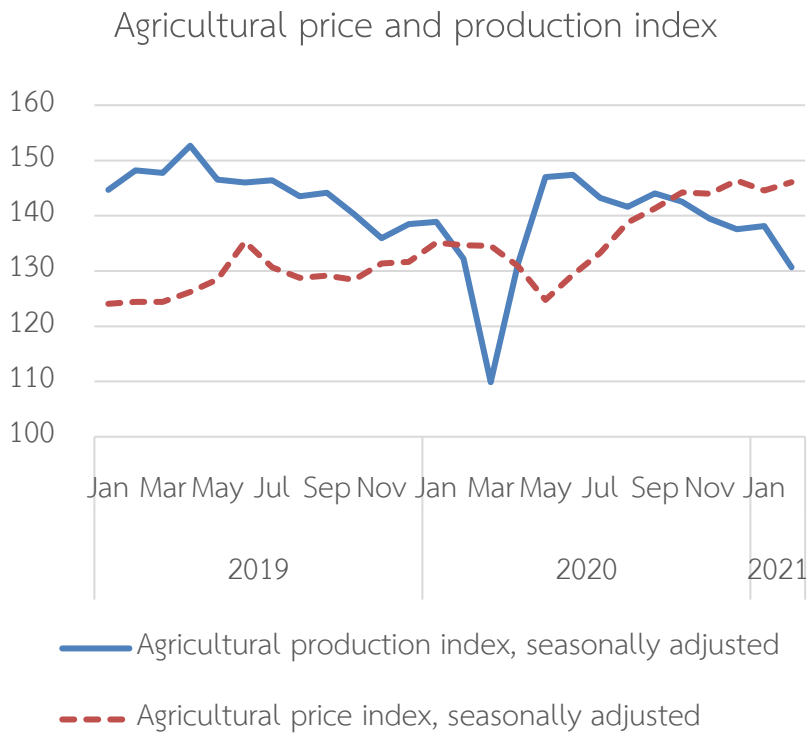
Thailand

CPI and Food CPI



Source: ETDI, MOC.

Agricultural price and production indices



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- An interesting question is whether or not the pandemic is a structural catalyst for a commodity super cycle, as argued by the Economist (January 16, 2021 : 39)
- In summary, agricultural GDP is forecasted to decline in only a few countries (Thailand -3% in 2020) or in some quarters (Q2 & Q3 in China), but increase in other countries, (India+3.4%, Indonesia, 2-2.5% etc)

3. The pandemic impact on poverty and food insecurity

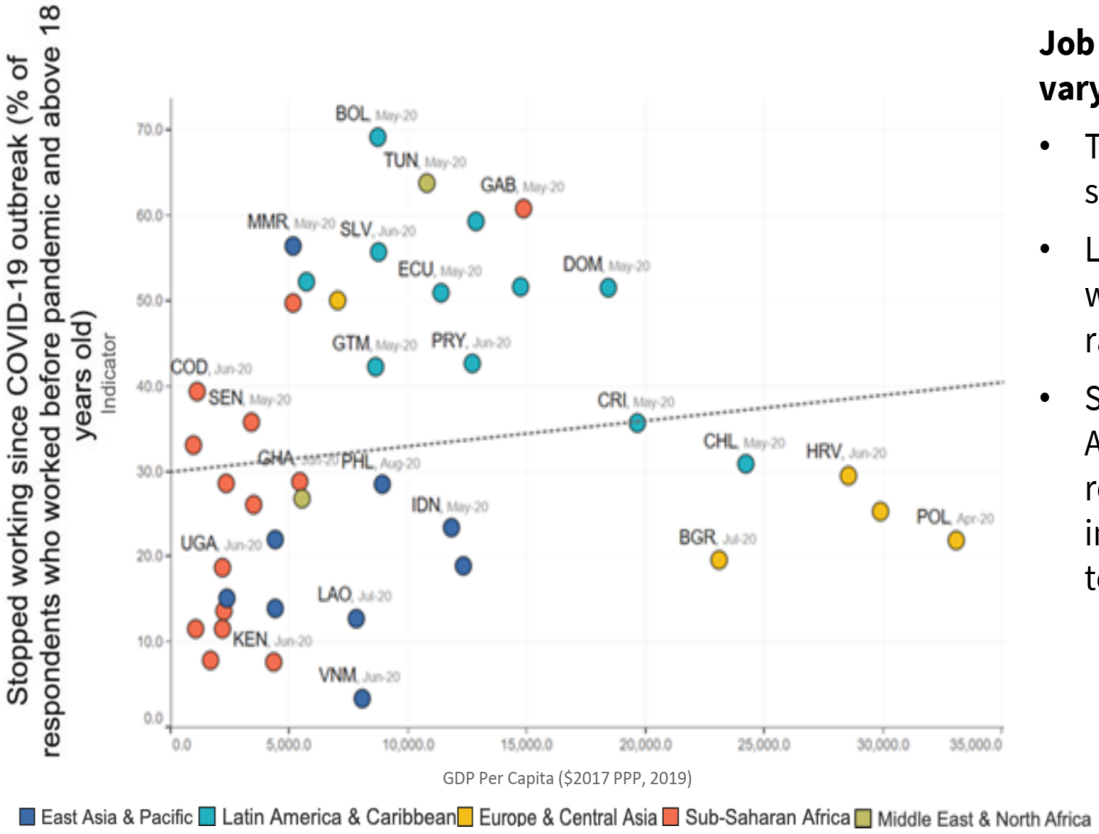
- Definition : There is food and nutrition security if all people at all times have physical, social and economic access" to sufficient (or availability), safe and nutrition's food that meets their preferences, and dietary needs for an active and healthy life
- What are factors explaining changes in the prevalence of undernourishment ? According to Timmer (2000), they are :
  - GDP per capita growth : 1 percent increase in per capita income will reduce undernourishment by 0.95% (IMF, April 2021)
  - Food price inflation : a 2-percent increase in food price increases undernourishment by 0.24%
  - Social transfer aimed at protecting the vulnerables
  - Initial conditions
  - Moreover, a decline in household income will force people to substitute cheaper staple foods for protein foods.
    - To the vulnerables, such move is a descent into poverty.

- What is a pathway from pandemic to food insecurity ?

  1) Disruption in access to food due to people's loss of employment and reduction in income leads to food insecurity

  - Job loss is the highest in the middle income countries, e.g., Indonesia, Philippines and Thailand as evidenced by the inverse U-shape relation between job stoppage and GDP per capita
  - A large number of people stop working temporarily, or work less with reduced income
    - In India, number of people in work fell by 118 million from 400 mil in 2019 to 282 million in April 2020 (The Economist, June 13th 2020, data from CMIE)
    - In Thailand, unemployment rate increased from 0.98% in 2019 to 1.95% in Q2/2010 and 1.90% in Q3/2020.....but the Labor Force Survey underestimated the number of unemployed.
    - Research centers estimate that total unemployed, including those who stopped working temporarily, is 4 million, or 10%

WHAT'S NEW? | The job stoppage rate is low in both low and high-income countries



Job stoppages since the start of the COVID-19 outbreak vary widely across countries

- There is an inverse-U shape relationship between job stoppages and GDP per capita.
- Low and high-income countries exhibit the lowest rates, whereas middle-income countries exhibit the highest rates.
- Some regional patterns also emerge. In sub-Saharan Africa, East Asia & Pacific, and Europe and Central Asia regions, the job-stoppage rates tend to be lower. Whereas in the Latin America & the Caribbean region, the rates tend to be higher.

Source: World Bank, *Covid-19 High-Frequency Dashboard*, February 2021.

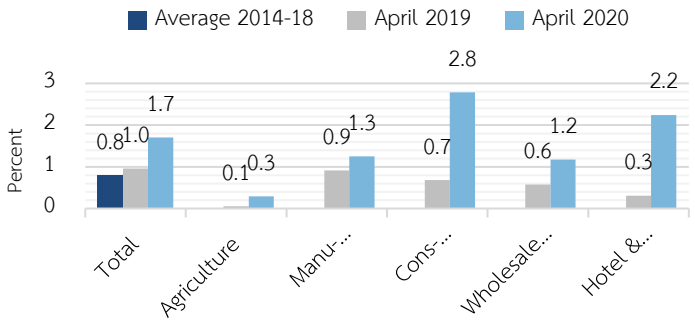
- Some unemployed family members go back home, and impose the additional pressure on agricultural household expenditure

Countries	Unemployed % of households	Reduced farm income % of households	Reduce remittance % of households
Cambodia	14%	76%	75%
Indonesia	23%	70%	74%
Lao, PDR	13%	46%	54%
Myanmar	57%	na	72%
Philippines	29%	80%	60%
Vietnam	3.4%	na	na

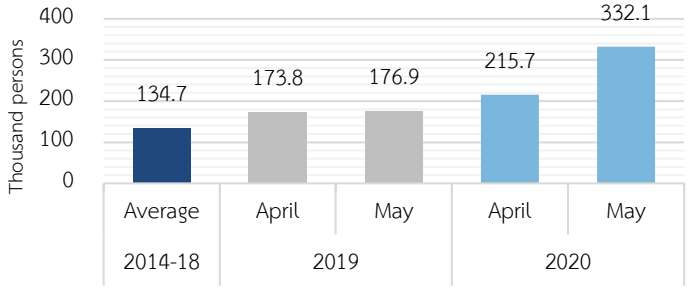
Coronavirus impact on unemployment in Thailand

- **Employment & Unemployment rate**
  - Employment has dropped by over 1 million in April.
  - Unemployment rate increased from an average of 0.8% during 2014-18 to 1.7% in April 2020 in all sectors, especially in construction.
  - Unemployment may be 3-5 million in September. (KKP research)
  - Number of unemployment benefit claims from the social security schemes rose rapidly since April, reaching over 1.37 million under Article 33 and 0.9 million under Article 75 in the first half of the year.

Unemployment rate (%)



Unemployment benefit claims under social security scheme Article 33



Source: Labor Force Survey and Social Security Office with TDRI calculation

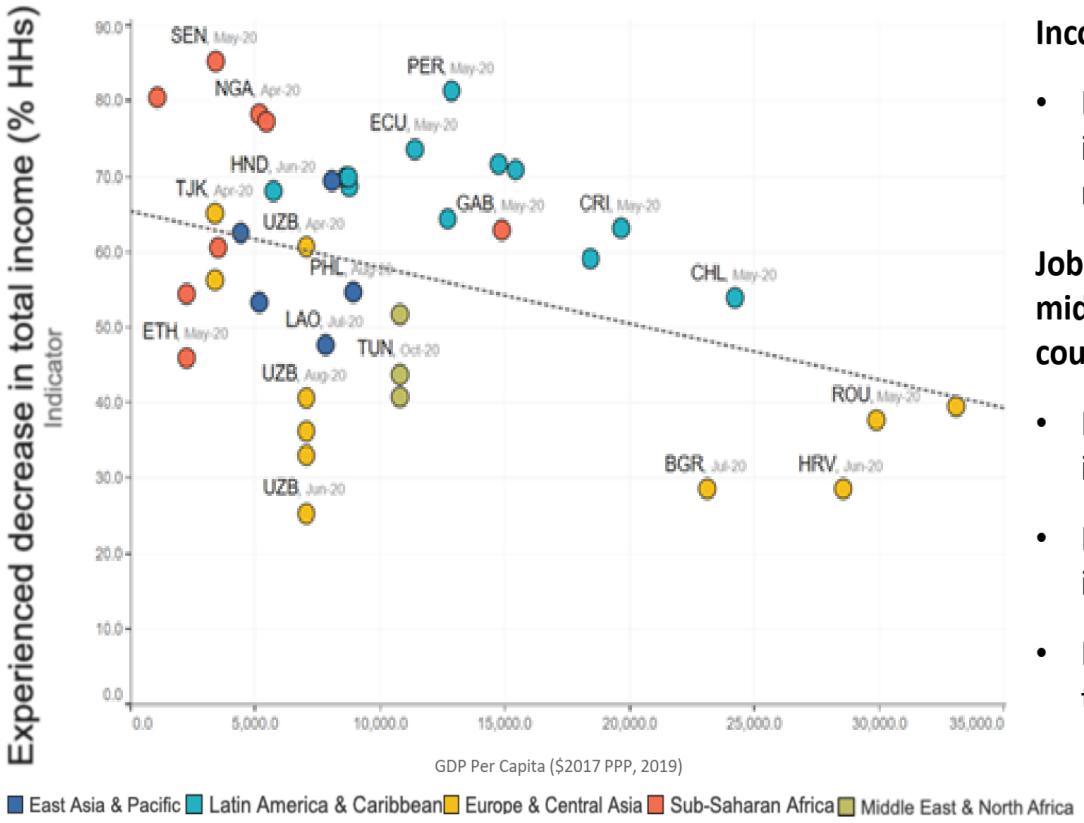
- What is a pathway from pandemic to food insecurity ? (cont.)

1) Disruption in access to food due to reduction in income

- Both low-and middle-income countries have suffered the highest ratio of income loss (World Bank, Feb 2021)
- Farm families in Asia which depend heavily on income from off-farm employment experienced sharp decline in household income, and remittance as their household members were laid off from their non-agricultural jobs

WHAT'S NEW? |

Employment appears a good predictor for income losses in middle and high-income countries but not in low-income countries



Income losses since COVID-19 outbreak vary across countries

- Low and middle-income countries exhibit higher rates of income losses whereas high-income countries exhibit lower rates of income losses.

Job-stoppage rates are a good predictor for job losses in middle and high-income countries but not in low-income countries.

- In high-income countries, both low job-stoppage and income-loss rates are low.
- In middle-income countries, both job-stoppage and income-loss rates are high.
- In low-income countries, the job-stoppage rate is low, but the income-loss rate is high.

Source: World Bank, *Covid-19 High-Frequency Dashboard*, February 2021

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Results from WB's High-Frequency Monitoring Dashboard of Covid-19 Impact on income, employment and food security

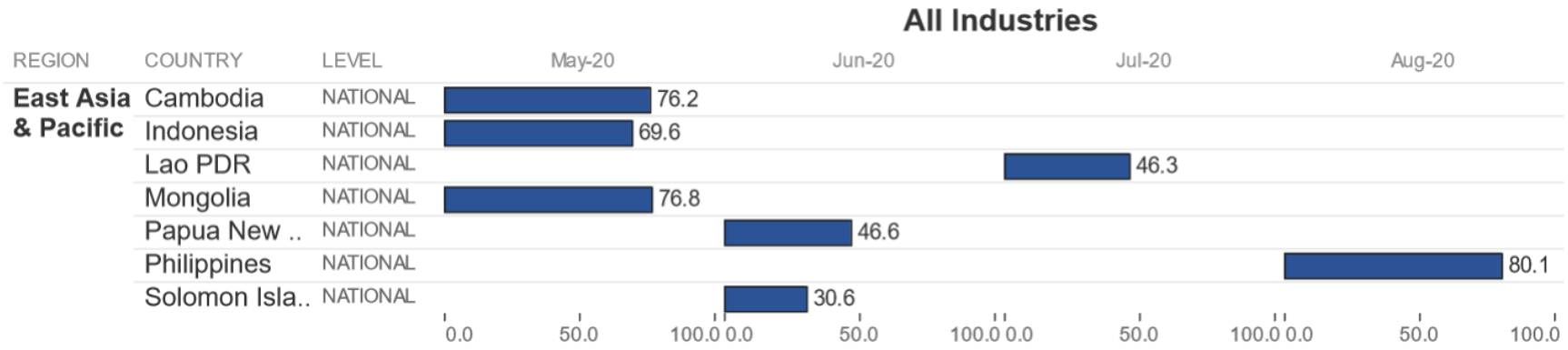
Indicators	Bangladesh	Cambodia	Indonesia	Lao	Myanmar	Mongolia	Philip	Vietnam
% HH experienced decrease in remittance		74.7 (5/20)	74.3 (5/20)	53.9 (7/20)	72.0 (5/20)	76.8 (5/20)	59.7 (8/20)	
% HH experienced decrease in farm income		76.2	69.6	46.3			80.1	
% HH experienced increase in total income				13.8	4.3 (4/20)		2.4	0.0 (6/20)
% HH engaged in non-farm enterprises		34.8 (5/20) 31.7 (8/20)	52.2		24.5 (5/20) 23.9 (10/20)	16.9 (4/20) 23.6 (11/20)		24.6 (6/20)
% respondent stopped working since covid-19 outbreak		14.0	23.4	12.8	56.6	18.9	28.5	3.4
% HH ate less than they should due to lack of money in the last 30 dops					11.1	16.7 (4/20) 14.9 (11/20)	60.4	
% HH hungry but did not eat due to eack of money in the last 30 days					5.0 (4/20) 19.1 (10/20)	6.1 (4/250) 5.1 (11/20)	28.8	
% HH reduced consumption of goods during the pandenic		76.3 (4/20)	79.8 (4/20)	27.0 (4/20)	56.6 (4/20) 52.8 (10/20)	19.3 (4/20) 17.5 (10/20)	68.3 (4/20)	
%HH sold assets to pay for basic living expense during the pandemic		16.7	14.7	1.3	9.1 (4/20) 14.8 (10/20)	2.9 (4/20) 1.6 (11/20)	7.2	
% HH received any food of gov't assistance since the start of pandemic	15.9	9.6	71.5			68.9	81.6	24.5
% HH received gov't assistance after losing job/receiving less income		9.9	71.4			80.9	80.8	17.7

Source : The World Bank, High-Frequency Monitoring Dashboard. Note: date surveyed in parenthesis

Decreased farm income in EAP

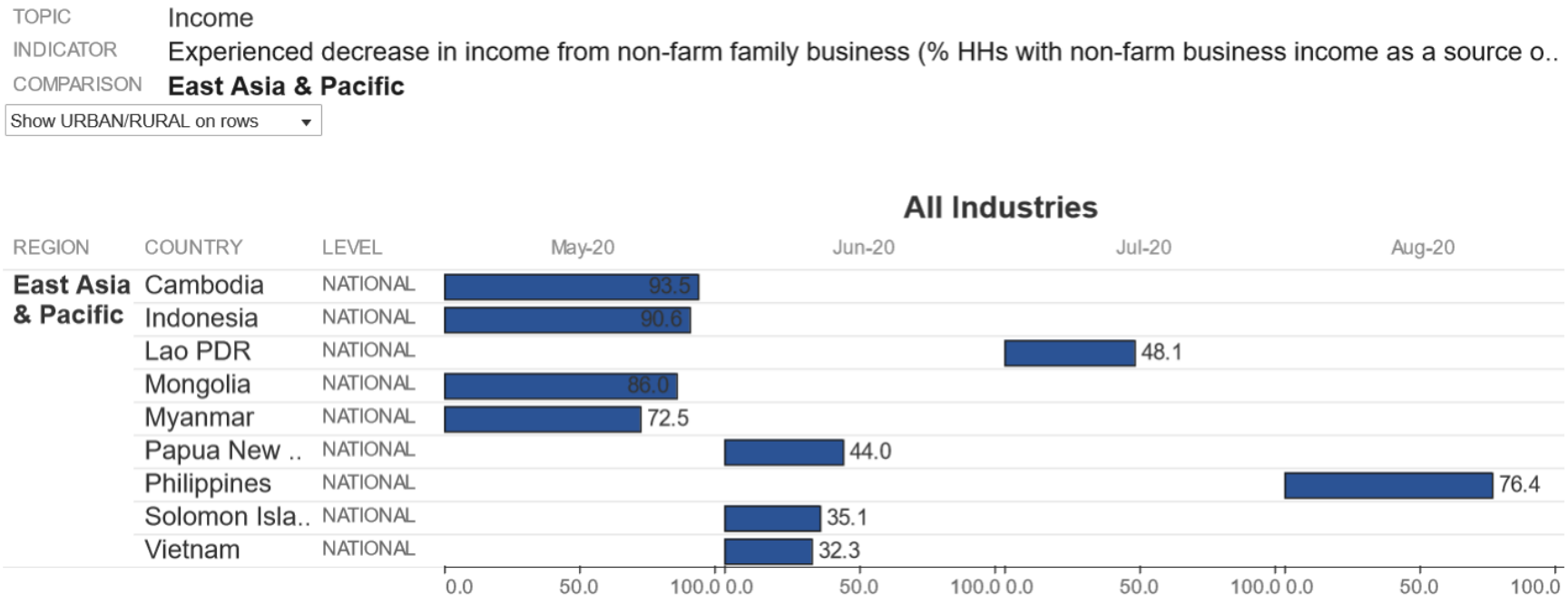
TOPIC Income
INDICATOR Experienced decrease in farm income (% HHs with farm income as a source of livelihood in the last 12 months)
COMPARISON **East Asia & Pacific**

Show URBAN/RURAL on rows



Source: COVID-19 High-Frequency Monitoring Dashboard, The World Bank

Decreased income from non-farm enterprise in EAP



Source: COVID-19 High-Frequency Monitoring Dashboard, The World Bank

- Loss of employment and reduction in income resulted in higher poverty incidence
  - IMF estimates that the number of extreme poverty (with daily income less than $1.9) will increase by 150 million in 2021, accounting for 9% world population
  - Thailand : urban poverty is expected to increase from 4% in 2019 to 6% in Q2 /2020 and 9% in Q3/2020 if there was no government intervention (UNICEF 2020)

(2) Disruption in the physical access to food in the urban outlets, especially during the time of complete lockdown, resulting in higher urban food price

- But in some countries, the lock down, has resulted in new form of food deliveries via online platforms

(3) Disruption in logistics for both domestic and export markets resulted in reduced supply of fresh food products (as some vegetables and fruits were left rotten) to the cities

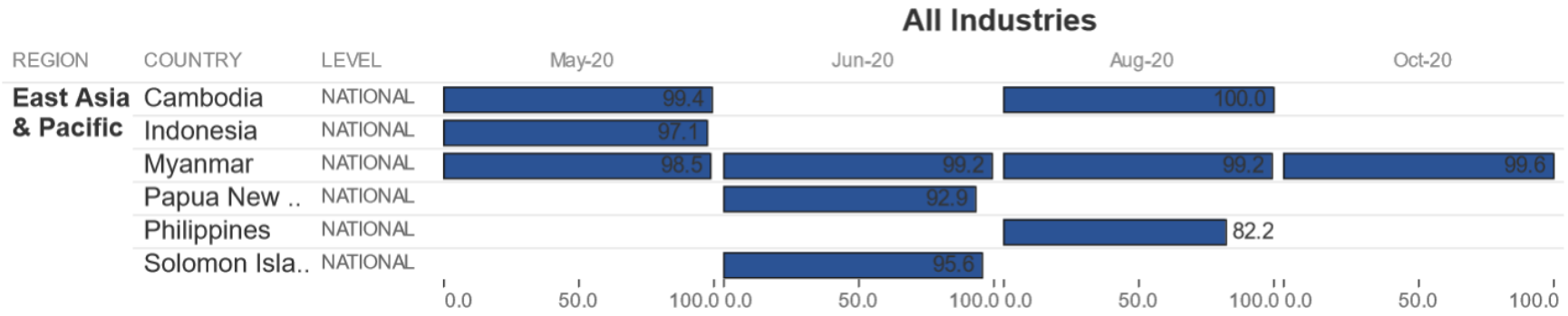
- Farm gate pries of most F&V and fish declined temporarily
- Yet the higher logistic cost and speculation pushed up the retail food price inflation

- Evidence of food insecurity
  - The World Bank's High-Frequency Monitoring Dashboard in several EAP countries reveal that a significant number of survey households have serious access to food

Still high % households able to access staple food

TOPIC Food Security
INDICATOR Able to access any staple food in the past 7 days (% of HHs)
COMPARISON **East Asia & Pacific**

Show URBAN/RURAL on rows

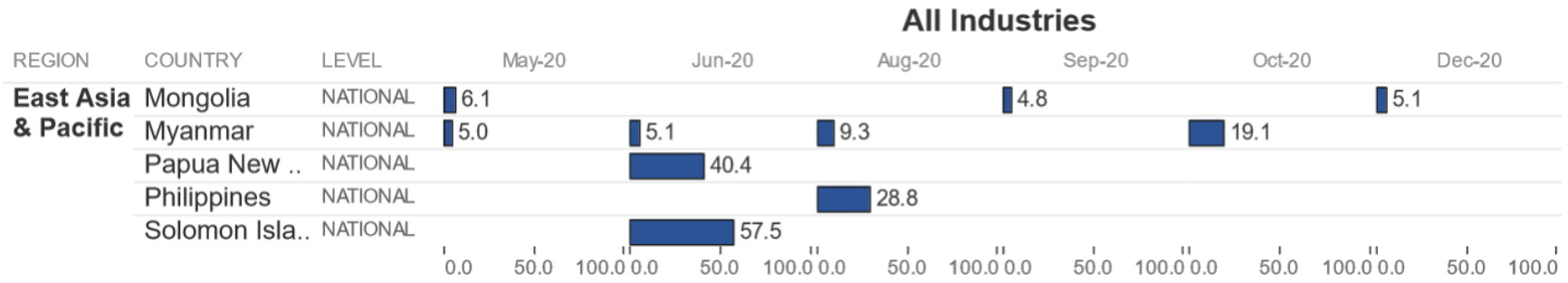


Source: COVID-19 High-Frequency Monitoring Dashboard, The World Bank

But significant number of households were hungry in the last 30 days of survey

TOPIC Food Security
INDICATOR In the last 30 days, were hungry but did not eat due to lack of money (% of HHs)
COMPARISON **East Asia & Pacific**

Show URBAN/RURAL on rows

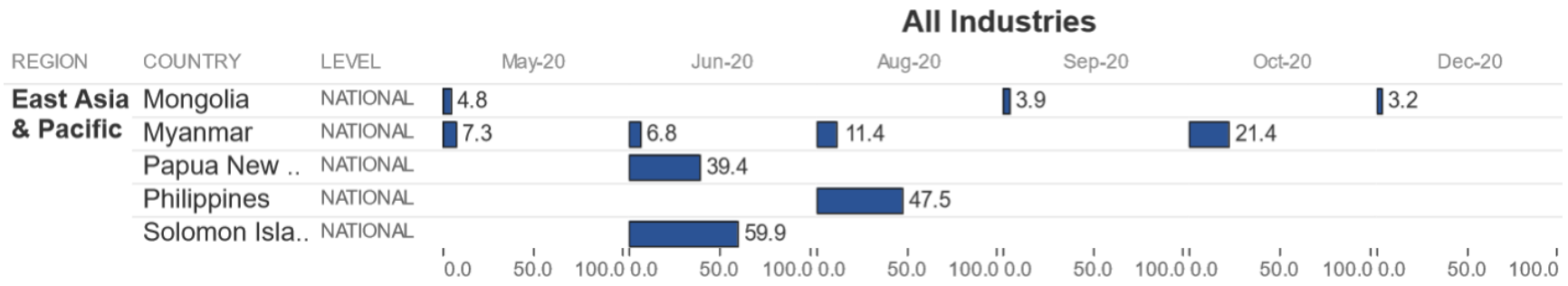


Source: COVID-19 High-Frequency Monitoring Dashboard, The World Bank

Also significant number of households running out of food

TOPIC Food Security
INDICATOR In the last 30 days, you ran out of food due to a lack of money or other resources? (% of HHs)
COMPARISON **East Asia & Pacific**

Show URBAN/RURAL on rows

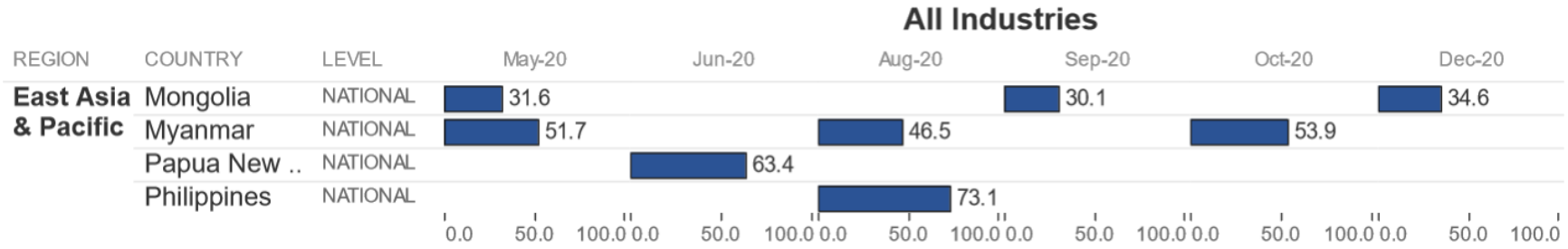


Source: COVID-19 High-Frequency Monitoring Dashboard, The World Bank

Large no. households were worried about running out of food due to lack of money

TOPIC Food Security
INDICATOR In the last 30 days, you worried about running out of food due to a lack of money or other resources (% of HHs)
COMPARISON **East Asia & Pacific**

Show URBAN/RURAL on rows



Source: COVID-19 High-Frequency Monitoring Dashboard, The World Bank

Evidence of food insecurity (cont.)

- Student undernourishment: More than 160 countries have implemented nationwide closure of schools, impacting 87% student population, which means the cancellation of school meals, often the only source of nutrition for children from vulnerable households (FAO Brief, 1 June 2020)
- According to UNICEF (2021), there are no evidence of significant increase in the prevalence of undernourishment in Thailand, thanks to abundant food availability, government cash support for the poor, and cash transfer to more than 22 million people for 3 months
  - Yet Thai people still have the serious problem of food safety, obesity and non-communicable diseases due to unhealthy diet (excessive consumption of sugar and salt) (Nipon 2020).

- At the inter-country level, the IMF (2021) analyses two dimensions of food & nutrition security
  - Prevalence of undernourishment measured by share of households with caloric intake below a given threshold
  - Diet composition proxied by the cereal contribution to the overall caloric intake and protein supply
  - IMF's major findings are as follow
    - A 1% decrease in GDP growth increases undernourishment by 0.95%
      - The undernourishment elasticity is more sizable for poorer countries, but vanish for high income countries.
      - This is because a bigger share of population is closed to undernourishment in middle and low income countries

- A 2 percent increase in food price inflation will increase undernourishment by 0.24 percent
  - Food price inflation is a concern for countries with per capita between $10,000 and $20,000 as they have a high weight of food in the CPI
  - The most important determinants of domestic food price inflation are
    - (1) the regional food production shock (with a coefficient of +0.7
    - (2) the domestic food production shock (coefficient of 0.3), and
    - (3) countries with a small arable area (e.g. Lao) tend to experience relatively larger production shocks

- According to IMF (2021), trade (and high dependence on food imports) tends to mitigate the impact of domestic production shocks on food prices because
  - The pass through from international food prices (caused by global supply shock) to domestic food CPI is very small (with elasticity of -0.15)
  - Domestic food supply shock have a low correlation with global food production shocks (0.2%)
    - Since a regional food supply shock has larger impact than a domestic one, food trade integration should extend beyond the region
  - Social protection (transfers) have a direct positive effect in reducing undernourishment for a given lavel of economic development
- In conclusion, the IMF and FAO are worrying that the pandemic may increase the number of undernourishment to the level that erases decades of progress in reducing undernourishment, and may jeopardize UN-SDG No 2 of bringing the number of undernourished people to zero by 2020
- Moreover, food insecurity may catalyze political change and trigger conflicts as happened during the food crisis in 1972-75, and the late 2000s

4. Conclusion : policy debates and recommendation

4.1 The new era of economic self-reliance: The pandemic has reinvigorated the "resilient" rhetoric and reinforced the backlash against globalization (especially the open system of trade) (Economist, 16 May 2020 : Béné, *et al*. 2021)

- But there is no evidence that the local food systems are more resilient than the global one.

- On the contrary, the Economist argues that domestic supply chains are less resilient than global ones
  - "The $8 trillion global food supply-chain rapidly adapted, keeping most supermarkets stocked" (the Economist, April 3rd 2021)
  - Trade is the effective means to mitigate, domestic food supply shocks and food price inflation because there is very low correlation between domestic food supply shock and global food supply shock (IMF 2021)
- Thus, a nationalistic and self-sufficient policy will not make the countries richer, or safer.

- The right policies of food supply chains and investment should be driven not by “resilience” (or self-reliance) consideration, but by the more important objective of making the food system more sustainable, i.e., socially equitable, nutritionally healthier, inclusive and environmentally sounder (Béné, et.al, CGIAR Covid-19 Hub Discussion Paper, Feb. 2021)

- Recommendation 1 : small food producing countries and LMICS that experience domestic food supply shocks should exploit international food markets to smooth the impact on local food prices
  - The Chinese government “medical masks” policy of subsidizing mask production, rather than leaving the task to the firms to scour the world for masks, is a classical example (The Economist, April 11th 2021).
  - China managed to increase production to nearly 120 million masks by February 2020, comparing to the domestic production of 20 million masks/ day (or 50% of world production) before the pandemic
- Recommendation 2 : WTO and FAO and country members should initiate a new agenda of “no food export restriction” to cope with the increasing risks of global food supply shocks due to climate change, increasing risks of pandemic and cross- border zoonotic diseases.

4.2 The high cost of food supply resilience on the poor and vulnerables in LMICs

- Empirical evidence and studies reveal that food systems in most LMIC resisted the pandemic shock and no major episodes of severe food shortage were observed, thanks to the actions of the governments, local governments, NGOs and a large number of heart felt citizens
  - The pandemic did not result in similar global food crisis that happened in the 1970s and 2007/08
- However, the resilient food systems come at high cost for the poor, the vulnerables as well as the small food suppliers and informal sector food providers
  - Some studies argue that those who reap the benefits of high food prices are the large-scale food suppliers and retailers
- Recommendation: Ensuring governance and effective enforcement of competition policy in the food supply chains that are dominated by oligopolists or firms with dominant market power (Ebata, et al 2021).

- Although most economists agree that “pricing is usually that best way to allocate resources”, there are large number of “price gouging” incidence in the wake of a disaster, e.g., police arrested traders who had stockpiled medical gear and sold at exorbitant pieces in Indonesia, Thailand and even New York (The Economist, April 11th 2021).
  - In the University of Chicago survey of prominent economists about a legislation that banned price gouging during a weather related emergency in 2012, only three economists supported the law, one of them is Angus Deaton
  - Deaton argued that “It is fair to cap prices after a natural disaster Economic efficiency is less important than distribution during such time.”
  - Price signaling alone would have been inadequate to the challenge of ensuring increases in supply of food (and essential medical gear).
  - Obviously, there is a need for government intervention, particularly subsidies to suppliers who promise not to capture outsized gains !!

- Other important recommendations
  - Strengthening safety nets for the most vulnerables and the poor
    - Yet, government should adopt practical measures to minimize the error of excluding the poor from the safety net program (e.g., Thailand).
  - Supporting the small farmers and suppliers to have access to the modern supply chains such as supermarkets and export markets E.g., low interest loans to formers in Myanmar (Ebata, et al. 2021), Bank for Agriculture (BAAC) in Thailand and communication companies supporting agri. tech start ups to link smallholders with the supermarkets, using digital market platforms (Elbeshri, 2020)
  - Ensuring that any necessary lockdown or curfew measures have minimum negative impact on the food supply chains, .e.g, the latest lock down measures in Thailand (which have no curfew, no transport restriction, and allowing all food markets to open between 04.00-23.00)

4.3 Alternative measures to international trade

- Trade is not a hedge against “global” food supply shocks (that happened in the 1970s and 2007/08) (IMF 2021)
- Government and CGIAR should invest in R&D and encourage development and adoption of more climate resilient crop and farm management methods
- Asian government should take measures that stimulate sufficient strategic food reserves at the reginal level, e.g., RCEP, BRICS and even CP-TPP

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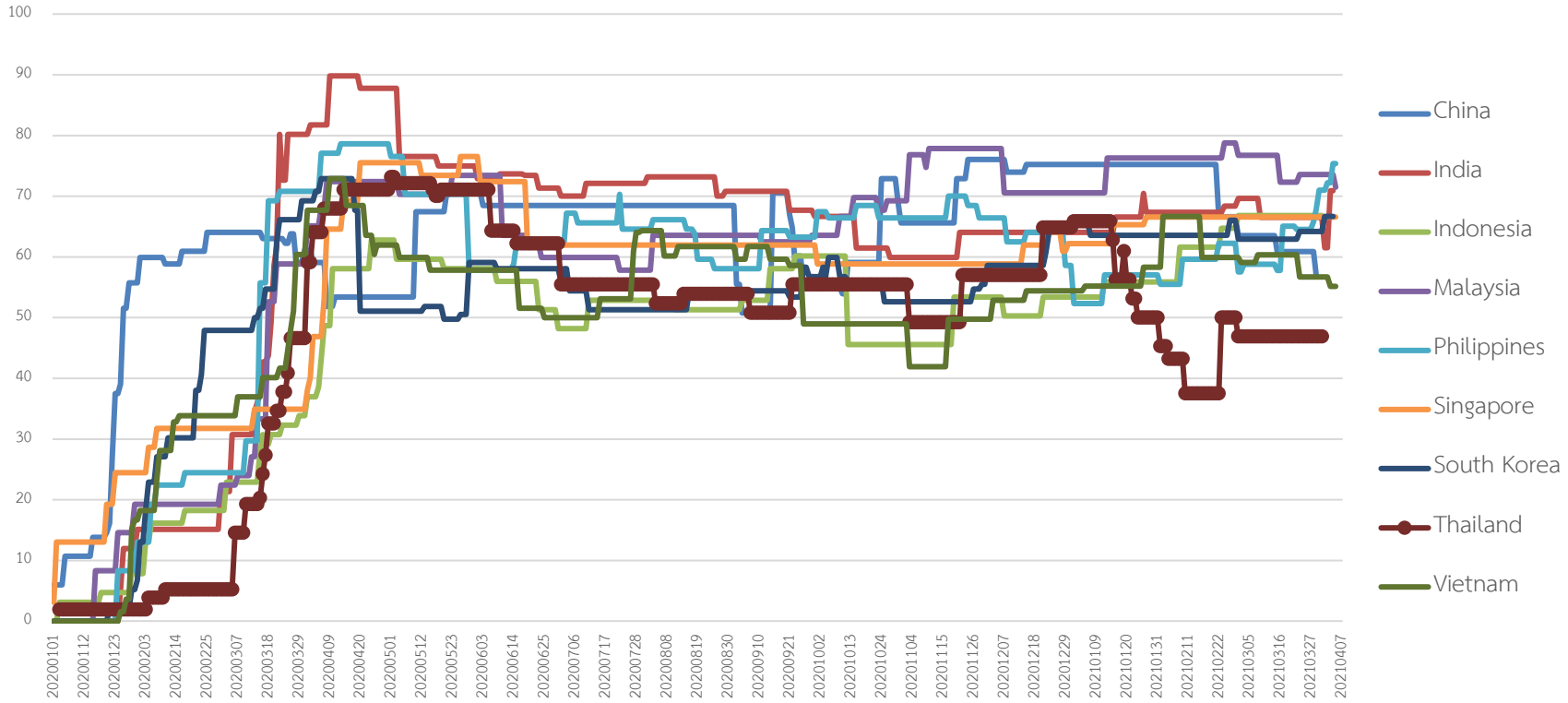
Appendix

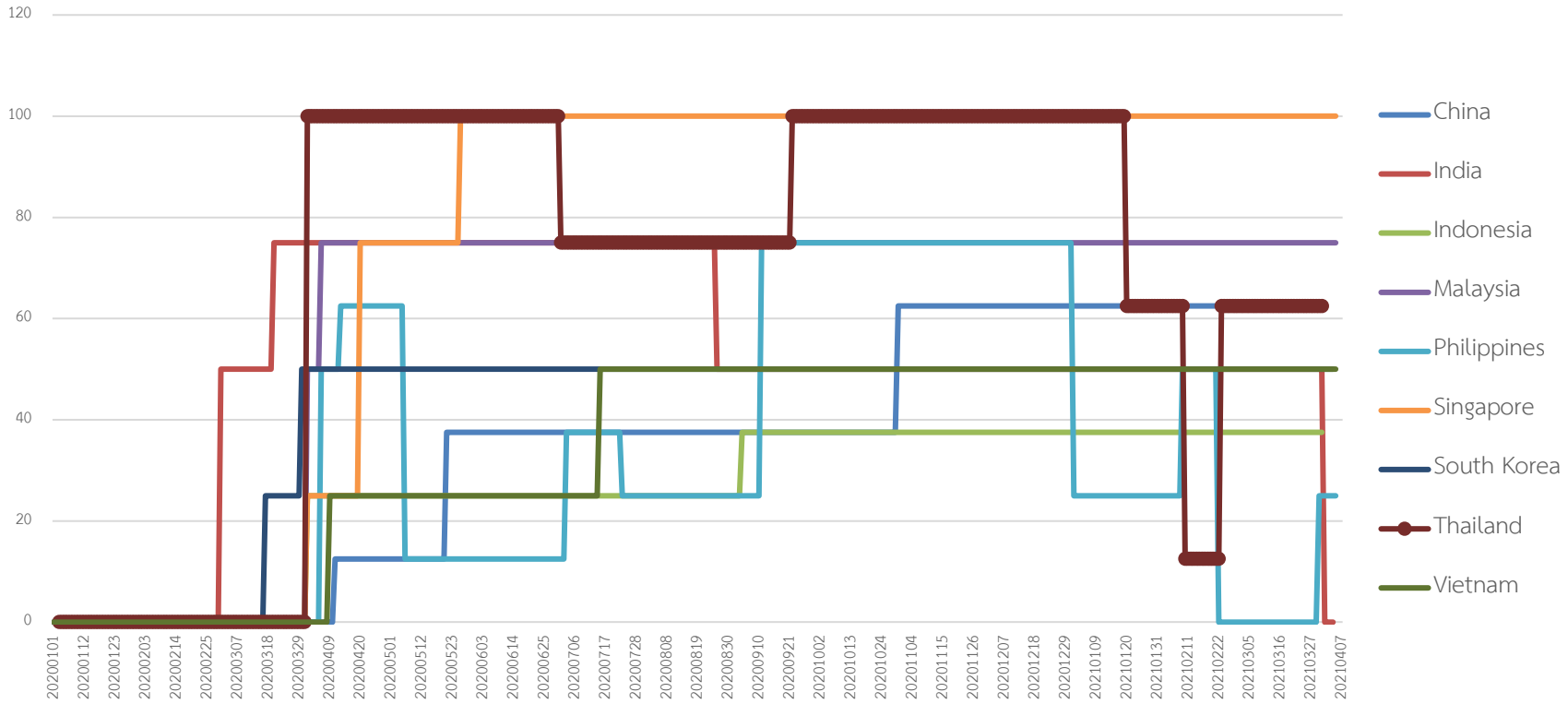
- Oxford's Stringency Indexes
- Tableau Public, the Covid-19 Data Hub
- Production, consumption, export and ending stock of selected agricultural products by major producing and exporting countries

Oxford's Government Response Index



Source: COVID-19 Government Response Tracker, OxCGRT.

Oxford's Economic Support Index



Source: COVID-19 Government Response Tracker, OxCGRT.

OxCGRT variable

Index	k	C1	C2	C3	C4	C5	C6	C7	C8	E1	E2	E3	E4	H1	H2	H3	H4	H5	H6	H7	H8	M1
Government response index	16	x	x	x	x	x	x	x	x	x	x			x	x	x			x	x	x	
Containment and health index	14	x	x	x	x	x	x	x	x					x	x	x			x	x	x	
Stringency index	9	x	x	x	x	x	x	x	x					x								
Economic support index	2									x	x											

$$index = \frac{1}{k}\sum_{j=1}^{k} I_j$$

I = value of indicators

j = indicators

k = number of indicators

ID	Name	Type	Targeted/ General?
Containment and closure			
C1	School closing	Ordinal	Geographic
C2	Workplace closing	Ordinal	Geographic
C3	Cancel public events	Ordinal	Geographic
C4	Restrictions on gathering size	Ordinal	Geographic
C5	Close public transport	Ordinal	Geographic
C6	Stay at home requirements	Ordinal	Geographic
C7	Restrictions on internal movement	Ordinal	Geographic
C8	Restrictions on international travel	Ordinal	No
Economic response			
E1	income support	Ordinal	Sectoral
E2	debt/contract relief for households	Ordinal	No
E3	fiscal measures	Numeric	No
E4	giving international support	Numeric	No
Health systems			
H1	Public information campaign	Ordinal	Geographic
H2	Testing policy	Ordinal	No
H3	Contact tracing	Ordinal	No
H4	Emergency investment in healthcare	Numeric	No
H5	Investment in Covid-19 vaccines	Numeric	No
H6	Facial coverings	Ordinal	Geographic
H7	Vaccination Policy	Ordinal	Cost
H8	Protection of elderly people	Ordinal	Geographic
Miscellaneous			
M1	Other responses	Text	No

Government Measures in Response to Covid-19 – Tableau Public

No. of Measures	South East Asia							
	Thailand	Cambodia	Laos	Malaysia	Myanmar	Indonesia	Philippines	Vietnam
Governance and socio-economic measures	26	9	2	37	19	3	111	20
Humanitarian exemption	0	0	0	0	0	0	0	0
Lockdown	4	1	1	24	0	2	41	5
Movement restrictions	79	16	19	86	21	37	101	36
Public health measures	68	10	14	83	20	32	133	34
Social distancing	16	9	13	61	4	14	71	12

No. of Measures	East Asia		South Asia		
	China	South Kor	India	Pakistan	Bangladesh
Governance and socio-economic measures	20	32	39	13	6
Humanitarian exemption	0	0	0	0	0
Lockdown	4	1	9	3	4
Movement restrictions	34	14	40	16	24
Public health measures	125	77	67	27	11
Social distancing	10	20	7	6	4

Source: acaps updated 10/12/2020 (www.acaps.org/covid-19-government-measures-dataset)

Appendix 1: Production, trade, consumption of major agricultural products by selected countries

	2018/19	2019/20	2020/21
1. Coarse grains (mil tons) World production	1,399.1	1,411.7	1,446
China	264.0	268.2	268
India	43.2	97.7	49.2
Indonesia	12.0	12.0	11.8
Pakistan	6.6	7.4	8.3
Thailand	5.7	4.6	5.7
2. Rice World production	497.3	497.7	504.2
China	148.5	146.7	148.2
India	116.5	118.9	121.0
Indonesia	35.5	35.2	46.7
Vietnam	27.3	27.1	37.1
Thailand	20.3	17.7	18.8
Phil	11.7	11.9	12.2
Consumption	484.6	496.3	504.7
China	142.9	145.2	149.0
India	99.2	105.9	106.5
Indonesia	36.3	36.0	35.8
Phil	14.1	14.3	14.4
Vietnam	21.2	21.25	21.25
Ending stock	176.5	177.9	177.8
China	115.0	116.5	116.4
India	29.5	29.9	28.9
Indonesia	4.1	8.3	3.5
Phil	4.1	4.0	4.3
Thailand	15.4	15.9	16.5
Export World	43.6	44.97	45.98
Burma	2.7	2.3	2.1
India	9.8	14.5	15.5
Thailand	7.5	5.7	6.2
Vietnam	6.58	6.17	6.4
Import World	43.6	44.97	45.98
China	2.8	3.2	2.9
Indonesia	0.6	0.55	0.7
Malaysia	1.0	1.22	1.10
Philippines	2.9	2.45	2.0
Nigeria	21.8	1.8	1.8

Source: FAS-USDA, (April 2021).

Appendix 1: (cont. (1))

	2018	2019	2020	2021
3. Swine (carcass weight) (1,000 mt)	112,939	102,025	96,698	101,481
China	54,040	42,550	36,346	40,500
EU	24,082	23,956	24,150	24,500
Phil	5,635	5,611	5,765	5,830
Vietnam	2,811	2,430	2,467	2,590
USA	11,943	12,543	12,843	12,832
Consumption	112,229	100,992	96,169	100,853
China	55,295	44,866	41,521	45,235
EU	21,258	20,425	19,621	20,120
Phil	1,883	1,806	1,281	1,349
Vietnam	2,869	2,493	2,687	2,784
USA	9,747	10,066	10,031	9,991
Export	8,246	9,332	11,603	11,544
EU	2,838	3,548	4,546	4,400
USA	2,666	2,867	3,303	3,289
4. Chicken meat (ready to work) (1,000 mt)	94,822	99,540	100,587	102,060
China	11,700	13,800	14,600	15,000
Brazil	13,355	13,690	13,880	14,150
EU	12,260	12,560	12,375	12,550
Russia	4,684	4,668	4,680	4,700
India	4,062	4,350	4,000	4,200
Thailand	3,170	3,300	3,250	3,325
USA	19,361	19,941	20,255	20,338
Consumption	92,784	97,433	98,675	100,002
China	11,595	13,952	15,211	15,440
EU	11,543	11,743	11,517	11,750
Brazil	9,683	9,884	10,144	10,280
India	4,059	4,347	3,997	4,197
Thailand	2,354	2,469	2,367	2,416
USA	16,185	16,702	16,992	17,076
Import	9,233	9,741	9,903	9,871
Export	11,291	11,831	11,852	16,953
Brazil	3,675	3,811	3,741	3,875
EU	1,421	1,541	1,467	1,450
Thailand	826	881	874	910
Japan	1,074	1,076	1,005	1,010
China	342	580	999	840
Phil	32.1	366	335	350

Source: FAS-USDA, (April 2021).

Appendix 1 (cont. (2))

	2018/19	2019/20	2020/21
5. Beef and Veal (MT)			
Production	61,522	60,572	61,543
Brazil	10,200	10,100	10,400
EU	7,878	7,810	7,730
India	4,270	3,760	4,000
Canada	1,342	1,310	1,345
Australia	2,432	2,123	2,060
USA	12,384	12,379	12,601
Consumption	59,466	59,068	60,040
China	8,826	9,486	10,080
EU	7,889	7,745	7,695
India	2,776	2,476	2,625
Russia	1,758	1,708	1,683
Canada	1,030	1,041	1,053
USA	12,408	12,519	12,520
Export	10,900	10,805	11,057
Brazil	2,314	2,539	2,725
India	1,494	1,284	1,375
Australia	1,739	1,476	1,390
USA	1,373	1,341	1,427
Import	8,828	9,353	9,519
China	2,177	2,782	3,100
USA	1,387	1,516	1,315
6. Production of oil seed	599.96	573,201	598.03
Palm oil	74,135	42,500	75,093
-Indonesia	41,500	19,255	43,500
-Malaysia	20,800	339.00	19,000
Soybeans	361.04	128.50	363.19
-Brazil	119.70	96.67	136.00
-USA	120.51	18.10	112.55
-China	15.97	190.19	19.60
Soybean oil	55.98	58.32	60.54
-China	15.23	16.39	17.38
-USA	10.98	11.30	11.57
-Brazil	8.18	8.85	9.00
-Argentation	8.04	7.68	7.95
Export of oil seeds	171.06	190.19	195.93
Palm oil	51.79	48.34	50.74
-Indonesia	28.28	26.25	28.85
-Malaysia	18.36	17.21	16.87
Soybean oil	55.98	58.32	60.59
-Brazil	8.18	8.50	9.00
-USA	10.97	11.29	11.57
-China	15.23	16.39	17.28
Ending stocks	134.13	112.22	99.98

Source: FAS-USDA, (April 2021).