AMRO
ASEAN +3 MACROECONOMIC RESEARCH OFFICE

Analytical Note

Crushing Waves: Diving into the Covid Cycle[1]

February 4, 2021

I. Introduction

1. **A year after its first appearance, the COVID-19 pandemic is into its second, third, and even fourth wave in economies around the world**. Since the first outbreak was reported, the virus has spread to 223 countries, areas and territories, according to the World Health Organization, sparing only few, mostly island nations with strict travel restrictions. More than 104 million cases have been confirmed across the globe, and more than 2.2 million deaths linked to COVID-19 have been reported. While a few economies have largely stamped out the virus, many are experiencing more intense resurgences, with reports of new, more contagious strains heightening concerns.

2. **In April, AMRO developed the "Covid Cycle" to track the progress of the pandemic through each economy.** The Covid Cycle (hereafter "the Cycle") is a high-frequency indicator that identifies the outbreak, intensification and recovery stages of the pandemic, and may be used as an input for analyses and policymaking (see Hinojales, Oeking and Ong, 2020a and 2020b). The Cycle does not claim to contain any epidemiological or other medical expertise input but rather, attempts to provide a framework to better understand the evolution of the pandemic in an economy using published daily data.

3. **This note updates our understanding of the Covid Cycle following the latest pandemic developments.** It presents the Cycle in a more accessible heatmap format, and assesses some pandemic developments over the past year. As the pandemic has progressed and we have gained more knowledge and data, our tracking tools have adjusted accordingly. Our goal is to have an easy-to-follow, graphical representation of the severity and current epidemic developments of individual economies. This note reviews the Cycle based on statistical information as of early February 2021.

II. Sidebar on the COVID-19 Data

4. **The Cycle relies on published data of confirmed COVID-19 cases, deaths, and recoveries, which are likely to be lower than the actual, but unknown, number of**

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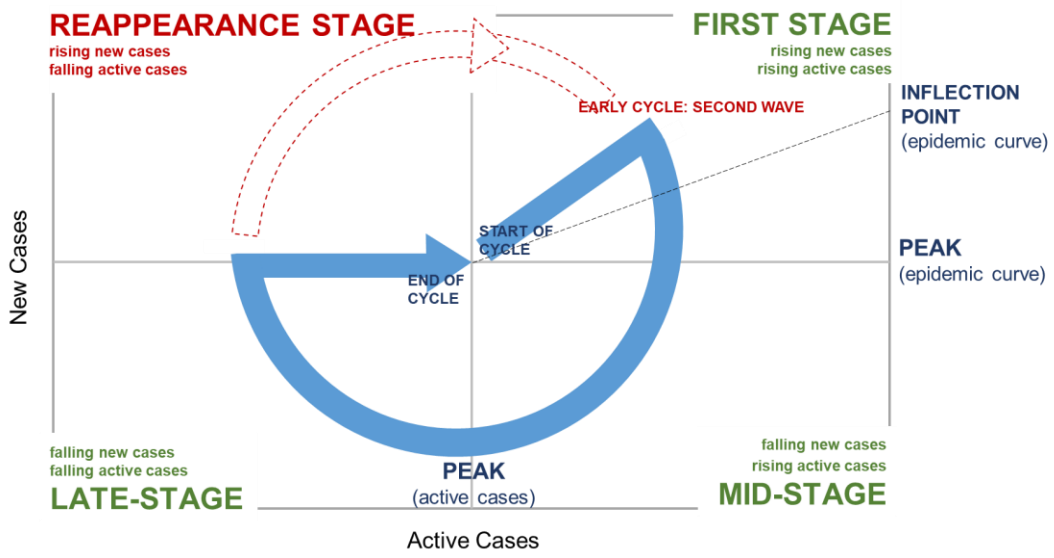
cases.[2] It is important to note that these data series are not standardized across economies. Any analytical tool is only as useful as its underlying data, and the data at hand are only as reliable as individual health authorities' reporting of the information. We assume that considerable differences exist in the way individual authorities track and record their outbreaks, which would naturally affect our findings (see Appendix I for more information). Further, we use our own estimates for economies not reporting recovery data,[3]

III. The Covid Cycle Revisited

5. **The Covid Cycle combines information on the number of new cases with that on active cases, and breaks down the pandemic cycle into four stages.** The number of new cases—the key metric for any epidemic (or "epi") curve—shows the progression of an outbreak and whether the infection rate is accelerating or slowing down. The number of active cases—calculated as the difference between confirmed cases less the number of recoveries and deaths—provides an indication of the maturation of an outbreak. The four stages of the Cycle—First, Mid, Late, and Reappearance—are defined by an increase or decrease in these two indicators, as depicted by Figure 1 (for more detail, see Hinojales, Oeking and Ong, 2020a).

Figure 1. Schematic: Stages of the Covid Cycle
(Change in number of cases per 1 million population)



Source: AMRO staff illustration based on Hinojales, Oeking and Ong, 2020a.

6. **Using the Cycle analysis, we summarize the information as a heatmap and highlight additional stages.** With longer time series and resurgences observed in many economies, the individual Cycles have become more difficult to assess graphically (see Appendix II). The heatmap summary depicts the four main stages of the Cycle, and adds several features—mainly to address data shortcomings as discussed above. The selection

[2] Data are sourced from Johns Hopkins University, and accessed via Haver Analytics.

[3] Data on recoveries for the United States, the United Kingdom and France are estimated based on the 3-week lag of confirmed cases minus deaths, in line with the clinical recovery time reported in World Health Organization (2020).

of these criteria is based on global trends that we have observed over the course of the pandemic. The heatmap is set up the following way:

- Every economy is assigned a stage, including the four main stages of the Cycle—**First, Mid, Late**, and **Reappearance**. In addition, once an economy records no new cases and has no active cases remaining, it will be classified as being at an **"End" stage**.

- We created an additional **"First-mid" stage** to reflect the fact that during many observed outbreaks, new cases stabilize and hover around the epi curve peak for some time before trending downwards. These shifts are reflected within the Cycle as a quick back-and-forth between the **First** and **Mid stages**. An economy is classified as being in the **First-mid stage** as long as infections fluctuate between the **First** and **Mid stages** at least once in any consecutive three-day period.

- We added a **"Minor outbreak" stage** to reflect different sizes of outbreaks across economies:

  — For economies that have not experienced sizeable outbreaks, even a handful of new cases could move them into the **First stage** of the Cycle, even though the implications could be quite different to those witnessing a major outbreak.

  — Similarly, any increase in imported cases in an economy with no or limited local transmission—which are immediately quarantined and thus represent low risk of contagion—would otherwise be classified as being in the **First stage**.

  To distinguish these circumstances from larger outbreaks, Minor outbreaks are classified as outbreaks in the bottom 75th percentile of an economy's 7-day average daily new cases as long as they remain below 2,500 daily cases; or outbreaks with less than 15 daily new cases in an economy's 7-day average.[4]

- We moved an economy to a new stage of the Cycle only after three consecutive days in that stage, to reduce "noise" surrounding the data.

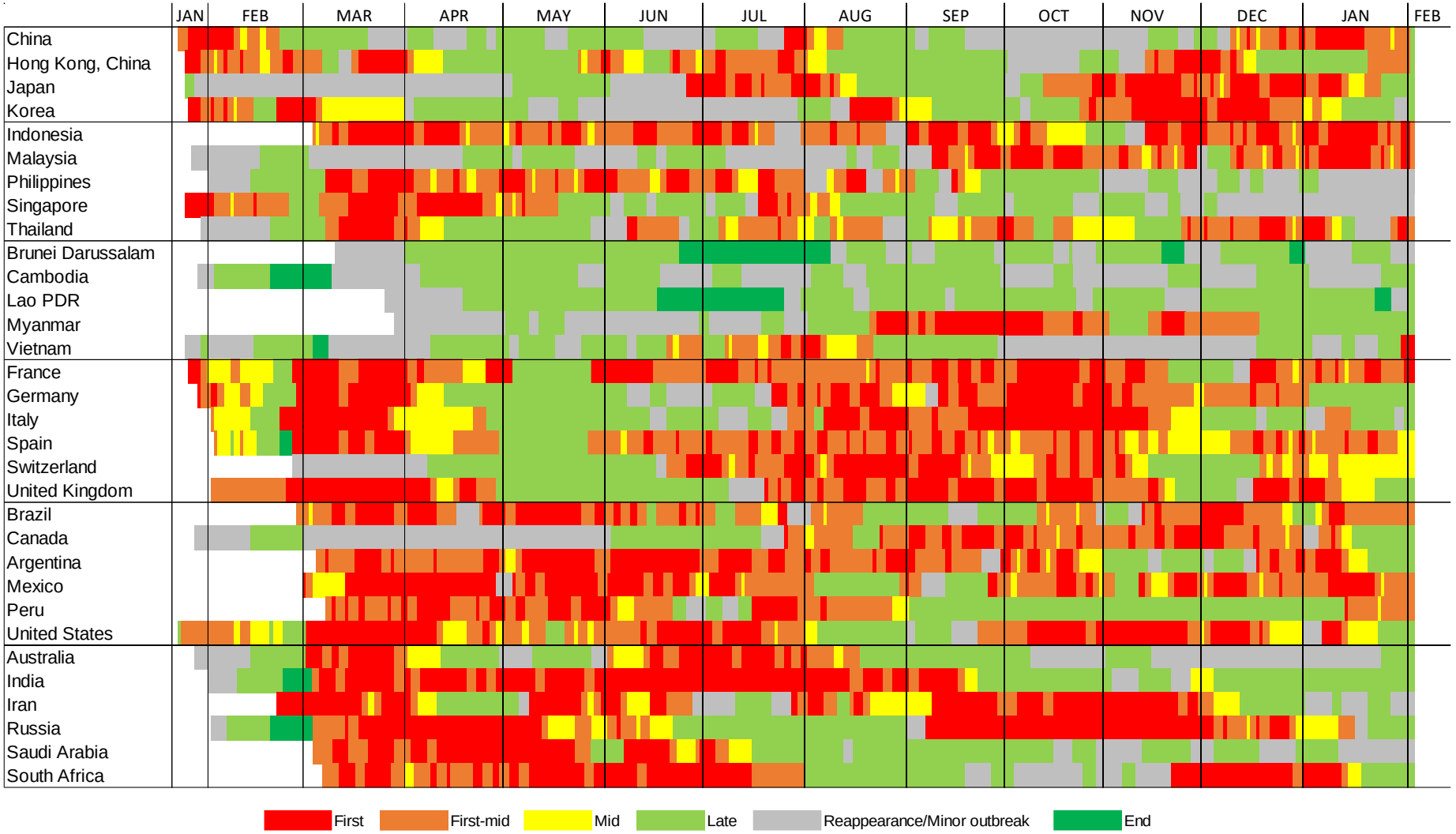
7. **As an economy moves through the various stages of the Cycle, policymakers can draw implications to use as input into designing containment strategies.** Broadly speaking, the different stages may be interpreted as follows (per the Figure 2 heatmap):

- Any economy in the **First stage** of the Cycle (red in the heatmap) is undergoing a surge in new cases, possibly necessitating a tightening in social distancing measures.

- At the **First-mid stage** (orange in the heatmap), new cases have stabilized and could be trending downward soon. Strict distancing policies should remain in place or economies would otherwise risk of being pushed back to the **First stage** by any sudden resurgence in infections.

[4] The classification of an outbreak as "Minor" is based on waves. Minor outbreaks can retroactively be reclassified as non-minor if it breaches the 75th percentile or 15-daily cases threshold at a later date within the same wave.

Figure 2. ASEAN+3 and Selected Economies: Covid Cycle Heatmap, as of February 2, 2021



Sources: Johns Hopkins University via Haver Analytics; and AMRO staff calculations.

- An economy moves to the **Mid stage** (yellow in the heatmap) when the situation improves through falling new cases, even though the number of active cases continues to rise.

- As the outbreak matures, and both new and active cases continue to fall, it is reflected in a move to the **Late stage** (light green in the heatmap). It is important to note that an economy can remain in this stage for a long time, including those with still-high, but falling new cases—when it might be undesirable to ease containment measures yet—as well as those with low case numbers for an extended period of time, but some remaining active cases. This latter group might gradually relax restrictions.

- Both the **Reappearance** and **Minor outbreak stages** (grey in the heatmap) signal an increase in new cases, which remains small, but also point to the need to remain continuously vigilant given the contagiousness of the coronavirus (Sanche and others, 2020).

8. **The Cycle does not quantify the severity of an outbreak across economies.** What constitutes a major outbreak in one might be relatively minor in another when comparing the absolute number of new cases. Still, any sustained increase in cases, no matter how small or large the absolute number, should constitute a concern for policymakers given the contagious nature of the COVID-19 virus. In addition, progress through the Cycle is oftentimes not straightforward. For example, economies on a clear path to the **Late stage** might be pushed back to the **First stage** amid a sudden resurgence in infections.

IV. Wave upon Wave of Infections

9. **The Cycle analysis allows us to differentiate between separate waves of outbreaks.** Over the course of the last year, it has become apparent that many economies across the globe are experiencing more than just one wave, and policymakers need to constantly remain wary of renewed outbreaks. Within our Cycle heatmap, a new wave is determined based on the move to either First, First-mid, or Mid stage following classification as either Late, End, or Reappearance stage for at least 14 days. This classification might not always line up with public perception of a wave, but is based on the same criteria for each economy and provides further insight into the ups and downs of COVID-19 infections across the world (see Appendix III).

10. **Most ASEAN+3 economies have experienced more than one wave of infections so far.** While some have successfully staved off any major outbreak, most economies in the region that have experienced at least one wave have, by now, experienced at least one, if not two, more outbreaks. Across the entire region, we observe four points in time throughout the first year of the pandemic when there were simultaneous outbreaks across several economies (Figure 3):

(1) when cases first started spreading around the region in late-January;

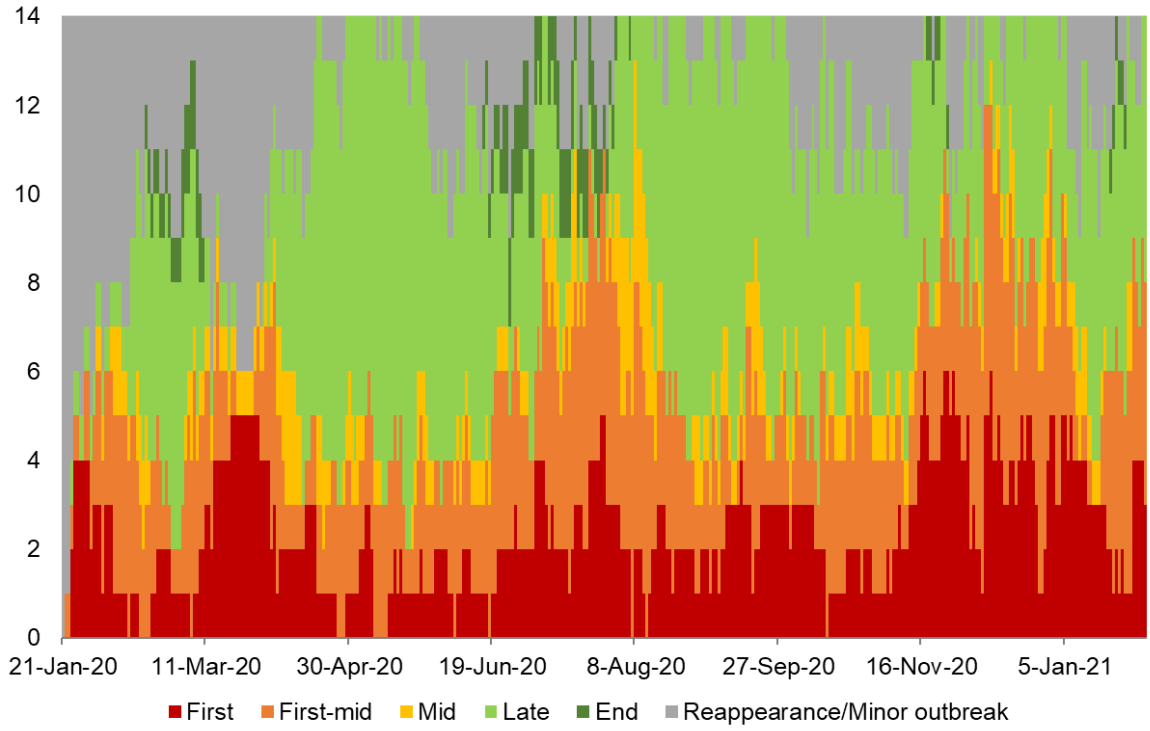
(2) during the first global wave in mid-March;

(3) at the height of summer from July onward; and

(4) toward the end of the year, around November/December.

11. **Each of these periods was followed by a time when most ASEAN+3 members were classified as Late stage, only to be followed by another wave**. While outbreaks are not necessarily linked across economies, the four main episodes of simultaneous regional outbreaks occurred around every four months, suggesting that further waves down the road are not unlikely. The regional waves are also one indication that as long as COVID-19 is rampant anywhere, it remains a risk everywhere, and economies cannot fully open up.

Figure 3. ASEAN+3: Summary of Cycle Heatmap Stages and Infection Waves, as of February 2, 2021
(Number of economies)



Sources: Johns Hopkins University via Haver Analytics; and AMRO staff calculations.

V. Conclusion

12. **The COVID-19 pandemic has impacted economies across the world, including in the ASEAN+3 region, and more waves of outbreaks are likely in the coming months.** Although knowledge about the virus has deepened, and therapeutic drugs and vaccines have been developed, the highly contagious virus has yet to be stamped out. And until vaccines become readily available and are widely taken up, we anticipate renewed waves of outbreaks in 2021. While the impact of each wave of infections depends on a variety of factors—such as an economy's healthcare capacity, its economic structure, and the policy space to provide the requisite support—each new wave is typically accompanied by some degree of containment measures and attendant negative shock to economic activity. To monitor these waves, the Covid Cycle may be used as a high-frequency tool for charting pandemic developments in individual economies, as input for policymaking.

Appendix I. A Note on the Data

13. We note several issues with regard to data quality, availability, and comparability:

- Limited testing is the main reason why actual case numbers will be higher than confirmed cases (for more information, see Ritchie and others, 2020).

- Delays in reporting—such as during public holidays or on the weekend—lead to significant fluctuations in daily data. We thus use averages across several days in our analyses as much as possible.

- In a few instances, confirmed, but previously un-recorded cases were reported all in one day, leading to sharp, temporary increases.

- Asymptomatic cases are treated differently across economies. While many authorities include them in their count of total confirmed cases, others do not. In some economies, these cases represent a significant share of the total. In other economies, many asymptomatic cases might not even be known and accounted for because testing is focused on symptomatic patients.

- The reporting of deaths depends on how authorities attribute the cause of death. Some authorities will only record the most direct cause of death (e.g., respiratory failure), while others count the underlying cause (e.g., COVID-19 as the reason for the respiratory failure). In addition, with limited testing, including post-mortem, some deaths from COVID-19 are not recognized as such.[5]

- Some authorities record deaths by the date on which they are reported, others present them by the date of death. Owing to lags between the occurrence and reporting of deaths, the latter method can yield incomplete data in the most recent reporting period until all deaths on a given day have been included in the dataset.

- Recoveries are a particularly non-standardized metric, attributable to the lack of an official definition of recovery. Some authorities only count those discharged from hospital, others count patients who are no longer infectious, or simply count anyone who has not died within a certain time period as "recovered." The latter would thus include patients suffering from medium- or long-term effects (for more information, see Covid Tracking Project, 2020). Several economies do not report data on recoveries at all and our estimates count anyone who has not died within three weeks as recovered.

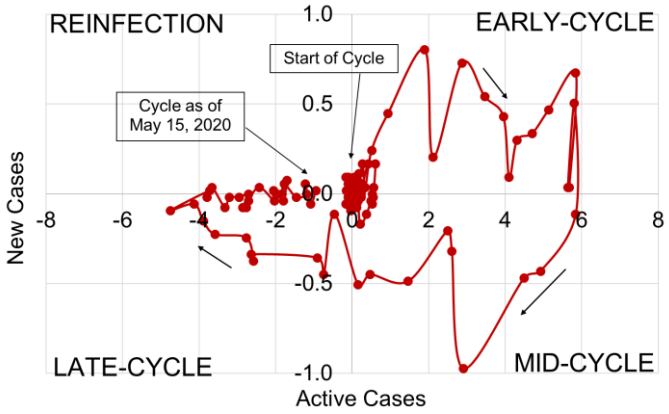
- Finally, the main data source publishes only headline case numbers. These numbers thus do not provide information on the composition of cases, for example, between local transmission and imported, but strictly isolated cases; or outbreaks in other parts of the population that are separated from the community-at-large (e.g., prisons). While some economies provide more granular information, such detail is not consistently available and presented across economies.

[5] This feature implies that the data we use may never show zero active cases for some economies. We calculate active cases as the difference between confirmed cases, deaths and recoveries. So, if some deaths among confirmed cases (either related to COVID-19 but not recorded as such, or unrelated to COVID-19 but occurring during the infection) are not counted as confirmed COVID-19 deaths, but also not recorded as recoveries, they will continue to be classified as active.

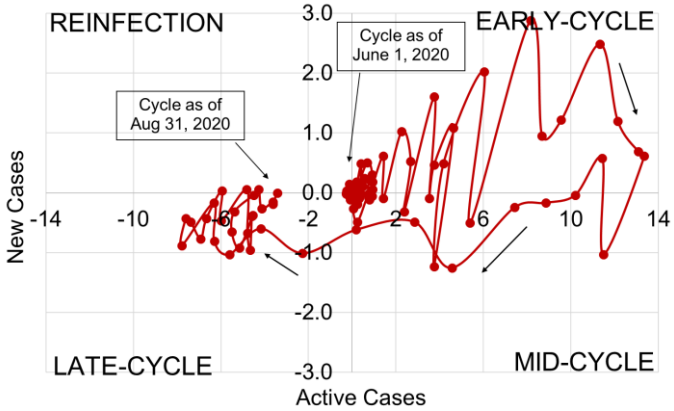
Appendix II. Example: Progression through the Covid Cycle

Appendix Figure 1. Covid Cycle: Hong Kong, China
(Change in number of persons per 1 million population)

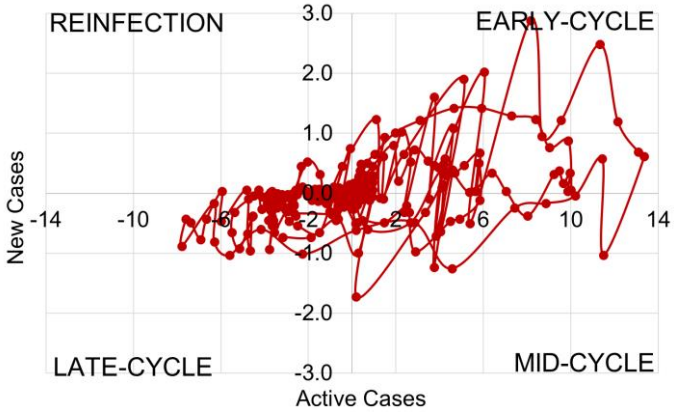
A. As of May 15, 2020



B. From June 1, 2020 to August 31, 2020



C. Full Cycle until February 2, 2021

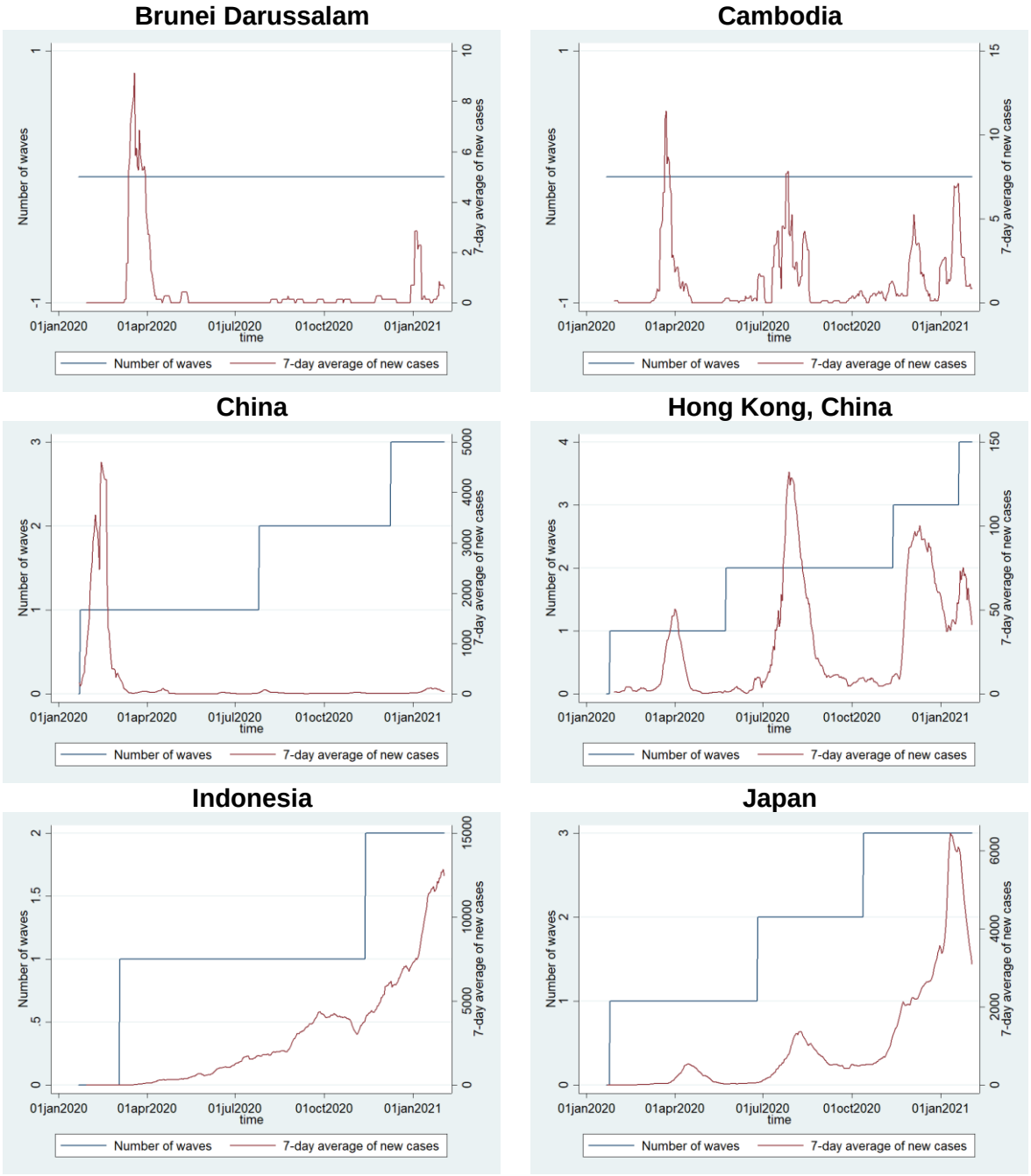


Sources: Johns Hopkins University via Haver Analytics; and AMRO staff calculations.

Appendix III. ASEAN+3: Epidemic Waves

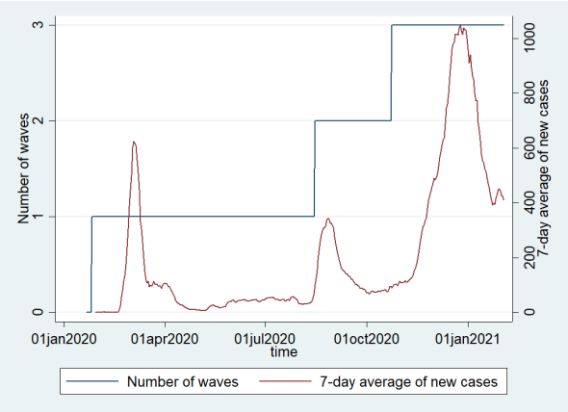
Appendix Figure 2. ASEAN+3: Number of Epidemic Waves and Epi Curves, as of February 2, 2021

(Number of waves; 7-day average of daily confirmed cases)

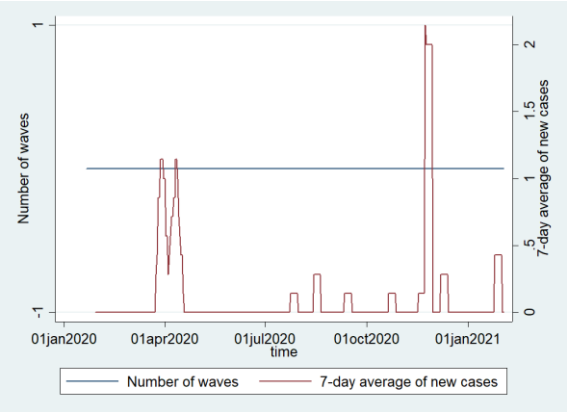


Sources: Johns Hopkins University via Haver Analytics; and AMRO staff calculations.

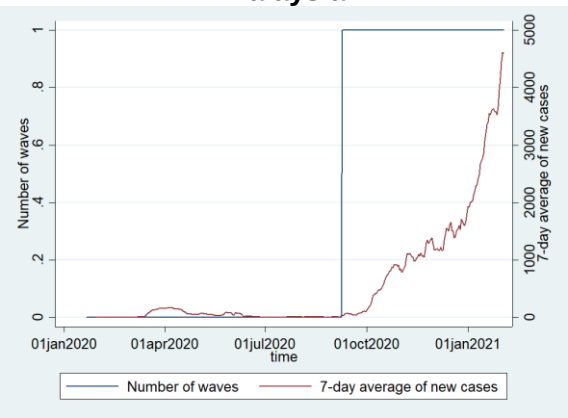
Korea



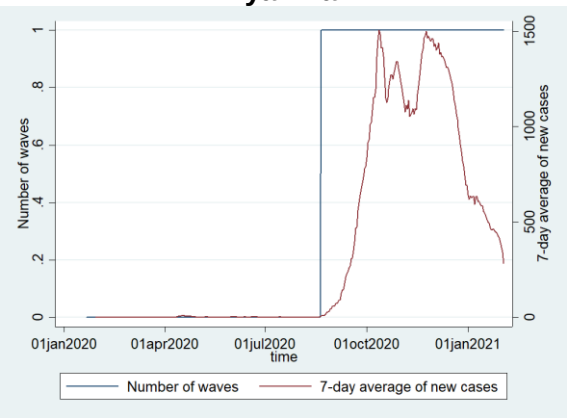
Lao PDR



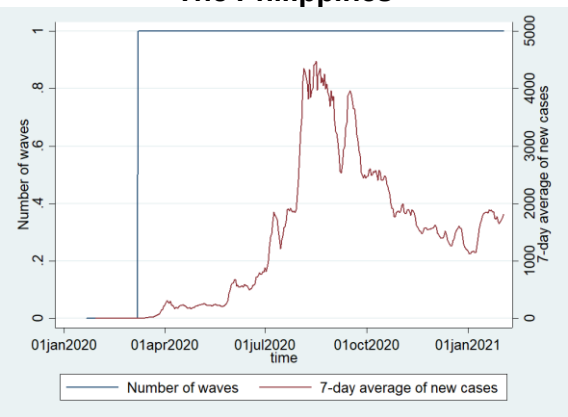
Malaysia



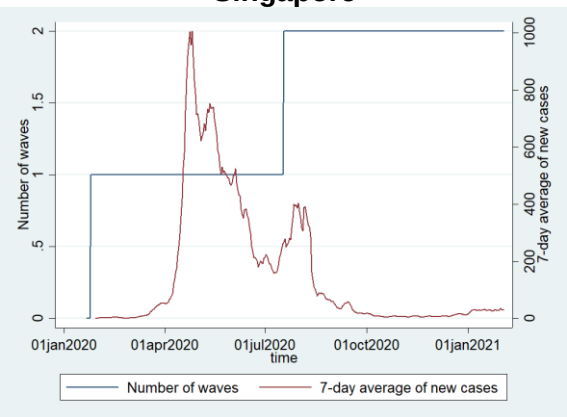
Myanmar



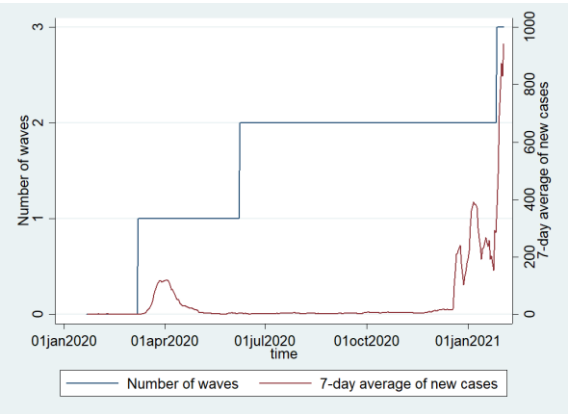
The Philippines



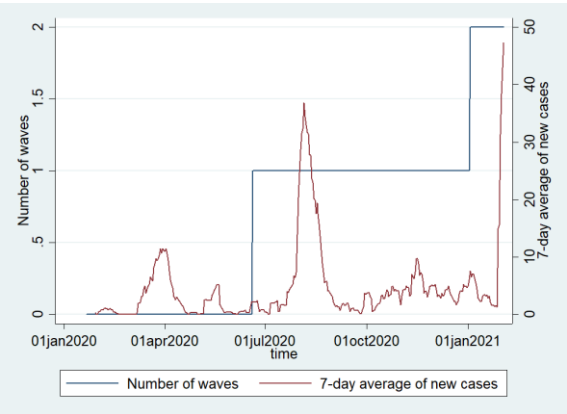
Singapore



Thailand



Vietnam



Sources: Johns Hopkins University via Haver Analytics; and AMRO staff calculations.

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