

Monday, February 17, 2020

THE IMPACT OF THE CORONAVIRUS EPIDEMIC ON THE ASEAN+3 ECONOMIES¹

I. Introduction

1. **The recent outbreak of a novel coronavirus in Wuhan, China, and its subsequent spread outside the country has heightened the risk to China's and regional growth.** The Chinese authorities alerted the World Health Organization (WHO) to several cases of pneumonia in Wuhan on December 31, 2019, and have taken unprecedented policy actions to contain the virus, but it has started to spread to other economies in the region. On January 30, 2020, the WHO declared the 2019 Novel Coronavirus (2019-nCov, hereafter "coronavirus") epidemic a Global Health Emergency.² The debate now is around the intensity of the epidemic and its likely impact on the domestic economy and spillovers to other countries.

2. **The epidemic affects economic activity on various fronts:**

- In China, the epidemic puts great pressure on the health system and results in lost wages and lower productivity from sick days and work stoppages. The fear of infection and attempts to curtail contagion could lead to disruptions in transportation, manufacturing supply chain, provision of most services, closure of schools and businesses. Hence, fighting an epidemic could have significant impact on the economy.
- Outside of China, the likelihood of spillovers has increased substantially as a result of increased regional integration and connectivity. In addition to the spread of the disease due to massive volumes of international travel, its impact is typically felt by the aviation industry, the tourism sector and hospitality services, as well as trade, including global supply chains (Bloom, Cadarette, and Sevilla, 2018).
- Public contagion avoidance behavior and measures to prevent the spread of the epidemic can add large strains on regional economies (Smith and others, 2019). In addition, the pervading uncertainty and fear will lower business and consumer confidence, and increase risk aversion in financial and commodities markets.

3. **A disease outbreak in China—the ASEAN+3 region's largest economy and the world's second largest—resulting in a marked slowdown in its growth, is likely to have**

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² The US Center for Disease Control and Prevention uses the term *epidemic* to refer to a sudden increase in the number of cases of a disease above what is normally expected in that population in that area; *outbreak* is similarly used, although it is often refers to an epidemic that is more limited geographically. *Pandemic* is an epidemic that has spread to many countries or continents. In this note, we use the term "epidemic" to also include pandemic episodes.

widespread spillovers to the region and the rest of the world. Estimates of the impact of the disease would depend on its duration, virulence and contagiousness. Previous virus epidemics, notably the Severe Acute Respiratory Syndrome (SARS) outbreak in 2003 (Appendix I), provide a guide on the potential economic losses to China, which could then be used to estimate the impact on other economies in the region (Section III):

- China's GDP growth in 2020 would be lowered by as much as 0.5 percentage point, taking into account the supporting measures by the government;³
- The slowdown in China would result in a deduction of 0.2 percentage point from ASEAN+3 growth.⁴ The main spillover channels to the region would be through (1) a sharp drop in Chinese outbound travel and tourism; (2) a drop in regional travel and tourism reflecting fear of contracting the disease; (3) a decline in China's imports through the supply chain as manufacturing production is disrupted and as domestic demand is affected;⁵ and (4) the spread of the disease to regional economies.

II. Impact on China's Economy

4. Among the major epidemics in the last two decades, the SARS outbreak could provide some guidance on the potential impact of the coronavirus. The SARS outbreak started in Q4 2002, but most cases were registered in Q1 and Q2 2003. SARS infected more than 8,000 people, mainly in China, but also elsewhere in the region—similar to the coronavirus epidemic to date. At this point, the number of coronavirus infections far exceeds the total number of SARS infections, and is expected to climb higher. The average fatality rate for SARS was almost 10 percent compared to only 2 percent so far for the coronavirus. But, preliminary estimates suggest that SARS had a much lower contagion rate, possibly because it is not contagious during its incubation period. A possible scenario assumes that the coronavirus outbreak (Table 1) would:

- spread for about 4 months, similar to SARS (see Figure 1 for the trajectories of suspected and confirmed cases of the coronavirus infection in China so far);
- have a fatality rate that is lower than SARS, as the data suggest;
- be much more widespread than SARS (Figures 2 and 3); the main infected areas already cover regions that are China's main economic centers.

Table 1. China: AMRO's Assumptions on the Coronavirus Outbreak

Virus	Chinese Regions Affected	Length of Main Epidemic Episode (Months)	Fatality Ratio (Percent)
SARS	Beijing, Pearl Delta	4	9.6
Coronavirus	Central China, Yangtze-Delta, Pearl-Delta, Beijing and Chongqing	4	~2

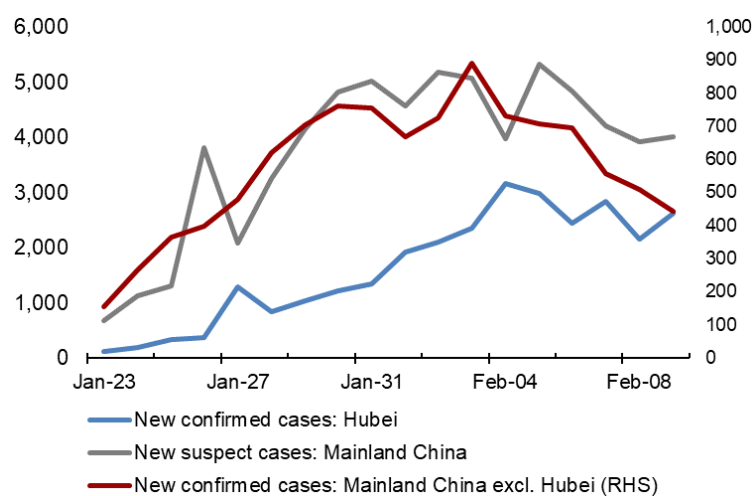
Source: AMRO staff estimates.

³ Private sector estimates of the epidemic's impact on China's 2020 growth range from 0.1 percent to 1.2 percent.

⁴ Estimates based on AMRO desks' projections.

⁵ As reflected in the sharp fall in oil prices in anticipation of weak transport activities in China.

Figure 1. China: Newly Confirmed Coronavirus Infections
(Number of persons, daily)



5. **The epidemic's impact on China is projected to be short-lived but significant.** A sharp slowdown is anticipated for Q1 2020, in both the manufacturing and services sectors. In the near term, the restrictions on population movements are disruptive for both production and demand. Most provinces announced extensions of about 7 days to the Lunar New Year holiday, which means that factories and enterprises would have to postpone production.

6. **AMRO forecasts that the coronavirus outbreak could reduce China's 2020 GDP by 0.5 percentage point.** The following scenarios are assumed:

- **In the manufacturing sector**, the global supply chain centered in the affected regions would experience significant disruption. However, companies are likely to find ways to make up for most (if not all) of the lost production subsequently, to meet demand, given that the manufacturing sector is relatively less constrained by production capacity. Hence, the manufacturing sector is likely to rebound strongly (Figures 4 and 5).⁶
- **In the services sector**, firms would have limited capacity to make up for the lost business days. Demand for several types of services, such as tourism, will not rebound sharply, and services provision cannot increase significantly in a short period. Hence, its rebound to pre-epidemic levels would be more gradual (Figures 4 and 5).

The estimated impact comprises: (1) a -0.15 percentage point reduction in growth attributable to the manufacturing sector on growth; and (2) a -0.35 percentage point reduction from the services sector, which is slightly larger than during the SARS outbreak (Appendix II). These estimates already incorporate AMRO's assumption of the authorities' support for the economy.

⁶ We anticipate that any disruption to the construction and agriculture sectors would not be significant.

Figure 2. China: Spread of the Coronavirus, 2020
(Number of infected persons)

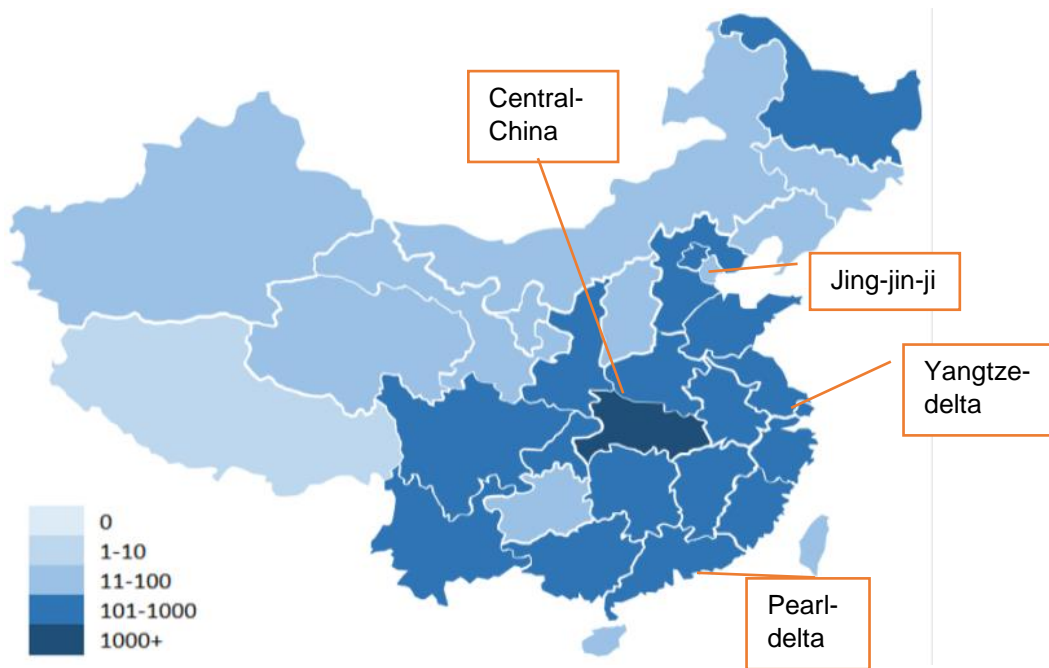
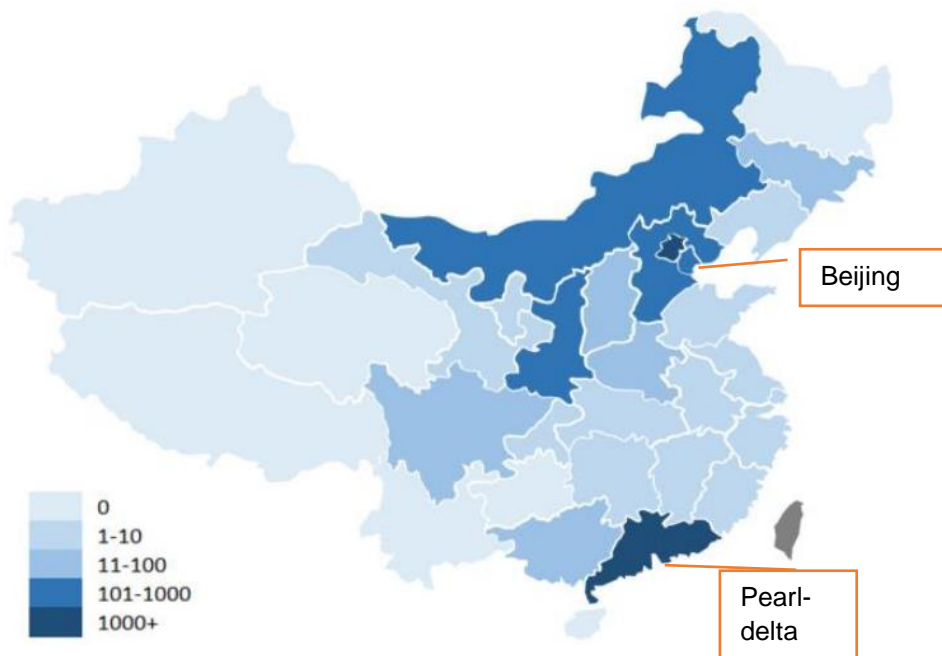
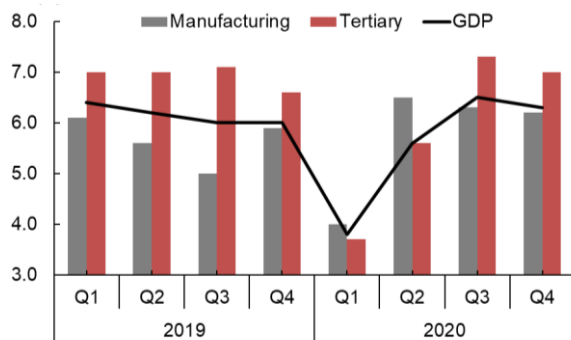


Figure 3. China: Spread of SARS, 2003
(Number of infected persons)



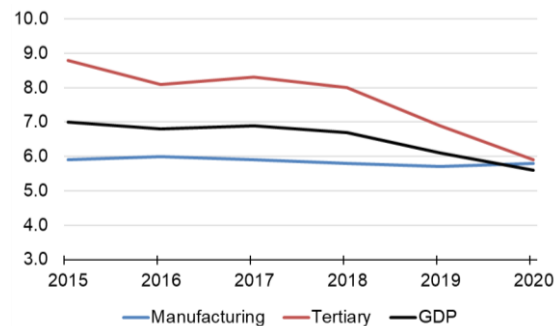
Source: Chinese Center for Disease Control and Prevention.
Note: The coronavirus infection numbers are as of February 5, 2020.

Figure 4. China's Quarterly Growth Projections
(Percent year-on-year)



Sources: Wind; and AMRO staff estimates.

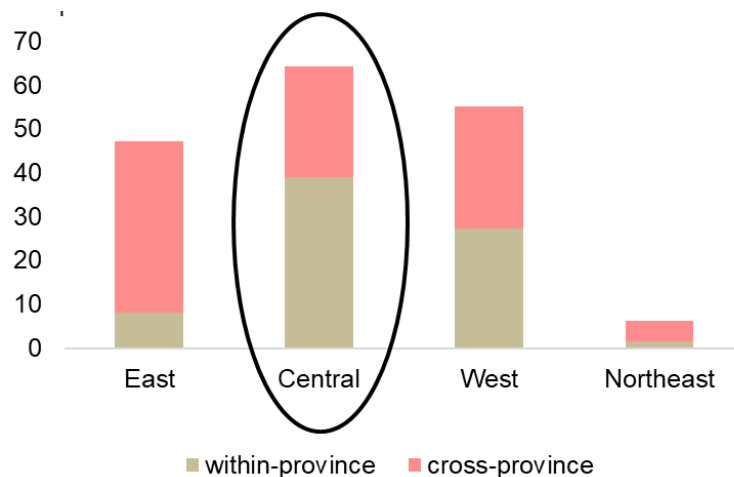
Figure 5. China's Annual Growth Projections
(Percent year-on-year)



Sources: Wind; and AMRO staff estimates.

7. **The impact on China would also be multifaceted, affecting employment and possibly also financial stability.** With more than 200 million migrant workers nationwide celebrating the Lunar New Year (LNY) Spring Festival in their hometowns, and with numerous cities (covering about 50 million people) under quarantine, most of these workers have not been, and may not be, able to return to their employment cities as they normally would after the LNY—particularly those in central China, the hardest hit region (Figure 6). The private sector, in particular small-and medium-sized enterprises (SMEs), are expected to be hardest hit, which may push up banks' non-performing loans. In addition, the outbreak could drive up local prices of goods in the near future.⁷

Figure 6. Regional Distribution and Composition of Migrant Workers in China, 2018
(Millions of persons)



Sources: National Bureau of Statistics of China; and AMRO staff calculations.

⁷ Amid the recent sharp increase in CPI in China—as a result of the swine virus epidemic—the outbreak is likely to cause the prices of various items in the consumer basket to rise further, given the disruption to the distribution and supply of many consumer goods. Concurrently, the outbreak is likely to weigh on producer prices because of interruptions to and delays in production. While these effects would likely be temporary and should dissipate as production comes back online, the timing remains unclear.

III. Impact on the ASEAN+3 Region

8. **Most countries in the ASEAN+3 region have already been infected by the spread of the disease, and their growth could be similarly affected as is developing in China.** The main channel of impact has been through travel and tourism and their ancillary industries, as well as the production and export of intermediate inputs linked to the production of final goods in the highly affected areas in China. In addition, domestic measures to contain the outbreak can disrupt production (and investment) and impact consumption. How widespread and intense the impact will be will likely depend on the severity of the outbreak. Moreover, should the Chinese economy slow down more than expected during 2020, the effects on regional economies could be severe.

A. Financial Markets

9. **Asian markets reacted very negatively to the news of the coronavirus outbreak before experiencing some relief.** While markets in China and Hong Kong, China (hereafter “Hong Kong”) were hardest hit, ASEAN equities and currencies also sold off. All regional bond markets saw a significant fall in yields, largely on the back of the fall in global yields, while idiosyncratic factors also played a role.

10. **Equity market reactions have varied across sectors.** Not surprisingly, tourism-related and energy stocks weakened the most, while healthcare stocks gained (Table 2). A breakdown of equity market performance by sector reveals markets’ anticipation of where economic activity could be affected. A fall in tourism would affect the consumer discretionary sector—which includes hotels and leisure activities—whereas a weakening in overall economic activity, and hence demand for energy, would have ramifications for energy sector stocks. The materials sector has also responded negatively to the event as demand from China is expected to fall.

11. **Market performance has also differed across countries, with Hong Kong, Korea and Thailand among the worst hit.** Outside China, Hong Kong’s equity prices have fallen the most, likely a result of its close ties to the mainland, its ongoing social unrest, and the bad memory of SARS, when around 22 percent of global infections were reported in Hong Kong. Among regional currencies, the Korean won and the Thai baht are the worst performers, complemented by equity market weakness. Besides the impact on tourism and energy sectors, sharp declines in specific sectors such as consumer staples (which include food, household and personal products) in Korea and Singapore, and materials (which include mining, metals and plastic) in Malaysia and Indonesia, point to expectations of significantly weaker demand from China and regionally.

Table 2. ASEAN+3: Equity Market Impact, January 17–February 6, 2020

	Shanghai	Shenzen	Hong Kong	Japan	Korea	Indonesia	Malaysia	Philippines	Singapore	Thailand	Average (CN, HK)	Median (CN, HK)	Average (ex CN, HK)	Median (ex CN, HK)
Communication Services	-5.4%	-0.5%	0.3%	0.7%	-1.6%	-2.9%	-4.9%	-2.5%	1.7%	-6.9%	-1.9%	-0.5%	-2.4%	-2.5%
Consumer Discretionary	-10.3%	-7.7%	-11.5%	-1.4%	-2.2%	-6.8%	-11.6%	-12.6%	-5.0%	-5.3%	-9.8%	-10.3%	-6.4%	-5.3%
Consumer Staples	-5.5%	-10.3%	-5.2%	-1.3%	-7.7%	-5.7%	-1.6%	0.3%	-4.2%	-3.4%	-7.0%	-5.5%	-3.4%	-3.4%
Energy	-9.7%	-10.8%	-9.5%	-3.7%	-2.5%	-11.5%	-2.5%	-6.7%		-5.5%	-10.0%	-9.7%	-5.4%	-4.6%
Financials	-6.5%	-10.0%	-6.6%	0.7%	-3.6%	-2.1%	-3.6%	-3.8%	-5.0%	-2.2%	-7.7%	-6.6%	-2.8%	-3.6%
Health Care	7.9%	9.0%	-1.1%	4.7%	5.5%	-3.9%	5.6%			-3.2%	5.2%	7.9%	1.7%	4.7%
Industrials	-8.6%	-2.7%	-6.4%	0.8%	-1.6%	-7.2%	-1.7%	-4.4%	1.7%	-3.8%	-5.9%	-6.4%	-2.3%	-1.7%
Information Technology	-0.8%	-2.6%	-8.3%	-2.0%	0.8%	-9.1%			1.7%	1.1%	-3.9%	-2.6%	-1.5%	0.8%
Materials	-9.2%	-7.6%		-0.1%	0.0%	-8.1%	-6.0%			-2.9%	-8.4%	-8.4%	-3.4%	-2.9%
Real Estate	-12.1%	-11.7%	-8.8%	5.8%	-1.4%	-6.7%		0.8%		-2.8%	-10.9%	-11.7%	-0.9%	-1.4%
Utilities	-6.6%	-10.8%	-3.1%	3.5%	-4.6%	-21.5%	-0.7%	0.6%		-7.2%	-6.8%	-6.6%	-5.0%	-2.7%
Equity Index	-6.8%	-4.4%	-5.4%	-0.7%	-1.0%	-4.8%	-2.7%	-2.8%	-1.6%	-3.7%	-5.5%	-5.4%	-2.5%	-2.7%
FX (vs USD)	-1.6%	-1.6%	0.0%	0.2%	-1.8%	0.1%	-1.6%	0.3%	-2.7%	-2.3%	-1.0%	-1.6%	-1.1%	-1.6%
Δ10yr bond yield (bp)	-25.1		-22.5	-1.9	-9.0	-25.3	-17.2	-35.5	-2.7	-20.2	-23.8	-23.8	-16.0	-17.2

Sources: Bloomberg; and AMRO staff calculations.

Note: Currency listed under Shenzhen is CNH. The outsized fall in Indonesia's utilities sector is attributable to idiosyncratic factors which include changes to tariffs and regulatory risks.

B. Economic Impact

12. **Aside from the physical spread of the disease, there are several key channels through which economic activity in the region could be affected.** They include a virtual stop in tourism, a marked slowdown in China's economy, disruptions to regional supply chains, public contagion avoidance behavior, and domestic measures to control the outbreak:

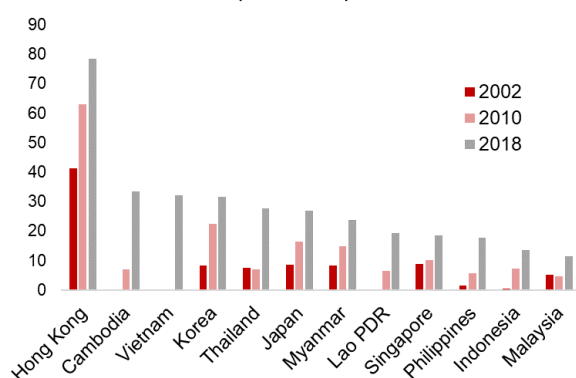
- Regional economies have become much more dependent on Chinese tourism today than they were during SARS, so that even a relatively short-lived embargo on Chinese travel would have a much bigger impact. Indeed, the drop in Chinese travel and tourism is already being felt across the region.
- Weaker Chinese demand for goods imports could become particularly significant for the region should the economic slowdown become worse, given the region's highly integrated regional supply chain.
- If the disease were to spread more widely within the region or fear of contagion increase, regional economies could be affected both directly from the epidemic as well as indirectly from implementing or sharpening measures to contain the virus. This could hurt economic activity similar to what is happening in China—albeit likely to a lesser degree—as a result of disruptions in domestic production and consumption.

13. **Although the impact of SARS on Chinese tourism in the region was already evident in the early-2000s, the effects will undoubtedly be significantly worse this time.** The number of Chinese visitors to the region has increased manifold in almost twenty years. It has risen from less than 20 percent of all visitors in 2002 to more than 40 percent in 2018—or from around 10 million to more than 80 million. Individual countries in the region have benefited from growing shares of tourists from China, making up almost 80 percent of visitors in Hong Kong in 2018, more than 30 percent in Cambodia, Korea and Vietnam, and about 30

percent in Thailand and Japan (Figure 7). Prior to the SARS outbreak, in 2002, those shares were considerably lower—only 41 percent in Hong Kong, and less than 10 percent in the rest of the region.

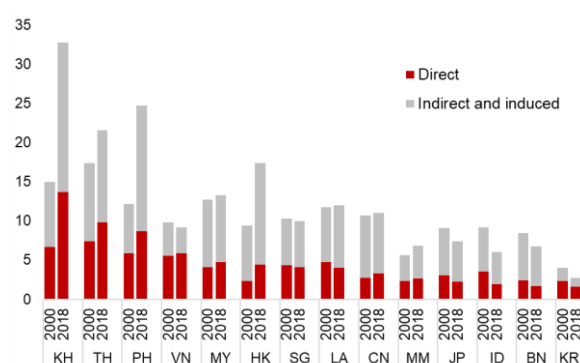
14. **Correspondingly, the importance of tourism's contribution to regional economies' GDP has increased.** The World Travel and Tourism Council estimates that the direct benefits of tourism in the region are highest for Cambodia and Thailand, contributing 14 and 10 percent to GDP, respectively (Figure 8). The overall contributions are much higher—more than 30 percent for Cambodia, higher than 20 percent for Thailand and the Philippines. Overall, tourism's contribution to GDP has increased in almost all countries in the ASEAN+3 region since the early-2000s.

Figure 7. ASEAN+3 ex-China: Share of Visitors from China (Percent)



Sources: Haver Analytics; national authorities; and AMRO staff calculations.

Figure 8. ASEAN+3: Travel and Tourism Contribution to GDP (Percent)

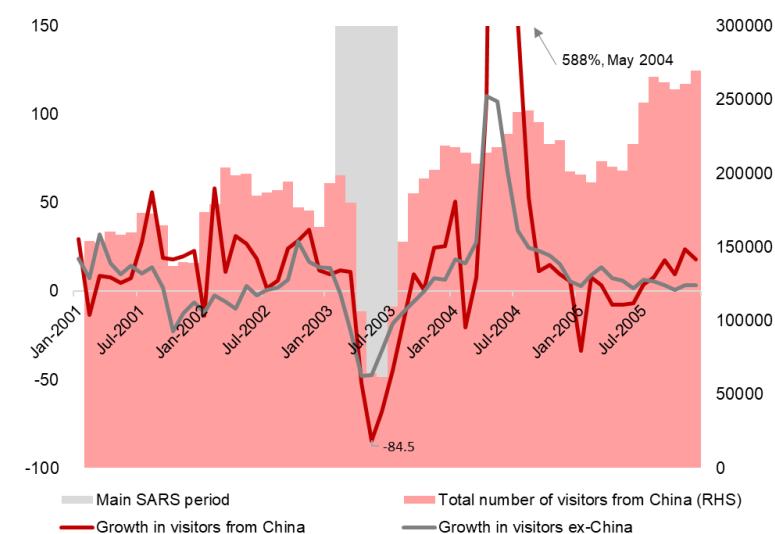


Sources: World Travel and Tourism Council; World Bank; and AMRO staff calculations.

15. **Consequently, regional economies with large tourism sectors and a high share of Chinese visitors are expected to be particularly hard hit by the coronavirus epidemic.** Tourism has been almost immediately affected, both by China's restrictions on outbound travel groups, and from travel restrictions and advisories, as well as flight suspensions, by countries in the region (such as Malaysia and Singapore) and elsewhere in the world, on their own citizens and visitors from China. Among the ASEAN+3, Cambodia and Thailand are expected to be most affected, and Vietnam and Hong Kong to a lesser extent (although the latter already suffered from low visitor arrivals as a result of the ongoing social unrest). Additional negative effects could stem from a drop in tourists from other regions, particularly if infections within the ASEAN+3 region were to rise, or simply because of a rise in risk aversion against travelling.

16. **The sharp drop in tourism during the SARS outbreak in 2003 represents a relevant benchmark.** At the time, tourism from China to Japan, Korea, Malaysia, Philippines, Singapore, and Indonesia plunged—by between 50–90 percent year-on-year—in the months of May and June 2003, but rebounded in 2004 (Figure 9). Thus, if the current epidemic is relatively short-lived, a similar rebound could somewhat mitigate the initial, sharp pull-back.

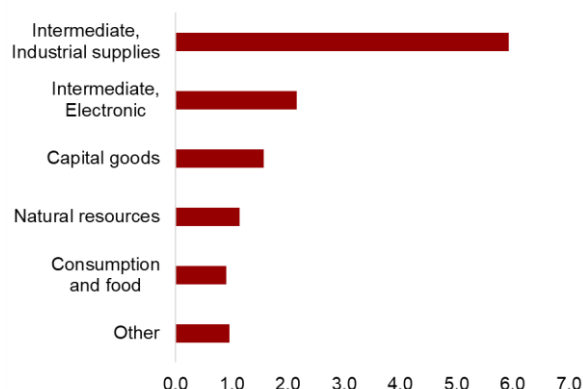
Figure 9. Selected ASEAN+3 Economies: Visitor Growth
(Percent year-on-year; number of visitors)



Note: Refers to visitor numbers in Japan, Korea, Malaysia, Philippines, Singapore, and Indonesia.
Sources: Haver Analytics; national authorities; and AMRO staff calculations.

17. **Meanwhile, intra-regional trade in goods will also be hit by demand and production disruptions in China.** Many regional economies are very open and well-integrated into regional and global supply chains of which China is an important link (Figures 10 and 11). Goods trade between China and the ASEAN region has increased substantially over the last two decades (Figure 12), and the share of goods exports to China has risen for most regional economies, to more than a quarter of GDP in Vietnam, and more than 10 percent in Malaysia, Korea, and Lao PDR (Figure 13). However, consistent with our assumptions on the life of the epidemic, the supply chain disruptions are expected to be transitory and trade is expected to rebound in line with China's demand for intermediate and final goods.

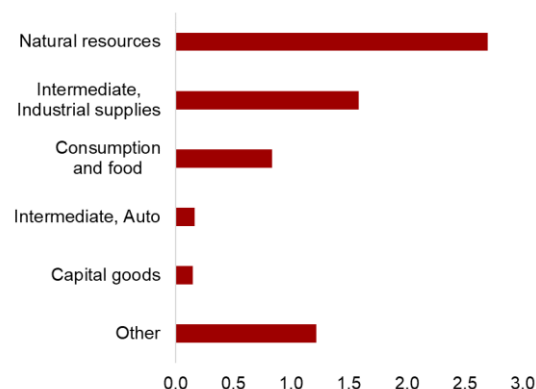
Figure 10. ASEAN-6: Goods Exports to China and Hong Kong, 2018
(Percent of GDP)



Sources: UNCOMTRADE, reporters=CN and HK, CEIC; and AMRO staff calculations.

Note: ASEAN-6 = ASEAN-5 (Indonesia, Malaysia, Philippines, Singapore, Thailand) plus Vietnam.

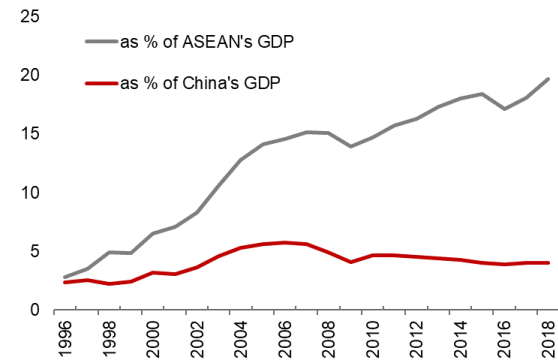
Figure 11. BCLM's Goods Exports to China and Hong Kong, 2018
(Percent of GDP)



Sources: UNCOMTRADE, reporters=CN and HK, CEIC; and AMRO staff calculations.

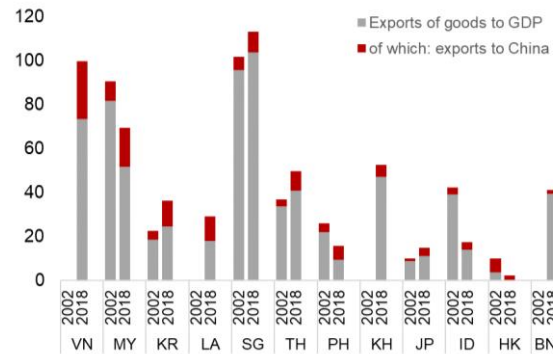
Note: BCLM = Brunei Darussalam, Cambodia, Lao PDR, Myanmar.

**Figure 12. Goods Trade between China and ASEAN
(Percent of GDP)**



Sources: CEIC; and AMRO staff calculations.

**Figure 13. Goods Exports in ASEAN+3
(Percent of GDP)**



Sources: Haver Analytics; and AMRO staff calculations.

C. Quantifying the Economic Impact

18. **The economic impact of the epidemic is quantified using a Global Vector Autoregression (GVAR) model.** The GVAR simulates two separate scenarios: (1) the transmission of an uncertainty shock to the region and the rest of the world, using the Global Economic Policy Uncertainty (GEPU) Index as a proxy; and (2) spillovers from a slowdown in China's growth to the rest of the region and the world. The findings provide broad guidance to potential impacts on regional economies, but cannot take into account specific channels such as travel and tourism as discussed above.

19. **The results suggest that a direct shock to China's growth has a much larger impact on the region, while any increase in global uncertainty also dampens economic growth (Figure 14):**

- A 25 percent increase in the GEPU, in line with the annual increase in Hong Kong's GEPU index during the SARS outbreak in 2003, would be quickly transmitted to financial market prices. Equity markets record a broad-based sell-off, while exchange rate movements reflect an immediate flight to safety, with the Japanese yen appreciating and the rest of the currencies (except for the Hong Kong dollar, which is pegged to the US dollar) depreciating against the US dollar. In addition, a flattening of the yield curve would occur in the advanced economies and most emerging Asian economies.
- Growth would also be impacted by a shock to uncertainty. While the direct impact is minimal, the GVAR model likewise maps the indirect impact, where a sharp decline in financial markets would spill over into lower growth. Overall, China would face a 0.1 percentage point decline in growth, and the more open economies of Singapore and Hong Kong impacted with a 0.2-0.3 percentage point decline in their respective growth rates. Indonesia is largely immune given its greater domestic-demand orientation.
- Separately, a 0.5 percentage point decline in China's economic activity would affect Hong Kong and Singapore disproportionately, while the hit to Thailand's growth would be almost as large as China's. The negative effects on Malaysia, Japan, Korea and the Philippines are of relatively similar magnitude, while Indonesia appears to be the least exposed.

Figure 14. GVAR: Impact of Shocks to China's Growth and Global Economic Policy Uncertainty
(Percentage point)



Sources: Haver Analytics; policyuncertainty.com; and AMRO staff calculations.

Note: GDP responses are deviations from the baseline over a 12-month period. The variables in the Global Vector Autoregression (GVAR) model are: real GDP (interpolated from quarterly data), inflation, equity prices, bilateral exchange rates, long-run and short-run interest rates, and non-resident capital flows. Monthly data from July 2003 to June 2019 are used.

IV. Policy Responses

20. **The Chinese authorities have implemented economic policy measures to support the economy in the short-run.** Among others, these measures have included temporary liquidity support, which has helped to calm the markets. If the epidemic is protracted, more measures may be needed to maintain public confidence and support the economy. Elsewhere in the ASEAN+3 region, policy space provides some buffer to adopt more accommodative monetary and fiscal policies, as needed. Should the epidemic worsen and external risks materialize, the region's economies also have sufficient reserves and exchange rate flexibility to withstand those challenges, at least for an extended period.

Appendix I. A Comparison of Global Virus Outbreak Episodes

With new information on the coronavirus and its contagiousness still emerging, existing and previous epidemics can provide insights into determining its potential economic implications. While some endemic diseases, such as HIV, malaria or even the common cold, pose ongoing risks to health globally, virulent epidemics—which may be short-lived—gain worldwide attention because of their visibility and impact on health and the economy. The world has been through several epidemics and pandemics over the last two decades alone, which could provide a gauge of the seriousness of the coronavirus for economic activity (Table A.1).

The epidemics differ widely in terms of their fatality and mortality rates, and their contagiousness:

- The most fatal (that is, the number of deaths per infection) among the epidemics have been the avian flu H5N1 (though with relatively few cases of the disease registered), Ebola and MERS.
- The mortality rate (that is, deaths among the population of the affected countries) was by far the highest for Ebola—with 57 deaths per 100,000 in Sierra Leone and 102 deaths per 100,000 in Liberia—followed by H1N1 (4 deaths per 100,000), and MERS (2 deaths per 100,000).
- Finally, contagiousness is estimated by the reproduction rate R_0 (that is, the average number of people who are infected from a single infected person—an estimate which can vary over time) and seems to have been among the highest for the non-fatal Zika virus and MERS.

Taken together, these parameters appear to influence the eventual economic impact—directly via the health impact, and also indirectly via measures implemented to contain the spread of an epidemic, a loss of business and consumer confidence, and public contagion avoidance behavior, all of which can impact production, provision of services, consumption, travel, tourism, and trade.

The current epidemic has spread quickly and is expected to become more widespread, but the fatality rate has remained relatively low. Given the sharp increase in outbound tourism from China (and other infected countries) since the SARS epidemic, it is likely that the coronavirus has and could be more widespread throughout the world than the SARS epidemic. On the other hand, the Chinese authorities have taken swift, unprecedented measures to contain this outbreak, which would have significantly reduced its contagion although it may have a more severe economic impact in the short run.

Table A.1. Previous Virus Epidemics: An Overview

Virus	Main countries affected	Outbreak dates	Worldwide cases	Deaths	Fatality (in %)*	Mortality per 100,000**	R ₀ ***	Median [max] incubation period (in days)	Human-to-human transmission	Survivability on dry surfaces***
SARS coronavirus	China; Hong Kong	2002/03	8,096	774	9.6	0.03	0.4 - 3.5	4-5 [14]	Symptomatic transmission	2 days
Avian flu H5N1	Egypt; Indonesia	2003-15	846^	449	53.1	0.15	2.0 - 2.7	2-5 [17]	Unusual	1 day
Swine flu H1N1	Pandemic	2009	n/a (CDC est.: tens of millions)	18,337^^	n/a	4.06^^	1.4 - 1.6	2 [7]	Asymp. & symp. transmission	12 hrs
MERS coronavirus	Saudi Arabia; Korea	since 2012^^	2,494	858	34.4	2.42	2.0 - 5.0	5 [14]	Symp. transmission under close contact	n/a (poor survivability)
Ebola	Sierra Leone; Guinea; Liberia	2013-16	28,616	11,310	39.5	57.00	1.7 - 2.0	8-10 [21]	Symptomatic transmission	4-11 days
Zika	Brazil; Colombia	2015/16	730,448 ⁺	0 ⁺	0.0	0.00	3.0 - 6.6	6 [14]	Asymp. & symp. transmission	8 hrs
2019-nCov ⁺⁺	China	2019/20	37,558	813	2.2	0.06	1.4 - 3.3	est. 6 [14]	Asymp. & symp. transmission	n/a (poor survivability)

Sources: WHO, CDC, PAHO, NCBI, IMF WEO, CIDRAP, NEJM, Science Daily, Live Science, ScienceAlert; AMRO staff calculations.

Notes:

* Fatality rate refers to the proportion of people diagnosed with a disease who die from that disease over a certain time period.

** Mortality rate here refers to the number of deaths per 100,000 citizens for the globally most affected country (by number of cases) during a certain time period.

*** R₀ estimates the average number of persons who will catch a disease from one contagious person. Estimated ranges obtained from WHO, NCBI, and CDCs.

^ Number of cases refers to all reported cases from 2003 to 2015.

^^ Total deaths is likely an underrepresentation of the actual number as many cases might have never been tested or recognized as H1N1 related.

^^^ Main episodes took place between 2014-15.

⁺ Number of cases refers to the Americas in 2015 and 2016. Number of deaths does not take into account fetal loss or stillbirth.

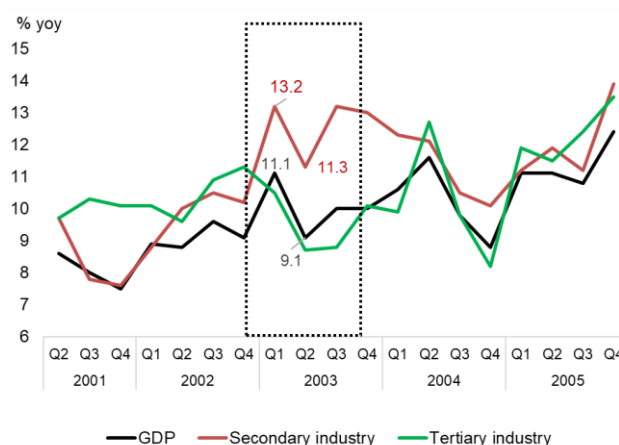
⁺⁺ As of February 9, 2020, WHO Situation Report 20.

⁺⁺⁺ Estimated survivability of virus on dry surfaces at room temperature. Obtained from WHO, Science Daily, Live Science, CIDRAP.

Appendix II. Juxtaposing the Impact of SARS versus the Coronavirus on China

In China, the economic shock from the SARS outbreak in 2003 was concentrated in the services sector. At the time, GDP growth, and growth in value added (year-on-year) of the secondary and tertiary industries (mostly services) each fell by about 2.0 percentage points from Q1 to Q2 2003 (Figure A.1). When the infection dissipated, strong external demand and recovery of production ensured that the secondary industry rebounded strongly, while the recovery of the tertiary industry was more gradual.

Figure A.1. China: GDP growth during the SARS period
(Percent year-on-year)



Sources: National Bureau of Statistics of China, Wind; and AMRO staff calculations.

In the services sector, shocks were concentrated in labor intensive sectors that require face-to-face interactions. During SARS, the transportation, accommodation, catering and financial services sectors were hardest hit (Table A.2). For these sectors, GDP in the second quarter of 2003 fell by 5.4, 3.6, and 3.6 percentage points from the first quarter, respectively.

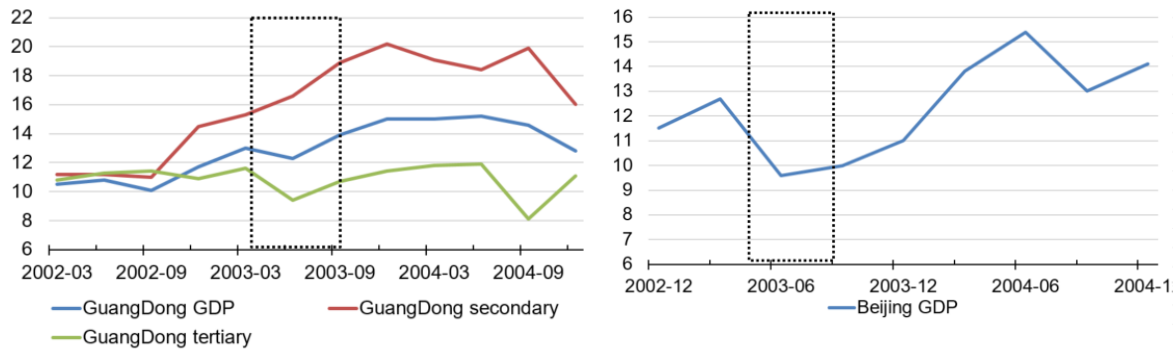
Table A.2. China: GDP Growth by Sector during the SARS Period
(Percent year-on-year)

	Wholesale retails	Transportation	Accommodation, catering	Finance	Real estate
2002-12	9.8	9.1	12.3	8.8	11.2
2003-03	8.3	7.7	11.0	11.3	11.1
2003-06	10.3	2.3	7.4	7.7	12.7
2003-09	13.8	7.6	16.9	7.2	6.9
2003-12	7.6	7.1	14.3	3.7	9.0
2004-03	0.8	14.5	5.0	6.5	8.0
2004-06	8.2	18.2	16.4	2.3	8.1
2004-09	5.3	15.8	11.0	2.7	4.5

Sources: National Bureau of Statistics of China; Wind; and AMRO staff calculations.

Guangdong province and Beijing were the most affected. They reported the highest number of SARS patients, and were hit harder than other parts of China. In Q2 2003, the GDP growth of Beijing and Guangzhou was 9.6 percent and 13.4 percent respectively, down 3.1 and 0.5 percentage points from the first quarter (Figure A.2).

Figure A.2. Guangdong Province and Beijing: GDP Growth during the SARS Period
(Percent year-on-year)



Sources: Wind; and AMRO staff calculations.

Sources: Wind; and AMRO staff calculations.

There are some similarities in the development of the SARS and coronavirus infections across economic sectors and regions:

- ***Both episodes may be characterized as short-term production-side and services-demand disruptions, with some services being severely impacted.*** The impact on the manufacturing sector and trade were more limited and transitory, as companies found ways to make up for most of the lost sales when demand bounced back. Services, such as tourism, were less replaceable over time owing to various constraints.
- ***Both epidemics hit the most developed regions in China, home to important industries and much of China's purchasing power.***
 - In 2003, the SARS patients were concentrated in two major economic centers: Beijing and Guangdong province, which accounted for 47 percent and 29 percent of all cases; there were very few cases in the Yangtze Delta and other regions.
 - The coronavirus has hit Wuhan (similar in importance to Chicago in the United States) and the rapidly industrializing central China region. Hubei province, including Wuhan, accounts for around 4.6 percent of China's GDP. In addition, central China, Pearl-Delta, Yangtze-Delta and Jing-jin-ji city clusters are among the most vulnerable to infection, according to a study by the University of Southampton (2020). These are the most developed regions in China and are also the most vulnerable to economic disruptions.
 - Both epidemics occurred over the Lunar New Year (LNY) period, when hundreds of millions of Chinese were travelling to visit family throughout the country.

However, there are also worrying differences in China's macro-financial environment between 2003 and the present:

- ***During the SARS period, the Chinese economy was boosted by rising exports, following WTO accession in 2001, and a strong external environment, in contrast to current weak external demand.*** In 2002–2003, the global economy was rebounding from the bursting of the internet bubble, which led to rapid growth in China's exports (which grew by more than 30 percent in 2003). At the same time, China was

undergoing rapid industrialization and urbanization. Today, the growth rate of China's economy is slowing as the economy becomes more developed. In addition, the ongoing trade tensions with the United States have put a strain on the economy.

- ***The services sector, which is experiencing significant disruptions, has become more important today.*** In 2003, the tertiary industry's value-added accounted for 32 percent of China's GDP; in 2019, it accounted for 54 percent of GDP. To put it in perspective, the retail and catering sectors in China achieved sales of about CNY 1 trillion, or 1.0 percent of annual GDP, during the 2019 LNY festival (February 4 –10), and tourism revenue was CNY 514 billion, or 0.5 percent of annual GDP. Hence, spending in the LNY festival is sizable and important to GDP. Much of the lost retail sales during this period, such as automobiles, could be replaced by purchases in future months; however, this is not likely to happen for services, as supply is more constrained by labor and consumers' availability.
- ***Financial sector risks are higher now.*** After the Asian Financial Crisis, credit risk was very high. A few years after the crisis, the Chinese government helped banks dispose their non-performing loans and to recapitalize them, while addressing some systemic risks in the system. Presently, local government debt levels are already relatively high, and small and medium-sized commercial banks are exposed to high credit risks while efforts to reduce systemic risks are ongoing.

On a positive note, online economic activities are helping to cushion the impact of the lockdown and quarantine on businesses. E-commerce accounted for 21 percent of retail sales in 2019, and a large share of the lost sales at shops owing to the coronavirus might be offset by an increase in online purchases. At the same time, online gaming, online social-media, streaming, education and other entertainment, which could be enjoyed even under quarantine, could support the services sector.

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