

# The Effect of Epidemic Diseases on Economy and Industry

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## 1. Major Epidemic Diseases Since 2000

As COVID-19 has spread all over the world, it is having a serious impact on the global economy. Since there are yet great uncertainties regarding the ultimate duration and scope of its proliferation, it is difficult to forecast the magnitude of its impact. In this regard, investigating previous cases can provide useful information. In this paper, we investigate the effects of major epidemic diseases since 2000 on the economies and industries of some of the hardest-hit countries, including Korea.

Major epidemic diseases since 2000 include SARS (2002-2003), swine flu (2009), and MERS (2015). Among these, swine flu spread the furthest and persisted the longest. Swine flu is most similar to COVID-19 as both caused pandemics — unlike SARS or MERS. However, the antiviral medication Oseltamivir<sup>1</sup> was successfully used to treat the symptoms of

the swine flu, which greatly helped to circumscribe both its mortality rate and its economic effects, especially as compared to COVID-19. In addition, since the outbreak of swine flu coincided with the rapid recovery of world economy from the Great Recession, it is more difficult to observe its economic effect than the other epidemic diseases. SARS by contrast, though not pandemic, was much more fatal and occurred intensively in a few East Asian countries, with serious economic impacts. Meanwhile, though MERS was spread to only a few countries and persisted for the shortest period among the three epidemics, Korea was one of hardest-hit countries, and the disease significantly affected the Korean economy.

In consideration of the above, we select three SARS cases and one MERS case and investigate them. They are three nations hardest-hit by SARS (Hong Kong, Singapore, and Taiwan; heretofore SARS Three) and the

1 It was sold under the brand name Tamiflu.

**Table 1. Major Epidemic Diseases Since 2000**

	SARS	Swine flu	MERS	COVID-19
Date	2002.11~2003.7	2009.5~2010.3	2015.5~7	2020.1~
Location	East Asia	World	Middle East, Korea etc.	World
Number of cases	8,096 (4)	n.a.	1,367* (186)	3.85 million**
Number of deaths	774 (0)	151,700~575,400	525* (39)	270,000**

Source: WHO and Wikip.e.

Note: 1) \* as of June 2015.

2) \*\* as of May 6, 2020.

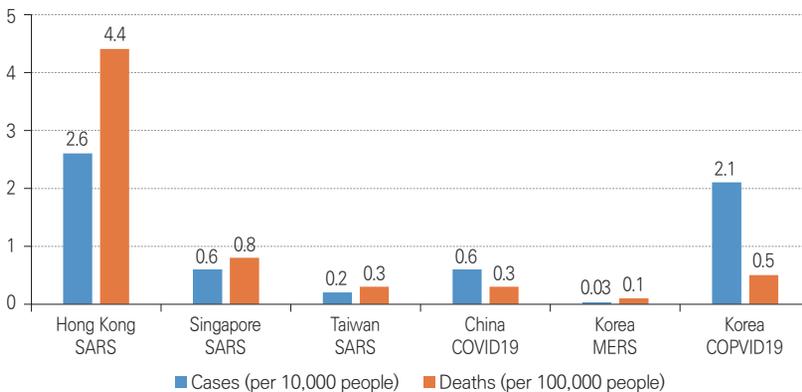
3) Figures in parentheses denote Korean case.

**Table 2. SARS by Country**

	China	Hong Kong	Taiwan	Singapore	Korea	World
Number of cases	5,327	1,755	346	238	4	8,096
Number of deaths	349	299	73	33	0	774

Source: WHO.

**Figure 1. Comparison of SARS, MERS, and COVID-19 (as of May 6, 2020)**



Source: WHO etc.

Korean MERS case. Figure 1 shows a comparison of the ratios of cases and deaths to population among epidemics cases, including the above four cases and COVID-19. As can be seen in the figure, Hong Kong SARS is the highest in terms of both case ratio and death ratio. In terms of case ratio, Korea COVID-19 is second-highest, next to Hong Kong SARS.

But, the death ratio of Korea COVID-19 as of early May 2020 is only about one-ninth of Hong Kong SARS and much lower than even Singapore SARS. We can assume that economic impacts of epidemics will have a positive correlation with their case ratios or death ratios, although not in exact proportion. In that sense, we will be able to get a rough forecast

of the effect of COVID-19 on the Korean economy from a combination of Figure 1 and the following case studies.

## 2. Data and Methodology

For starters, let us briefly explain the data and the methodology we used to estimate economic effects. In this paper, we estimate the economic effect of epidemics by comparing economic growth rates over the periods that include the outbreak of epidemics. Specifically, we divide a longer period including the outbreak of disease into four shorter sub-periods — before the outbreak, during the outbreak, the post-outbreak recovery, and the period post-recovery — and obtain growth rate trends from the average of the pre-outbreak and post-recovery' growth rates. We then estimate epidemics' effect on economic growth by comparing growth rates during the outbreak with trend growth rates. Trend growth rates were obtained from the arithmetic means of growth rates during the four to eight quarters before the outbreak and growth rates during the eight quarters post-recovery. Outbreak periods were set as the first and second quarters of 2003 for SARS and the second and third quarters of 2015 for MERS. We used seasonally-adjusted quarterly data obtained from IHS Markit and Bank of Korea ECOS.

This method has some limits as it does not control for other factors besides epidemics. Nonetheless, we think it is useful, albeit not

rigorous, in these cases since first, the periods of outbreak are pre-defined, and second, the changes in growth rates during those periods are visually obvious, and finally, any special assumptions are not needed.

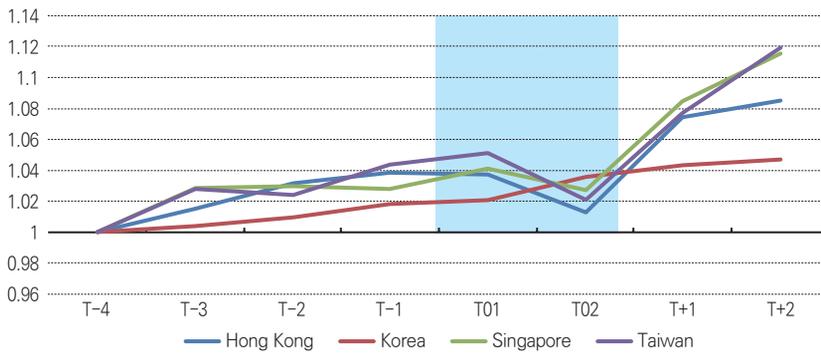
## 3. Effects on the Macro-economy

The effects of SARS on Hong Kong, Singapore, and Taiwan (abbr. SARS Three) are easily recognizable in their GDP growth rates. We can see marked falls in the economic growth rates of the three countries during the period from Q4 2002 to Q2 2003 (Figure 2). The fall was greatest in Q2 2003 in all three countries with negative economic growth in that quarter. By contrast, the growth slowdown is not so marked in Korea's economic growth during the MERS outbreak. MERS' effect on the Korean economy is significant only in private consumption and some sectoral output, with a smaller impact than that of SARS on the SARS Three.

Comparing GDP growth rates of the SARS Three during Q1 and Q2 2003 with their trend growth rates, average quarterly growth rate fell by 1.8 percentage-point during that period, bottoming out in Q2 2003 with a 3.3 percentage-point drop. The steepest falls during that period were seen in Hong Kong with a 2.4 percentage-point decline and Taiwan, where growth plummeted by 3.8 percentage-points (Table 3).

But, the impact did not last long. All three countries grew rapidly after the end of epi-

**Figure 2. GDP of Each Country during SARS and MERS Outbreaks**



Source: IHS Markit.

Note: 1) Graph depicts Korean GDP for the MERS period, and the other countries for the SARS period.

2) The shaded areas (T01 and T02) denote the period of outbreak (SARS: Q1-Q2 2003, MERS: Q2-Q3 2015).

demic (during Q3~Q4 2003), offsetting the fall in growth rate during the period of outbreak. While the average growth rate at the nadir of the outbreak (Q2 2003) was -2.2 percent, it sharply rebounded to 5.8 percent in Q3 2003 (Figure 3). Thus, the fall in the growth rate of all of 2003 compared with the trend was only 0.1 percentage-point in terms of quarterly rate.

As for components of GDP, while con-

sumption and investment fell similarly, exports were hit less severely (Figure 4). Yet, since consumption accounts for a bigger share of GDP, the consumption shock seems to have played the most important role in the GDP growth slowdown. The fall in private consumption growth was greatest in Singapore, with a drop of 3.1 percentage-point. The average decline of the SARS Three was 2.3 percentage-point. The impact of MERS on Korea was much

**Figure 3. GDP Growth Rates of SARS Three (average of three countries, percentage changes from the previous period)**



Source: IHS Markit.

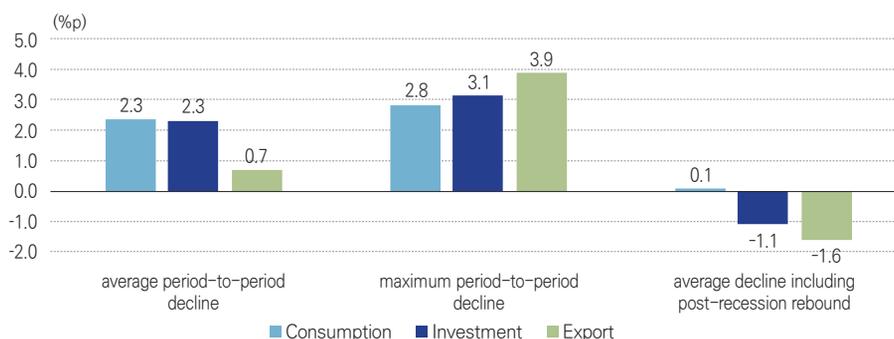
smaller, with private consumption falling by three components of GDP rebounded sharply after the end of epidemics with long-term 0.2 percentage-point (Figure 5). Meanwhile, all

**Table 3. Changes in GDP Growth Rates during the Outbreak of SARS (quarterly growth rates, percentage-point)**

	Size of fall (= trend – average of Q1 and Q2 2003)	Size of greatest fall (= trend – Q2 2003)	Size of rebound (= average of Q3 and Q4 2003 – trend)
Hong Kong	2.4	3.5	2.5
Singapore	1.2	2.5	3.1
Taiwan	2.0	3.8	3.8
Average	1.8	3.3	3.1

Source: IHS Markit.

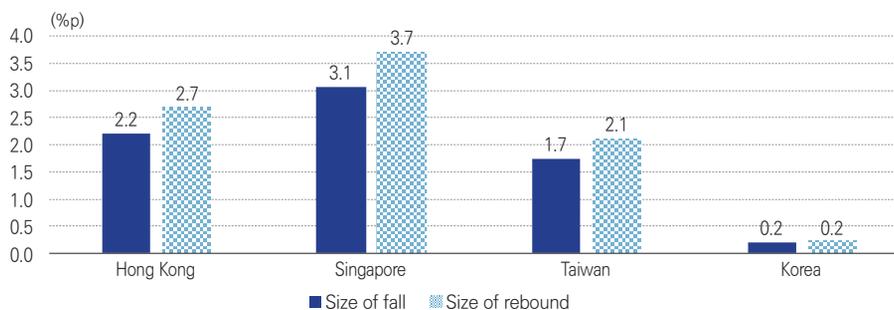
**Figure 4. Changes in Growth Rates of GDP Components (average of SARS Three countries, percentage changes from the previous period)**



Source: IHS Markit.

Note: The y-axis measures percentage decline in growth rate; larger numbers indicate greater declines.

**Figure 5. Changes in Growth Rates of Private Consumption Before and After Epidemics (percentage-point)**

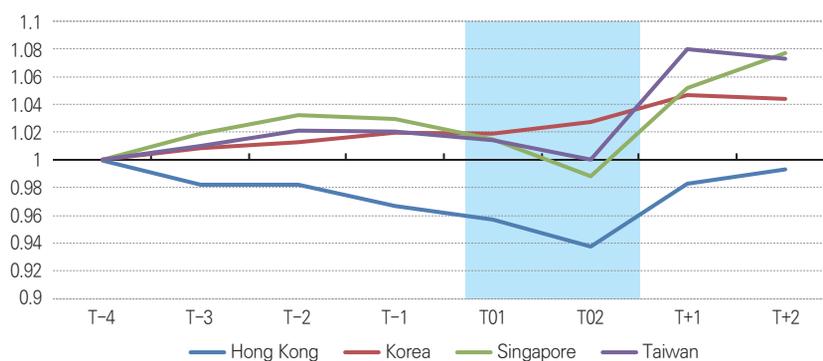


Source: IHS Markit.

Note: 1) Graph depicts Korean GDP for the MERS period, and the other countries for the SARS period.

2) The solid blue bars represent private consumption growth rates before the epidemics; the checkered blue and white bars represented private consumption growth rates following the epidemics.

**Figure 6. Private Consumption of Each Country**



Source: IHS Markit.

Note: 1) Graph depicts Korea for the MERS period, and the other countries for the SARS period.  
 2) The shaded areas (T01 and T02) denote the period of outbreak (SARS: Q1-Q2 2003, MERS: Q2-Q3 2015).

effect negligible.

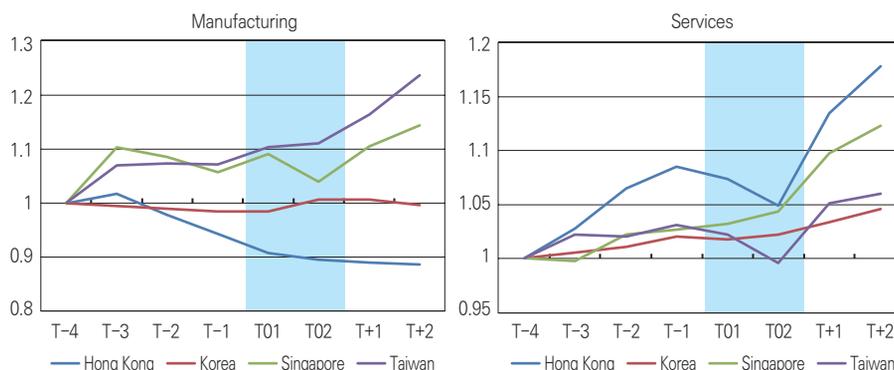
According to related studies, the impact occurred mainly from demand side. This seems due to the fact that both SARS and MERS had only limited impacts on the Chinese supply chain, to which both the SARS Three and Korea were (and are) closely related

#### 4. Effects on Sectoral Output

In the cases we investigate, epidemics affected services more than manufacturing. As can be seen in Figure 7, services exhibited a much more marked slowdown than manufacturing during the outbreak of SARS. The same was also true for Korea during the outbreak of MERS. This seems due to the fact that both SARS and MERS spread only regionally, not worldwide, and affected mainly domestic demand of the infected countries rather than exports.

Within services, it is notable that impact was concentrated in a few sectors, with many other sectors showing few changes. Also remarkable is that the hardest-hit sectors are similar across countries. In the case of SARS, the impact was greatest in the hospitality industry (hotels and restaurants) in all three countries, followed by the transport and wholesale and retail sectors. Both hospitality and transport showed negative growth rates in Q2 2003 in all SARS Three countries. In particular, the hospitality sector was hit hardest; the sector's average growth rate across the SARS Three was a 12 percentage-point drop during the outbreak periods, bottoming out with a 20 percentage-points plunge in Q2 2003. Hong Kong, the hardest-hit country, witnessed its hospitality sector shrink nearly 30 percentage-points at its nadir. The growth rate of the transport, on average across the SARS Three, fell by six percentage-points during the outbreak periods,

**Figure 7. Sectoral Output of Each Country during SARS and MERS Outbreaks**



Source: IHS Markit.

Note: 1) Graph depicts Korea for the MERS period, and the other countries for the SARS period.

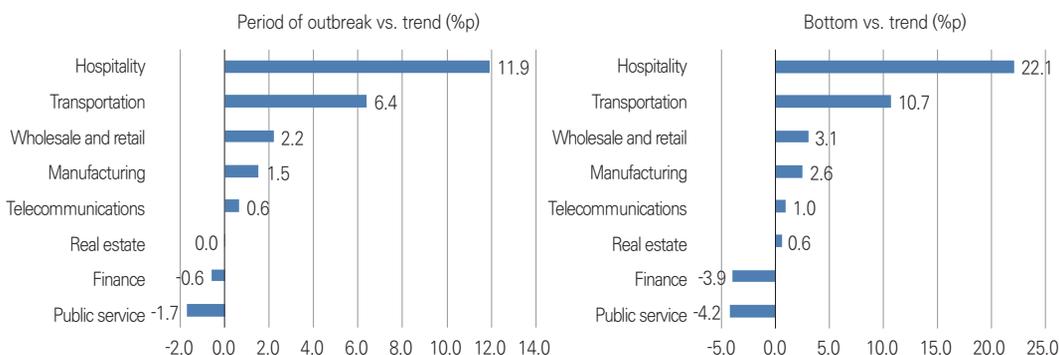
2) The shaded areas (T01 and T02) denote the period of outbreak (SARS: Q1-Q2 2003, MERS: Q2-Q3 2015).

sinking to an 11 percentage-points decline at rock-bottom (Figure 8).

Compared with the SARS Three, services in Korea during MERS showed relatively moderate growth slowdown and little difference in terms of hardest-hit sectors. In the case of Korean services, the impact of MERS was greatest in health and social services, followed by arts and other services and the

hospitality sector. The reason why health and social services was hit hardest by MERS in Korea seems to be that MERS outbreak was concentrated mainly in hospitals at that time. However, the growth rate of the sector during the MERS outbreak fell by only about two percentage-points, much smaller than the drop in the growth rates of the hardest-hit sectors of the SARS Three (Figures 10 and 11).

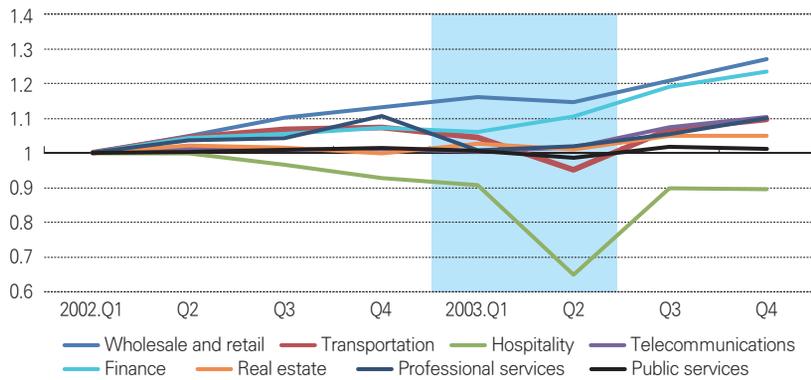
**Figure 8. Changes in Sectoral Growth Rates of SARS Three Countries (average of three countries, percentage changes from the previous period)**



Source: IHS Markit.

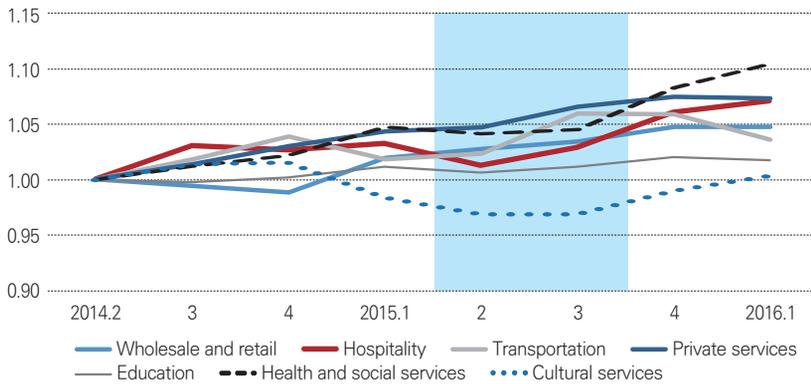
Note: Singapore excluded in manufacturing.

**Figure 9. Output of Hong Kong Services during SARS**



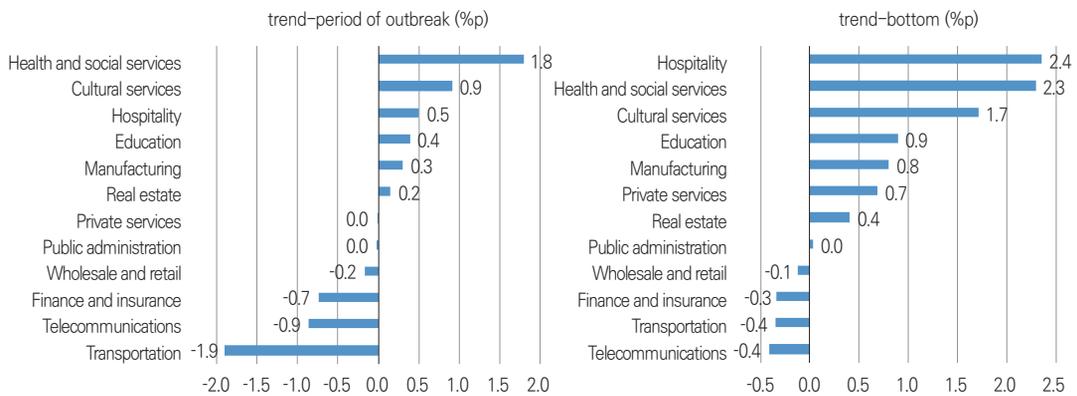
Source: IHS Markit.

**Figure 10. Output of Korean Services during MERS**



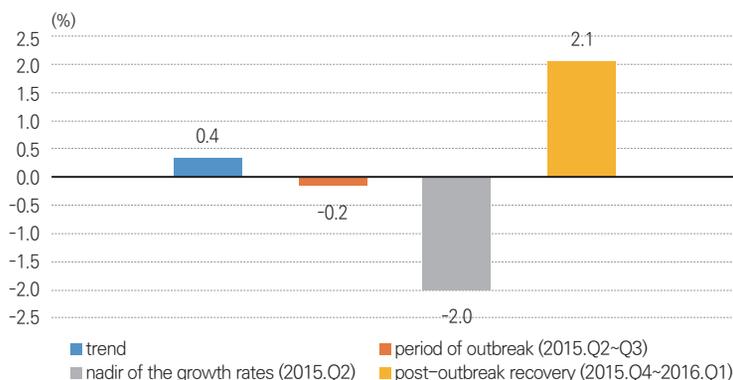
Source: Bank of Korea ECOS.

**Figure 11. Changes in Sectoral Growth Rates in Korea during MERS (percentage-point)**



Source: Bank of Korea ECOS.

**Figure 12. Growth Rates of Korean Hospitality Sector before and After MERS (quarterly rates, percent)**



Source: Bank of Korea ECOS.

Meanwhile, even the hardest-hit sectors recovered rapidly after the end of the epidemics and the long-term effects were negligible. This was the same in both the SARS Three and Korea after MERS.

### 5. Implications for the Economic Effect of COVID-19

What we found in the above investigation of economic effects of epidemics is, at least in part, closely related to the features of SARS and MERS. Both SARS and MERS persisted for a relatively short period and spread only regionally. As a consequence, these epidemics affected mainly the domestic demand of infected countries rather than external demand or the supply side and accordingly, the impact was more significant in services than in manufacturing.

Now, taking into account these features, let us summarize some common characteristics

found in the above investigations. First, it is notable that despite the difference in the magnitude of shocks, the impact was temporary and long-term effects were negligible, with rapid recoveries observed after the outbreaks were suppressed. Both the macroeconomic and sectoral effects were identical. Of course, this is closely related to the fact that both epidemics persisted for a short period. Yet, it seems that once that condition (a short period of outbreak) is satisfied, this characteristic is highly reproducible as a typical case of the effect of a temporary and external shock on an economy. Second, the impact was concentrated in a few sectors. Even in Hong Kong SARS, the hardest-hit case where GDP growth rate fell more than 2 percentage-points for two consecutive quarters, about half of services sub-sectors did not exhibit significant growth slowdowns. Third, the sectors hit most severely were similar in all four cases. The impact was greatest in hospitality,

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transport, and wholesale and retail trade (in that order) in the SARS Three. In the Korean MERS case as well, hospitality was one of the hardest-hit sectors.

Will economies hit by the COVID-19 epidemic also exhibit these characteristics? Begin with temporary shock and rapid recovery. If COVID-19 comes under control in a relatively short period of time (say, within the first half of this year) and it does not lead to worldwide recession, then it is likely to end up a temporary shock. However, since COVID-19 is already a pandemic, unlike SARS or MERS, and there is neither a cure nor a vaccine, it seems likely to last longer than SARS or MERS. The impacts of COVID-19 on affected economies also appear, as of now, to be much greater than the impact of SARS and MERS. Moreover, the world economy is in weaker position now than in the early 2000s when SARS broke out as the global debt-to-GDP ratio hits a record high. Considering these facts, the economic impact of COVID-19 is very likely to last longer than the impact of SARS or MERS at the very least, and the probability of it ending up a temporary shock with a V-shape recovery seems to be getting lower.

Second, the scope of impacted sectors is likely to be broader in the COVID-19 epidemic than in SARS or MERS, since the former has already brought about a supply disruption as well as a demand reduction and as a result of its worldwide spread, an impact on not only

domestic demand but also on exports seem inevitable. Korean manufacturing, which is closely interwoven into the global value chain will be substantially affected. However, considering the characteristic of the shock as one caused by the threat of epidemic disease, even if the scope of impacted sectors is broader in this case, the strong unevenness of impact across sectors is still likely to persist. Therefore, the variance in the magnitude of impact across sectors will be much greater than in ordinary recessions.

Third, hardest-hit sectors in this case are likely to be similar to those during the SARS and MERS outbreaks. Since the cause of shock is the threat from epidemic disease, face-to-face services such as travel-and-leisure-related services and cultural and personal services will be inevitably hit hardest.

Finally, as for the scale of impact, considering the situation up to now, the effect of COVID-19 on the Korean economy is expected to be, at least, no smaller than the average shock experienced by the SARS Three in 2003. If the disease persists much longer, the impact can be far greater than even that of SARS in Hong Kong.

## 6. Implication for Policy Responses

First of all, the first priority in resource allocation should be on efforts to curb the spread of disease and minimize the loss of lives. This is also the best way to minimize economic

costs. In some cases, we may need to pursue resource allocation based on a command and control system as in a war-time economy. In such cases, it will be important to find an appropriate division of roles between market functions and the capability of the administrative state.

Meanwhile, economic policies to address the impact of the disease should focus on three fronts. First, boosting aggregate demand to avoid recession. Second, assisting businesses to prevent bankruptcies and job losses and third, protecting weak and vulnerable households.

When designing and implementing economic policy, it is also important to take into account the peculiarities of the impact. As mentioned above, impacts are likely to be more uneven across sectors in this case than in an ordinary recession. Thus, policy supports should target hard-hit sectors and vulnerable households rather than being universal. In addition, for hard-hit sectors, the scale of the impact and the speed of downturn are likely to be much greater than in an ordinary recession. This implies that a prompt response is particularly important for those sectors.

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