The Impact of SARS on Asian Economies*

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Abstract
This paper describes the economic implications of the SARS outbreak that hit many Asian economies in spring 2003. Without a workable diagnostic test and a treatment for the illness, surveillance and quarantine were the key weapons against SARS last year. In general, risks are greater in countries with poor public health care, poor sanitation systems, high mobility, or high population density. During the height of the SARS outbreak, we estimated that the total costs of the epidemic would be about 1.5 percent of GDP for China. Better-than-expected containment of the virus reduced the impact to only about 0.5 percent of GDP. The experiences of the SARS outbreak point to the strong need to improve both the public health system and the governance structure in Asia.

1. Introduction

In spring 2003, Asia was the epicenter of a potentially global health crisis. The advent of a new, deadly disease, severe acute respiratory syndrome (SARS), disrupted the lives of millions of people in China and its Southeast Asian neighbors. A pandemic was avoided, but economic disruptions were not. Quarantine, a "Middle Ages solution" for outbreaks of disease, rather than a 21st-century breakthrough in biotechnology, was the key strategy in containing the disease. A cure for SARS has not been found, nor has an effective diagnostic kit been developed.

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Should the disease reappear, as some epidemiologists fear, social and economic disruptions could resurface.[1]

This paper was drafted during the height of the crisis to gauge the effects of SARS on Asian economies. Thankfully, the duration of the outbreak was far shorter than we had feared. Our initial estimates of the magnitude of these impacts were too large, and therefore we have scaled these down to reflect actual outcomes. Still, the channels through which the outbreak disrupted economies remain relevant, and an analysis of these channels may prove useful to our understanding of the likely impacts and risks to Asian economies, should a new wave of the disease appear before effective diagnostic procedures and cures are in place.

Section 2 begins with a brief chronology of the SARS outbreak. We summarize the data on the increasing numbers of SARS cases as the virus was carried from China to other countries and describe the measures taken to halt the spread of the disease. Section 3 describes the difficulties facing scientists who are searching for a cure or developing better diagnostic procedures and treatments and discusses the likelihood of achieving these goals soon.[2] In section 4 we identify some of the risk indicators for the spread of SARS to predict which Asian countries would have a higher chance of infection if another SARS outbreak were to occur. In section 5 we discuss the economic effects of SARS on China; for example, we note the impacts on the tourism and retail industries and on foreign direct investment (FDI). We also present the results of simulations we conducted using the Oxford Economic Forecasting (OEF) model. In the final section, we revisit our forecasts and discuss some implications for Asian economies in light of the actual outcome of the SARS outbreak.

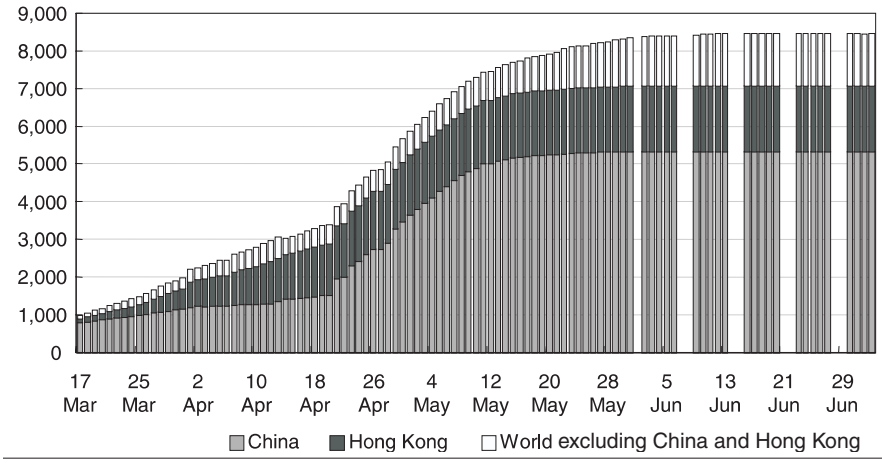
2. Spread and containment of SARS

The first case of SARS inside China appeared in mid-November 2002. The first case outside China was reported in late February 2003, when a Guangdong-based doctor became ill in Hong Kong. By 31 May 2003, the number of probable cases had reached 8,359, and the mortality rate had climbed to 14.3 percent outside China. After that, the growth of the number of probable cases slowed sharply (figure 1). By 5 July 2003, when the World Health Organization (WHO) declared the outbreak con-

1 Singapore reported a suspected SARS case in early September 2003, the first case since June 2003. The World Health Organization continues to issue warnings about the risks of a future epidemic. See www.who.int/csr/SARS/en

2 This section draws heavily from an earlier report by Donald Hanna and Robert Bonte-Friedheim, a pharmaceutical analyst at Citigroup's Smith Barney (Hanna and Bonte-Friedheim 2003).

Figure 1. Total probable cases of SARS in China, Hong Kong, and the rest of the world (2003)



Source: *World Health Organization (2003).*

tained, the number of probable SARS cases had climbed to 8,448, with 5,377 cases reported in China and 1,755 in Hong Kong. SARS presented a grave threat to much of Asia in April and May 2003, with serious implications for economic activity. In Taiwan, the growth of the number of cases accelerated to nearly 10 percent in mid-May, and in China, around 200 new cases were appearing daily at the end of April 2003.

Probable SARS cases were reported in 32 countries/regions, including Brazil, South Africa, India, and Indonesia. In the United States, 74 probable cases were reported. Our analysis suggests that the number of probable SARS cases reported globally lagged the true incidence of the disease. This is partly because of the nature of SARS itself and partly because of the global case-reporting system. WHO and most countries report probable SARS cases, which generally means patients whose chest X-rays show the telltale signs that distinguish SARS from ordinary pneumonia. In many cases these signs become apparent between day 5 and day 10 after the onset of symptoms. SARS is also believed to have an incubation period of 2–16 days. This means that the number of probable SARS cases is clinically accurate, but at any given time, it is largely a measure of the number of people who became infected 10–20 days earlier. The global SARS case-reporting system itself also has several time lags. Most national health authorities report cases to WHO one or more days after the cases are first reported by regional health offices, and some countries do not report case numbers on a daily basis. Moreover, we believe that in some countries political pressures delay the reporting of probable or suspected cases.

The spread of SARS was not contained by early July 2003 as a result of tremendous advances in treating the disease's symptoms or curing patients; rather, it resulted from a concerted effort by public health organizations worldwide to quarantine suspected carriers. This "medieval" method proved effective in stemming the outbreak despite the increased mobility of people in the 21st century. Of course, this success was also a result of a very modern development: easier access to information. Faster and cheaper dissemination of information about SARS improved public awareness of the disease, thereby helping the containment strategy. Other modern developments, such as Web cameras and electronic bracelets, also helped countries (e.g., Singapore) to enforce quarantines.

Quarantine and information dissemination halted the SARS outbreak, but they may have increased the short-term economic consequences of the disease by disrupting normal economic activity among those who objectively faced a very low risk of infection. In the case of SARS, no news may have been good news, in the sense that lower-profile coverage of the disease may have led to a lower perceived risk of infection and hence to less disturbance of people's normal lives. The evolution of the disease and its consequences in the Chinese province of Guangdong illustrate this point. Although the province had the first documented case in November 2002, and the disease spread over the winter, press reports about SARS were minimal. As a result, commercial and retail activities were not heavily affected. Without adequate control of SARS by the medical community, however, and little or no awareness of the disease by the public at large, SARS soon spread. When widespread quarantine was imposed in China and social disruption occurred in April 2003, the peak of the Guangdong outbreak was long past.

It is uncertain whether the end of the SARS outbreak in summer 2003 marked a victory over the disease or a lull before another outbreak.[3] Thus, it is important to assess the prospects for effective control of SARS in different economies across Asia.

3. Difficulties for discovering a medical cure

The world's top virology scientists and laboratories are engaged in a round-the-clock effort to study the SARS virus and develop diagnostic tests and therapies. Within 4 weeks of the first Hong Kong case, these scientists, coordinated by WHO, conclusively identified a coronavirus as the cause of SARS. Some laboratories have sequenced the virus's genome. Nevertheless, many crucial details about the disease

3 See WHO comments on the possibility of future outbreaks when the summer heat and humidity subside, available at http://www.who.int/csr/don/2003_07_03/en

remain unknown. Current knowledge suggests that some of the symptoms of SARS are triggered not by the coronavirus itself, but rather by an overreaction to the virus by the patient's immune system. Some viruses have a relatively simple mode of action, whereas others are very complicated and can take years to understand fully. In terms of forecasting the path of the SARS epidemic, this means that the likelihood of scientists' discovering a cure for SARS in the short term is low, but it is not zero.

The SARS virus's mode of transmission has not been scientifically established. Most researchers' working hypothesis is that SARS is transmitted via droplets (i.e., sneezes, coughs, or bodily fluids), because the epidemic's spread has been broadly consistent with droplet transmission. However, some cases strongly suggest there is another disease vector, possibly involving exposure to sewage or fecal matter or to rats.

Development of a diagnostic test that is workable in real-life situations (e.g., in hospitals and airports) is at present the single most crucial step in minimizing the spread of SARS should it reappear. Without a workable diagnostic test, the onset of another flu season might lead to a resurgence in suspected SARS cases (along with the disruptions of quarantine), when in fact patients are suffering only from an ordinary flu. It is one thing to identify the genetic material of the SARS coronavirus in a petri dish, as scientists have already done, but it is quite another to find the best parts of the virus's genome to target and to determine which bodily fluids (saliva, blood, urine, or stool) contain the virus at which times. Several months have passed since the initial polymerase chain reaction tests were created, but a diagnostic test that is fast, reliable, and accurate has not yet been developed. If the virus returns as a different strain or mutates rapidly, new variants of the test will have to be created.

Cures would likely rely on drugs or vaccines. The time between the discovery and the market launch of a typical antiviral drug is 7–9 years. Adding a new indication for an existing drug is faster; typically, it takes 3–4 years. Thus even in a best-case scenario, in which an existing drug is found to be effective against SARS and the speed of regulatory and scientific processes is doubled, the launch of a treatment for SARS would be at least 2 years away.

In general, it is easier to develop a vaccine against a virus than a treatment for the illness the virus causes. Now that the genome of the coronavirus has been sequenced, an innocuous vaccine utilizing the coronavirus DNA could be created, or even a recombinant glycoprotein vaccine. Still, vaccines typically take years to develop because of the difficulties of cultivating cell lines, titrating the correct dosage,

and ensuring that the vaccine is innocuous. If the virus mutates rapidly, creating similar but not identical strains, a vaccine that protects against one strain may not work against another. As a result, even in a best-case scenario, an investigational vaccine will take 1 year to develop, followed by another 1–2 years of clinical trials.

4. Risk indicators for SARS in Asian economies

If a scientific instrument to eliminate SARS will not be available in the near term, then we might have to live with the virus for a relatively long period. The risks to individual Asian economies from SARS will likely differ, depending on such factors as their medical systems, the importance of tourism to their economies, their population density and mobility, and their systems of sanitation. We discuss some of these important risk indicators for several Asian economies.

4.1 Health care

As shown in table 1, Hong Kong and Singapore have health care expenditures per capita that are at least eight times greater than those of other countries in Asia, with the exception of South Korea. Even adjusting for purchasing power parity, health care spending in Indonesia or India, for example, is one-tenth of the spending in Hong Kong and Singapore. Overall health care spending as a proportion of GDP in Hong Kong (4.4 percent) and Singapore (3.5 percent) is not so strong in comparison: China, Vietnam, and India spent about 5 percent of GDP on health care (both public and private expenditures). However, this is only half of the high-income OECD average (10.2 percent).

The number of hospital beds is also not as low as might be expected: in China there are 2.4 beds per 1,000 people, which is higher than the 2.0 beds per 1,000 people for Malaysia or Thailand, but is a far cry from the 7.4 beds per 1,000 people in the OECD.

4.2 Population density and tourist arrivals

Population densities are 10 to 80 times higher in Hong Kong and Singapore (over 6,500 people per square kilometer) than those in the rest of Asia. Nearly 40 percent of China's population resides in urban areas, and several cities have more than 10 million people. It is understandable that Hong Kong and China accounted for the largest shares of the total probable cases of SARS in Asia: a high population density is ideal for a virus that spreads by human contact. In the rest of Asia, urban populations vary from 20 to 60 percent of the overall population, with high densities in Bangkok, Manila, and Jakarta.

Table 1. Health expenditure, tourist arrivals, and sanitation indicators for Asia

	Population density (per km^2)	Total health expenditure (% of GDP)	Health expenditure per capita (current US$)	Hospital beds (per 1,000 people)	Tourist arrivals (million)	Tourist arrivals per population (%)	Improved sanitation facilities (% of population)
China	136	5.3	45	2.4	33.2	3	29
Hong Kong	6,555	4.4	950	4.9	13.7	203	100
India	347	4.9	23	0.8	2.5	0	16
Indonesia	115	2.7	19	0.7	5.2	2	47
North Korea	n.a.	2.1	18	n.a.	n.a.	n.a.	99
South Korea	480	6.0	584	6.1	5.1	14	63
Malaysia	72	2.5	101	2.0	12.8	53	n.a.
Philippines	263	3.4	33	1.1	1.8	4	74
Singapore	6,772	3.5	814	3.6	6.7	163	100
Thailand	120	3.7	71	2.0	10.1	16	79
Vietnam	n.a.	5.2	21	1.7	1.4	2	29
United States	31	13.0	4,499	3.6	n.a.	n.a.	100
Japan	56	n.a.	n.a.	16.5	4.8	4	n.a.
High-income OECD countries	30	10.2	2,771	7.4	377.6	n.a.	n.a.
World	47	9.3	482	3.8	696.5	n.a.	55

Source: *World Bank (2003).*

Note: *n.a. = not available. Tourist arrival data are for 2002 and all other data are for the latest year available in the World Bank's World Development Indicators 2003.*

Not surprisingly, those countries with high tourist arrivals, either in absolute numbers or as a percentage of the local population, have also suffered from SARS (see table 1). Hong Kong saw annual visitor arrivals amounting to over 200 percent of the local population (13.7 million) in 2002, whereas the number of tourist arrivals in India was miniscule (2.5 million) in comparison with that country's population. About 33.2 million tourists came to China in 2002. One country that stands out in this regard is Malaysia. Although the number of tourists arriving in Malaysia (largely from Singapore) in 2002 was relatively large (12.8 million, amounting to 53 percent of the population), the number of SARS cases in Malaysia in 2003 was small.

In an effort to offset the negative economic effects of the SARS outbreak in Hong Kong, China began easing restrictions on visits by mainland nationals to Hong Kong. Although high-tech body-heat screens have been put in place to weed out feverish visitors, the increase in arrivals to Hong Kong as a result of the relaxed restrictions poses risks as well as gains.

4.3 Poor sanitation in populous countries

A key health risk in Asia is the lack of access to good sanitation, particularly in those countries with the largest populations. In China, India, and Indonesia, roughly one-third of the population has no access to modern sanitation. With concerns about oral-fecal transmission of SARS, poor sanitation could be a much more important transmission mechanism in these countries than has been the case in Hong Kong, Singapore, or the OECD countries. Note that one major outbreak in Hong Kong has already been linked to poor sanitation in just one apartment block.[4]

5. Economic impact of SARS on China

When it became clear that SARS was contagious, many people minimized their travel, business meetings, and other social interactions. Official travel warnings by WHO further hit the tourism industry. The cancellation of the week-long May Day holiday in China to prevent further spread of the disease also had a major impact on the tourism and retail industries. Total tourist arrivals (domestic and foreign) dropped 30 percent year-on-year in both April and May 2003. During the May Day holiday in 2002, about 87 million people traveled, generating a total revenue of Rmb33 billion (0.3 percent of China's GDP). During a normal year, consumers spend more during the May Day holiday, with the retail sales value in May being about

4 Whether the transmission was in fact oral-fecal is now being challenged, with one research group claiming that the outbreak in the Amoy Gardens apartment block was the result of rats.

3 percent higher on average (or Rmb9 billion) than the April and June numbers. After the SARS outbreak, retail sales in May 2003 grew about 5 percent less than the Q1 trend (or Rmb16 billion, about 0.1 percent of GDP).

Another example of the disruption caused by SARS in China was the outbreak's impact on the spring Canton Export Exhibition, at which domestic producers sign export contracts with foreign businesspeople. The 2003 Canton Export Exhibition was held between the end of April and the beginning of May. During the exhibition there were about 22,670 visitors, and the total value of signed contracts reached US$3.9 billion. These figures are considerably lower than the 120,576 visitors and US$16.86 billion in contracts recorded for the same period in 2002. They represent a drop of 77 percent in contract value and an 81 percent reduction in the number of visitors.

Many projects financed through FDI were delayed because of the SARS epidemic. It was reported that Nissan Motor delayed the launch of its Sunny model in China. The management of the Suzhou industrial zone, where many Singaporean businesspeople invested, told visitors in late April 2003 that most business deals were on hold because of SARS. In June 2003 the growth of FDI approvals slowed to only 2.8 percent, from rates of over 20 percent earlier in the year.

To gauge the impact of SARS on the Chinese economy, we used the Oxford Economic Forecasting model to run some simulations during the height of the 2003 epidemic.[5] We made the following assumptions for China, relative to the baseline forecast:

1. Given the size of China, it would take 3–6 months to control the disease effectively nationwide.
2. Reduced demand for service products would reduce retail sales by 10 percent in 2003:Q2 and 5 percent in 2003:Q3, compared with the baseline demand.
3. FDI would be reduced by 30 percent in 2003:Q2 and 15 percent in 2003:Q3 because of reduced international travel.
4. Loss of export orders would decrease exports by 5 percent in 2003:Q2 and 10 percent in 2003:Q3.
5. Government budget expenditure would increase by 7 percent in 2003:Q2 and 2003:Q3 (4 percent for medical spending, assuming a boost of current spending on health by 30 percent and an increase in direct investment for infrastructure projects of 35 percent).

5 The OEF model is a multiregional macroeconomic forecasting model. For details, please visit the official Web site at http://www.oef.com

The results of the model suggested that the overall impact of SARS would be a decrease of about 1.5 percent in GDP, assuming no additional fiscal stimulus. Our actual forecast reduction to GDP was 0.9 percentage points, reflecting anticipation of the government's using more aggressive fiscal and monetary policies in the face of a slowdown in growth.

These assumptions proved to be too pessimistic. China was able to control the epidemic by June 2003, which limited most of the economic effects to one quarter. Simply halving the duration of the shock lowers its magnitude roughly proportionally. Still, China's GDP in 2003:Q2 contracted by over 5 percent on a seasonally adjusted annualized basis, and we believe that this decrease in GDP was largely attributable to SARS.

6. Economic impact of SARS in retrospect

Overall, governments across Asia, particularly in China, contained the virus more quickly than we expected. SARS might still pose two types of risks to China's economy. The first risk is that SARS might exert delayed impacts on FDI and exports. The SARS outbreak discouraged international business travel, and foreign tourist arrivals in July 2003 were still 25 percent lower than those of July 2002. The numbers of new investment contracts signed during those months fell sharply. In June alone, utilized FDI increased by only 2.5 percent on the year, compared with an increase of 48 percent during the first 5 months of 2003. FDI in July 2003 was 19 percent lower than that of July 2002. The second risk is that SARS might return in December 2004, but we expect that the economic impact, if any, of a future outbreak would be much smaller than it was in 2003, because Asia's governments and health care systems are on the alert.

In late June 2003, we revised our forecast for China's GDP in 2003 from 6.7 percent to 7.5 percent in light of the milder-than-expected effect of SARS. We think the overall impact on the economy was probably a fall in GDP of about 0.5 percent, rather than our original estimate of 1.5 percent (excluding the fiscal countermeasures).

The better-than-expected outcome in China has a few favorable implications for other Asian economies. However, although SARS is probably behind us at the time of publication (mid-2004), the direct impacts on demand for service products, including airlines, restaurants, hotels, shopping, and other cultural and entertainment activities, are not completely over. The flow of tourists has increased lately in Hong Kong, Singapore, Thailand, Indonesia, and Malaysia, but most of these visitors are from Asia rather than from America or Europe. It will take longer for Asia to restore its tourism industry to its pre-SARS state.

Will the economic shocks from the 2003 SARS outbreak be permanent or temporary? Obviously, much of the lost or delayed FDI and most export orders can be recovered once the SARS situation is completely under control. So even if there are any forthcoming effects on exports and FDI, they would not be permanent. However, two issues need to be watched closely in the coming years. First, the SARS outbreak has highlighted the importance of effective governance and therefore might serve as a trigger for some improvements in governance structure across the region. Second, the outbreak probably reinforced the need for risk diversification. Investors might become more conscientious about the dangers of concentrating investment in one country, even a large country such as China.

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