Putting the economic shock of the coronavirus in context

(3) Economic value of "social distancing"

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Executive Summary

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- *Minimizing physical contact between people is essential to combatting the spread of COVID-19, as we have yet to develop immunity to the virus. This has led many countries to enact "social distancing" policies that include stay-at-home orders, business shutdowns, and lockdowns of urban areas.*

- *Choosing not to implement social distancing policies removes the constraint on economic activity but also increases the risk that infections will surge and overwhelm the healthcare system. While social distancing slows economic activity and thereby entails huge costs, it prevents the virus from spreading and can therefore help to prevent a collapse of the medical system.*

- *Social losses due to the coronavirus can be roughly divided into two categories: the decline in GDP due to reduced economic activity and the loss of human life.*

- *In this report, I introduce two papers undertaking a cost-benefit analysis of social distancing measures in the United States. These papers suggest that social losses due to social distancing policies are less than the losses that would be incurred if no such policies had been implemented. The papers estimate the economic value of social losses avoided via these policies (i.e., the net benefits) at around USD5-8 trillion.*

- *In Japan as well, the government declared a state of emergency for seven prefectures on April 7 [1] and requested that people in the affected areas stay home and that businesses shut down. These social distancing policies can be expected to minimize social losses by reducing the number of infections. However, the government needs to enhance their effectiveness by providing early and adequate economic assistance to businesses and households.*

NOTE
1) This was expanded to the entire nation on April 16.

Modeling economic value of social distancing (1): "The benefits and costs of flattening the curve for COVID-19" (4/12/2020)

2) Linda Thunstrom, Stephen Newbold, David Finnoff, Madison Ashworth, and Jason F. Shogren, "The Benefits and Costs of Using Social Distancing to Flatten the Curve for COVID-19" (https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3561934).

First, we will look at a paper published by a team at the University of Wyoming.[2] The authors estimate the reduction in the number of coronavirus deaths resulting from social distancing measures and then attempt to assign a monetary value to the lives saved. They also estimate the impact of social distancing measures on the decline in GDP. They then compare the total social losses for two cases: one with social distancing and one without. The estimates of infections and deaths are derived from the SIR model, which is used to estimate the progress of an infectious disease over time. This epidemiological model estimates the number of Susceptible, Infected, and Recovered (or Removed) persons over time based on a number of parameters including the infection rate, the incidence rate, and the recovery rate. Of particular importance is a parameter called the basic reproduction number, which is written as R0 and signifies the average number of people who will be infected by one person carrying the virus. A large R0 can lead to an explosive spread of disease, while an R0 of less than one means the infection will die out.

■Key parameters for SIR model

- Basic reproduction number (R0) of 2.4. Based on reports from China.
- Average infection period of 6.5 days. As with R0, initial values were confirmed by team to be consistent with CDC data.
- Authors assumed 38% reduction in personal contact due to social distancing measures, based on estimated effectiveness of Australian social distancing measures during Spanish flu of 1918.
- The medical resources threshold, which gives an indication of when the healthcare system will be overwhelmed, was set at 36 million infections. Case fatality rate (CFR) was assumed to be 0.5% if number of infections was below this threshold and 1.5% if it was above the threshold, preventing patients from receiving needed medical care.

■Assumptions behind estimates of economic losses due to loss of human life

The value of statistical life (VSL) approach was used to measure the economic value of human lives. This approach measures the amount of money individuals

would be willing to pay to reduce the death rate for a given period of time and then applies those values to average remaining lifespan to determine the economic value (in monetary terms) of a life.

- In the United States, the VSL is estimated to average about USD10 million (this value is frequently used in government reports).

■Assumptions behind estimates of lost GDP (present value)

- Average growth rate for US GDP was assumed to be 1.75%.
- Assumed GDP would drop by 6.2% with social distancing measures (based on Goldman Sachs projections).
- Assumed GDP would drop by 2.0% without social distancing measures, taking into account increased number of deaths and large numbers of infected employees who have to stay home.
- A discount rate of 5% was used to calculate the present value of future GDP estimates.

■Economic value of social distancing measures

The SIR-derived estimates of infections over time with and without social

Figure 1: Estimated coronavirus infections over time (benchmark outcomes)
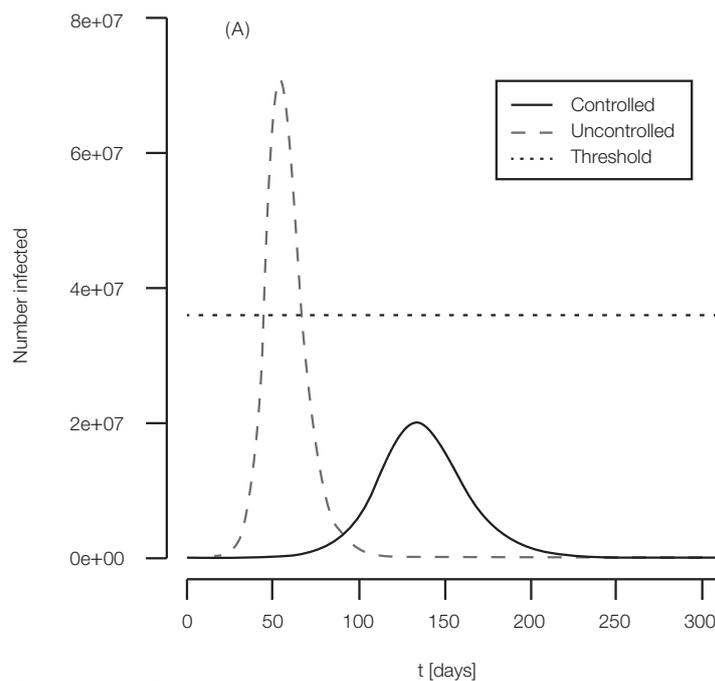
Source: Ibid., p. 21.

distancing using the parameters noted above are shown in Figure 1. The dotted horizontal line represents the healthcare system threshold. The dotted curve, which assumes no social distancing, peaks substantially above that threshold. The peak of the other curve, which is with social distancing measures, is lower, occurs later in time, and does not exceed the threshold.

Estimates of economic losses with and without social distancing measures are shown in Table 1. Total losses are estimated at USD28.3 trillion with no social distancing and USD23.1 trillion with social distancing. The difference between the two—USD5.16 trillion—represents the net benefit of these measures (the difference is due to rounding errors).

Table 1: Estimated economic losses with and without social distancing measures (benchmark outcomes)

	Without social distancing	With social distancing
Infections (millions)	287	188
Deaths (millions)	2.18	0.94
GDP losses ($trn)	6.49	13.7
Value of lives lost ($trn)	21.8	9.4
Total losses ($trn)	28.29	23.11

Source: Ibid., p. 25.

Modeling economic value of social distancing (2): "Does Social Distancing Matter?" (3/31/2020)

Next, we look at a paper published by two researchers at the University of Chicago.[3]

The authors of this paper take a similar approach, estimating the number of coronavirus deaths saved by social distancing measures and then attaching a monetary value to that number.

The estimated impact of social distancing measures is based on a March 16, 2020 paper by the Imperial College of London's COVID-19 team (Ferguson et al.) titled "Impact of non-pharmaceutical interventions (NPIs) to reduce COVID-19 mortality and healthcare demand."

3) Michael Greenstone and Vishan Nigam, "Does Social Distancing Matter?" (https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3561244).

### ■Estimated outcome without social distancing

The authors estimated that without social distancing measures, the infection rate for the US would rise to 81% by October 1, 2020, resulting in 2.2 million deaths. The CDC projected late in February that the infection rate would range from 48% to 65% and that there would be 160,000 deaths by next March with a CFR of 0.5% and 1.7 million with a CFR of 1.0%. With the CFR in the United States currently approaching 1.0%, the pessimistic scenario is looking increasingly realistic.

■Estimated outcome with social distancing

Here, social distancing measures include isolating people who are potentially symptomatic for a period of seven days, asking the general public to stay at home for 14 days, and isolating people aged 70 and over from contact with others. The authors estimate the number of deaths could be reduced to 440,000 (which is still tragically high) if these measures were implemented.

In effect, this would prevent 1.76 million deaths, with 1.10 million lives saved by reducing the number of infections and another 630,000 saved by preventing the

Figure 2: Projected ICU patients
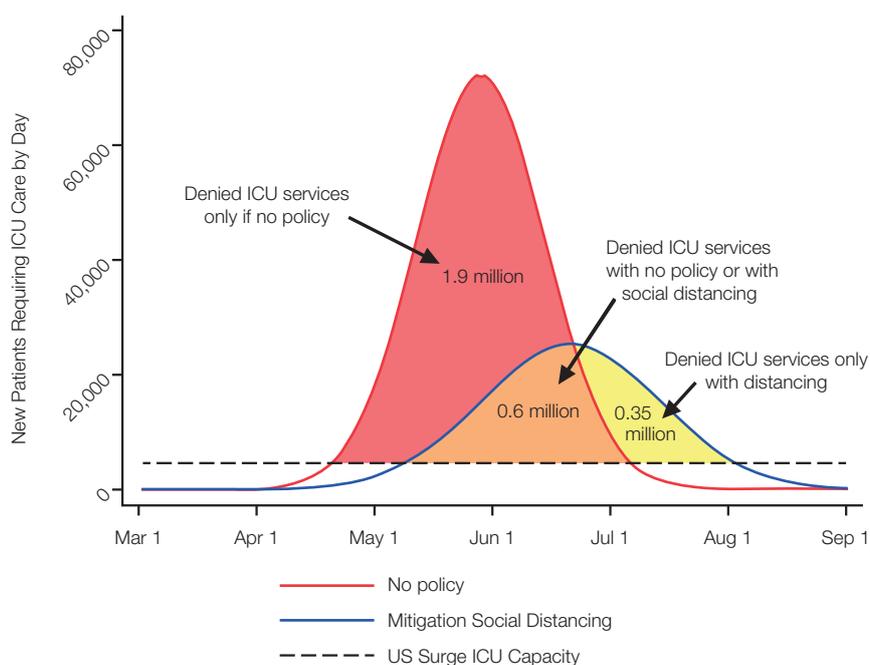
Source: Ibid., p. 9.

overwhelming of the healthcare system. This result is illustrated in Figure 2.

The dotted horizontal line in Figure 2 represents the medical resources threshold, and specifically the number of ICU beds available to treat severely ill patients. The red curve, which estimates the number of serious cases without social distancing, rises to levels far in excess of that "surge capacity." The blue curve represents the number of serious cases with social distancing. Although it still exceeds the surge threshold, the number of patients who would be denied ICU services is much smaller.

■Economic value of social distancing measures

This paper also uses the VSL approach to estimate the economic value of lives saved by social distancing measures. Here as well the standard VSL is USD10 million, but the authors estimate the VSL for various age groups and then project the number of deaths in each age group to arrive at their results. They concluded that social distancing measures would save USD7.9 trillion, which corresponds to an economic value of about USD60,000 per household.

The authors also posit that there are additional factors not included in this figure that might further add to the economic value of social distancing measures. One is a likely increase in the percentage of seriously ill patients without coronavirus whose lives would be saved by reducing stress on the healthcare system.

How to increase effectiveness of social distancing measures in Japan

■Assumptions underpinning social distancing measures in Japan

The Japanese government declared a state of emergency for seven prefectures on April 7 and requested that people in the affected areas stay home and that businesses close their doors. The government is targeting an 80% reduction in personal contact and a 70% reduction in commutes to work. The former target was derived based on an analysis by the Ministry of Health, Labour and Welfare's Cluster Response Team. One of the team's members, Hokkaido University Professor Hiroshi Nishiura, cites research indicating that the R0 for the coronavirus in Japan is currently 2.5 as the basis for the 80% reduction (this from an April 10 interview with Prof. Nishiura).

On April 15, the Cluster Response Team presented the results of its model showing that there would be some 850,000 critically ill patients in Japan if no social distancing measures were undertaken. This model used an R0 of 2.5, roughly the same as that in other countries. The team also assumed a fatality rate of 49% for seriously ill patients, resulting in a simple estimate of some 420,000 deaths.

■**What is Japan's VSL?**

In the United States, USD10 million is the standard value for the VSL (value of a statistical life), which is used to estimate the economic value of social distancing measures. I was unable to find a similarly official and standardized value for Japan. However, a June 1, 2009 publication by the Ministry of Land, Infrastructure and Transport (MLIT) contains estimates of the economic losses resulting from traffic accidents. According to those guidelines, traffic deaths in Japan produce losses estimated at some JPY240 million per person. This report also notes estimated losses due to traffic deaths in other countries. The figure for the United States was about JPY390 million.

While these are very rough calculations, the standard VSL in the United States (JPY1.1 billion) is about 2.8 times the JPY390 million estimated economic loss from traffic fatalities (which is in itself a kind of VSL). Adjusting the JPY240 million estimated loss for traffic fatalities in Japan by the same 2.8 multiplier produces a VSL of about JPY670 million.

While we should be cautious about mechanically applying this multiple to the coronavirus, a back-of-the-envelope calculation suggests the economic value of human lives lost if social distancing measures were not implemented would amount to some JPY101 trillion (420,000 x JPY240 million) if we use the VSL for traffic fatalities and about JPY281 trillion (420,000 x JPY670 million) if we apply a 2.8 multiplier to the Japanese VSL in line with the standard US VSL.

This, of course, represents the losses in a worst-case scenario with no social distancing measures. The ultimate economic losses are expected to be lower than this inasmuch as Japan has implemented social distancing measures under the current state of emergency, including recommendations to stay at home and shut down businesses. It should be emphasized that social distancing measures are meant to prevent the loss of lives that could have been saved as

an explosive outbreak of the virus overwhelms the medical system. While these social distancing measures weigh heavily on economic activity, the two papers introduced here show that they generate economic value in excess of those losses.

■Economic assistance needed to enhance effectiveness of social distancing

A week has already passed since the prime minister declared a state of emergency, but Japan does not appear to have achieved an 80% reduction in human contact. Many have suggested this is because people cannot survive if they stop working. The Japanese government has announced plans to increase its temporary employment subsidies, distribute JPY300,000 to struggling households, and pay affected small businesses and sole proprietors JPY1-2 million. However, these amounts are insufficient and include programs that will need to wait until the supplementary budget has been passed, raising the question of whether the single most important element of any social distancing measure—that contact with other people be curbed as soon as possible—is being overlooked.

The economic value of social distancing measures in Japan is likely to be substantial. The value of preventing an explosive outbreak probably lies somewhere between a few percent of GDP and a few dozen percent. If the Japanese government hopes to avoid such an outbreak, it needs to supply adequate funds to businesses, sole proprietors, and households.

Finally, it would appear that there is no research estimating the likely decline in Japanese GDP with and without social distancing measures (if there is, please let me know). When thinking about a policy response, we need to consider not only how to avoid the loss of human life but also how to minimize the ensuing damage to the economy.

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