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### **The Responses of Consumption and Prices in Japan to the COVID-19 Crisis and the Tohoku Earthquake**

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# The Responses of Consumption and Prices in Japan to the COVID-19 Crisis and the Tohoku Earthquake

Tsutomu Watanabe\*

March 30, 2020

## Abstract

This note compares the responses of consumption and prices to the COVID-19 shock and another large-scale natural disaster that hit Japan, the Tohoku earthquake in March 2011. The comparison shows that the responses of supermarket sales and prices at a daily frequency during the two crises are quite similar: (1) the year-on-year rate of sales growth increased quickly and reached a peak of 20 percent two weeks after the outbreak of COVID-19 in Japan, which is quite similar to the response immediately after the earthquake; (2) the items consumers purchased at supermarkets in these two crisis are almost identical; (3) the year-on-year rate of consumer price inflation for goods rose by 0.6 percentage points in response to the coronavirus shock, compared to 2.2 percentage points in the wake of the earthquake. However, evidence suggests that whereas people expected *higher* inflation for goods and services in the wake of the earthquake, they expect *lower* inflation in response to the coronavirus shock. This difference in inflation expectations suggests that the economic deterioration due to COVID-19 should be viewed as driven mainly by an adverse aggregate demand shock to face-to-face service industries such as hotels and leisure, transportation, and retail, rather than as driven by an aggregate supply shock.

## 1 The Spread of COVID-19 in Japan and the World

The spread of COVID-19 is still gaining momentum. The number of those infected in Japan started to rise from the last week of February, and the spread of the virus began to gradually affect everyday life, as exemplified by increasingly empty streets in Ginza. In March, the outbreak spread to Europe and the United States, and stock markets in the United States and other country began to drop sharply on a daily basis, leading to market turmoil reminiscent of the global financial crisis. At the time of writing (March 29), the

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Dow Jones Index of the New York Stock Exchange had dropped by 35%, while the Nikkei Index had fallen by 30%.

Governments and central banks have responded swiftly. The US central bank, the Federal Reserve, reduced its benchmark rate by 50 basis points on March 3 and another 100 basis points on March 15, moving to a zero interest rate almost in one fell swoop. At the same time, it initiated quantitative easing. Following suit, the BOJ at an extraordinary monetary policy meeting on March 16 decided to provide ample liquidity by raising the annual purchase target for exchange traded funds (ETFs) from ¥6 trillion to ¥12 trillion. Moreover, the European Central Bank (ECB) on March 18 decided on a new asset purchase program. On the fiscal front, the United States on March 27 passed a \$2 trillion stimulus budget that includes direct payments of \$1,200 to individuals, while the European Commission of the European Union (EU) has suspended strict rules on member states' public deficits. Japan is also preparing emergency economic measures, including cash payments to individuals. However, despite a surge in response to the series of policy measures in advanced countries, stock markets remain substantially below their pre-crisis levels.

Against this background, the view that the coronavirus shock will lead to an economic crisis equal to or greater than the global financial crisis is rapidly spreading. However, I believe that the coronavirus shock differs from previous economic crises, including the global financial crisis, in at least two respects.

**Suddenness of the shock** The first is the suddenness and speed of the shock. Economic crises are generally not anticipated in advance and typically spread as people helplessly watch events unfold. However, in the case of the coronavirus crisis, the extent of the shock is without precedent. There is probably no one who at the beginning of the year would have predicted the coronavirus shock. In addition, in the four weeks or so since infections in Japan took off in late February, the coronavirus shock has completely changed the economic landscape. This crisis is different in terms of its suddenness. Since the global financial crisis was caused by human failure, its speed was within the bounds of human comprehension. However, during this crisis, it is the spread of the virus that determines the speed, which is far beyond human everyday comprehension.

**Synchronization of people's behavior** The second characteristic is that people's behavior is extremely synchronized. To protect oneself from the novel coronavirus, it is

necessary to avoid contact with others. People are doing everything they can to do so, such as avoiding crowded places, not attending events, and not using public transport. As a result, almost everyone is taking the same actions.

Theaters and restaurants that are usually popular and difficult to get tickets or reservations for are empty and would be easy to enjoy. Under normal circumstances, one would expect people to take this opportunity and try these places. This would be the normal economic mechanism. However, during the current crisis, no one is taking a chance and everyone follows the same behavior and stays at home. The government's request for organizers to voluntarily cancel events has reinforced this trend.

In the midst of an economic crisis, it is not uncommon for synchronized behavior to occur in the form of one person's behavior being followed by others. However, the degree of synchronization during this crisis is of a different order of magnitude from a normal economic crisis. Moreover, the current crisis also differs from the past in that people choose the same behavior on their own accord rather than to conform with others.

It has only been a month since the coronavirus shock emerged and its full nature is still unclear. However, various kinds of data are starting shed some light. In this note, I will outline the features that have come into view and will use these as a starting point to consider the future.

## 2 Economic Impacts of the Coronavirus Shock

**Supply shocks** Let me start by reviewing the economic impact of the novel coronavirus. The reason for the economic impact of the novel coronavirus is that it limits contact with others. People want to avoid contact with others in order to protect themselves and try to engage in economic activities within the bounds of this constraint. This has the following effects on supply and demand.

Starting with the supply side, since people (=workers) stay at home, they cannot engage in production activities. Of course, some work can be carried out remotely, so that staying at home does not mean that all production activities cease. However, work such as working on a production line in a factory cannot be done remotely since it requires collaboration. Moreover, even activities that can be easily carried out remotely, such as university classes, have elements that can only be conveyed face-to-face, so that productivity falls.

A decline in production can also occur for reasons other than people staying at home. Deaths through viral infections mean that the number of workers declines. This happened

in the pandemic of a hundred years ago, the Spanish flu, which started in 1918 and ended in 1919. The Spanish flu is thought to have killed 2% of the global population, and deaths were concentrated among those in their prime working years, causing a fall in production. Loss of supply capacity also affects wages and prices. According to a recent study by Robert Barro et al., the decline in the labor supply due to the 1918 pandemic raised wages and prices of goods and services by about 5%.<sup>1</sup>

It is said that the death rate of COVID-19 is lower than that of the Spanish flu, and that deaths are concentrated among the elderly rather than the working age population. In this regard, the coronavirus pandemic differs from the Spanish flu, and at least at present we are not yet in a situation where production is falling due to deaths from the coronavirus.

**Demand shocks** Turning to the demand side, people (=consumers) staying at home leads to a slowdown in consumption activities. Of particular concern is services consumption. There are numerous ways to minimize contact with others when purchasing goods, such as shopping online. However, this is not the case for services. Contact with staff or other customers is inevitable. A typical example is entertainment such as watching sports events or going to the movies. Moreover, when using transportation services such as trains and airplanes, contact with others is inevitable.

Firms that provide such services are diverse and, in terms of conventional categories, belong to industries such as hotels and leisure, transportation, retail, etc. Until now, one would not have considered bunching these industries together into one category. The epicenter of the global financial crisis, for example, was the banking industry, which could be referred to using just this one term; however, during the current crisis, such labelling is impossible, which makes it more difficult to comprehend the nature of the crisis. In this note, I will refer to these services collectively as face-to-face (F2F) industries.

Another channel through which coronavirus infections can affect aggregate demand is the increase in uncertainty. It is known that when people are faced with serious uncertainty and no one knows what the future holds, they assume the worst and then choose the best action based on this assumption.<sup>2</sup> During the current crisis, people assumed the worst, leading to drastic changes in demand, resulting in the stockpiling of cup noodles and toilet

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<sup>1</sup>Robert Barro, Jose F. Ursua, and Joanna Weng, “The Coronavirus and the Great Influenza Epidemic: Lessons from the ‘Spanish Flu’ for the Coronavirus’s Potential Effects on Mortality and Economic Activity,” AEI Economics Working Paper 2020-02. March 16, 2020.

<sup>2</sup>See, for example, Kiyohiko G. Nishimura, and Hiroyuki Ozaki, “Economics of Pessimism and Optimism,” Springer Books, 2017.

paper.

**Which dominates?** The coronavirus shock is both a supply and a demand shock, but knowing which of these is more salient is a key issue for understanding how the coronavirus affects the economy. Necessary policy responses differ depending on whether the shock to supply or demand is more important.

Distinguishing which of the two is more important is straightforward. All we need to do is look at the direction of price changes. Prices should go up if the contraction in supply dominates. Conversely, prices should fall if the decline in demand outweighs the drop in supply. For example, in the case of the Spanish flu a hundred years ago, prices, as mentioned, rose, showing that the supply shock dominated. In terms of a recent example for Japan, when the Tohoku earthquake struck in 2011, GDP fell sharply and prices rose. This is another example where the shock to supply was dominant. In contrast, during the 2008 global financial crisis, prices fell along with the decline in GDP in developed countries including Japan. This indicates that the demand shock was dominant.

As will be seen in more detail below, recent data indicate that in advanced economies including Japan, GDP and prices have fallen in tandem, strongly suggesting that the shock to aggregate demand is dominant. In terms of a policy response, this means that the key issue is how to make up for this shortage of aggregate demand.

**Temporary public health damage but permanent economic damage** An important issue both for supply and demand is how long the economic damage of the coronavirus pandemic will last. In the case of the global financial crisis, negative or sluggish economic growth lasted for six years from the end of 2008 to the end of 2014. In the case of the coronavirus shock, the stock market is pricing in a similar period of economic recession or stagnation.

If the coronavirus pandemic itself were to last for six years, it would not be surprising if economic stagnation lasted for a similar period. However, as far as I am aware, no medical professional expects the pandemic to last this long. Looking back at the Spanish flu a hundred years ago, the outbreak began in the spring of 1918. The initial outbreak was followed by a second wave in the fall of 1918, a third wave in the spring of 1919, and the pandemic finally ended in the summer of 1919. Thus, the Spanish flu lasted for about a year and a half. The current pandemic could probably be resolved more quickly with

modern medical technology.

If the underlying shock - the spread of the virus - is transient, the economy should recover in a V-shape once the pandemic has been brought under control, in which case the extent of the fall in stock prices seems exaggerated. Investors with ample funds should rush to buy stocks during this bargain sale in the expectation of rising stock prices once the pandemic has been resolved.

For this reason, some say that the stock market has been gripped by panic and investors have been unable to make calm decisions. If this is the case, investors should come to their senses at some point and start buying furiously, so all we need to do is wait. However, perhaps investors have not lost their senses and maybe expect that even if the shock due to the pandemic itself may be transient, it could be amplified by events such as large-scale bankruptcies and concomitant damage to the financial system, resulting in lasting economic damage. It cannot be ruled out that investors - in the process of carefully collecting micro-information on individual companies - are catching a whiff of permanent damage to the economy.

### **3 Consumption and Prices in Japan since the Outbreak of COVID-19**

**What credit card data tell us about current consumption patterns** To obtain a first tentative sense of the economic impact of the coronavirus pandemic, I use various kinds of data from February onward, when the outbreak started to gather pace in Japan, to examine (1) whether the coronavirus shock is primarily a demand or a supply shock, and (2) whether the presumably transient pandemic may cause lasting economic damage.

The most useful way to examine the impact of the coronavirus shock on consumption is to use credit card transaction data. Figure 1 shows how credit card spending in the first half of March (March 1-15) differed from the second half of January, just before the coronavirus shock. The expenditure data are based on JCB card transaction data and are calculated using the transactions of one million JCB active credit card users from among the total of 100 million JCB card members.

The red bars show expenditure on services, while the blue bars represent spending on goods. In services, travel spending has fallen substantially by 57% compared to the second half of January, while spending on most other services such as eating out and transportation has also declined. Thus, spending on F2F industries has dropped sharply. An important

thing to highlight is that the decline in spending in F2F industries is mainly due to a decline in the number of consumers spending on those services (i.e., the extensive margin) rather than due to a decline in the average of spending on those services per person (i.e., the intensive margin). For example, the extensive margin associated with the decline in travel spending is 47%, while the corresponding intensive margin is only 10%. Turning to spending on goods, on the other hand, spending at supermarkets has increased significantly, reflecting stockpiling. E-commerce, which allows buyers to avoid contact with others, has also increased. Overall, total spending (green bar) has declined by 14 percent reflecting the substantial decline in F2F service purchases.

The fall in spending on F2F services represents an aggregate demand shock. On the other hand, the hoarding of goods reflects consumer expectations that supplies will run short and prices will rise in the near future. This indicates that the demand shock and the supply shock exist alongside each other.

**Stockpiling of goods** Next, to take a closer look at the stockpiling of goods, Figure 2 shows the year-on-year rate of change in daily sales using point-of-sale (POS) data collected from about 1,000 supermarkets. The number of newly infected people began to increase rapidly around February 22, and a government panel of experts on February 24 stated that the next 1-2 weeks would be critical in terms of whether the outbreak would accelerate or could be brought under control. Purchases at supermarkets surged on February 24, reaching a year-on-year rate of increase of 20% at the beginning of March. Shoppers bought daily necessities such as instant cup noodles, rice, and toilet paper. After that, however, stockpiling came to an end, the rate of change decreased and has fallen back to more or less the same level as before the coronavirus outbreak.<sup>3</sup>

Supermarket prices also started to rise at about the same time as sales (see the left panel of Figure 3). The year-on-year inflation rate was about 0.9% before the coronavirus shock, but as the frequency of bargain sales and discounts decreased, it increased, reaching 1.4% at the beginning of March. It was still below the 2% target set by the Bank of Japan but relatively high. However, since then, the year-on-year rate of increase has declined along with sales and has recently returned to the level before the shock.<sup>4</sup>

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<sup>3</sup>More recent data indicate that the rate of sales growth began picking up again on March 25, when Tokyo Governor Yuriko Koike warned that Tokyo could be on course for an “explosive spike” in new cases and hinted at a lockdown of Tokyo.

<sup>4</sup>More recent data indicate that the inflation rate has started to rise again since March 25.



In fact, these developments in supermarket sales and prices are very similar to those in the wake of the Tohoku earthquake. At that time, the outlook was uncertain, including problems at the Fukushima nuclear power plant, and people rushed to stock up. The right-hand panel of Figure 3 shows sales and prices following the earthquake, indicating that both sales and inflation first increased and then decreased in a pattern similar to the current episode. The time it took for sales to normalize was three weeks in the wake of the earthquake, and it looks like the time for sales to normalize this time around is about the same. Moreover, not only are the patterns of fluctuations similar, the items people purchased are also very similar. In Figure 4, the horizontal axis shows price movements following the Tohoku earthquake, while the vertical axis shows recent price movements. The figure shows that items purchased in large quantities during the current crisis are daily paper products (toilet paper), instant noodles, bread, etc. - the same items that were purchased in large quantities following the earthquake.

**Declining inflation expectations** The reason why people stock up on items such as cup noodles is that they expect such items will be either difficult to obtain or be very expensive in the future, if they can be obtained at all. The reason why people expect such items to be difficult to obtain is that they are worried that production will stop. In other words, the reason for the stockpiling is that although the probability may be very low, there is an expectation that the coronavirus will lead to the disruption of production in the future. In this sense, the stockpiling of goods and the accompanying rise in prices suggest that people anticipated a supply shock.

This raises the question whether the spike in goods prices has led to expectations that consumer price inflation in general will pick up due to the coronavirus shock. In order to examine this point, Figure 5 shows how the GDP growth and inflation forecasts of professional forecasters changed over time. In the figure, the horizontal axis shows the date when the forecast was made. Forecasts toward the very right are those made in March and reflect the impact of the coronavirus outbreak on expectations.

Forecasts for GDP growth show a 1 percentage point drop from forecasts in February (+ 0.3%) and signal that negative growth is expected. Moreover, the inflation forecasts are slightly lower than in February 2020. Similar trends can be seen in the United States and the euro area. Further, looking at inflation expectations estimated from US bond market data (the breakeven inflation rate), these have fallen from about 2% before the coronavirus

shock to just 1%, indicating a marked decline in inflation expectations.

The current decline in inflation expectations stands in stark contrast with the time of the Tohoku earthquake. Following the Tohoku earthquake, as shown in the right panel of Figure 5, GDP growth forecasts also fell sharply, but inflation expectations increased rather than decreased. Since the Tohoku earthquake was a supply shock caused by the destruction of capital stock, supply bottlenecks occurred, and as a result prices were expected to rise. In contrast, during the current crisis, there were concerns about supply bottlenecks for some items, such as cup noodles and toilet paper, as in the wake of the earthquake, but such concerns were limited and did not spread to many other products and services. On the other hand, the sharp decline in demand for F2F industries has pushed down the prices of these services, and the anticipation that this will continue in the future has given rise to expectations that consumer prices as a whole will fall.

## **4 Long-term Economic Damage Caused by the Demand Shock**

The Tohoku earthquake destroyed capital stock, and repairing or replacing it took time. The Spanish flu a hundred years ago killed a large number of working-age persons, and this loss of human capital also took time to replace. Thus, since replacing production factors such as capital and labor takes time, supply shocks caused by natural disasters can give rise to a prolonged period of negative or sluggish growth.

In contrast, during the current crisis there are no losses of production factors such as capital and labor, and it is not expected that such losses will occur in the near future. Instead, the main cause of the crisis is the decrease in demand for the F2F industries caused by concerns about the risk of coronavirus infection. Therefore, once such concerns disappear, the decline in demand should disappear, and the F2F industries should rebound. However, the stock market does not seem to anticipate such a V-shaped recovery.

This raises the question how a transient public health crisis can lead to a prolonged economic crisis. Although nothing is certain at the moment, the following scenarios are possible. The first is one in which the health crisis triggered by coronavirus infections develops into a financial crisis. For example, it has been reported that Boeing's business is rapidly deteriorating due to the sharp decline in international passengers, and the company has suspended dividends and may reduce the number of employees. In the F2F industries, there are many examples of major firms experiencing a similar deterioration in business, and some of them may actually go bankrupt in the near future. In that case, financial

institutions may be affected as loans to such firm become irrecoverable. In fact, the shares of some financial institutions have been sold off due to such concerns. Moreover, some observers believe that central banks such as the Federal Reserve have decided to supply large amounts of liquidity partly to prepare for this eventuality. At the moment, it is unclear whether this will happen, but if it does, the financial system could be damaged and financial functions be paralyzed, as during the global financial crisis. This could lead to a severe recession followed by prolonged economic stagnation.

A second reason why economies might remain sluggish for a prolonged period is that demand might not return to the F2F industries once the pandemic has ended. At least part of the F2F industries were exposed to a wave of technological innovation before the coronavirus shock occurred and were headed for a decline. For example, the credit card data show that expenditure on cinemas and theaters has been declining in recent years, and instead expenditure on online content delivery services has been on the increase. The coronavirus shock could finish off such industries and firms. In that case, unemployment and bankruptcies in these industries would continue even once the pandemic is over, leading to prolonged economic stagnation.

Of course, not all F2F industries will go online in the future and no longer be face to face. For example, many people find professional baseball matches or sumo wrestling tournaments without spectators unattractive. Forms of watching sports where fans go to the stadium will return once the pandemic is over. On the other hand, with regard to services that many believed require face-to-face interaction, such as university classes, remote provision during the coronavirus crisis might lead people to realize that this also has advantages. Thus, there might be more services than we realize that could be switched online without difficulty.

## **5 Policy responses**

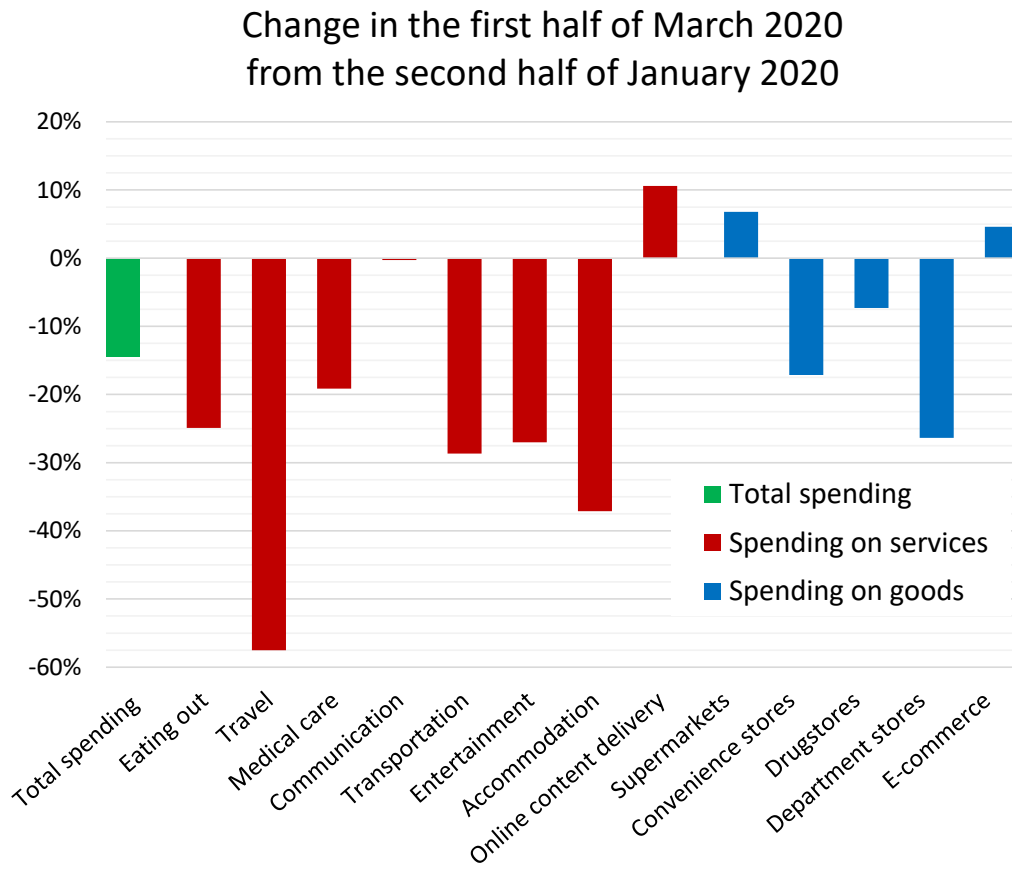
Finally, I would like to touch on how governments and central banks need to respond. Needless to say, the most important task of governments at this time is to minimize the human cost. To this end, no expenditure should be spared. A repeat of the tragedy of the Spanish flu a hundred years ago, which claimed the lives of 2% of the global population, must be avoided at all costs. Minimizing the human cost will also restrain the economic cost.

In addition, regarding policies focusing on the economy, central banks need to provide

on-hand liquidity for firms and financial institutions. Governments need to provide financial support to firms in F2F industries that are suffering from the deterioration in business, while providing employment and wage security to workers in these industries. The measures that the US and European governments and central banks have launched so far generally go in this direction.

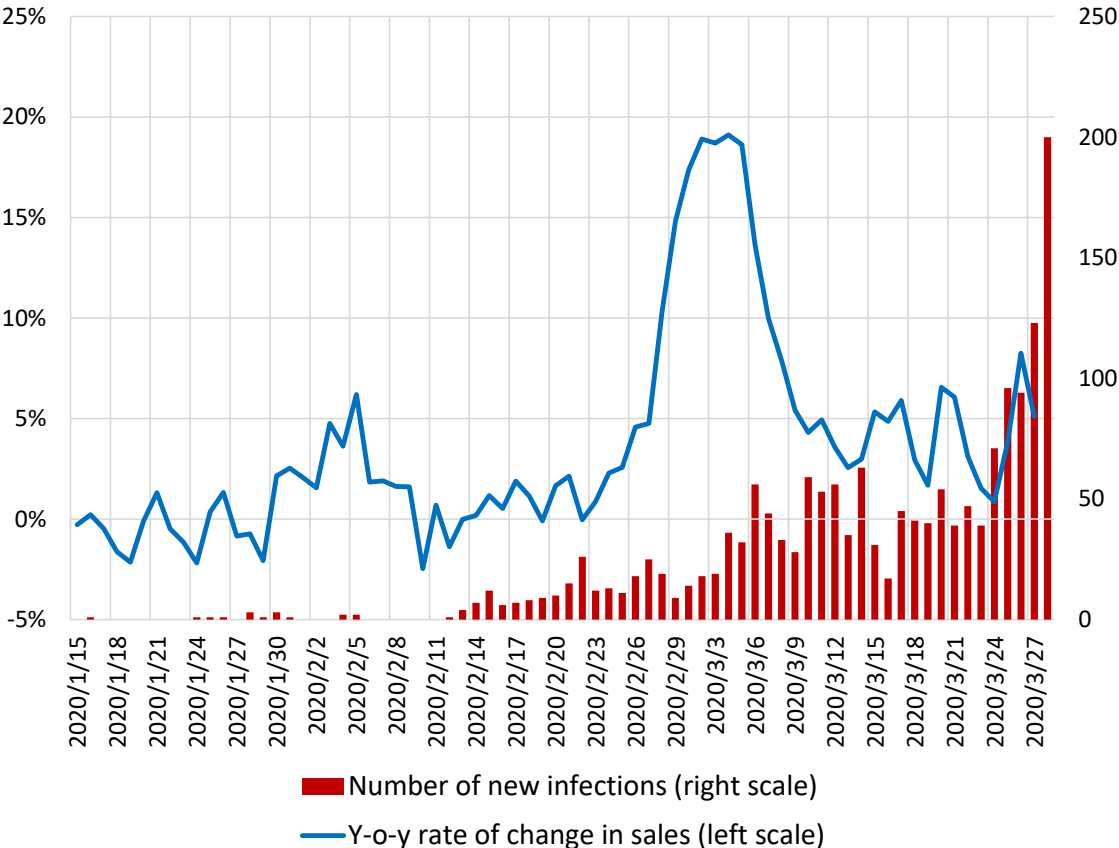
However, these are only provisional measures to address the turmoil in the F2F industries. The prolonged recession or stagnation feared by the stock market may need to be dealt with separately. It is necessary to closely watch how unemployment and bankruptcies in the F2F industries propagate through the economy.

Figure 1: Credit Card Purchases



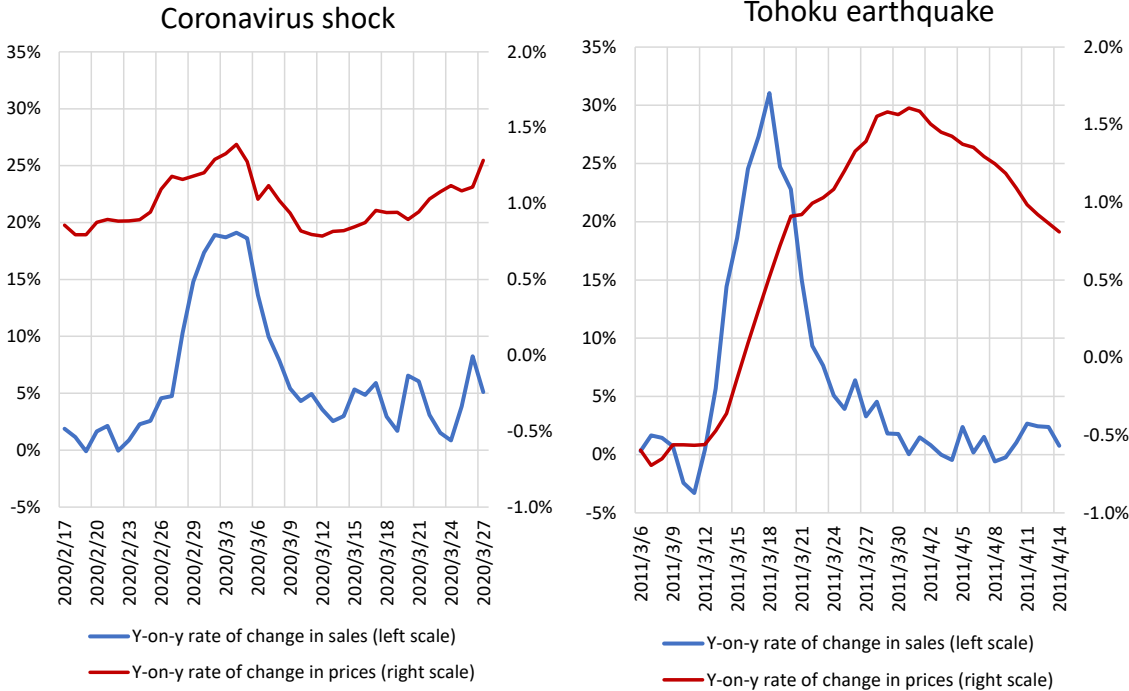
Source: Nowcast Inc., "JCB Consumption NOW."

Figure 2: The Number of New Infections in Japan and Supermarket Sales



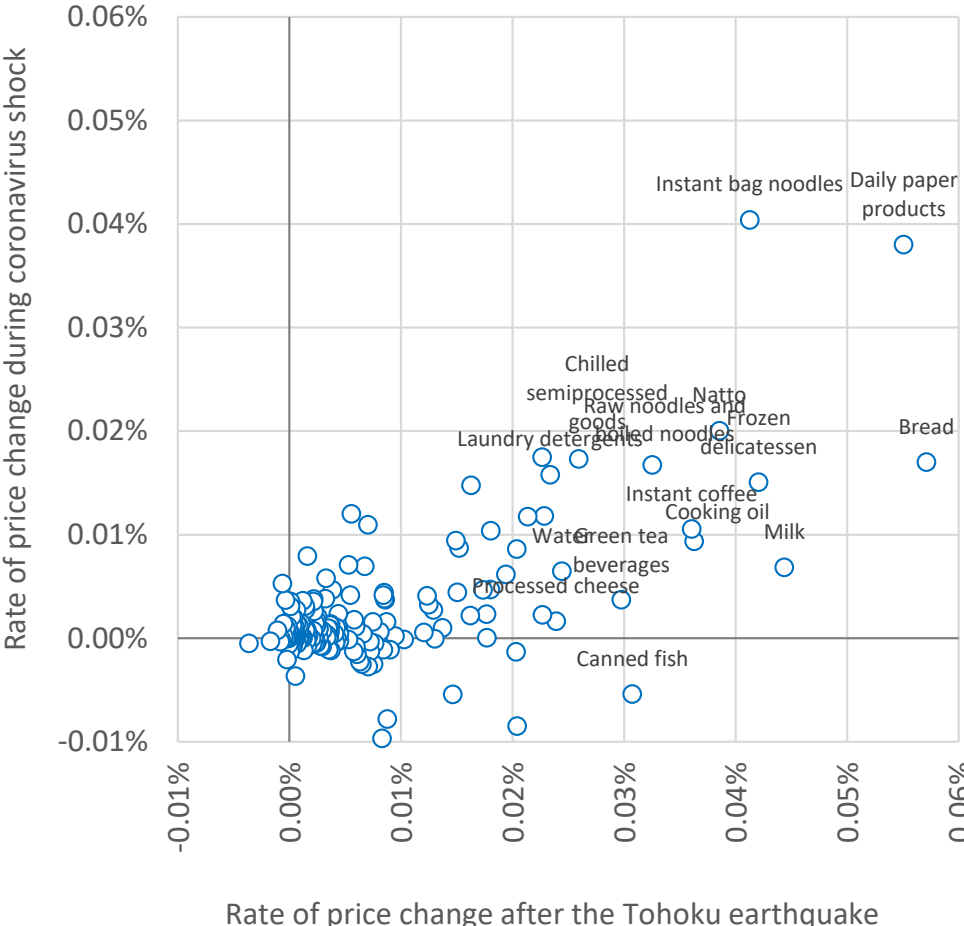
Sources: Nowcast Inc., “Nikkei CPINow.” NHK News Web.

**Figure 3: Supermarket Sales and Prices at a Daily Frequency Following the Coronavirus Shock and Tohoku Earthquake**



Source: Nowcast Inc., “Nikkei CPINow.”

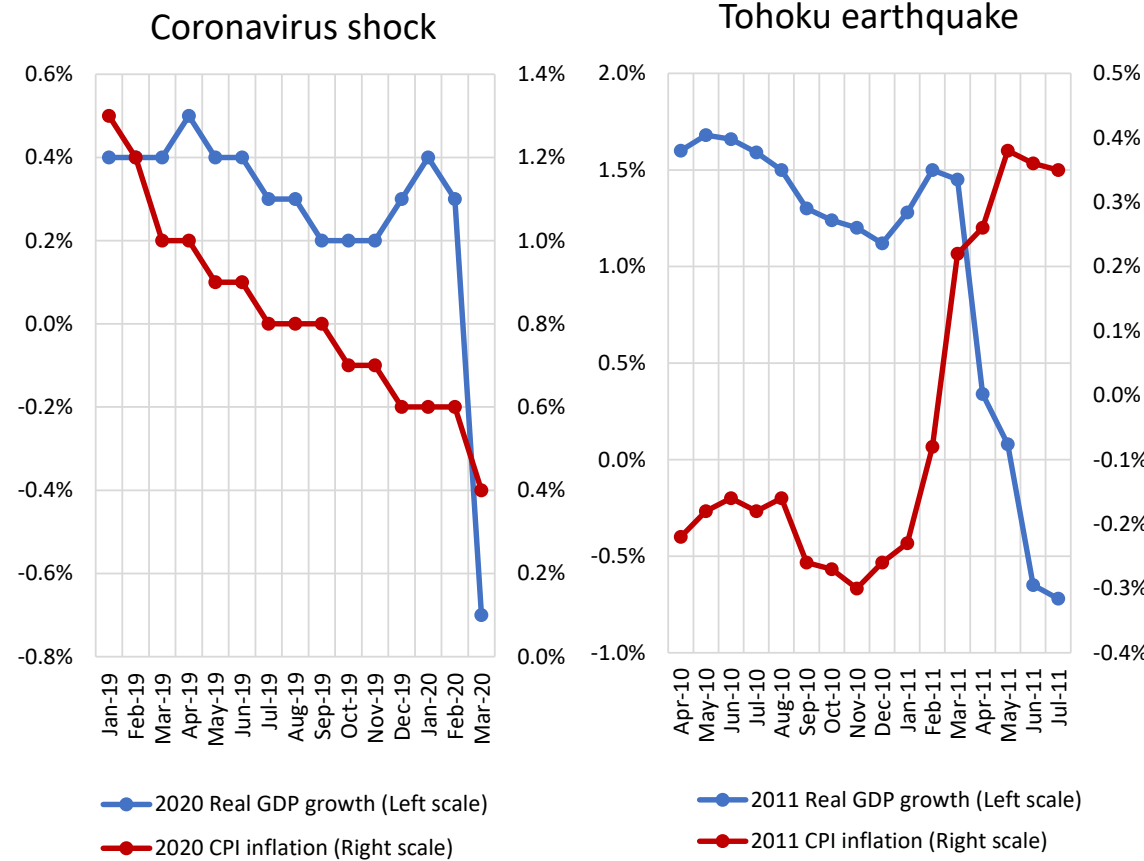
Figure 4: Inflation Rate by Item during Coronavirus Shock and after Tohoku Earthquake



Source: Nowcast Inc., "Nikkei CPINow."



Figure 5: GDP Growth and Inflation Forecasts by Professional Forecasters



Source: Consensus Economics Inc., "Consensus Forecasts."