Japan Crisis

A Test to the Sensitivity of Global Supply Chains

The calamity and the shock waves created as a consequence of Japan’s strongest ever earthquake and the "triple blow" were clearly not confined to the affected region in Northeast Japan. It has shaken whole of Japan physically and cascaded down to hurt its economy making it the world’s costliest natural disaster ever. It has also created major disruptions to global supply chains affecting manufacturers around the world. The triple blow could also be the most severe sensitivity test ever for global supply chains.

The massive quake, the subsequent tsunami, and the resulting explosions at a nuclear plant had sent crippling shock waves across Japan on March 11, 2011. The human suffering and the damage to the basic infrastructure is beyond anything Japan had seen in its recent memory. With more than 14 thousand deaths and almost an equal number missing, Japan’s Prime Minister declared that it is the biggest calamity to have hit Japan since the World War II. According to Japanese government estimates the cost of the earthquake and tsunami that devastated the northeast could reach $309 bn, making it the most expensive natural disaster on record.

Within days, the “triple blow” inflicted a 10% plunge on the Tokyo Stock Exchange, taking down with it the shares of Japan’s global giants, such as Toyota, Nissan, Sony, and Panasonic. The stock price of TEPCO, the utility Tokyo Electric Power Co that operated the crippled nuclear plant in Fukushima Prefecture, North of Tokyo, has nosedived to one-fourth of its pre-crisis value. In the currency markets, the fear that overseas subsidiaries of Japanese companies may sell assets to bring back yen to help finance the rebuilding of their damaged factories and infrastructure had sent yen hitting a record high against the USD.
Cascading Impact

While the economists estimate the damage from the whole crisis created by the quake to be about $200 bn or about 3% of Japan’s GDP, its cascading impact can be much worse. Perhaps, this is why the Japanese government estimated the cost to be more than $300 bn.

To see the point, one can just look at the impact on Tokyo, which relied heavily on the power supply from the crippled nuclear plant. The city of 18 million was partitioned into 5 regions and had rolling 3-hour power cuts, which itself had caused many companies to cut down business hours. Further, the fear of nuclear meltdown caused a global humanitarian crisis where many foreign nationals, including many Indians working in the IT industry in Tokyo, were being hastily airlifted out of Japan. It is estimated that thousands of foreign students studying in universities in affected areas also left Japan. It is reported that many came back after the schools reopened for the autumn term; but nagging troubles at the crippled nuclear plant are reportedly scaring potential new foreign students from coming to Japan.

Nuclear news has also caused the foreign tourists to cancel their trips to Japan; April is especially a big tourist season in Japan due to Cherry Blossom. According to Japan Tourism Organization, the number of foreign tourists to Japan fell by half in March, from a year earlier, causing more than half a million hotel cancellations in Japan. Though the crisis-affected area is mostly the northeastern part of Japan, the foreign tourists has caused cancellations across the whole country.

Japan and Global Supply Chain

While the crisis is a big blow to Japan’s already fragile economy, its effect is being felt around the world. The main reason is that Japan is a source of key components and feeds the global supply chain, from China, Vietnam, Thailand, Singapore, and India to US, Mexico and Canada. Almost any country making any of the most demanding consumer products needs Japanese components or raw materials.

Though the affected region is not the most industrialized area of Japan, it still is a base for key components used in automotive and electronic industries. Specific cases of damage due to this crisis include a Hitachi factory which produces about 100,000 lithium battery units per month for hybrid cars made by General Motors in the US, six factories of Renesas Electronics which account for 60% of world automotive microcontrollers that are used in car navigation systems, and some factories of Toshiba which provide special type of flash-memory for Apple’s iPhone and iPad. A single critical component can shut down a factory continent apart.

To see further impact, take China, which recently jumped over Japan to become the world’s 2nd largest economy. China imports more from Japan than from any other nation; 13% of China’s imports come from Japan. When one considers other key manufacturing nations, such as Korea and the US, Japan is ranked 2nd, behind China, in terms of imports (Exhibit 1).

While Japan’s renowned giants such as Toyota, Nissan, Panasonic, and Sony, along with chemical and steel giants such as Mitsubishi, Ube, and Nippon Steel contribute most in terms of overall exports, the role of their medium and small suppliers cannot be ignored.

A detailed look at the items imported by China reveals the role of parts suppliers and raw material suppliers. Exhibit II shows the breakdown of typical category of items imported by China to Japan.

As everyone knows, China is the “Factory of the World” for almost anything. While China exports large volumes of final products, it requires key raw materials, sub assemblies and components.
parts. As Exhibit II shows, Japan is playing a major role here as a critical supplier. In fact, one reason China needs Japanese parts is the quality, though China produces many parts, some highly complex chips and high-quality machines and machine parts to process them have to be imported from Japan.

Take the case of iPhone, which says, “Designed by Apple in California, Assembled in China.” According to reports, Japanese parts account for 34% of the manufacturing cost of producing an iPhone; while Germany, Korea, US, and China provide parts, a majority of the value of parts come from Japanese components.

**Japan and Globalization**

Going back a bit into the history reveals that Japanese companies started the globalization in the late 1950s. Toyota first exported an automobile to the US in 1958. The major target of Japanese companies at that time had been the US and affluent Western European countries. Through strenuous efforts in improving quality, such as Deming method, and innovative process improvement technologies, such as Just-In-Time or JIT, Japanese companies have gradually established themselves in all five continents, making Toyota, Sony, and a host of others like household names for quality and affordable price. By 2010, Toyota had established itself as the largest automobile maker in the world. The expansion of large companies in the US and Europe was followed by the globalization of Japanese part suppliers.

Another important reason for the globalization of Japanese part suppliers was the “local content” laws enforced in the US and other countries. The opening up of China and the growth of emerging markets saw further expansion of Japanese production base overseas (Exhibit III), especially in China. China also adopted local content laws, and lately, India also had begun enforcing such.

**Role of Japanese SMEs in the Supply Chain**

In order to understand the globalization of Japanese companies better, one must understand the manufacturing hierarchy of entities involved. On the top of the hierarchy are the top makers, who now mostly do the final assembly. They are being fed by mid-size companies, which in turn are fed by even smaller companies, which are in hundreds of thousands in Japan.

The automobile manufacturing demonstrates the situation well (Exhibit IV). On top lie the major brands, such as Toyota and Nissan; they are being fed parts and sub-assemblies by mid-size companies. In the case of Toyota, one of the big suppliers is Denso, which provides about 50% of its production...
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to Toyota. When Toyota sets up a new factory overseas, Denso usually follows, to be close to the factory. Thus, Denso is also a globalized company. While Toyota has about 318,000 employees, Denso has 120,000, including overseas employees. Denso, in turn, gets supplies from smaller suppliers, most of whom are scattered around Japan. In fact, many are in rural prefectures where labor costs are low.

Marcon Denso, a small supplier to Denso, as shown in the Exhibit IV, has 200 employees. It is 16% owned by Denso and located in Yamagata Prefecture, which is close to the area devastated by the quake on March 11. This particular factory did not suffer any damage, but the infrastructure disruptions, such as power cuts and transportation problems, had been severe and still continuing more than one month after the massive quake which could affect its customers.

In the case of Marcon Denso, the products include small buzzers that are used in passenger car door locks. They may cost just one or two dollars, but a delay in supply could close all assembly lines of Toyota factories that use Marcon buzzers.

Denso itself has 80 or so smaller suppliers in Japan alone where, Prior to the recent massive quake, another one in 2007 in Niigata Prefecture shut down a piston ring factory owned by an SME company called Riken, which controls 50% of the domestic market for the component. The disruption caused Toyota and 11 other companies to shut down the production lines for one week.

In the automobile industry, it is said that a typical car uses about 30,000 parts. While the brands in the top layer of the hierarchy are just limited to less than 10 companies, main among them are Toyota, Nissan, and Honda, the industry in Japan is supplied by about 7000 SMEs.

Some of these SMEs are quite small and do not have the resources to move overseas. And since the parts can be physically small, they can be shipped out from Japan quite quickly; thus they have chosen to remain domestic. They are the ones that had caused Toyota to cut the production in half through this year. They have shut down the factory lines of Japanese subsidiaries, which has affected the non-Japanese manufacturers around the world as well.

‘Only One’ Supplier Risk

Indeed, various cost-cutting measures by auto manufacturers and the like had made the smaller part suppliers focus on certain products. Especially at high-end or for highly specialized products, some companies control the whole market or a large percentage of the global market.

The dominance of Japanese SMEs in the global supply chain is best visible in electronic and machinery related parts.
manufacturing, where Japanese parts are in most demand around the world, especially in China, ASEAN countries with large manufacturing outsourcing, and the US. Exhibit V shows a small list of some such SMEs based in Japan.

As one can see, these are not very big companies. If they are big, like the case of Murata Mfg. with 35,000 employees, they are middle-layer companies (Exhibit IV); such companies could have many subsidiaries or partner companies. In case of Murata, 18 domestic subsidiaries are suppliers, along with 7 other domestic partners. Its own supply chain includes those 25 domestic suppliers, plus 4 subsidiaries in the Americas, 7 in Europe, 8 in China, 1 in Korea, 1 in Taiwan, and 6 in ASEAN countries. Murata itself has 3 of its own plants in Japan.

Another company in Exhibit V with sizable number of employees is Nippon Chemi-Con. In Japan itself, this company has several subsidiaries, besides those overseas. Four of its factories which produce Aluminum Capacitors, for which it is the world’s leading supplier, are located in the quake-affected prefectures of Fukushima, Iwate, and Miyagi. Their production had been affected and the company had to postpone the shipments resulting in disruptions in the global supply chains.

The dominance of Japanese companies in key areas of manufacturing had paved way to “Only One Supplier Risk” factor into Supply Chain Management (SCM) literature. While SCM research had, in the past, addressed various disruption risks caused by supply delays, the ‘only one supplier risk’ needs to be addressed in a more subtle way, as it includes sensitivities linked to technology transfers and intellectual property risks associated with very high-end and highly specialized products.

Taking a comprehensive view, it is clear that the calamity and the shock waves created as a consequence of Japan’s strongest ever earthquake and the “triple blow” is not just limited to the damaged region. It has already shaken Japan physically and is hurting its economy; it has also created major disruptions in the global supply chains, affecting manufacturers around the world, making it the world’s costliest natural disaster ever. The “triple blow” could also be the most severe sensitivity test ever for global supply chains.

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