

Impact of the Great Thai Floods on the International Supply Chain

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Abstract: The international supply chain for intermediate goods is widespread across East Asia and constitutes an important part of the global economic system. Recent natural disasters both in Japan and particularly Thailand highlighted its importance and revealed underlying structural weaknesses, as the knock-on effect of localised production disruptions caused stoppages of and delays in production and trade across Asia and beyond. In this paper we elucidate the major problems of the international supply chain by analysing detailed bilateral trade data for three key export goods. We find that the current structure of the supply chain implies that when one part of the chain is cut, the whole chain will necessarily be affected. In conclusion policy suggestions are outlined, giving ways to improve supply resilience and mitigate the impacts of frequently-occurring localised natural disasters on the regional and global economy.

Key words: Natural disasters, parts and components trade, supply chain
JEL classification: F15, F23, O53

1. Introduction: Disaster-Prone Asia

Asia is a region highly prone to natural disasters. In the period 1990–2011, the region experienced nearly 40 per cent of the total natural disasters in the world, and Asia's share of the total death toll from these disasters was almost 80 per cent. It is also interesting to observe that approximately 58 per cent of natural disasters in Asia occurred in the East Asia region. Countries that are particularly prone to natural disasters in Asia include China (681 disasters), Japan (291), Hong Kong (103), Indonesia (412), the Philippines (529), Thailand (119), Vietnam (177), Bangladesh (312), India (604), Iran (193), Pakistan (166) and Sri Lanka (81 disasters), during the period 1990-2011.

In March 2011, for example, an earthquake and tsunami killed more than 15,000 people in eastern Japan. Later that year, extensive floods in Thailand's central provinces and parts of Bangkok killed more than 800 people. The economic and social costs of such natural disasters are enormous. In addition, these disasters reveal the fragile nature of the international supply chain as it is presently structured. Natural devastation inflicts tremendous social, economic and human costs. What these recent disasters have revealed is that they damage not only the domestic economy, but also the rest of the world through interconnected production networks in this globalised era. In this paper, we focus on the effects of the 2011 Thai Great Floods on global production by analysing how the global supply chain has been affected. Given that Asia is the most natural

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disaster-prone region of the world, it is essential that appropriate precautions are taken in a variety of ways to mitigate the potentially serious economic impacts.

2. Supply Chains Affected by the Thai Great Floods

On 11 March 2011, a 9.0 magnitude earthquake and subsequent tsunami struck Tohoku, the North-east region of Japan. This disaster has come to be known as the Great East Japan Earthquake (GEJE). The situation arising from these two natural disasters was further complicated by a nuclear disaster in Fukushima. Since the affected area is the center of production of high tech products, these events caused significant interruptions to the global supply chain. Specifically, what occurred was the non-delivery of intermediate- to high-value added products to the main factory operations. Since many Japanese companies have extended their supply chains across Asia, the GEJE substantially affected not only Japan but also the world economy.

In addition to the GEJE, Asia experienced another big natural devastation when widespread floods lasting three months struck Thailand in the last quarter of 2011. These Thai Great Floods (TGF) were also a global event affecting the supply chains in Asia, particularly in the automotive sector and in high technology components manufactures. The impact was so severe that for certain products, including hard disks, final goods could not be delivered to meet the world demand.

Throughout Thai history, past damage from flooding in the Chao Phraya River Basin were confined mainly to the agriculture sector. The 2011 TGF affected more than 3 million people through displacement, and claimed more than 800 lives. About 380,000 workers in more than 930 factories in 28 provinces were directly affected by the floods, which crippled at least seven industrial estates. We observed widespread supply stoppages and damaged logistic systems.

As far as production is concerned, overall industrial output fell 21.8 per cent for the quarter, with capacity utilisation declining to 46.4 per cent in the 4th quarter of 2011. The recovery process was relatively fast after water had drained from the affected industrial estates in December 2011, and the production level returned to around the pre-flood level by March 2012.

3. Industrial Sectors Interrupted by the Thai Great Floods

Our analysis is based upon bilateral trade flows in detailed commodity classification. Monthly data were taken from the UNCOMTRADE at the HS six-digit level. We focus on three important export items here: hard disk drives, digital cameras, and one-ton pickup trucks. Examining these selected products closely offers valuable insights into the structure and weaknesses of the supply chains involved.

3.1 Hard Disk Drives (HDD)

Thailand is ranked the second largest producer of HDDs in the world; it accounts for about a quarter of global output. Thailand's HDD exports were seriously impacted during the flooding period (Sept to Nov 2011) and bounced back strongly in the following year, as evident in Figure 1.

China, the USA, Hong Kong, the Netherlands, and Japan are the major export destinations for Thailand's HDDs. The TGF halted HDD production in Thailand and the

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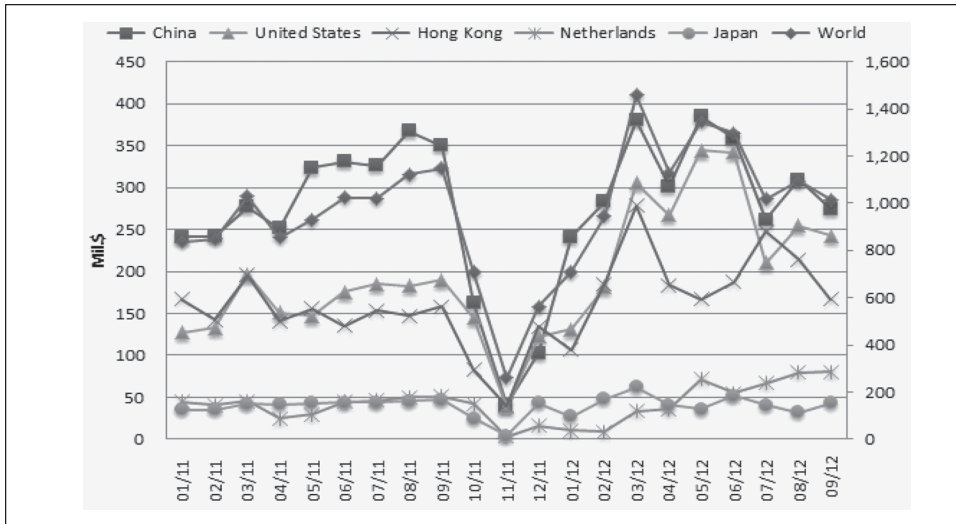


Figure 1. Thailand's exports of storage devices

Note: The right axis is for the 'World' and the left axis for 'Other countries'.

immediate impact was a drop in value of exports to China from USD350 mil. to USD300 mil. It was only in February 2012 that the recovery took place. Exports to the USA recovered one month earlier, and by March 2012 the export value had doubled. Figures for Hong Kong showed a similar recovery pattern to the USA. Thus, overall, export values dropped initially and bounced back during the recovery process, but in an uneven manner.

Thailand imports HDD parts mostly from China, followed by Malaysia. As HDD production and exports recovered, imports of the parts and components increased (Figure 2). Larger imports were made for three to four months before the level tapered back to the pre-flood level. Interestingly, parts imports from the USA did not show recovery to the pre-flood level, while parts imports from Singapore increased substantially with a lag. Here again we can observe that the TGF induced uneven changes in exports and imports by destination.

China is the largest export destination for Thailand's HDDs. China uses imported HDD to assemble PCs. As Figure 2 shows, China's PC exports fell after the TGF. In order to keep PC production going, China imported more from Malaysia to compensate for its drop in imports from Thailand. The USA, Hong Kong, the Netherlands, and Japan are China's PC export destinations, with the USA by far the largest of these destinations. Despite the halt in HDD exports from Thailand, China had restarted its PC exports to the world again by early 2012, as illustrated in Figure 3.

3.2 Digital Cameras

A similar analysis and pattern can also be made for Digital Camera and Camera Lenses reflected in Figures 4, 5 and 6. Digital camera production, with an annual global market size of about USD30 bn in value in 2011, reveals another intriguing story. The drop was

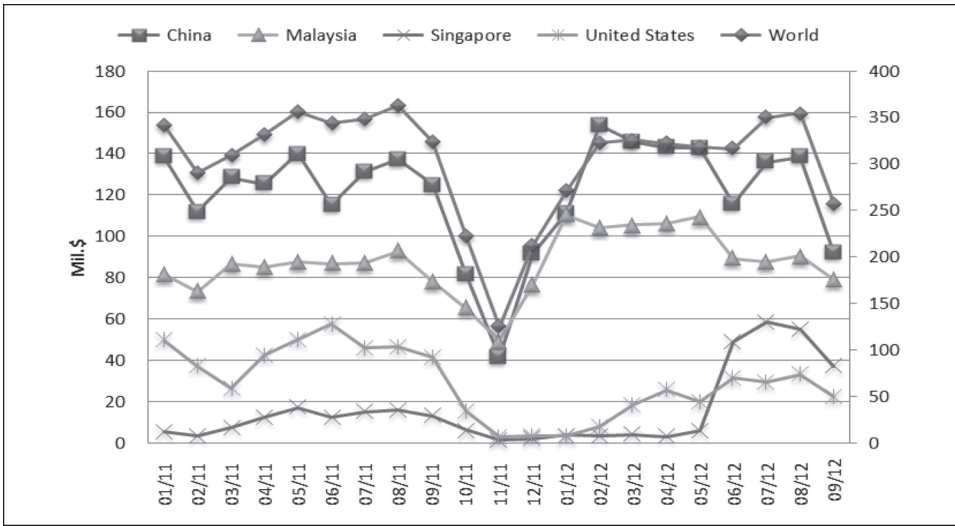


Figure 2. Thailand's imports of HDD parts and components
 Note: The right axis is for the 'World' and the left axis for 'Other countries'.

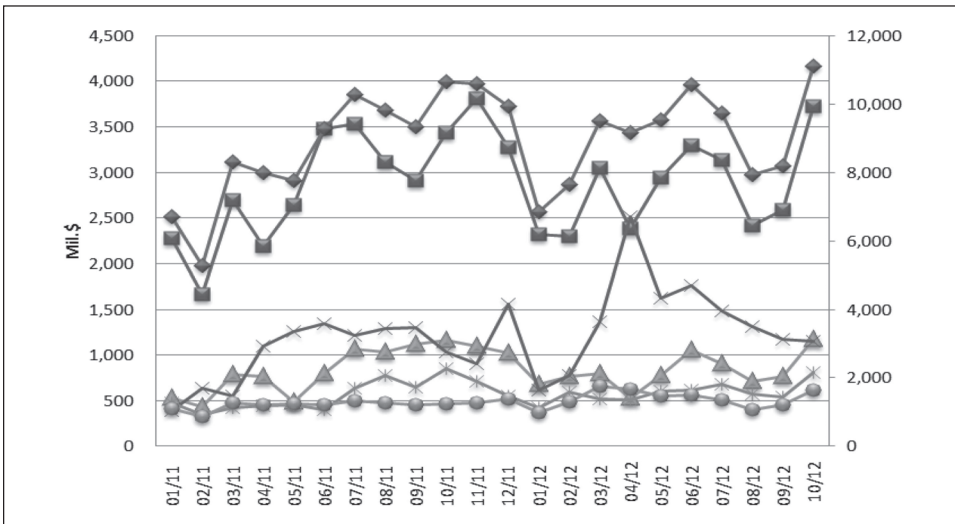


Figure 3. China's exports of PCs
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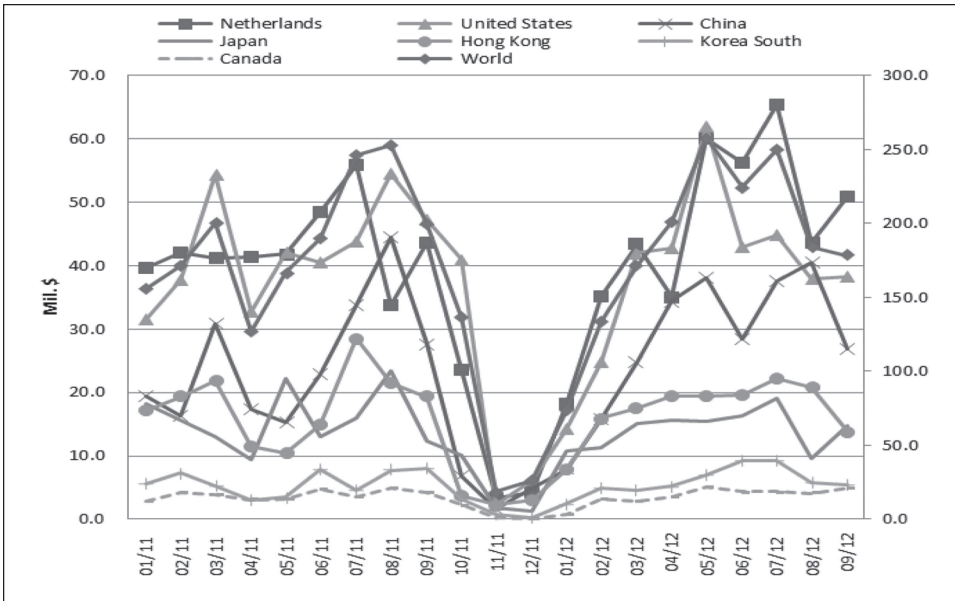


Figure 4. Exports of digital cameras from Thailand
 Note: The right axis is for the 'World' and the left axis for 'Other countries'.

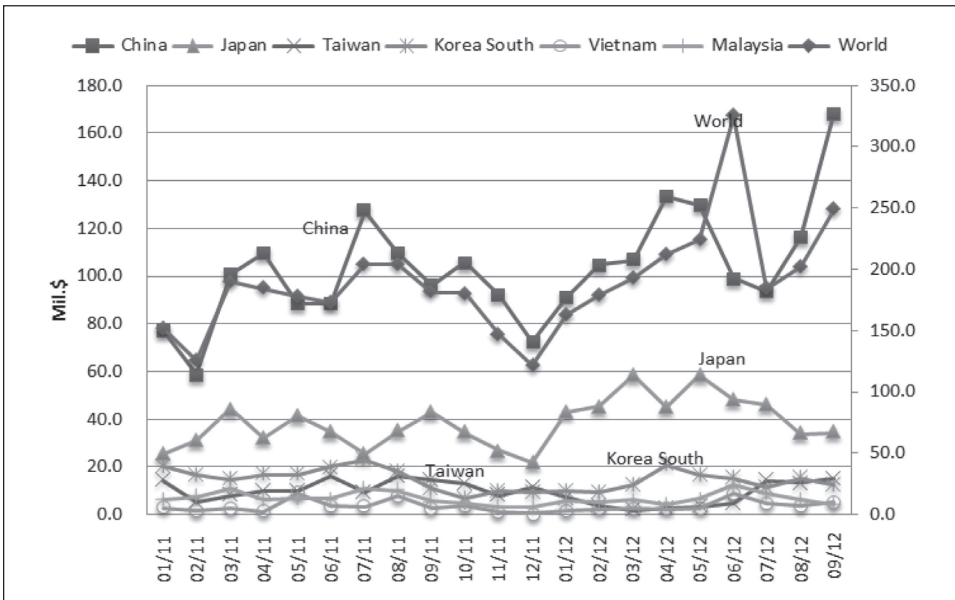


Figure 5. Thailand's imports of digital camera parts and components
 Note: The right axis is for the 'World' and the left axis for 'Other countries'.

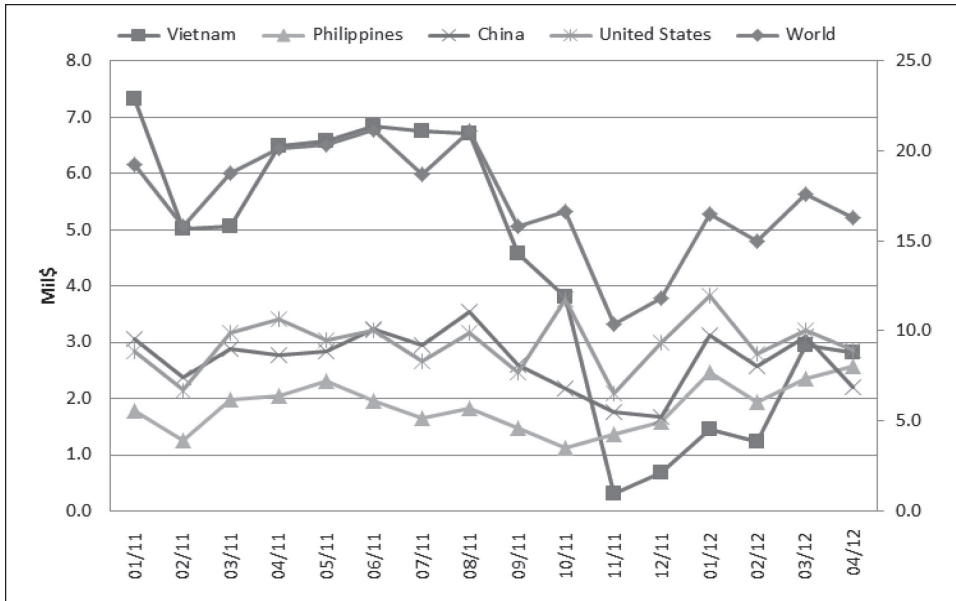


Figure 6. Thailand's imports of camera lenses

Note: The right axis is for the 'World' and the left axis for 'Other countries'.

largest in digital camera exports, which fell almost to zero. Thailand's main export destinations are the Netherlands, the USA, China and Japan. To all these destinations the drop was abrupt, and yet recovery was also fast, reaching the pre-flood level in half a year.

Thailand imports digital camera parts from Japan and China. These parts imports were affected, but not to the extent of digital camera exports. In November 2011 digital camera exports dropped to nil with recovery taking half a year. Export destination ranking did not change before and after the flood. For parts other than lenses, China and Japan did not differ much in the recovery process but Taiwan took a longer time to recover, to almost until July 2012. Lenses show an interesting trend. Prior to the flooding lenses were imported from Vietnam, China, the USA, and the Philippines in that order. The level of imports from the Philippines was substantially lower than that of the USA. After the flooding, however, imports from the Philippines increased to a level even higher than that of China. Vietnam, China, the USA, and the Philippines contributed about the same to imports. As this digital camera market case shows, the flooding markedly changed the lenses import market.

3.3 Automobile Industry (Pickup Trucks)

Thailand's overall vehicle output fell to 1.4 million units in 2011, compared to 1.6 million units in the previous year. Half of the units and components produced are for export, especially to Japan and Japanese companies' subsidiaries, as Japan maintains

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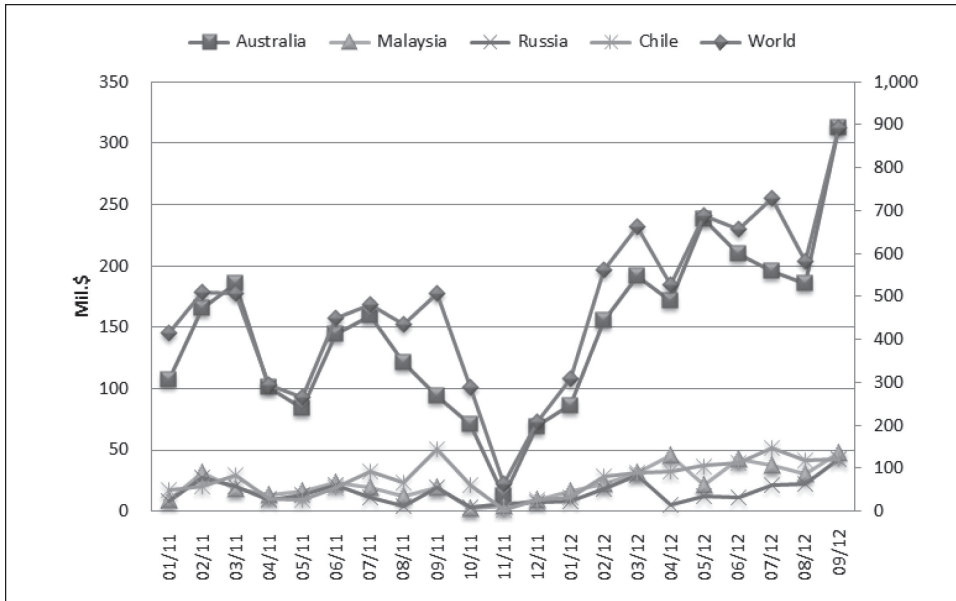


Figure 7. Thailand's exports of one-ton trucks

Note: The right axis is for the 'World' and the left axis for "Other countries".

its strong presence in Thailand. Considering the scale of the floods, it is surprising to find that only two out of thirteen auto plants in Thailand were directly impacted.

One of these is Honda, which had its large operation in Nikom Rojna Industrial Estate which was left inaccessible during the floods. Several small OEM auto part suppliers were also badly hit. The TGF had a global reach and caused Honda to cut output at all six plants in the US & Canada. Furthermore, Toyota claimed it was able to find other sources for many of electronics parts to fill the gap even though Thailand is Toyota's main production hub in Southeast Asia. The General Motors assembly lines, on the other hand, in Rayong hundreds of kilometres away from the submerged area, were severely impacted due to parts, goods and services bottlenecks.

In addition to passenger cars, Thailand is also well known as a major supplier of one-ton pickup trucks, the production of which was also affected by the flood. The largest export market for Thai trucks is Australia. We observed a huge drop in exports. However, the recovery was fast and the pre-flood level was reached in March 2012, that is, within four months. Other export markets, including Chile, Malaysia, and Russia, also experienced a sudden drop and then quick recovery (Figure 7).

Japan was affected by this flood in terms of engine exports, as shown in Figure 8. The largest drop was in December, not in November, and it took quite a while to recover to the pre-flood level. It is interesting to observe that Japan also experienced a drop in its engine exports in December, and it took four months for exports to the USA, China, UK, and Brazil to recover to the pre-flood level. As Thailand is a major parts and components supplier in the world market, the floods affected the global automobile exports in general.

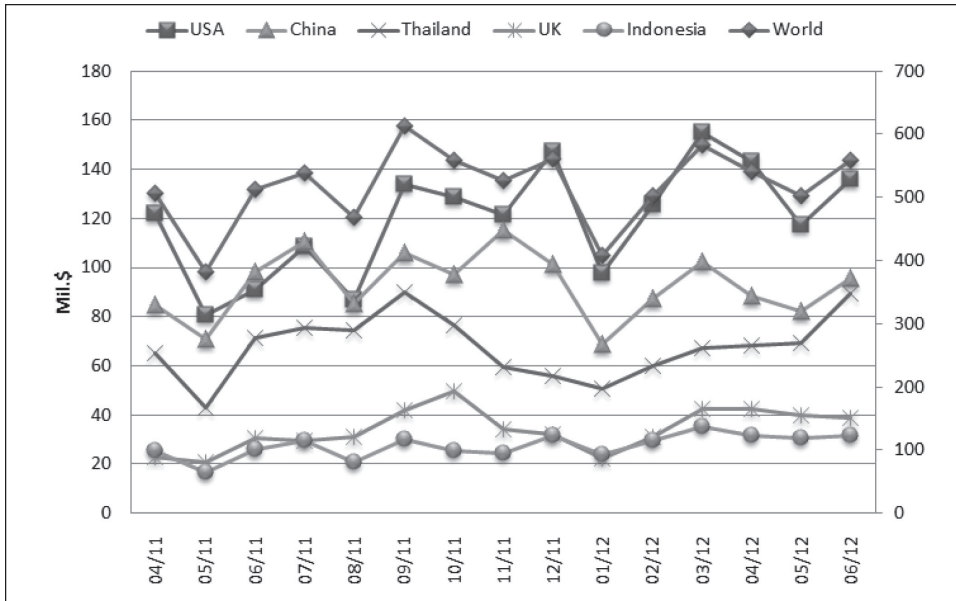


Figure 8. Japanese exports of automobile engines
 Note: The right axis is for the 'World' and the left axis for 'Other countries'.

4. Conclusion

In light of the data analysed here, businesses should rethink the very basics of their international supply-chain operations. Modern manufacturing is enabled by modern technology, low-cost transportation and low tariffs. Module production makes it possible to site in different locations the separate processes needed to make a product. Labour-intensive processes are located in countries that are labour abundant and have low wages. The completed modules are brought together at a final assembly site. This supply chain production is very efficient and substantially lowers the prices of final products. However, we should realise that seeking too much efficiency often leads to negligence of safety and reliability. In both Japan and Thailand, core parts production was concentrated in one area, and factories did not store sufficient surplus parts in the case of disruptions to the supply chains. The result was that the natural disasters which occurred in 2011 severely impacted manufacturing and supplies, not only in the directly-affected areas but also in the unaffected areas of Thailand, in Japan, and worldwide.

The solution to this problem extends from the old saying, 'don't put all your eggs in one basket.' In fact, some Japanese multinational manufacturers have already initiated a revised industrial strategy to separate core suppliers into two or more locations, although this does mean having redundant suppliers. Alternatively, maintaining stocks of inventory, although more costly, can help ensure that operations are not disrupted by disasters which occur at a higher frequency in Asia.

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