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Thailand's 2011 flooding: Its impacts on direct exports and global supply chain disruptions

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1. Introduction

Fragmentation and agglomeration forces, together with the concept of just-in-time production, have made it possible for many countries to establish manufacturing production through vertical specialization and economies-of-scale even though they do not have a comparative advantage at the level of all manufacturing production. This is true for Thailand today, much as it previously was in Taiwan Province of China and, some decades before that, the Republic of Korea. As Thailand becomes a part of this production sharing and global production networks, it also becomes increasingly evident that supply chain disruptions could be a serious threat. Natural disasters and some types of man-made catastrophes can endanger the just-in-time approach to procurement and production because any disruptions to a single node of production may lead to a breakdown of the entire production chain.

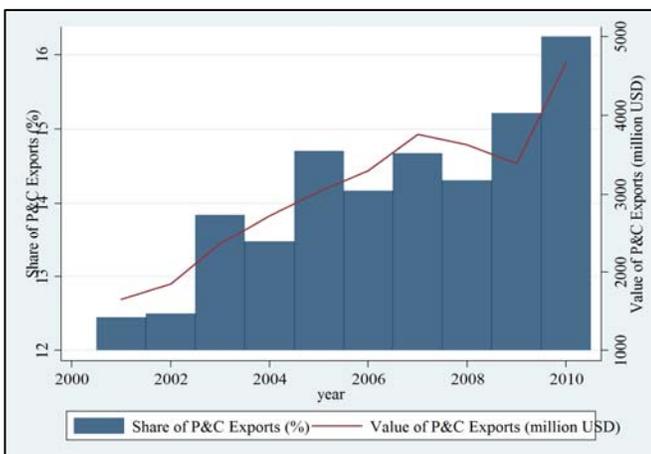
Despite the past experience from natural disasters that brought the global supply chain to a halt, the recent flooding that seriously affected Thailand's industrial manufacturers highlights the fact that the prevailing just-

in-time procurement and management systems have not fully recognized the potential damage that can result from supply chain disruptions as well as the pivotal role played by building up resilience in supply chains. Strategic assessment and management of the disruptions must therefore constitute the basis of supply chain management.

2. Global production networks and Thailand's manufactures

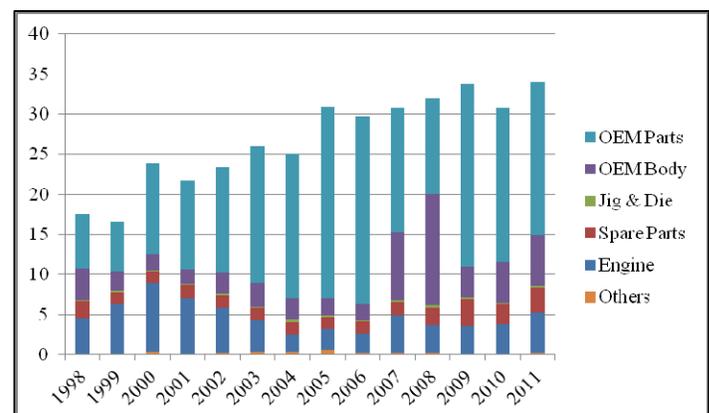
The proliferation of production networks has often been cited as the source of Thailand's sustained growth of output and employment in the past two decades (see, for example, Punyasavatsut, 2007, and Poapongsakorn and Techakanont, 2008). Firms and operators generally rope in production sharing and just-in-time procurement and tend to concentrate in a few locations in order to secure a competitive advantage from lower transportation costs, well-developed infrastructure and more efficient coordination (Kimura and Obayashi, 2011).

Figure 1. Share of parts and components exports in total electronics exports (per cent)



Source: Author's calculation based on the United Nations Commodity Trade Database.

Figure 2. Share of parts and components exports in total automotive exports (per cent)



Source: Author's calculation based on the dataset provided by Thailand Automotive Institute.

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The growing importance of global production networks in the Thai economy is reflected in the escalation of the share of trade in parts and components (Kuroiwa, 2008). In the electronics sector, for example, the share of parts and components exports in total electronics exports increased exponentially from nearly 12.5% in 2001 to more than 16% in 2010 (figure 1). The share of parts and components in total exports of automotive products approximately doubled from 17% in 1998 to almost 35% in 2011 (figure 2). The proportion of original equipment manufacturing (OEM) parts increased considerably from one-third of parts and components exports in 1998 to more than two-thirds in 2011, signifying the fact that producers of automotive parts and components in Thailand have become part of the global supply chain for car production.

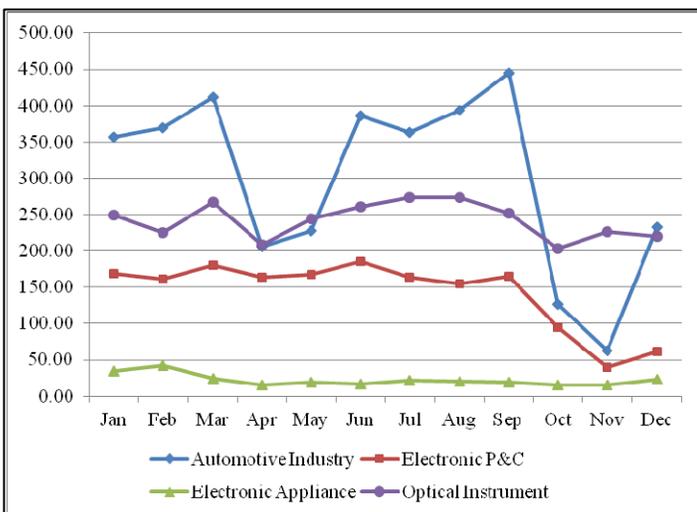
However, the emergence of industrial agglomeration and the unprecedented complexity of global production networks has spawned the risk that supply chain disruptions will set back domestic as well as global production. The vulnerabilities are particularly pertinent to the Thai economy as production plants are heavily concentrated in a few provinces, i.e., Bangkok, central provinces such as Ayutthaya, Samut Prakarn and Samut Sakhon, and the eastern provinces including Chachoengsao, Chonburi and Rayong. Samut Prakarn and Chonburi host the largest number of production plants, mostly in the automotive and electronics sectors, and many operate in major industrial estates such as those at Bangpoo, Bangplee, Amatanakorn and Laem Chabang.

3. Impacts of Thailand's flooding on production and direct exports

In the last quarter of 2011, Thailand experienced its worst flooding crisis in 70 years. The unexpectedly drastic and widespread rainfall caused by monsoon storms inundated the central region of Thailand including Bangkok and peripheral provinces, where factories and businesses are intensively grouped. The immediate impact of the floods on the Thai economy was a contraction of output in the last quarter of 2011, forcing the downward revision of the gross domestic product (GDP) forecast from 2.6% to 1.0%, even though the flooded areas were limited to a few provinces in the central and northeastern regions. This revision was due to the fact that the flooding seriously affected several key central provinces, especially Ayutthaya, Pathum Thani, Nonthaburi, Samut Sakhon and, not least, parts of Bangkok.

Although the overall impact on the economy was transitory as the affected industries were expected to return to normal capacity in the first quarter of 2012 (Bank of Thailand, 2012), the slump in the production of key manufactures was remarkable. The reason was that the industrial estates in those areas are a major source of intermediate input procurement through which parts and components are delivered on a just-in-time basis for final assembly. Therefore, the disruptions of parts and components delivery inevitably had a strongly adverse effect on the non-flooded areas, both in Thailand and other countries, as other stages of production were forced to cease their operation.

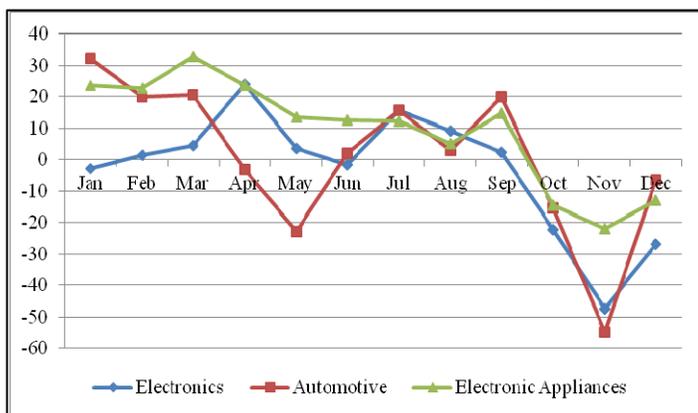
Figure 3. Monthly production index in selected industries, 2011



Source: Office of Industrial Economics, Ministry of Industry, Thailand.

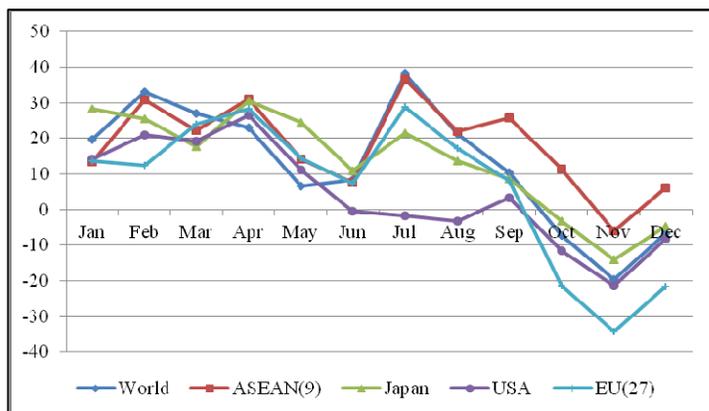
The automotive industry appeared to experience the most severe contraction in the production index by approximately 87.5%, from nearly 444.5 in September 2011 to a low of 62.5 in November 2011. However, the industry bounced back quickly and strongly as the index started to pick up in December 2011, and the upward trend was expected to continue in the first quarter of 2012. The production of electronic parts and components exhibited a sharp drop of more than 65%, from 165.1 in September 2011 to 40.2 in November 2011; recovery appears to be relatively patchy as production nodes of key electronic parts and components are highly clustered in the affected areas, and supplies cannot be easily superseded, at least in the short term, by production from other parts of the world. The production of electronic appliances and optical instruments was less affected, with an approximate decline of only 12.5% in production; in fact, the decline in optical instrument production was negligible. The production index of electronic appliances, albeit having recorded a slight decline in August-October 2011, remained quite robust at 200-250.

Figure 4. Monthly growth rates of Thailand's key industrial exports in 2011 (per cent, year-on-year)



Source: Office of Industrial Economics, Ministry of Industry, Thailand.

Figure 5. Monthly export growth by key markets in 2011 (per cent, year-on-year)



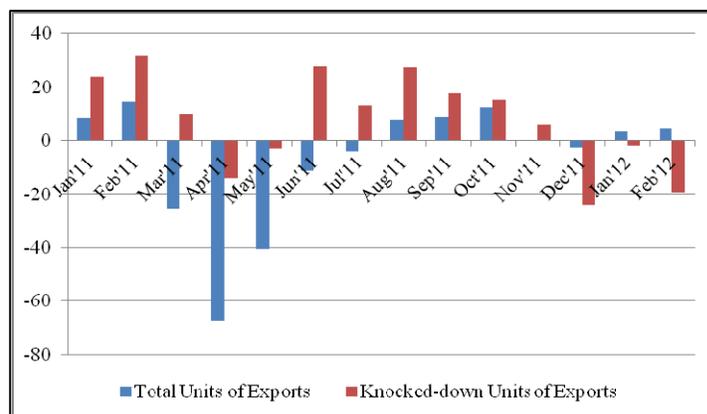
Source: Office of Industrial Economics, Ministry of Industry, Thailand.

Automotive exports exhibited the most severe decline, with a year-on-year export contraction of more than 50% in November 2011 (figure 4). Significant declines in exports were recorded in the electronics and electrical appliances industries, which hit 47.4% and 21.9%, respectively. This can be explained by the fact that manufacturers in Thailand, both domestic and multinational corporations (MNCs), serve as low-cost assembly lines, and the finished goods are exported. Therefore, disruptions to Thailand's manufactures will adversely affect delivery of these products to foreign markets. The contraction of industrial exports to advanced economies, particularly the European Union, Japan and the United States, were more pronounced than similar exports to other ASEAN countries, which, by and large, are also emerging as low-cost production bases. The sharpest contraction of Thailand's industrial export markets was in the European Union where the industrial export growth dropped by 34.2% in November 2011, followed by 21.4% for the United States and 14.1% for Japan. However, industrial exports to ASEAN countries remained relatively

robust with a slight dip of only 6.1% in November 2011 (figure 5).

From the perspective of global production networks, a contraction of exports of manufactures as a result of the major flooding is not limited to Thailand. In the automotive industry, for example, the shutdown of the Japanese car assembly lines in Thailand could have a severe impact on exports of knocked-down units – vehicle parts and components that are produced in one country and then exported to another country for final assembly – from Japan. Although the year-on-year growth of total automotive exports from Japan remained stable and rather robust, with slightly positive growth in the last quarter of 2011, the exports of knocked-down vehicles experienced a noticeable decline of 24.1% in December 2011 (figure 6), a trend that appeared to persist during January-February 2012. This demonstrates the significance of the global production chains in automotive production and is a clear warning that supply chain disruptions in one country can bring about knock-on effects on exports of other countries.

Figure 6. Growth rates of automobile exports from Japan, January 2011-February 2012 (per cent)



Source: Japan Automobile Manufacturers Association.

Notes: Numbers are year-on-year growth rates. A knocked-down unit refers to an unfinished set of vehicles with a value less than 60% per vehicle.

4. Managing supply chain disruptions

There are at least three main avenues that businesses can follow in managing the risks of supply chain disruptions and to build up the supply chains that are resilient to uncertainties.

4.1. Vulnerability assessment and awareness

Most companies develop contingencies to shield against the high-probability, low-impact risks that are typically recurrent and transitory, such as machinery breakdowns and failed coordination. However, high-impact, low-

probability risks such as natural disasters are often not considered. There is abundant evidence that many organizations have not taken into account the heavy costs imposed by such unpredicted events, in terms of a decline in long-term performance, competitiveness and, ultimately, business survival (Christopher and Peck, 2004). Supply chain management, in practice, continues to focus on efficiency improvements through a “lean” operating platform while downplaying, if not neglecting, the strategies that ensure resilience of operations against such potential threats (Milner and Kouvelis, 2002).

Companies need to accept the fact that managing supply chain disruptions associated with high-impact, low-probability events is one of the most fundamental aspects of corporate culture and management mindset. Nevertheless, realizing the risks of supply chain breakdowns is easier said than done. Most manufacturers, and even governments, are not fully aware of the disruption risks associated with just-in-time procurement policy, and they continue to put excessive emphasis on enhancing improvement in efficiency through lean operations, industrial clustering and economies-of-scale. Without making appropriate identification of risk sources and a comprehensive business continuity plan, a company will likely fail to respond rapidly and systematically to such disruptions, thereby ultimately incurring greater damage than would otherwise have occurred.

4.2. Enlarging redundancy in supply chains

There are two aspects of redundancy in supply chains – redundant inventory and redundant suppliers (Bode and others, 2011). The former aspect can act as a shock absorber for companies while the latter helps to diversify any risk that a breakdown in delivery by one supplier will cause a halt in the entire operation. Several strategies augment redundancy of supply chains, such as larger inventory stockpiles, multiple-sourcing strategies, backup production sites and product designs that advocate compatibility with supplies from various sources (Tang, 2006). With redundancy, procurement decisions made by a firm on a just-in-case basis will make it possible for that firm to become less reliant on timely delivery and well-functioning activities of its contractual partners and suppliers, thus ultimately reducing the need for effective communications and coordination.

The aftermath of Thailand's flooding saw a growth in the quest for greater redundancy through reducing dependence on a single supplier as well as the spreading out production sites throughout the region. This spawned the fear among local businesses as well as the Government that Thailand would lose its long-standing position as a global supply chain hub. However, such dispersion, fortified by the escalating trend towards procurement redundancy, are subject to trade-offs between the lower risk of disruption and higher costs in terms of holding outlays, transaction-specific investment

and operational inefficiencies; therefore it can only be implemented limitedly.

4.3. Strengthening flexibility

Flexibility is of equal importance. The capability to forestall uncertainties and respond to them quickly, through reliable and timely information about the potential disruptions and their consequences, is crucial. This capability boosts a firm's vertical relationship with its partners, and helps companies respond quickly and effectively to disruptions through information exchange and coordination with its counterparts. It relies on flexibility in supply procurement, conversion and distribution (Sheffi and Rice, 2005).

Flexibility of supply procurement implies the development and alignment of the corporate-supplier relationship in both single- and multiple-sourcing policies. Deepening the vertical specialization relationship requires investment in monitoring suppliers, better exchange of information and, not least, mutually agreed business continuity planning (Harrald, 2002). Conversion flexibility is achieved through the use of standardized processes and identical machinery, allowing the operating teams to carry out activities in various locations. Last, distribution flexibility pertains to the extent to which a company can continue to service and maintain good relationships with its key customers in the aftermath of any supply chain disruption. For example, one business model that advocates distribution flexibility is the build-to-order operating strategy – as opposed to fixed configuration – whereby a firm that is facing a parts shortage relies on pricing strategies and services to sell its products, rather than disappointing and losing customers.

5. Conclusions

The substantial impact of Thailand's flooding in 2011 on industrial production and direct exports not only demonstrates how the country and, to a larger extent, developing Asia have become central to global production networks; it has also re-affirmed the fact that supply chain risk management serves as another pivotal impetus for enhancing competitive advantage. Given the expected future occurrences of increasingly drastic natural as well as man-made disasters as a result of climate change, together with the ever-expanding competitive pressure on industrial agglomeration and clustering, just-in-time production networks will incur heavy costs due to supply chain disruptions. Therefore, resilience to the shocks and breakdowns resulting from such disasters, together with efficient management of the risks and damage to supply chains, will be the key to keeping a company ahead of its competitors.

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