

# International Specialization and Collaboration in Global Production: A longitudinal case study of Taiwan-Japan Alliance in Machine Tool

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**Abstract:** This paper explores how joint-venture (JV) firms exploit opportunities for international specialization and collaboration. Based on a longitudinal case study of JVs (5 years, 14 interviews) between a Japanese and a Taiwanese machine-tools manufacturer in China since 2004, we demonstrate how firms expand their global production networks by sharing resources from collaborative JVs through intra- and inter-firm specialization.

**Keywords:** Global production network; International alliance; International specialization; Case study.

## I. Introduction

This paper presents a longitudinal case study of joint ventures (JVs) between a Japanese and Taiwanese machine-tools manufacturer in China since 2004. The main aim is to understand how the two firms exploited opportunities for *international specialization* and *collaboration*. *International specialization* is defined as the division of specialisms within the boundary of a firm (intra-firm specialization), with suppliers and between international JV firms (inter-firm specialization) across national boundaries.

The Japanese firm, called TM, is a Japanese mid-side enterprise who manufactures machines tools (mainly CNC precision lathes) serving primary automotive parts manufacturers. Due to a lack of fund and sales channel, TM entered the growing Chinese market by forging its first international JV plant in China with a Taiwanese firm called FFG, who had already setup another plant and sales channel in China. From this first JV, the two firms later formed several other JVs and collaboration through exploiting *intra- and inter-firm specialization*. The case data were collected by interviewing top management teams from the headquarters of the two firms in Taiwan and Japan, as well as the JV firm in China (FT-China) on an annual basis over six-year (2010-2015). Other data sources include plant tours and archival documents.

## II. Theoretical background

The literature on global production network (GPN) has long since examined the strategic roles of single foreign production plants [3]. However, there is a need to explain configurations of roles and relationships between multiple

foreign production plants [1]. Configuration dimensions such as the allocation of resources among plants along the value chain [2] [14], degree of geographical dispersion and level of coordination [18] [19] have been explored.

Specialization is another important dimension for studying configuration of GPN. Early work on specialization explores whether foreign plants should focus on specific product or process [9] [4]. However, the idea of specialization is limited to a single-firm perspective. To fully consider specialization in a GPN, there is a need to include domestic and foreign production plants that a firm can access to through ownership, outsourcing and alliance. This perspective allows researchers to consider foreign plants and their networks of suppliers, customers and alliances as sources of market, competency, expertise and knowledge.

This paper adapts the concept of *international specialization* from the Economists and International Business disciplines. It originally refers to countries specializing in producing specific goods and services, which is in contrast with an alternate strategy called diversification [17] [8]. The concept *vertical specialization* originally means a country specializes in a specific sequence of production while *horizontal specialization* occurs when trade goods are produced from start to finish in just one country [10].

The concept of *international specialization* has been applied to study specialization from a perspective of a firm's internationalization strategy for deciding whether a foreign plant should specialize in a specific value chain activity and outsource the other activities [11] [13] [12]. To contribute to the GPN literature, we define *international specialization* as the division of specialisms within the boundary of a firm and with firms outside of its boundary and between international JV firms across national boundaries.

*International specialization* can be divided according to firm boundary: first is *intra-firm specialization* concerning what a foreign plant should specialize in relative to the headquarters and other foreign plants owned by a firm, including its international alliance and joint-ventures (JVs); second is *inter-firm specialization* concerning what a foreign plant should specialize in relative to the other firms. International specialization can also be divided into horizontal and vertical dimensions. *Horizontal specialization* involves plants specializing in specific products or service in a GN

that serve different markets. *Vertical specialization* involves plants that are responsible for part of the value chain, creating multi-functional production networks.

### III. Research design

Our sample consists of a mid-size Japanese machine tool maker-TM, a leading firm in Taiwan machine tool industry-FFG, and their subsidiaries including their joint ventures and their own plants located in China and Taiwan. The relationships between the two firms started from one joint venture established in China expanded to a complex alliances network using a broad range of *international specialization* based on divisional cooperation, such as vertical specialization on manufacturing process, horizontal specialization by segregated products, sharing suppliers, sales channel and service.

We focus on machine tool market in China because the annual production of Japanese machine tool industry was overtaken by China in 2009, and fell to third place after Germany in the world from the first where it maintained for 28 years. Japan replaced Germany as the world's second largest in 2010, and TM decided to enter Chinese market.

Interviews were conducted with top Japanese and Taiwanese executives and managers in headquarters (HQs) and plants located in Japan, Taiwan and China during a six-year period from 2010 to 2015. Altogether there were fourteen two-to-four hour formal interviews with presidents, chairman, vice chairman, general manager and so on at the HQs of TM and FFG in Japan and Taiwan respectively, and subsidiaries of FFG in Shanghai, Hangzhou, Taizhong and Milan. Top management was interviewed because they had an overview of the JVs, their internationalization strategies as well as deeply involved in the JVs between TM and FFG. The interviews were fairly unstructured such to allow the interviewees to express their views openly about intra- and inter-firm specialization and collaboration between the two firms. During the interviews, various documents related to market analysis, the JVs, and reports were collected. Data were also gathered from other staff who were involved in informal meetings and plant tours.

Case study is a suitable methodology for the building of theories for explaining emerging phenomenon [20], such as that of *inter-firm* and *intra-firm international specialization*. We carried out a single longitudinal study of the entire process of building international specialization between HQs, domestic plants and oversea plants owned by the Japanese machine tool maker (TM) and its Taiwanese alliance partner (FFG) who had already advanced into China markets.

The case study aims to uncover four aspects related to intra- and inter-firm specialization and collaboration. First, we identified the reasons why the TM chose a Taiwanese firm

(FFG) not a Chinese local firm as a business partner in China. Second, we mapped the different intra- and inter-firm specialization strategies undertook by both TM and FFG in building a system of global production, procurement and R&D in their respective GPNs, and how they leveraged each other's strengths to achieve their internationalization goals. Third, we explain how the two firms established mutual alliance partnerships to expand their collaboration (JVs) and face intense competition. Finally, we overlaid multifaceted cooperative relationships in the JVs with inter- and inter-firm specialization to understand how the collaborative relationships had affected the allocation of functions, roles and specialization across GPNs owned by the two firms.

### IV. Findings

#### Background: TM and FFG

TM was founded as a Japanese manufacturer of machine parts in 1948 and started to manufacture machine tools in 1961. TM manufactures and sells machine tools (CNC precision lathes, special-purpose machines, machined auto parts and IT-related making equipment. Around 70% of its customers are automotive parts makers and 90% of the customers are regular buyers of its machines. TM has four plants in Japan. Since the 1990s, TM has been expanding its foreign sales dramatically. In 1996, TM established sales offices in America, German, Thailand and Indonesian.

FFG is a Taiwanese firm who has become the world's largest machining center manufacturing group and the largest machine tool group in the Asia (i.e. Taiwan, China, Hong Kong, Singapore and Southeast Asia). FFG was established in 1979, as an exclusive agent in Taiwan for a Japanese steel firm to distribute construction machinery, and started to manufacture machine tools in 1985. In 35 years, the firm has grown into a large corporation groups with 82 manufacturing bases worldwide some through JVs and companies by M&A. FFG consists of four major divisions of business: Machine Tool, Industry Equipment, PCB, and Green Energy in 2016. Machine Tool is FFG's core business, with 51 manufacturing bases scattered in 10 major countries and 32 machine tool brands under the conglomerate.

FFG successfully entered the Chinese market and expanded its business in 1990s. In 1991, FFG started to export machine centers through a Japanese trading company from Taiwan to China. FFG then established its first oversea subsidiary, FFG-China, in Hangzhou. Among the existing 400 suppliers of FFG in Hangzhou, the key suppliers are Taiwanese and Japanese subsidiaries in China, for FFG in recent years also has developed some Chinese suppliers and led to the rapid growth of clusters of parts manufacturers. In 2015, FFG-China not only played an important role in Chinese market but also becomes a leading production base for FFG with the largest production volume in the group.

### **The first TM-FFG JV in China (FT-China)**

Reacting to trends to procure machine tools from China by automakers instead of importing from Japan, TM recognized the needs to change its strategy. This was a clear invitation to TM to invest in China. TM felt the pressure from its customers, acted decisively on this information and seriously began to consider how to enter the Chinese markets.

In considering how to expend its business into China, TM compared two options: direct investment and joint venture. For external direct investments, TM could enjoy benefits such as the preferential treatment to foreign companies and avoid technology leakage, but the raising of an initial investment fund and facility investment fund would be a major issue, because TM is a mid-size firm in the machine tool industry in Japan. In addition, they had no experience to run business abroad such as facing the complicated situation of the Chinese institutional environment head on including the Chinese laws, regulations and interactions with the local government and personal management and labor relation. Due to the language barrier and different skill levels, a wholly owned business is difficult to transfer to a Japanese production system such as Just-In-Time (JIT) into a Chinese business; many Japanese firms have failed to achieve this when they tried to enter the Chinese market [7].

In a case of JV, TM needed to identify a local partner and form an alliance with it. The immediate benefits are that TM did not need to deal with the Chinese institutions directly and could avoid high investment on a production facility up front. It would be best if TM could cooperate with a business that understands the Chinese business environment, regulations and laws, knows how to deal with local governments, as well as being familiar with the operation model and culture of Japanese business. As a mid-size company, TM opted for the second solution.

In October 2003, the TM's Senior Vice President, Mr. Maeda (a decision maker for TM's China Strategy) met in an unplanned occasion with the owner and CEO of FFG, Jimmy at a trade fair in Italy, and expressed for the first time the intention of collaborating with FFG. Both parties regarded each other as an ideal partner for their new business plan due to their complementary capabilities. After the meeting at the fair in 2003, TM paid many visits to FFG HQ in Taipei and its Chinese subsidiary FFG-China in Hangzhou in the following years. It did not take long for both parties to make the decision to establish a JV in China. The joint venture with Taiwanese firm gave three advantages to TM. The first was that TM could receive preferential tax treatment for a foreign company by forming a joint venture with Taiwanese's HQ. Second was that it could be facilitated to start up a factory in a short term, and could effectively use a great deal of skill and know-how accumulated by FFG in China market. Third was that TM could be facilitated to boost quality control in China because

the Taiwanese firm had higher technical capabilities than other Chinese local firms. As a Taiwan's top machine tool maker, FFG needed to increase its production competencies and upgrade its alliance networks around the world.

Establishing an alliance with a Japanese machine tool maker would bring FFG three advantages: first, Japanese companies enjoy the reputation of having high technical expertise and lean manufacturing knowledge, represented by the Toyota Production System (hereafter abbreviated to TPS), which FFG was expected to learn systematically to improve its own production capabilities and products' quality. Second, TM is a top CNC lathe machine tool manufacturer in Japan, so collaboration with it could bring FFG's reputation worldwide. Third, FFG expected that TM could help it penetrate the Japanese machine tool market.

In December 2004, TM and FFG announced the establishment of the JV firm in China, FT-China. It was a new production plant located at FFG-China in Hangzhou (on rental) until it had enough capital to build its own new and large plant in June 2015. Both firms held 50% of the shares initially. FT-China was established based a combination of TM's production technology and FFG's business experience, supply and sales networks and production facilities in China. Initially, Mr. Maeda was concerned about the lack of enforcement of Intellectual Property Rights (IPR) legislation and bureaucratic regulation issues in China. He argued that local government may have various jurisdictions and the Japanese are not familiar with how to deal with this. Therefore, the Chairman of the Board of JV, Mr. Chen (also the CEO of FFG-China) assumed responsible for their relationship with the government and related law issues. Meanwhile Mr. Maeda assumed the first General Manager of JV and was responsible for production activities and administration of the JV plant. As for the JV operations, TM provided management and technological knowhow while FFG-china provided the production facilities, skilled production line workers and supply base.

FFG and TM targeted the top market share in China by increasing the competitiveness of their product through their first JV. TM successfully entered the Chinese market anticipated growing demand in sales and production in the automobile industry and intended to do its best to expand sales based on a high degree of specialization. Meanwhile, FFG added "CNC lathes" products to its product range after the JV. FFG aimed to expand its market shares by maximizing synergy effect with the Japanese high quality and functionalities for adding a new competitive product range to its existing sales channels.

### **Intra- and inter-firm specialization in the first JV**

Intra-firm specialization from the TM perspective was constrained by the size, staff and foreign experience of TM.

For the Chinese JV plant, TM sought to improve management efficiency by sharing functions between their domestic and foreign operations. The emphasis was placed on having domestic plants in Japan specialization in product planning, R&D, and high value-added, high-mix and low-volume production. Thus, it was decided that the TM's domestic plants in Japan would play the role as base plants with the functions to develop and accumulate the technologies and skills for foreign (and Chinese) markets. That means FT-China had a 'horizontal specialization' strategy, from TM's perspective. With this strategy, TM expanded and enhanced its domestic plants in Japan through active investment in M&A and foreign JV that created new overseas market, which demanded high-value-added products from the domestic production plants and specific medium-value-added products from the foreign plants.

The above specialization strategy was used because TM had no enough technicians to be sent to foreign plants. The two expatriates in FT-China were needed to continually expand the production while maintaining quality standards in China through the supports from FFG-China. TM trained staff from FFG to understand the know-how and sense of value of the HQ and then sending them to the Chinese plants. For positions associated with design, development, product planning, plant manager and production control, it was decided to involve local Chinese managers, the number of which was almost as equal as that of Japanese expatriate, to procure manpower for its Chinese plant. Especially, positions such as sales, procurement, purchasing and local supervisors, hiring and fostering local born was localized.

Inter-firm specialization was developed mainly from decisions related to supply base. To strengthen the alliance, FT-China, from the beginning, placed greater emphasis on manufacturing and selling products that were spread over a wide range of prices, including relatively low-priced products and some high-value-added products for specific customers in Chinese markets. Comparing the products quality of similar types made in Japanese plants, there was almost no difference. The JV plant relied on procurement of key parts from foreign (30% from Japan and 10% from Taiwan) and the remaining 60% came from the Chinese, due to the existing supply base developed by FFG-China. FT-China could use local suppliers from the very beginning. Whilst most of the TM's domestic plants in Japan adopted a 'vertical specialization' strategy, the JV in China provided an opportunity to consider 'horizontal specialization'.

TM recognized there was a need to develop some key suppliers itself from the pool of the existing 400 suppliers including FFG-China. To ensure the quality, FT-Chine outsourced key casting components to processing businesses of FFG in China. Before that, FFG-China itself outsourced the casting process. But TM suggested that FFG-China started to produce of the casting process in-house within its

plant, because this process needed minute-processing technology, and if two plants (FFG-China and FR-China) met the minimum production quantity required, the volume would be large enough to justify in-sourcing. In respond to the request of FT-China, FFG-China started to supply casting FT-China. By consolidating procurement of materials, the Purchasing Divisions of the two firms could lower their costs and enhance operating efficiency. In addition to that, the two firms further established JVs with their suppliers to produce compressors and core components of machine tool, at their own plants in China, to keep the core competences within the JVs.

International procurement opportunity exposed by the JV had triggered TM to implement 'horizontal specialization' globally. Seeing the benefits of low-cost procurement in FT-China, TM identified some suppliers in China who could potentially reach the requirements of its high-end products that were assembled at its Japanese plant. In 2007 TM selected a team of people from FT-China, trained them in Japan, and in the meantime set up an International Purchasing Office (IPO) within FT-China, which was responsible for identifying and qualifying the very best suppliers with the greatest potential for further development (including FFG-China) for TM's plant in Japan. The IPO reports to TM Japan's purchasing department directly. In 2010, the IPO was separated from FT-China and transformed to a TM Trading company in China. Expansion of local procurement was made possible through providing continuously technical guidance in production management and the development of an efficient production system to FFG-China and other suppliers in China.

Subsequently, TM started international sourcing from China and Taiwan. FFG-China became one of the key suppliers to TM's plants in Japan and Thailand since then. Thus, TM managed to develop its end-to-end global production systems in East Asia by exploiting intra- and inter-firm specialization in its JV with FFG, that would allow everything from development to parts procurement and production to be performed locally in its foreign plants, and are working toward increasing the proportion of parts and materials sourced from within China and nearby regions to cut procurement costs. Since that, TM's share of procurement from Japan was expected to drop gradually. Furthermore, TM has proactively offered technical training and production management to FFG's Taiwan plants every three months. Simultaneously, TM increased procurements from China and Taiwan the plants in Japan, since the suppliers in China are recently demonstrating the improvement in their technology standards.

### **Multiple international alliances and specialization**

By utilizing the connections and sales network of the Taiwanese partner, TM managed to become one of the top

10 foreign machine tool makers in China only three years after entering the market, though it was the tenth such firms who entered China. TM in China began its operation at May 2005, and reached break-even in the second year, then profitable in the third year of operation. This was attributed to accessing to FFG's resources and infrastructure. When FFG-China sold its products to customers, it also promoted the JV's products. Therefore, the JV's Chinese customers were mainly obtained through existing FFG-China's customer base. In addition, the two firms established further collaboration to expand their customer bases.

In 2006, expecting grow, Toyota Tsusho Corporation, established by Toyota to provide sales financing for Toyota cars, made a 20% capital injection in FT-China. That also mean FT-China started to access to major Japanese parts and automakers, which was a significant sales networks expansion. With a great deal of influence of Toyota Tsusho Corporation in the automobile industry overall, TM as well as FFG would be able to diversify its customer base through discovery of and trades with Japanese parts and components makers in China in addition to coordination with FFG in terms of procurement and the use of sales networks. By 2012, the customers of FT-China consisted of 40% domestic Chinese customers and 60% Japanese company's subsidiaries operating in China. FT-China gradually became independent from FFG in terms of its sales network through the building of four sales branches in North China, South China and the inland provinces.

Since the quality of products made by FT-Chine was considered as high as those made by plants in Japan, TM became widely known in Chinese market, such that products made in its Japanese plants begin selling well also in China. Gradually the quantity sold to Chinese customers by TM Japan justified the establishment of a trading company. The Chinese laws required a separate sales company needs to be set up to sell imported products in China, thus TM set up a trading company in JV in 2007, which became the independent sales company of TM's products in 2010. To avoid conflict of interests with FT-China, TM-Trading sells only TM products produced in Japan to the Chinese market. It is actively pushing forward their export operation.

The profits gained from FT-China generated in China provide TM with the capital required to access other markets while effort to strengthen and improve the efficiency of sales functions. TM reorganized a clearer division of roles between its domestic and foreign operations through the deft use of their international specialization and collaboration. TM reinforced and expanded its domestic plants to focus on production of value-added-products and R&D for domestic market and Western markets where the customers require advanced technology and high quality. Expected an increase in the share of exports to China, TM enhanced its production systems in Japan, through expansion projects of factories

and business establishments in 2006 and the acquisition of an existing company for speedy business expansion in 2008 and further expansion of the plant in 2013.

Meanwhile, TM was trying to expand export and develop sales routes to Europe, and to enter Southeast Asian markets, such as Thailand and Vietnam. TM founded its sales office in 1996 for export to ASEAN, and established its Thailand corporation in 2003, but there was not enough investment to admit of extensive dealings. In contrast, TM completed the building of a whole owned production facility in 2006 in Thailand as an assembly and export base to strengthen sales efforts aimed at the South East Asian market. Components for the Thai production base were mostly purchased from FT-China. Thus, TM was working toward optimization of supply chains through the construction of optimal specialization structures in the East Asian region in line with product characteristics that would allow them to take full advantage of past capital accumulation and the merits of international specialization. Furthermore, to widen sales channels, TM established its German corporations, a joint venture with the German company EMAG in 2009, upgraded from a sales office which established in 1996 to a base for export to Europe.

The equity relationship changed as the different JVs developed. In 2006 Toyota Tsusho Corporation (TTC) saw the growth potential of FT-china and invested the whole amount needed for expanding the production facility and holding 20% shares, TM and FFG held 40% each. In 2010, TM-Trading was established and the IPO was separated from the JV and put it within the trading company. Besides these Chinese operations, TM and FFG established another alliance in Japan. In 2008, to support FFG's sales in Japan, TM and FFG established a JV in Japan (FT-Japan) aiming to sell FFG's products and providing after sales service to the Japanese market, with both parties holding 50% shares. Four more JVs between TM and FFG were established between 2010 and 2015.

FFG benefited a lot from the JVs with TM. benefits. For FFG and its Chinese subsidiary FFG-China, the biggest benefit from this alliance is advancement on a technological level. In 2004, almost all components of FFG-China production were bought from other suppliers, after six years, FFG has learned management skills from the Japanese machine tool maker, FFG (and TM in China) and dramatically increased the rate of vertical integration i.e., by making the key components in house. The vertical integration rate had always been a vital issue for Taiwanese machine tool makers, as if they did not have the key technology, they could not compete with the global players. Due to the evolutionary path of Taiwanese companies importing key components from foreign, they did not possess the key technologies. However only when the vertical integration rate reaches a certain level, it became

possible for the business to accumulate the know-how for the development of new products based on the capabilities of developing key components.

FFG took the advantage of learning the Toyota Production System (hereafter shortened to TPS) from TM. TM was famous for the application of TPS in the machine tool industry. The GM of FT-China Mr. Kawakami was sent to Toyota to learn their production system, and then successfully developed TM's own TPS. TM taught their TPS to FFG's plants in Taiwan and China. Seeing the success of FT-China, FFG operations in Taiwan were motivated to learn TPS and made lots of improvements in production technology and management tools. For example, at the very beginning when FFG sold its products produced in Taiwan to Japan, Japanese clients found some recurring defects and a lack of 5Ss in FFG plants. To improve FFG site 5Ss skills, Kawakami visited FFG's plants in Taiwan twelve times from 2008 (the establishment of FT Japan) to 2011, each visit lasting three to four days focusing on teaching TPS. In the last two years (2011-2013), Kawakami spent two days a month on average at these plants. Now clients can clearly tell that FFG's 5S was much more sophisticated compared to its competitors.

Second, FFG had successfully entered the Japanese market through the alliance with TM. In 2008 TM and FFG co-established a JV (FT-Japan) mainly responsible for selling FFG's products (e.g., Taiwanese made machine centers and 10-foot and over NC lathes) made in Taiwan for the Japanese market. In 2010, with the introduction of TM, FFG signed another JV contract with a Japanese supplier which specialized in CNC drilling and tapping machines and they had successfully developed capabilities for automated production and 9-axis machining. This JV was established around the FT-China plant and brought immediate benefits to FFG by providing a new opportunity for technology transfer and revenue to FFG. The broader benefits included the success of the TM-FFG alliance which was copied by other Japanese companies aiming to forming international alliances.

One of the main obstacles for selling Taiwanese machine tools in Japan is that Taiwanese firms did not have a network of after sales service. The quality of Taiwanese made machine centers were close to but cheaper than Japanese made ones, therefore if FFG could provide a satisfying after-sales service, it was possible to sell their products in Japan. The core product of TM was the CNC lathe, and for FFG it was the machine centers. In terms of technology level, CNC lathes demanded a higher level than machine centers, thus TM was fully capable of providing FFG products' after sales support with its existing network. Whenever TM's customers needed machine centers, TM recommended FFG's products to them, and promised that TM would provide the after-sale service and maintenance.

The assistance in marketing was two-way i.e., they helped each other in getting access to the other party's market. FFG's would not be successful without TM's after sales network support.

Moreover, based on TM's experiences and customer feedback, FFG dramatically improved its R&D capacity. In 2007, TM and FFG co-developed a new product, which was designed based on FFG's existing product. TM and FFG worked together to improve its function and design, it was then exhibited in Tokyo business forum. In this way, FFG increased its production capability due to the improvement of quality. They received orders for 802 machine tool on March 2011, which was an 87 percent increase from the previous year. FFG further opened more sales offices and marketing channels across China and the number reached over 80 by 2016. Although, FFG had 11 operations totally in 2004, just for machine tool business by 2016, it had been growing its operations to nine including twelve plants in China, five operations and ten plants in Taiwan and 29 operations in other countries. Besides the JV with TM, FFG engaged in a lot of M&A and JVs with other firms.

## V. Discussion and conclusion

### The benefits of international specialization

This case study shows that two firms could grow their respective markets and further expand their businesses globally by exploiting international specialization, through starting a single international alliance. TM and FFG initially produced two slightly different products but shared largely similar type of customers (automotive parts manufacturers). This case does not represent a traditional horizontal collaboration, which often ended quickly. Instead, both firms built a long-term collaborative setup with each other while complementing each other's specialized fields (in production, supplier base and marketing, etc.), and managing and integrating their global operations into an optimal internal production networks and efficient business operations, while better meeting market needs and diversifying of products. Instead of developing an internationalization strategy that is based on a firm's own production network, the case study demonstrates the competitive advantages firms could gain in global competition by establishing and coordinating systems of international specialization through determining optimal resource arrangement suited to their internal strengths and weaknesses along the overall value chain and corporate activities relative to their international partners [6] [16].

Just as many other manufacturers in developed world, through international specialization this case study shows that a Japanese manufacturing firm could increase its production of high-value-added product, develop new products and service and repair facilities in domestic market, while in abroad, invested in capacity expansion through

setting up or expanding foreign mass-production plants where there are higher rate of economic growth and where labour cost is lower. This case study is of the interest of SMEs, who have limited resources in comparison to large enterprises. Through partnerships with appropriate foreign firms that would allow of the development of appropriate 'horizontal specialization' the case study shows that a Japanese mid-size machine tool manufacturer could expand its reach to new customer and supply bases in the Chinese market, while its Taiwanese partner expanded their product ranges to higher-end products, production techniques and technologies that would allow them to achieve "vertical specialization" and likewise gained access to the Japanese markets. Like this case, both firms reached a continuing expansion of complementary and cooperative relations by exploiting strengths of both sides and developing an intertwined network of global alliances, sales, production and supply networks.

The case study also brings new perspective to the global sourcing literature. It is argued that companies can succeed in securing competitive advantage and gaining profits through global sourcing [5]. While the literature has an emphasis on how a firm manages its global sourcing, less is known how two firms collaborate through different international alliance to manage global sourcing together. The case study shows, when two firms started an international alliance, there will be a lot of opportunity to create meaningful intra-alliance trade. Greater international specialization is leading to greater intra-company trade in recent years [15]. The two firms were procuring parts from each other in many countries within the East Asian region consists of Japan, China, and Taiwan. By enabling mutual supply between plants, they built up a system of production and procurement from optimal locations across Asia. Furthermore, we notice that a greater international specialization can strengthen the value of global sourcing, and subsequently create complementary relationship of supplying parts and components among global production plants own by the two partners. By deepening international specialization across an emerging economic region, even a mid-size firms could manage to handle extensive network of production processes by relying on the product networks of its alliances. Firms forming international business networks need to learn how to optimally achieve international role-sharing with their partners, such that it is possible to diversify and improves technology capability.

### **How are international specialization developed?**

This case study shows that international specialization was developed based on complementary and cooperative relations and a careful division of specialization between domestic, foreign and partner operations. Both firms had succeeded in improving management efficiency, securing competitive advantage and gaining profits through forming

international business networks by sharing functions that utilize the strengths of their management resources (technologies, financial power, product competitiveness, etc.) while developing appropriate specialization structure through the construction of an optimal manufacturing and R&D roles-sharing between domestic and foreign plants.

Another important means for inter-firm international specialization along the value chain of corporate activities was through the construction of an optimal production and specialization structure from the perspective of East Asia including Japan, ASEAN and China as a single business region. Though a serial of JVs, the two firms could procure parts from each other in many countries within the East Asian region and enabled mutual supply between operation, thus building a system of production and procurement at optimal locations within the region. Compared to a network of suppliers and buyers without relationships built on international alliance, ability of the two firms were more effective in building international specialization because they had mutual interests in their JVs with capital ties. In a way, this mirror the Japanese Keiretsu, but with a Japanese-Taiwanese multiple alliance arrangement that allowed for horizontal and vertical specializations.

To enable a clear division of roles between their domestic and foreign operations, TM and FFG needed to build an GPN by reviewing international role-sharing among their operations. The formation of inter-firm facilitated their production activities more effectively and contributed to improved profitability in operations networks. TM and FFG jointly managed and integrated their global operations to create an efficient production and procurement structure for better meeting respective market needs. This is not a traditional horizontal collaboration by associations. Instead, individual firms built collaborative setups to gain profits of cost reduction and increase their joint competitiveness substantially through construction of an optimal production and specialization structure, while complementing each other's specialized fields by forming a network of international alliances. They set up of integrated production systems that links plants from the two firms enabling them to engage in quick delivery, high-quality mass production. To improve the quality of important processed parts and achieving short delivery times through an integrated production system, they then chose to produce core components such as casting and compressors in house at their own manufacturing plants in China.

As the inter-firm specialization progressed, TM gradually expanded its production of quality of parts and components for its Chinese plant, and increased exports of comparatively high-level intermediate goods from China and Taiwan while manufacturing products with high technological levels to achieve cost saving across its all manufacturing plants. TM could reinforce and expand greater scope for reinvestment in

Japan and other countries, and creating virtuous circles between its own and partner's domestic bases and foreign bases while successfully entering the Chinese market.

On the other hand, FFG has built a large-scale and price-competitive integrated production and supply systems enabling them to engage in quick delivery, high-quality mass production. Traditional production regimes are therefore being revised, the plants in Taiwan have enabled a focus on the bulk of their management resources on their core business, fighting for new products (or advanced products) and the advantage in functional components which are intensively developed and produced, as it seeks to establish optimal procurement and production systems on a global scale. Meanwhile, in addition to its Chinese subsidiary shifting to in-house production with a precise and high-efficiency parts machining and sharing parts to many countries within the East Asian region through vertical specialization, it was possible for the Chinese plants to manufacture products of the same quality as those made in Taiwan through using the core parts made in Taiwan. By accumulating necessary technologies with the deepening of alliance with the Japanese partner who shared and fostered the same supply base in China and Taiwan, FFG could increase the quality of its parts and end-products in its whole group. Consequently, FFG's plants in Taiwan could produce advanced products for Japanese markets. This, furthermore, strengthened cooperation relationship and increased opportunities for learning from its alliance partner.

The development of global production networks through international alliance has led FFG's business to maintain a high growth rate. FFG has been accumulating enough capital to enable a series of acquisitions in Italia and Germany, while enhancing its existing production system. This is thought to meet a strong growing demand of precision processing machine in China. Firms in China have shifted their production to high-value-added products by promoting transformation of industrial structure. To expand the export of high-added valued product for meeting the high-end Chinese market, through a series of acquisitions, FFG become a parent company of foreign firms that manufactured advanced equipment with a strong brand, thereby securing markets as soon as possible. This explains why FFG is developing products by acquiring firms who have long history of developing precise machine tool in Europe that can be sold over a broad area, and why they are moving to establish efficient production and sales systems. Thus, by advancing global operation under the GPN consisting of Japan, China, Italia, and Germany, FFG has been able to grow its market and further expand its business.

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