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Abstract

In this paper, we look into the advantages that have contributed to the creation of Kunshan as an important ICT cluster in the world. One unique feature of Kunshan is that virtually all industries in the region have been transplanted from foreign countries, especially Taiwan. One obvious advantage of Kunshan is the availability of low-cost labor, which, however, is non-essential. Two essential advantages of Kunshan are its proximity to Shanghai, the industrial center of China, and its ability to create unique local institutions that allow the region to become a part of global production networks (GPN). Proximity to Shanghai allows the region to attract skilled labor, which is essential to the formation of a high-tech cluster, and to handle a large volume of trade in a speedy and flexible fashion, which characterizes the new methods of production in the ICT industry. Furthermore, Kunshan has created a unique set of local institutions which are loosely coupled with institutions in the rest of China, but are closely connected with international institutions that support the trans-boundary operations of GPN. This institutional design enables the poorly endowed Kunshan to leverage the Chinese resources to form alliances with foreign capital.

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I. Introduction

The most outstanding feature of Kunshan as an emerging ICT cluster in the world is its rapid transformation from a farm land into a power house of industrial production within a decade or so. Before the transformation, there was no apparent endowment of skilled labor force in the region, and skilled workers are considered to be a precondition for the birth of a high-tech cluster (Bresnahan et al. 2001). Most observers of the dramatic rise of Kunshan pointed to the role of global connections, whereby Kunshan was largely seen as a relocation and reconstruction of ICT clusters that previously existed in Taiwan. This view is over-simplified. It provides no explanation as to how these global connections have worked wonders for Kunshan, what circumstances have induced the relocation of the cluster from Taiwan to China, and what local conditions have made the relocation possible. Without answers to these questions, the rise of Kunshan can only be attributed to pure luck. The main purpose of our study is to find these answers.

We will study the rise and the evolution of Kunshan cluster, using the concept of global production network (GPN) (Gereffi 1995). GPN views global production to be accomplished by a differentiated network of producers, which are globally dispersed, but may be locally concentrated. A cluster emerges when a significant number of producers are locally concentrated. The configuration of GPN evolves overtime, driven by technological innovations and changing patterns of competition and consumption. But a wholesale relocation of a cluster from one place to the other did not happen often.

Our working hypothesis is that the rise of Kunshan is caused by the reconfiguration of GPN of the ICT industry in recent years, which in turn, was precipitated by technological innovations as well as demand shifts. In terms of technology, the

widespread diffusion of Internet that began in the early 1990s precipitated the revolutions in production methods. The new technology enables a new production model known as “build to order” (BTO) to replace the traditional “build to forecast” model. On the demand side, the increasing popularity of ICT products, particularly personal computers (PC), around the world translates into a demand for producers to offer low-price but differentiated models in order to avoid commoditization. In response to this trend, GPN has to be reconstructed to create responsiveness, differentiation, and low costs at the same time, and Taiwanese firms have played a key role in this restructuring process.

The advantage of Kunshan is understood to be low cost of production, on which no discussion is needed. But low cost is not sufficient to make Kunshan a viable player in the global production chain, as two other more important factors, namely differentiation and responsiveness, also have to be delivered. Japan lost out to Taiwan in the PC manufacturing mainly on the account of responsiveness to markets. But if we consider the infrastructure of Kunshan in the early 1990s, it is hard to imagine that Kunshan would out-compete Japan, or even Southern China in terms of the facilities that would enable responsiveness. For one thing, Southern China is adjacent to Hong Kong, which is one of the most efficient sea ports and financial centers in the world. Therefore it must be something else that underlines the superiority of Kunshan over other potential locations for a new cluster in the “China Circle” (Borras 1997).

We found that Kunshan’s success hinges on two advantages. First advantage is the geographical proximity to Shanghai which gives Kunshan the ability to attract skilled labor into the region (labor pooling) and to export notebook PCs in large volume and in a flexible fashion to accommodate the BTO scheme. Second advantage is the ability of

the local government to create local institutions that are loosely coupled with domestic institutions and tightly coupled with international institutions. This institutional arrangement allowed Kunshan to leverage international resources for industrial growth. The concept is to create a kind of filter that only allowed desirable domestic forces into the region to combine with external resources for growth, while dispelling anti-growth factors into the region. The concept of 'filter' differs from an enclave which is completely isolated from the domestic economy. In Kunshan, local linkages are selective rather than absent. Using the concept of selective linkages, Kunshan was able to create a location advantage that is not available in other parts of China. It is the combination of geographical advantage with institutional innovation that gave Kunshan a unique place in the global production networks.

II. The Agglomeration Process

When China opened 14 coastal cities to foreign direct investment in 1985, Kunshan quickly joined the bandwagon. As a third-tier city outside Shanghai, Kunshan established an 'economic and technology development zone (ETDZ)' to attract foreign direct investment. This local ETDZ was dwarfed by other national ETZDs in the country because of lack of resources. However, Kunshan was smart to target the small Taiwanese investors who were overlooked by the Shanghai government because they were small and infamous. Because Kunshan was only 60 kilometers away from Shanghai seaports, for Taiwanese exporters, locating in Kunshan makes little difference from municipal areas of Shanghai. In fact, if Hongqiao Airport was to be used for shipment, it was only 40 kilometers away from Kunshan. Better yet, Kunshan was under the jurisdiction of Suzhou customs instead of the busy and bureaucratic Shanghai

customs, the time it takes to clear the customs was shorter. In later years, as Kunshan had developed into a big export cluster, customs procedures were expedited to facilitate the flows of imports and exports.

In the early stage of Kunshan ETDZ, major investors were in the traditional industries such as bicycle, metal fabrication, and electronics products. In 1992, Kunshan was formally recognized by the central government as a national ETDZ which entitles all foreign invested companies in the zone to a reduced tax rate of 15% as opposed to 24% rate applied to foreign investors located outside the zone. The earliest investors of Nantz and Foxconn came to Kunshan in 1992, right after it secured the national ETDZ status. Nantz made printed circuit boards (PCBs) and the Foxconn made electrical connectors. Both are key parts used in personal computers and other electronic devices, but they are by no means high-tech products. Beginning in the mid-1990s, a large number of computer peripheral makers began to congregate in Kunshan area. Noticeable examples included Acer Peripheral (later became BenQ) investing in keyboard and monitor production in 1994 (in Suzhou), Compal investing in monitor production in 1997 (in Kunshan), Delta investing in power supply in 1998 (in Wujiang), and Tatung investing in monitor production, also in 1998 (in Wujiang). This wave of investment was very important for Kunshan region because it represented a large scale exodus of Taiwan's major PC-related companies. Most of these companies had previously invested in Southeast Asia in the mid-1980s and were looking for an additional investment site in China rather than a replacement. Although they were export oriented, they were conscious of the future opportunities of selling their products in China's domestic markets. The greater Shanghai region, therefore, was the top choice. This wave of investments started the agglomeration process for Kunshan. For example,

when Acer Peripheral invested in Suzhou, it brought with it 14 major suppliers which collectively located in Wujiang.

The agglomeration force may be originated from large-scale assemblers or from large-scale parts suppliers (Yang 2007). In other words, the agglomeration may either be a backward integration or a forward integration process. For example, big parts suppliers such as Foxconn, and big assemblers such as Compal all generated their own agglomeration effects. The supply chains were inter-woven as they were located in proximity.

The foreign investment wave in 1994-98 was promoted by new tax incentives given by the Chinese government to high-tech foreign companies, which enjoy 10% tax rate after two years of tax holiday plus three years of 5% tax rate. Following this incentive program, Suzhou high-tech park was inaugurated in November 1992 which later attracted many giant multinational firms like Phillips, Siemens, Fujitsu in addition to Acer Peripheral. The Chinese government also devalued the RMB by 50% in 1994 to enhance the competitiveness of Chinese exports. The congregation of large multinational firms in Suzhou, which is 30 kilometers away from Kunshan, made Kunshan more attractive because of the benefits of agglomeration.

However, Kunshan-Suzhou area did not become an ICT powerhouse until after the second wave of massive investment by Taiwanese notebook computer makers beginning in 2001. Almost every major PC assemblers joined the parade, including Compal, Mitac, Acer (later renamed Wistron), Asustec. Only Quanta chose to locate in Shanghai instead of the Kunshan cluster. By 2004, China had surpassed Taiwan to become the world's largest exporter of ICT products. This wave of investment was precipitated by the big consolidation in the world's PC industry after the bursting of great IT bubbles in 2001

whereby Compaq was merged by HP, Siemens was acquired by Fujitsu, and Texas Instrument acquired by Acer. The consolidation necessitated a large scale of production and shorter product cycles. Each brand marketer was under pressures to produce at lower costs yet with more varieties. China was the only answer to this mission. Mitac and Acer, both of which had formerly produced PC in Guandong Province in Southern China each established a large production facility for notebook PC in Kunshan. They were convinced that it was only Kunshan that could allow them to achieve scale and speed at the same time.

It can be seen from Table 1 that Kunshan has experienced a dramatic expansion of industrial production since 2001. Between 2001 and 2005, industrial output in Kunshan increased about five times, making its 2005 output value rivaling that of the entire Pearl River Delta. Out of 54 ETDZs in the nation, Kunshan also recorded one of the highest concentrations of multinational firms, with 96.8% of its industrial output in 2005 accounted for by foreign invested companies.

It is important to note that around this time, HP and Dell, two leading PC brands, have both adopted the 'build to order' scheme in their global operations whereby orders collected from consumer demands are to be fulfilled within a week by contract manufacturers. To run this scheme, proximity of suppliers is indispensable for the speedy response to changing orders. In addition, airport and customs efficiency and air cargo capacity are also crucial factors. South China could not compete with Shanghai in terms of air transport capacity and customs efficiency. In fact, in the immediate years following the massive relocation of notebook PC makers to Kunshan, Pudong Airport in Shanghai did not have enough flights to handle Christmas season shipments, Taiwanese PC makers had to haul PCs by sea to Taiwan and used Taipei Airport as a back-up hub

for shipment to the US.

Along with the consolidation of the PC industry since 2001, the structure of global production networks has also changed significantly. The volume of production was increased and time to market shortened, therefore both the inventory and the number of suppliers had to be reduced. In order to achieve this goal, modularized production was accelerated. One supplier of outer cases for notebook PC told us that the variety of cases had been reduced from about 80 before 2001 to only four in recent years (interview 4/7/2007). Variety of PC is to be created by functional units such as memory, storage, display and add-on devices, not the architecture of the PC itself. The burden of inventory reduction is shifted largely to the first-tiered suppliers, which are under pressures to increase the scale of production as well as the degree of vertical integration. As a result, the number of first-tiered suppliers also decreased and they are virtually all Taiwanese in the Kunshan cluster. They had to undertake large capital investment in order to meet the increasing demand for production capacity. If there was no trust between them and final assemblers, it is hard to imagine that they would have made such kind of commitment. As the first-tiered suppliers increased the degree of vertical integration, the production system also became more stable as the vulnerability caused by second-tiered suppliers was lessened. For example, the supplier of outer PC cases would internalize plastic and metal molding facilities, thus eliminating the transactions with suppliers of metal and plastic moulds. Compared to the production networks which previously operated in Taiwan, the Kunshan networks are characterized by a smaller number of players, each with a larger size. This, of course, is a manifestation of a mature PC industry.

In fact, the massive relocation of notebook PC production was not foreseen by

anyone in the industry before 2001 as the Taiwan government still imposed a stringent restriction on investment in China for notebook PC production. The bursting of IT bubbles in 2001 was the main cause of what happened afterwards. Therefore the success of Kunshan must be attributed to the efforts that the local governments have put into developing the cluster before 2001. The location of PCB, metal and plastic moulds production facilities was crucial in this process. As the production of PCBs and moulds may pollute the environment, the local government's effort to help producers comply with environmental regulations was important. The effort to attract Japanese and Taiwanese investors at the same time is another factor that contributes to success because the presence of two distinctive groups of firms creates synergy in the local production networks. We will discuss this issue in more details in Section V. The co-presence of Japanese multinationals also gave legitimacy to Taiwanese companies as they were sometimes considered to be low-tech by local skilled workers.

As soon as the Kunshan cluster had become a major production base of notebook PCs, LCD panel producers quickly moved into the region. AUO of Taiwan and Hitachi of Japan, both established LCD panel assembly facilities in the region. These facilities not only provided flat panels to notebook PCs, but also helped transformed the computer monitor industry from CRT based to LCD based monitors. It is fair to say that the Kunshan government's efforts to attract non-fancy and sometimes dirty industries in PCBs and metal and plastic moulds paved the foundation for the ICT cluster that we see today. Industrial policy played virtual no role in the process of agglomeration. Innovation was virtually non-existent in Kunshan. Although the local government invited Tsinghua University to establish and manage a mini-science park in Kunshan and to offer grants for foreign subsidiaries which undertake R&D, the effects are

minimal. The evolution of the local industry was primarily driven by the evolution of the ICT industry in the advanced countries rather than local initiatives.

III. Local Linkages

In this section, we will discuss how Kunshan created a system of institutions that make selective local linkages to generate most benefits out of foreign investment. In essence, it is an effort to make local institutions loosely coupled with institutions defined by the central government. Loose coupling creates flexibility and selectivity that suit the needs of foreign investors.

Before foreign investment came into Kunshan, textile was the major industry in this small city in the outskirts of Shanghai. With roughly 400,000 population in 1985, labor force quickly ran out of supply when foreign investment came en masse which used up the surplus labor. A large number of migrant workers began to be imported from Northern Jiangsu Province, Hubei, and Sichuan. Today, population in Kunshan is estimated between 1.6 and 2 million, among which 650,000 are domicile holders, another 500,000 are granted a temporary resident status, the rest are migrants without resident status (floating people). The city government of Kunshan is one of the most liberal local governments in China in granting resident status to migrant workers. Migrant workers with a college degree are automatically granted a domicile status. Higher ranked staff of local companies can obtain a domicile status by owning a residential property if they do not hold a college degree. Sometimes, they can even obtain a domicile status with a property purchased by the company on their behalf. The liberal migration policy provides a stable labor supply to foreign-invested companies which are typically labor intensive.

Among different kinds of labor force, skilled workers are most critical. In this regard, being adjacent to Shanghai is both an advantage and a threat to Kunshan. Being adjacent to Shanghai allows Kunshan to attract skilled labor from inland provinces to migrate to Kunshan because they can take advantage of amenity of Shanghai. However, skilled labor can easily be lured away by Shanghai if there is an employment opportunity there. Kunshan's liberal policy toward providing domicile status to skilled labor is a policy designed for retention of skilled workers. In fact, there is no university in Kunshan and most college graduates working in the area are migrants from the rest of the country.

In China, workers employed by state-owned companies are entitled to a full range of social security benefits, including health insurance, retirement benefits, and housing support. Those who are employed in the private sector have to pay into this system with their employers sharing a large proportion of the contributions. The so-called 'three funds' which consist of the contributions to health insurance, retirement, and housing benefits are to be managed by local governments. The local government stipulated the range of wage bill as a base for calculating the contributions. The government of Kunshan was quite generous to labor in this regard. For example, as of 2006, the stipulated monthly wage bill for migrant workers in Kunshan was 950-6122.5 RMB, while it was fixed at 1341 RMB in Shanghai. Employers in Kunshan paid 18% of the stipulated wage bill for the pension fund, and 11.5% for the health insurance and others. In comparison, employers in Shanghai paid 17% for the pension fund and 7.5-10% for the health insurance and others (Wu 2007). As a small city, being able collect such contributions was quite an achievement. However, the enforcement of the social insurance program was mainly targeted at domicile holders and migrant workers with a

temporary resident status. Migrant workers without a temporary resident status were usually left out of the system, and they constituted more than a half of the migrant population in Kunshan. Whether to extend a resident status to migrant workers is an outcome negotiated between the investors and the local government. The local government determines the number of residents to be allowed based on its capacity to offer social services. The investors determine the number of residents to be registered based on the cost considerations (including social security contributions and registration fees for temporary residence). This system provides some flexibility to the labor market whereby workers are classified into three classes: residents, temporary residents, and non-residents, who are entitled to distinct social benefits. By increasing the ratio of non-residents to residents, the employers can lower the average labor cost. This, of course, has to come with a cost of increasing labor turnovers. Employers can combine the residential status with the salary scale to form a flexible compensation policy. Nevertheless, unlike other migrant cities, the Kunshan government was keen on providing education to children of migrant workers, regardless of their residential status. Before 1985, there was only one primary school in the territory of ETDZ, today there are 24 primary schools and five high schools (Wu 2007).

When the city of Suzhou, which is only 30 kilometers away from Kunshan, opened two high-tech industrial parks in 1992 and 1994 respectively, which enjoyed better tax incentives than an ETDZ and attracted a large number of world renown brand marketers, Kunshan quickly repositioned itself as a supplier of components and parts to major assembly operations in Suzhou. Components and parts based on conventional materials such as steel and plastics, which were not considered high-tech by Suzhou parks, were welcome to locate in Kunshan. This created a complementary relationship between

Kunshan and Suzhou. The fact that Suzhou was able to attract R&D facilities of multinational firms in later years also allowed Kunshan to benefit from knowledge spillovers by concentrating on its role as a supplier. In fact, component suppliers are more durable compared to assemblers which are susceptible to product cycles.

In 2000, Kunshan succeeded in obtaining the permission to establish one of the few export processing zones (EPZ) in China. Although business tax rate in EPZ is the same as that in ETDZ (15%), and both are higher than the 10% rate applied to high-tech parks, EPZ enjoys the benefit of duty-free import of machinery and equipment (See Table 2 for tax rates applied to different zones). This is very attractive to business firms that use capital intensively in export processing. EPZ also allowed all materials to be imported duty free under a bonded warehouse scheme. The move enabled Kunshan to continue to attract foreign direct investment when labor costs were rising in coastal provinces.

Local institutions evolved as economic conditions changed over time. The government of Kunshan was very good at making institutional changes that exerted the slightest impacts on multinational firms operating in the region. If local institutions failed to adjust to new economic and social conditions, then the cluster will be stagnant due to 'lock-in' effects (Wei, Li and Wang 2007). Like other local governments in China, the chief attraction of Kunshan to foreign investors is the provision of cheap land, in addition to low-cost labor. As the economy grew, the value of land inevitably increased. The Kunshan government was very effective in relocating old factories in the city centers to more remote areas by expanding the city perimeters. The relocation was usually compensated with a larger size of land to original occupants or monetary rewards. Resale of the land occupied by an old factory would generate enough funds to

settle farmers whose land was to be converted into industrial usage and to pay for new infrastructure investments. Restructuring of the city was possible because the government never relinquished the ownership of land. The Chinese system did not allow factory owners to 'sit on' the land as they only have a leasing right. If they did, they would be expelled. In the relocation process, the government captures most increment of land value as economy grew. Although the local government sold the land at a price below the market value in early years, it was able to capture the incremental value of the land in later years. Because the value of land is closely tied to the amount of capital that is invested on the land, the land price charged by the government is tied to the amount of capital to be invested per unit of land. The higher the capital intensity, the lower the unit price. The logic is simple: more capital investment enhances the value of land more, and it is the incremental value of the land that the local government will reap from FDI.

Because most multinational operations in Kunshan are export oriented, and exports are free of VAT which is the major tax revenue for the local government (Local government gets 25% of VAT collected locally). Kunshan government has to generate tax revenues by encouraging domestic trade, mainly by indigenous companies. However, land sale and resale appear to be the major source of income. For example, in 2006, the total fiscal income of Kunshan was 5.404 billion RMB, out of which only 2.164 billion RMB was the budgetary income (including taxes and fees), the rest was mainly collected from land sales. Given the estimated GDP of the region at 53.929 billion RMB in 2006, the effective tax rate was merely 4%. Land sales are possible only if the economy continues to grow, which in turn, is driven by a continuous inflow of foreign capital. In 2006, a total of 236,400 square meters of farmland was converted into

industrial and commercial usage, with 1,027 households being relocated to evacuate the land. At the same time, 35 companies were relocated from the old factory sites to new ones, with 73,000 square meters of land changing hands. This suggests that recycle of land is an important source of government revenue.

Keeping the tax rates and the initial selling prices of land at low levels while recycling the land to enhance the value accrued to each piece of land is the formula Kunshan has adopted to achieve economic growth. In 2006, Kunshan attracted 98 new investment projects with committed capital investment amounting to 921 million US dollars, more than the amount of FDI flowed into most developing countries. Most new investment projects were in the areas of photo-electronics and computers. The ability to do so lies with the government's positioning itself as a partner of foreign investors. The local government always stands ready to prevent hazardous factors from adversely affecting the business climates of foreign investment. For many years, Kunshna has been consistently ranked by Taiwan's Association of Electrical and Electronic Industries as the most desirable Chinese city to invest in.

In 2008, the central government of China drastically modified the tax system whereby the differential of business income tax rates between locations (such as those between ETDZ, high-tech parks, coastal cities) was eliminated and a uniform tax rate of 25% was applied. However, tax incentive offered to high-tech industries was retained, although the rate was raised from 10% to 15%. The government of Kunshan went out to each foreign investor in the region to encourage them to apply for certification as a high-tech industry to help them attenuate the adverse effects of the tax change. In some sense, Kunshan government has considered itself a business partner of foreign investors. In addition to tax matters, the local government also extends its helping hands to foreign

investors who apply for registration as “famous brands” or R&D subsidies. Being a famous brand, the company can be exempted for periodical quality inspections engineered by the provincial and central governments.

IV. External Linkages

Whereas Kunshan was selective in making linkages to local institutions, it was very active in promoting external linkages to international markets. The government of Kunshan did everything it could to make sure that multinational firms operating in the region are fully connected with the global production networks. In most cases Taiwanese subsidiaries work as contract manufacturers for Western brand marketers. Their products go to US, Europe and Japan which are governed by Western institutions. Their production chains, both inside and outside China, are regulated by foreign institutions. They purchased components and parts from local suppliers, who are often subsidiaries of Taiwanese firms, and sometimes from Japanese and Korean subsidiaries. They rarely purchase from indigenous Chinese firms; and if they do, it is often materials that do not require coordination in the production process, such as packing materials and general purpose chemicals. Components and parts that need to be coordinated in the production process are either purchased from local subsidiaries of multinational firms or imported. When they purchase components and parts, contracts are typically written in English, quantity measured in thousands and millions, and price denominated in dollars. When there is a defect in the components and parts, the responsibility can be easily tracked down. The brand marketers assume the responsibility for consumers when there are defects and make the recalls and compensations. The brand marketers then charge the assemblers for the responsibility for fixing the defects; the assemblers, in turn,

charge the component suppliers of the defect products. In case that the brand marketers designated specific component suppliers, the brand marketers would directly charge the component suppliers for responsibility. The liability is clearly defined and every player on the production chain is held accountable. In case that someone on the production chain infringes on the intellectual property rights of others, it is again the brand marketer who will take the ultimate responsibility, although the liability can be transcend to the offender. This is the chain of responsibility. It is unwise to bring into the system anyone who may escape the responsibility without being punished by the system. If the legal framework in the host country makes it difficult to hold local suppliers liable for the defects of their products, it is better not to include them in the supply chain.

The terms of transaction within the system follow the international standards. Trade credit is available to all players on the production chain by banking on the credibility of brand marketers whereby accounts receivable can be resold in the financial markets outside China. Financial institutions are a part of the global production network. They are closely tied to final assemblers and major component suppliers. The entire operations were independent of local institutions in China and were governed by external institutions.

Financing of working capital is a very important part of cross border operations. Take notebook computer as an example, the players along the supply chains can be separated into three tiers: final assemblers, components and parts supplier, and material suppliers. Final suppliers like Foxconn, Compal, Wistron are typically large companies undertaking labor intensive operations. First tier suppliers are device makers who provide components and parts, such as Auo (LCD panels), Yageo (passive components).

They are also large companies which undertake capital intensive operations. The second-tier suppliers that provide metal or plastic parts to device makers consist of many small and medium firms. With labor intensive operations at the assembly level, the major assets of final assemblers are accounts receivable from brand marketers and inventory that they maintain. The longer it takes to recover the accounts receivable, and the larger the inventory, the greater the financial burden for them. In order to pass on part of the financial burden to first-tier suppliers, they offer similar terms of payments to the suppliers and shorten the lead time of delivery of components and parts so as to shake the burden of inventory. The first tier suppliers, in turn, shift some accounts receivable to the second-tier suppliers (Seki 2005, 211-222). The supply chain is therefore accompanied by a financial chain, and the operation of which is based on trust that has been established in the previous working experience. The chain of account receivable is normally refinanced by Taiwanese or multinational banks which are familiar with international contract manufacturing operations. The financial chain provides the players in the system with needed liquidity and allows them to spread financial risks. If local companies are brought into the chain, the risk-sharing scheme will be disrupted. One characteristic of the financing status of Taiwanese subsidiary companies in China is that they are almost debt free. This makes them immune to disruptions in the local financial markets.

In addition to the chains of responsibility and risk sharing, another reason to deny indigenous suppliers from participating in the production network is to maintain isomorphism within the system. Although new players in the local networks are unavoidable as production networks are reconstructed, all players have to follow the same codes of conduct. In fact, all major suppliers in the networks have to be certified

by brand marketers to become a vendor to the branded products. The suppliers have to conform to environmental standards, labor practices, and the like, in addition to offering good quality of products. As brand marketers are closely scrutinized by international NGOs on human rights and environmental activists, working conditions within the factory compounds and living conditions in the company dormitories all have to be approved before certification is granted (Harrison and Scorse 2004). The certification system reduced the number of suppliers in each supply chain, stabilizing the long-term relationship to facilitate cooperation among the local networks. Indigenous firms operating under domestic labor standards may not wish to comply with the international labor practices.

The local production chains in Kunshan are fully self-contained under the so-called 'export processing system' whereby imported materials are allowed to enter the customs territory with duty and VAT payable recorded in a 'duty account.' The liability for duty and VAT payments can be transferred to the next-stage producers who undertake processing on the imported materials until the final products are exported. This constitutes a chain of duties. The exporters can clear the duty account by demonstrating that the materials embodied in the final goods to be exported equal to the amount of materials that had been imported. The relay of this duty liability can be easily handled if all production activities along the value chain are originated from the initial imports. If at a certain stage of production, some domestic-originated materials are incorporate into the products, then this part has to be separated out when clearing the duty account. Domestic originated materials are duty free but they are subject to VAT, and a certain portion of the VAT payment can be rebated upon exporting. Mixing domestic with imported materials increases the costs of administrating the system exponentially. In a

sense, the local institutions in China reinforce the external linkages of foreign subsidiaries and discourage their local embeddedness. In fact, because the ‘duty account’ system operates within a customs territory, there are extra administrative costs if the production chains transcend the customs borders. That is to say, it is difficult to write off a duty liability recorded by Customs A by exports recorded by Customs B. Therefore it is advantageous to bring suppliers and downstream processors into the same customs territory, if not in the same town. The duty rebate system in China provides a natural force for agglomeration.

The power of the global production network lies with brand marketers who bridge uncertainty (Pfeffer 1978). Foreign subsidiaries in the relocated production chain may leverage brand marketers to create entry barriers for indigenous firms. For example, they can engage in joint research to create new components and parts for the new products. The connectivity of this production networks was constantly strengthened by the brand marketers who are the power brokers as well as the top beneficiary of the system. While placing the orders with final assemblers, the brand marketers will also designate suppliers of key components and parts with pre-negotiated prices. By doing so, the brand marketers maintain their central position in the networks and strengthen their relationships with key component suppliers.

Brand marketers have to come up with innovations from time to time in order to prevent profits from falling. They often engaged key component suppliers in innovation as many of which do not own production facilities or relevant technologies to carry out the innovation. In some cases, more than one supplier were invited to participate in the joint research project and only one would be awarded the contract, depending on their contributions to the project and the capabilities that they have demonstrated.

Competition for bounty also enhances the power of brand marketers.

One distinctive characteristic of Kunshan cluster, or clusters in China in general, from other transplanted industry clusters in Southeast Asia is an extensive degree of horizontal integration. In Southeast Asia, industrial clusters formed by multinational firms are characterized by a relatively large degree of vertical integration and a relatively small degree of horizontal integration. In other words, there tends to be more comparable and differentiated firms in Kunshan clusters compared to Southeast Asia. Both the number of firms and the size of firms grow over time as the Kunshan cluster develops. As the division of labor is limited by the size of the market, the reason why Kunshan was able to do so is closely related to the consolidation of the world's PC industry beginning in 2000. The consolidation resulted in a higher degree of market concentration, which translated into large-volume orders given by brand marketers to contract manufacturers. While the volume of production is enlarged, the degree of product differentiation in each order is heightened, and time to market is shortened. The only way to fulfill three requirements at the same time is to produce in a cluster comprising extensive network of suppliers. Indeed, beginning in 2001, almost all major Taiwanese PC assemblers have opened shops in Kunshan or Suzhou. Some of them had migrated from Southern China to Kunshan. This secured Kunshan's position in the world PC map. It is typical nowadays in Kunshan that key components and parts are required to be delivered to the assembly sites at a "just in time" fashion. Proximity is indispensable to the operation of the 'just in time' scheme. In other words, consolidation of the world's PC industry has resulted in concentration of PC production in the Kunshan-Suzhou cluster.

Although PC is a mature product, ICT is not necessarily a mature industry.

Through Taiwanese subsidiaries, Kunshan was firmly connected with the world's growing ICT markets. The production of ICT products in Kunshan began with computer monitors, key boards, mother boards, computer mouse, and the like. It gradually moved into desk-top computers, and then notebook computers. In recent years, mobile handsets, PDA, and GPS have also become major items of production in the cluster. The evolution of the cluster was apparently driven by the manufacturing capability that the Kunshan region has accumulated over the years. Key technologies are embodied in PCB and plastic moulds, both of which are extensively used in the ICT products. Kunshan, along with Suzhou, Wujiang, and Wuxi was the largest production center of PCB in China. Plastic moulds, which support everything from computer cases to monitor frames, require a large number of technicians. Most are expatriates from Taiwan, who collectively form the largest community of molding technicians in China. They also trained a large number of local technicians to support their work. Both PCB and plastic molding industries are characterized by large capital investment and high skilled intensity, and both of which were initially sourced from Taiwan and gradually localized. These two industries paved the foundation for the evolution of ICT industry in Kunshan, which may be absent in other regions where PCs were also assembled. The capability in the designs and processing of PCBs and moulds also enabled Kunshan to attract ICT related investors from other ICT strongholds like Japan and Korea. For example, alongside with Taiwanese PCB operations, there is also a sub-cluster of Korean PCB firms in the Kunshan region. Unlike the Taiwanese PCB operations which focus on ICT products, the Korean counterparts concentrated on consumer electronics and mobile handsets. However, co-location with Taiwanese firms allows them to share the benefits of specialized suppliers, such as those of chemicals and fiberboards which are common

to all PCBs.

Because institutions are path dependent, the fact that Kunshan is deeply embedded in international institutions makes its adjustments to changes in international institutions fast and costless. For example, beginning in 2007, European Union started to implement a new environmental standard on ICT products, called RoHs whereby contamination of certain toxic materials such as lead are restrained. The regulation affected the traditional soldering process in which lead is used. Large contract manufacturers who work closely with European brand marketers were consulted about the availability of new technologies before the regulation was introduced. They therefore had prior information about the regulatory changes and had access to new technologies that enable them to comply with the new regulation. The entire local production networks in Kunshan actually benefited from the regulatory change because competing clusters in China or in other parts of the world may fail or take more time to adjust to new regulations.

Linkages to foreign institutions instead of local institutions also allowed foreign subsidiaries to insulate against policy shocks that occur locally. For example, the Chinese government implemented contraction monetary policies from time to time when the economy was overheated. Local companies would feel the pinch of credit crunch, whereas foreign subsidiaries can always offset it with external credit facilities. They can also neutralize exchange rate fluctuations by balancing exports with imports if both are denominated at the same currency.

V. Taiwan-Japan Alliances

One outstanding feature of Kunshan cluster is the close alliance between Taiwanese and Japanese firms. According to official statistics of Kunshan Economic

and Technology Development Zone, by the end of 2006, 1357 projects have been approved to invest in the zone, with actual investment amounting to 5.856 billion US dollars. Taiwan led all countries with 302 projects, followed by British Virgin Islands with 260 projects, then Hong Kong with 204 projects, and Japan with 122 projects (See Table 3). However, most projects registered under British Virgin Islands, and some under Hong Kong, are understood to be Taiwanese investors. Therefore, it is actually Taiwanese and Japanese companies that accounted for the majority of FDI in Kunshan. Renown Japanese companies in Kunshan included Shimano, Makida, Nihon Seiko, Toyota Boshoku. More Japanese companies are in Suzhou high-tech park, including Matsushita, Fujitsu, Fuji Film, Hatachi, and in Wujiang, including Mabuchi, Mitsumi.

Many Japanese companies have come to invest in this region as a joint action with their Taiwanese partners to establish a production base in China. For example, Shimano, the world's leading producer of bicycle gear boxes, came to Kunshan together with Giant of Taiwan, the world's largest bicycle manufacturer. Toyota Boshoku came to Kunshan together with its joint venture partner in Taiwan, Liuho Machinery. Mabuchi, the world leading producer of micro-motors also came to Wujiang with its Taiwanese partner. In fact, the Wujiang subsidiary of Mabuchi was formed as three-way joint venture between the Japanese parent company (30%), its subsidiary in Hsinchu (30%) and its subsidiary in Kaohsiung (40%). Mr. Song, a Taiwanese, served as the chairman of the company. Among top managers, six are Japanese, two are Taiwanese, and two are local. The company produced 150 million units of micro-motors annually, most of which went to Taiwan-owned PC and peripheral companies (mainly used for CD-ROMs) (Seki 2005, 292-296).

The Mabuchi case illustrates the close alliance between Taiwanese and Japanese

companies. Technologies that have been originated in Japan and later modified in Taiwan were transferred to Wujiang where most customers are Taiwanese subsidiaries. The Wujiang subsidiary is, in fact, an offspring of the Taiwanese subsidiary. Taiwanese managers are useful in maintaining and renewing the relationships with other Taiwanese subsidiaries. They are also more effective in managing local labor relations than Japanese managers. On the other hand, the main responsibilities of Japanese managers are technological developments. A study of Ito (2006) has shown that Taiwan-Japanese joint ventures show a higher survival rate than wholly owned Japanese subsidiaries or Sino-Japanese joint ventures.

The smooth working of Taiwan-Japan alliance, whether it takes the form of equity joint venture or pure contractual relationship, is rooted in the relational assets that have been accumulated in the global production networks outside of China. Although Japan has a very different kind of capitalism compared to US and European countries (Whitley 1994), Japanese component and material suppliers have been working closely with Taiwanese assemblers and device makers in the ICT industry for a long time. For example, Taiwanese device makers dominated the world production of CD-ROMs, but they depended on Japanese supply of micro-motors and optical heads, and some high-precision metal moulds. Taiwanese makers are good at reducing costs to capture the market shares, but their ability to conquer the markets depends on the weaponry of key Japanese parts, which often hold a monopoly power in the related fields. However, Taiwanese assemblers provide the connection between Japanese parts suppliers and non-Japanese brand markers. As Burt (1992) argued, those who bridge the structural holes attain power in the network. Theoretically, the brand marketers can directly purchase from Japanese suppliers to bypass the intermediary role of Taiwanese

assemblers and they indeed did so in the past. However, in recent years, as brand marketers have increasingly shifted the product development responsibility to Taiwanese subcontractors, they could no longer do so because these key parts have to be integrated into the products early in the design stage. In addition, Taiwan also holds the geographical advantage in coordinating with Japanese parts suppliers in the design process. When Japanese brands such as NEC and Toshiba were losing world market shares in PCs to American brands such as HP and Dell, the alliances between Japanese parts suppliers and Taiwanese assemblers were strengthened. When they invested together in China, the advantage of geographical proximity was maximized.

For Taiwanese assemblers, alliance with Japanese suppliers not only creates the benefits of geographical proximity, but also the benefits of technology spillovers. Taiwanese subsidiaries invest little in R&D, except for process-related technologies. However, because mass production now took place in China with close collaboration with Japanese parts suppliers who are located in proximity, there was good chance for mutual learning. As the theory has suggested, the effectiveness of learning tacit knowledge is likely to improve with the reduction in distance. Because Kunshan is essentially a manufacturing base, knowledge interchanges between cooperative firms are mostly related to processing technologies, which are difficult to transmit over long distance. Trust between Taiwanese and Japanese partners was also conducive to learning. As the protection of intellectual property rights is lax in China, restricting the flow of knowledge within the networks where local firms are absent is also a comfort to Japanese firms.

In the ICT cluster in Kunshan, Japanese subsidiaries normally serve as the second-tier suppliers of key components or materials, and sometimes as suppliers of

first-tier device makers. Japanese operations are relatively skill intensive but the size of employment is typically smaller than Taiwanese subsidiaries. This reduces the burden of labor management, which seems to be the weak point of Japanese firms as they suffer from a large cultural distance from China. The presence of Japanese suppliers in the local production networks not only enhances the technological capabilities of the cluster, but also strengthens the financial soundness of the entire supply chain. The co-location of Japanese and Taiwanese subsidiaries made it possible that newly invented products such as Apple's 'ipod' or Sony's 'PS3' could be manufactured in Kunshan since their inception.

VI. Conclusion

In essence, the emergence of Kunshan as an ICT cluster resembled that of Taiwan. The base of the cluster was rooted in the production capabilities associated with 'basic industries' of ICT such as PCB, plastic and metal moulds. The transplantation of assembly lines or capital intensive manufacturing facilities is relatively easy, but this type of operations may not create a vibrant cluster as the benefits of agglomeration are limited. The "basic industries" of PCB, metal and plastic moulds carry industrial skills which can be applied to a range of products and therefore generate agglomeration benefits through economies of scope. The fact that Kunshan welcomed this type of investment despite their lack of glory and high-tech appearance contributed to its success. The city also took advantage of its geographical proximity to Shanghai to out-compete contenders in other parts of China in attracting skilled workers who are essential to the agglomeration process.

Kunshan also out-competed contenders from Southeast Asia where Taiwanese

firms had invested vigorously in the mid-1980s. In this regard, Kunshan won by the sheer size of China. Although Kunshan itself is a small city, the greater Shanghai area (including Suzhou) hosts more than 30 million of population. Moreover, there is almost unlimited supply of labor force from inland provinces. Kunshan took full advantage of this potential labor force by adopting a liberal internal migration policy which nicely accommodated the need for labor intensive operations. Scale of production became a big advantage for Kunshan after the rapid consolidation of the world's PC industry beginning in 2001.

Although the backbone of the Kunshan cluster was Taiwanese investment, Kunshan was also successful in leveraging the investment from Japan, and to a lesser extent, that from Korea. Kunshan did this through its concerted efforts with Suzhou which was designated as a high-tech park and was endowed with rich cultural heritages of China. The presence of Japanese and Korean multinationals generated a synergy effect which broadened the scope and comprehensiveness of the ICT industry. Japanese key component suppliers which suffered from a losing war by Japanese brands to their US counterparts in the computer industry found a sanctuary place for themselves in Kunshan. The Taiwan-Japan alliance was an outstanding feature of the Kunshan cluster which was unobserved elsewhere.

One element that is conspicuously missing in Kunshan is the innovation capacity. Up to date, Kunshan has drawn on the innovation capacity outside China to drive the evolution of the cluster. This was possible because there was a continuous pressure for cost reductions in the ICT industry and Kunshan provided a relief for it. Once the cost advantage is lost, the dynamism driven by outside forces will also cease. There are two possible solutions to this unpleasant yet imminent scenario: one is to build a local

innovation capacity, which seems to be beyond the control of the local governments, the other is to redirect the connections of the cluster from outside to inside. The second option seems to be more feasible.

Although a combination of selective local linkages and uninterrupted international linkages has been quite successful in facilitating the formation of an industrial cluster, Kunshan was not quite successful in excising its industrial policy. This may be a price that Kunshan had to pay for being so accommodative to international institutions. For example, the local government was keen on attracting foreign investment on IC fabrication or assembly operations to upgrade the ICT industry. But the government's wish was never fulfilled as the ICT operations in Kunshan could always obtain IC products from imports, which were free of duty. They could also choose to add IC chips onto the 'barebone' devices outside China to avoid round-trip shipping costs of IC products. The government recently has succeeded in creating a government-private joint venture aiming at producing LCD panels to feed the computer monitor industry. However, whether it will succeed is uncertain. The key problem for the government's industrial policy is also the key reason for its success: the cluster is operating under the domain of international institutions, not local institutions. It is hard to pursue policy goals by manipulating domestic institutions.

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Table 1
Industrial Output Value of Economic & Technology Development Zones, 2001-2005

EDTZ	Industrial Output (100 million RMB)					Share of Foreign Invested Enterprises (%)				
	2001	2002	2003	2005	2005	2001	2002	2003	2003	2005
Total	6053.94	7866.74	12957.18	23376.88	23376.88	72.87	73.95	75.16	75.16	78.34
Bohai Basin	2511.10	2978.03	3759.76	7049.82	7049.82	82.33	81.42	76.79	76.79	82.29
Yangtz Delta	1378.68	2076.69	4914.97	9085.46	9085.46	76.43	77.10	84.34	84.34	85.49
Kunshan	253.40	535.03	852.11	1760.67	1760.67	93.65	96.33	95.63	95.63	96.80
Suzhou			897.97	1652.80	1652.80			85.39	85.39	74.65
Pearl River Delta	511.88	647.62	1009.64	1929.62	1929.62	92.81	90.87	88.58	88.58	92.88
Other Parts of Eastern Region	463.55	546.99	986.36	1513.14	1513.14	71.52	72.52	69.52	69.52	68.93
Western Region	310.45	445.67	689.80	1072.39	1072.39	37.47	38.70	38.97	38.97	36.85
Middle Region	878.28	1171.74	1596.65	2726.46	2726.46	41.59	54.11	53.67	53.67	55.52

Source: Annual Report of China Development Zones, 2004-2006.

Table 2
Business Income Tax Rate by Regions*

	Normal rate	Special Economic Zone	Economic & Technology Development Zone	High-tech Park	Export Processing Zone	Border Economic Zone	Coastal cities opened to foreign investment	Unit: %
Ordinary manufacturing industry	30	15	15	15	15	24	24	
Ordinary service industry	30	15	30	30	30	30	30	
High-tech industry & R&D centers	30	15	15	15	15	15	15	
Export industry (export 70% output or more)	15	10	10	10	10	12	12	
Financial institutions with \$10 million investment or more	30	15	15**	15**	15**	15**	15**	

Source: Wu (2008), compiled from State Council directives.

Notes: *: rates applicable up to January 1, 2008.

** : applied to regions approved by State Council only.

Table 3
Foreign Investment in Kunshan
(cumulated up to December 2006)

Country	Approved Projects	Approved Amount of Investment (million US\$)
Taiwan	302	1000.94
Hong Kong	204	2287.36
Japan	122	965.01
Singapore	66	456.02
Korea	40	100.74
USA	100	374.88
British Virgin Island	260	3607.33
Others	263	2088.93
Total	1357	10881.21

Source: Kunshan Economic & Technology Development Zone Administration.