

## Chapter 3

### Surviving in the Middle: Embedded Learning and Managed Dependency among Taiwanese Automakers

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**Abstract** This paper studies the shifting position of Taiwanese car makers in the international production networks of the auto industry in order to reveal the complexities involved in the competition and cooperation among sources of capital in a regional economy. Akamatsu's flying geese model is a suitable starting point for this broadly-defined area of research. The research on the one hand intends to unveil the contemporary complexities that Akamatsu naturally was not able to foresee when he was writing many years ago, and on the other hand, it inherits one important assumption of Akamatsu's model that competition and cooperation are potentially in conflict and therefore require careful management to be kept in balance. More importantly, in order to grasp the dynamic processes of the regional division of labor at the present time, I suggest focusing on the level of the firm (instead of on the macro level) so as to investigate how firms (instead of policy makers) manage economic dependency and cultivate learning in their network environments. The cases of Taiwanese car makers are selected for demonstrating the merits of this research approach.

**Keywords** Taiwan, Auto industry, Learning, Regional economy, Dependency, Network.

## **Preface**

This paper studies the shifting position of Taiwanese car makers in the international production networks of the auto industry in order to reveal the complexities involved in the competition and cooperation among sources of capital in a regional economy. Akamatsu's (1950) flying geese model is a suitable starting point for this broadly-defined area of research. The research on the one hand intends to unveil the contemporary complexities that Akamatsu naturally was not able to foresee when he was writing many years ago, and on the other hand, it inherits one important assumption of Akamatsu's model that competition and cooperation are potentially in conflict and therefore require careful management to be kept in balance. More importantly, in order to grasp the dynamic processes of the regional division of labor at the present time, I suggest focusing on the level of the firm (instead of on the macro level) so as to investigate how firms (instead of policy makers) manage economic dependency and cultivate learning in their network environments (Cheng 2006). The cases of Taiwanese car makers are selected for demonstrating the merits of this research approach.

The world motor industry is at present undergoing fierce competition and drastic restructuring. While new technologies are demanding huge investment, competition is leading to over-production and shrinking profit margins. In response to these challenges, car makers are aggressively pursuing mergers and alliances in an attempt to achieve scale efficiency, reduce investment risks, and create potential synergy. In the turmoil, old empires like GM have been pushed to the brink of breakdown while relatively new players such as Toyota seem ready to assume world leadership. Meanwhile, the chaos of the battlefield does not deter newcomers from entering. Korean car makers are keen to expand their shares of world production, while Chinese motor manufacturers are eager to establish an important presence. In current circumstances, the car market in China with its vast size and increasing consumption power has now become a terrain into which no motor vehicles manufacturer can risk not entering. The Chinese government is aware of its own advantages and disadvantages and has been using its market leverage to facilitate cooperation between local and global car makers with the aim of bringing capital and technology into China (Marukawa and Takayama 2004).

It has already been well established that competition is a major force that renders cooperation vulnerable. However, the above-mentioned complexities show that

competition and cooperation are not necessarily antithetical. In fact, without competition, cooperation would not be needed and would not be sustainable. The Chinese car market can be seen as a field of competition characterized by complex networks, with ties among firms that facilitate the transfer of resources and with gaps among them that cause tension. From the standpoint of the sociological conception of the market (Granovetter 1985; Granovetter and Swedberg 1992; Smelser and Swedberg 1994), this article tries to offer a glimpse of network dynamics so as to demonstrate how competition and cooperation are played out at a concrete level and among multilateral firms by focusing on an unlikely actor in the market, namely the car industry of Taiwan.

Considering their limited technological capability, and the smaller firm size and fragmented home-market base characteristic of Taiwan, indigenous motor manufacturers at first sight do not seem eligible to enter onto the stage of the world motor industry. In fact so far, not a single book or article on the Chinese motor vehicles market has mentioned the Taiwanese car makers. Many writers may have been aware of the presence of the Taiwanese motor companies, but have chosen to ignore them, and no doubt for empirically sound reasons, for the Taiwanese makers seem to play only a minor role (Marukawa and Takayama 2004; Tsuchiya and etc. 2006).

However, if our aim is to understand the changing nature of the car industry and the region-wide competition/cooperation dynamics, this lack of awareness might turn out to be theoretically shortsighted. Even a minor example can be theoretically revealing if it is positioned properly. I argue in this article that given the unwelcoming nature of the business environment, investigating why and how Taiwanese motor companies learned and managed to hold a position in international car market networks can provide a key to clarifying problems of general concern, in both practical and academic terms. I will focus the discussion on two major Taiwanese car makers, Yulon Motor (hereafter, Yulon) and China Motor Corporation, for they have the majority share of Taiwanese auto-making capital and share certain organizational similarities, yet have encountered contrastive power-balance relationships with their cooperative global firms (that is, Nissan and Mitsubishi respectively).

The article will be divided into a preface and five sections. The following section introduces the subject of the research, namely the regional division of labor in the East Asian car market. To emphasize the complex network dynamics of competition and cooperation in the trans-border field of the motor industry, I will begin

with Akamatsu's "flying geese model" and then raise contemporary questions by rephrasing it in world-system terms (Wallerstein 1974). This will allow me to pose specific research questions and validate my research approach of focusing on two cases in the semiperipheral territory of Taiwan.

The third section introduces the Taiwanese car industry and examines in greater detail the question of how Taiwanese firms have managed to survive in the regional industrial field. The section will also set out the background for an analysis of the performance and evolution of the two case studies. The fourth section deals with the case of Yulon Motor. I explain the evolution of Yulon's network niche and its organizational capability in terms of consecutive stages with regard to its strategic-cooperative relationship with Nissan and other global firms. In the fifth section, I compare Yulon with China Motor Corporation to show how the dynamics of competition and cooperation in the international auto market are translated into a network environment in which local firms must adjust their embedding strategy and manage external dependency skillfully in order to maintain autonomy and continue growth. The conclusion summarizes and discusses theoretical issues related to the research and indicates the limits and potential of the present study.

### **Cooperation and Competition among Firms in East Asia**

With regard to the regional division of labor, Akamatsu's "flying geese model" (1950) is often introduced as a starting point for further discussion. Akamatsu's flying geese model offers a vivid picture of the regional division of labor with countries at different economic levels "flying forward" one after the other, and thereby forming a series of ranks led by the most advanced. This simple image of economic order, often assumed to be an East Asian version of the product cycle theory, has proved to be an easy target for criticism (Ernst 2006).

The East Asian economies of course have gone through dramatic changes that are far beyond what Akamatsu could have imagined in the 1950s. At the beginning of the 1990s, the Japanese economy dropped from high rates of growth to seemingly endless economic slowdown and has only recently begun to show signs of recovery (Emmott 2005). Communist China opened its borders to capitalist investment and emerged as a world factory and as a potentially huge market. In the meantime, the miracle economies of the East Asian NICs matured and the resilience of their economic power was questioned and debated after they became stricken by the Asian financial

crisis of 1997. It would be neither fair nor useful to criticize Akamatsu for not foreseeing all of these changes. Indeed it would be unfortunate to ignore the Akamatsu's insights which provide helpful hints for our investigation.

Unlike the product cycle theory, the model advanced by Akamatsu is based on the assumption that global or regional economies are intrinsically endowed with potential conflicts. Indeed he believed that if a balance between "homogenous competition" and "heterogeneous cooperation" could not be reached, large-scale international war would be a possibility. Between Akamatsu's foresight and the reality of the world today, the difference is that, given the complex economic realities pointed out earlier, competition and cooperation in regional economies is now manifested in multilateral settings and also at different aggregate levels.

One major reason for the changes lies in the underlying technical and organizational infrastructures that are apparent in the shifting sources of competitiveness. Whether it be Gereffi's "global commodity chain" (Gereffi and Korzeniewicz, 1990; Gereffi, 1994; Gereffi and Bair, 2001), Sturgeon's "de-linking innovation and manufacturing" (1997), Fujimoto's "hybrid product architecture"(2001) or Ernst's knowledge diffusion through "global flagship network" (2006), all attempts at analysis in the field point to the organizational and technological complexity involved in our global industrial landscape. As a result of these changes, "short and straight causal chains" can no longer explain the main changes in the global economic landscape (Ernst, 2006).<sup>1</sup>

With regard to the "formation" of the flying geese pattern, Akamatsu obviously did not foresee that: (1) differentiation of one single product could spread with such unprecedented speed around the globe; and (2) the advancement of late-developing economies could go so far as to threaten the position of those leading the flying-geese patterns. The country that heads the pattern may continue to lead, but increasingly it seems as though the leader is being "pushed from behind to lead" and therefore that (3) the extent to which global firms based in the core countries can build relationships with the periphery can be a crucial factor in its future growth. Three related questions are essential to understanding the complicated reality of competition and cooperation in the contemporary East Asian economy especially in the context of world system theory. (1) Can the Japanese core keep its leading role? For example, Ernst (2006) doubts the inevitability of Japan leading, and therefore envisions an East Asian division of labor that is "beyond Japan." (2) Will the semi-peripheral Korea

and Taiwan be "skipped over" by direct links between peripheral China and the core countries of Japan and the United States? (Wallerstein, 1994) (3) Is peripheral China the engine of regional growth or a potential threat?

In mapping the changing dynamics, examination of semi-peripheral Taiwan can be especially revealing because of the ambivalent, unstable but active position it occupies in the hierarchy of the regional economy. In this article, I will examine the case of the Taiwanese car makers, the transnational network structure in which they are positioned, and the survival strategies that they are adopting in the changing regional economy. Put specifically in empirical terms, the paper tries to answer the following questions: (1) how do Japanese automakers play their leading roles in the regional network? (2) how do Taiwanese firms manage to survive in this uninviting environment? How vulnerable or sustainable is the niche of the "semi-peripheral elbow" (Cheng, 1996, 1999, 2001 )? (3) Why would the Chinese automakers, backed by a strong policy drive by the Chinese government, accept Taiwanese firms as occupying a midway position between themselves and the Japanese automakers? (4) To what extent do "scale economies" work in the Taiwanese automakers' business environment? What is the evolving trend of the product architecture in the car industry (Fujimoto 1997, 2003), and can it be observed in the "deviant" case of Taiwan?

The Chinese auto market amounted to over 5.7 million units in 2005 and in 2006 surpassed the Japanese market to become the world's second largest, behind that of the United States. It is predicted that the Chinese car market will further increase by 80%, reaching 10 million units by the year 2012. Because of the importance of the Chinese car market and the close cultural and geographical proximity of China and Taiwan, I will pay particular attention to the Taiwanese car makers' presence in China. Analysis of the Taiwanese cases allows us to focus on the tensions between competition and cooperation, and the dialectics between learning and control that lie at the heart of the regional division of labor. Some final reminders: my argument is not about Taiwan as a success case, nor do I intend to provide a broad map of the Chinese market for motor vehicles. The paper is better understood if the reader sees it as a medical slide sample, at the level of the firm, that will enable us to examine more closely the dynamics of competition and cooperation involving foreign capital in the Chinese market and in the East Asian regional economy.

### **The Taiwanese Auto Industry: Defining a Heuristic Case**

The post-war economic growth of Taiwan has been portrayed as a miracle, although different authors have given us quite contrasting explanations (Gold 1986; Balassa 1988; Wade, 1992; Liu 1992). However, among other successful cases of industrial growth in Taiwan, the Taiwanese car industry has been seen as an exception. It has even been identified as a “miracle in illusion,” or, to put it simply, a failure. According to Chang and Wu (1997), the history of Taiwan's auto industry can be divided into four stages. The first stage began in 1953 with the birth of Taiwan's first automaker Yulon, which developed a cooperative relationship with Nissan after 1957 for bringing know-how and model changes to the Taiwanese car industry. The government prohibited new outside investment in the motor vehicles industry and created a legally protected monopoly to support Yulon.

In 1965, disappointed by the poor performance of Yulon, the Taiwanese government changed its policy and allowed new car-making firms to set up in Taiwan while maintaining strict import prohibitions in the hope of improving the capabilities of Taiwanese motor companies by introducing some market discipline. Honda, Toyota, Mitsubishi, and Ford all came to Taiwan and established new motor companies in cooperation with local capital. As a result, five companies began to compete for a domestic market with scale of less than 200,000 vehicles per annual.

The third stage began in 1978. Annoyed by the technological dependence of local automakers on foreign capital, and threatened by the Korean government's drive to create national champions in the motor vehicles industry, the Taiwanese government decided to jump into the market and tried to match state-owned enterprises with foreign companies in purpose of building export-oriented, large-scale motor vehicle factories. The aim was to take advantage of the restrictions that the United States government had imposed on Japanese car imports by offering an overseas production platform relatively close to Japan. However, the local car makers feared that, in order to attract foreign capital, the new car assembly plants would enjoy policy preferences in the domestic market. They expressed their resentment collectively and mobilized political influence to stop the plans. As a result, the prime minister, who was pushing hard to develop the project, was replaced and the policy shifted abruptly. At the level of implementation, after long and controversial negotiations, plans to build two assembly plants, “Hua-ton Heavy Vehicle” and “Toyota Big Auto”, were abandoned consecutively, in 1982 and 1984 (see also Arnold, 1989).

**Table 1 Volume and Shares of Taiwanese Auto Market (1993-2005)**

(Units: number of newly registered cars, thousand sets, percentages)

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Domestic volume	406	420	397	356	377	399	363	357	291	345	357	422	444
Market Share	73%	73%	73%	77%	79%	84%	86%	85%	84%	87%	86%	87%	86%
Imported Car Volume	151	156	146	106	102	75	60	64	56	54	57	62	70
Market Share	27%	27%	27%	23%	21%	16%	14%	15%	16%	13%	14%	13%	13%
Total Volume	557	576	542	462	479	474	424	420	347	399	414	484	515
Growth Rate	121%	125%	117%	100%	104%	103%	92%	91%	75%	86%	90%	105%	111%

Source: Ministry of Communication and Transportation.

([http://www.artc.org.tw/tech\\_main6.asp](http://www.artc.org.tw/tech_main6.asp) ; <http://www.ttvma.org.tw/>)

From 1953 to 1984, after three stages of trial and error, the Taiwanese government was finally left with no sound policy options. In 1985, the government decided to gradually lift its protective measures, and lowered the local-production rate and as well as import tariffs. This marked the beginning of the fourth and final stage, namely that of "market liberalization." Unlike other traditional industries, the car industry is technology-intensive and scale-dependent and the global market is controlled by a handful of increasingly concentrated monopolistic companies. A small country like Taiwan offers a market that is too limited to allow efficient domestically-oriented car production, and liberalization seems to be the only valid choice. Viewed from the perspective of left-wing dependency theory, without strong state intervention, an industry that is under the domination of foreign capital would have little chance to maintain growth (Evans 1979). The industry pessimistically predicted that domestic production would shrink by 30% after Taiwan entered the WTO in 2001. After 1985, the Taiwanese car industry finally abandoned the "miracle illusion" and the "realistic prospect" seemed to suggest a linear decrease in the scale of domestic production and of course it seemed likely that the terrain of the local car makers would be trapped within the domestic market.

In fact, however, between 1997 and 2005, the output value of the Taiwanese auto industry registered an increase of 45%, from 166 billion NT\$ to 230 billion NT\$. The growth of its motor components industry was even more striking, with output rising from 119 billion NT\$ in 1996 to 171 billion NT\$ in 2005. Both the assembly

sector and the component sector experienced 50% of their growth from 1993 onwards. Expansion of the domestic market had nothing to do with this remarkable development. In fact annual domestic car sales actually fell, from 462,000 units in 1996 to 347,000 units in 2001, with consumers delaying car purchases in anticipation of mass imports of cheap cars following Taiwan's entry to the WTO. Domestic sales gradually recovered to 484,000 units in 2004, but even so, total sales were still about 20,000 units below the 1993 level. Table 1 shows changes in the number of domestic cars and imported cars sold in Taiwan from 1993 to 2005. After reaching its lowest point in 1996, the market share of domestic cars has increased over the long run. The share of imported cars actually dropped from 27% in 1995 to 13% in 2005, confounding pessimistic predictions shared by motor industry observers that the share of imports would increase to over 30% after 2001. In response to the threat of import competition, Taiwanese car makers tightened their relationships with global company partners and began to assemble higher-end cars while upgrading their development and manufacturing capability.

Perhaps more surprising still is the overseas expansion of the Taiwanese car manufacturers. Yulon took over Nissan's assembly plant in Philippines in 1999 and turned its investment into a profitable one. In 2001, Yulon joined with Chinese car maker Dongfeng to build new factories in Guangdong Province. Meanwhile China Motor Corporation allied with 35 component suppliers to invest collectively in Fujian province (southeastern China) and in 1995 built an assembly plant in cooperation with the Chinese automaker Dongnan. In 2005, China Motor Corporation also cooperated with DaimlerChrysler (hereafter DC) to construct a plant at Guangdong Province to assemble Mercedes Benz cars.

Likewise, exports of car components from Taiwan have also been increasing, from 44.2 billion NT\$ in 1993 to 127.3 billion NT\$ in 2004, almost tripling their value in ten years. Another significant development worthy of mention is that China Motor Corporation now holds shares in Mitsubishi Motor and occupies a seat on the Mitsubishi board of directors. This is not of course the reverse of dependency but it is clearly a sign of a relationship that is moving toward balance. Because of this development, China Motor Corporation is now able to participate earlier and more extensively in Mitsubishi's global investment plans that are especially oriented toward China albeit not exclusively limited to that destination.

In the past, Taiwan's auto industry was seen as a failure in the midst of an array of

industrial miracles. Government support of the industry changed from market protection to direct intervention but these measures all proved doomed to failure. Complying with the rules of the WTO only seemed to worsen the situation and threatened to turn the failure into a foreseeable tragedy. The Taiwanese auto industry seemed likely to end up as a case that would demonstrate the vulnerability of the "semiperiphery" in a situation where the Japanese "core" was linked directly with the Chinese "periphery." However, Taiwanese car makers somehow managed to survive in what Ernst (2006) would call the "global flagship networks."

The presence of the Taiwanese car makers in this very competitive market might seem negligible compared with those of the other big players. However, given China's strong policy leverages, the fierce competition in the world car market, and the need to achieve scale economies in the car industry (none of which factors suggest the presence of Taiwanese firms at the party), the Taiwanese case becomes highly heuristic in helping us to better understand the complex interplay between competition and cooperation in East Asian regional production networks.

It is easy to argue in an ex post facto way that all the counter-predictive facts were merely a reflection of the comparative advantages that the Taiwanese auto industry holds in the context of liberalized market competition. However, the same line of argument could be employed to argue the opposite, namely that the industry would inevitably decline due to its obvious lack of comparative advantage. It is admittedly true that history does surprise us from time to time and therefore in a certain sense developments that are contrary to expectations are inevitable. However, the model of the anonymous and efficient market offers us only a rather static view and prevents us from enquiring closely into the evolution of the capabilities and shifting control strategies of firms. It is here that we again come to appreciate Akamatsu's insights, as he did not assume a harmonious relationship between competition and cooperation in line with the teachings of classical economics but instead envisaged potential conflicts between cooperation and competition among firms and across countries, and sketched a situation in which multilateral adjustments are needed to keep regional growth in balance. An investigation into the Taiwanese automakers offers us exactly this kind of grass-roots viewpoint appropriate for the task.

### **Yulon Motor: Embedded Learning & Managed Dependency**

Recently, The four stages of industry development discussed earlier are all centered on government policy, and the actual behavior of the firms was largely pushed to the background and ignored. As we have seen, observers of the auto industry in Taiwan came to pessimistic conclusions by assuming that local firms had been impotent or irrelevant. Meanwhile a development perspective based on dependency theory sees causality in terms of whether or not the state is strong enough to negotiate controls on foreign capital to protect local firms. Although unintended, the image of Taiwanese firms as portrayed in the work of auto industry observers did not accord with reality. The actual struggles of the Taiwanese auto makers in both learning to improve their capability and in controlling the external dependencies were overlooked.

Yeutyuan and Sanyang were two companies that dared to pursue technological independence and both immediately incurred controls from, and conflicts with their foreign partners. Both of them failed to achieve their objectives, and both left the market. Their experiences remind us that, when we investigate trans-border competition and cooperation at the firm-level, we should not study each development as an isolated, purely technological process, but as a step in the learning process, and as being embedded in “global flagship networks” where core firms enjoy dominant power and therefore must be understood as actors in a control process of dependency management. In other words, learning and control are both essential, not reducible to factors independent from each other, and must be studied together as a part of a process of interplaying relationships. With this perspective in mind, we now examine the survival story of Yulon. A summary of the analysis of Yulon’s evolutionary trajectory on both learning and control is set out in Table 2.

The government’s announcement that it would skip over existing local firms and build a new car assembly plant by matching state-run enterprises with foreign automakers was seen by Yulon as a public humiliation, since the company had been helped by policy protection and had been a candidate for development as an independent national car maker. In 1981, in the midst of the government’s big push, Yulon decided to go it alone and invested 2 billion NT\$ to set up a design center for the independent development of a new car, a bold and dangerous move intended to eliminate the company’s technological dependence on Nissan. To prevent intervention and disturbance from Nissan, Yulon placed the center in Taoyuan county, at a location distant from the plant where it continued to assemble Nissan-licensed cars. In other

words, in order for the dependent firm to develop autonomous capability, the business relationship with its existing partner had to be carefully controlled so that the learning process would not be hampered.

In 1986, the long-kept secret was unveiled and Yulon began to produce the company's first self-designed new model, the "Feeling 101." With its development driven by a nationalistic enthusiasm for "placing the nation on wheels," the car was well received at the beginning, and the number of orders received went beyond the initial production capability. However, the new model soon faced consumers' complaints about instability in quality. In the following three years, Yulon went through two major remodeling phases and continued to struggle to improve the new car's quality and performance. The steep learning curve that confronted Yulon came as no surprise and was equivalent to the uphill task that Japanese and Korean car manufacturers had once had to tackle. The crucial point is how fast could the company decode, and learn from and adjust to its mistakes before market confidence shrank below the unsustainable.

However, variables in the "learning against time" equation are not just about closing the gap between the material qualities of products on the one hand and psychological acceptance by consumers on the other. Consumer dissatisfaction must be received, decoded, interpreted, stored, reasoned out, and transferred upstream in order for the company's design, development, and manufacturing units to learn, improve and respond precisely and on time. Moreover, the tolerance level of consumers is not static and intrinsic either; it depends on how integrative the retail, marketing, manufacturing, and development functions are in coping with the dissatisfaction. For both producers and consumers, learning is not an intrinsic process, and the network environment in which the automaker resides plays an intervening factor. In other words, organizational learning depends on the network platform in which the focal organizations are embedded.

To Nissan, Yulon's move toward developing a technologically self-reliant car was clearly a threat to its control of its regional production network and meant a possibility of falling profits in the long run. The relationship between Nissan and Yulon now involved no longer just cooperation through the chain but also competition in the final market. To ease the tension, Yulon had to place its development center for new cars away from the company's manufacturing establishments both geographically and organizationally so as to reduce the likelihood of intervention from, or conflicts with,

Nissan. However this attempt to keep control burdened its learning processes as it also brought “noise” into the information flow and into exchanges among the development, production, and marketing departments. A veteran engineer of Yulon reflected upon his experiences and concluded that "we were pushing the ball (i.e., product design and development) from inside the ball" (Business Next 2002/09/01) In other words, the design unit worked in an isolated fashion and was insensitive to feedback from downstream units. It was however a trade-off that any dependent firm in any developing country must bear if it wishes to achieve some degree of self reliance.

The situation was not improved after the launch of the “Feeling 101.” In fact, the launch ignited conflicts more openly and started the real challenge for late-comer firms. The introduction of Yulon’s new model immediately brought up tensions throughout the value chain. Nissan was not happy and doubted whether Yulon was seriously working as a Nissan partner on its product lines. Nissan had a long-term relationship with Yulon's retail dealership Chinese Automobile (or Guotsan Auto, hereafter GS). In fact, Yulon was first introduced to Nissan through the boss of GS in 1957 when it was searching for a partnership with foreign capital to provide it with technological assistance. GS immediately expressed discontent over Yulon's move toward selling its own self-branded car. It regarded the consumer complaints as an unnecessary burden incurred by Yulon's unwise move.

For its part, Yulon, which was urgently working on improvements to the new model, was not satisfied with GS. Was GS, which continued its good relationship with Nissan and complained about Yulon's bold move, pushing hard enough to market the new car? Did it handle the marketing and the delivery service carefully enough to mollify consumer complaints? In the end, Yulon abruptly terminated its cooperative relationship with GS and took on retailing itself in order to directly control the downstream sale service. This sudden move shocked the whole car industry in Taiwan and of course further irritated Nissan since the marketing channel of its own cars also was forced to undergo restructuring (Chang, 1999). Both in terms of efficiency and gaining power as a motor producer, Yulon's experience on the “Feeling 101” project was embedded in a poorly structured network environment and was therefore inimical to learning.

From 1990 to 1995, Yulon experienced continuous deficits and began to approach the edge of bankruptcy. In 1994, the company decided to make a U-turn and announced that it would give up its own brand of car and that all its product lines

would thereafter carry only Nissan brands (Global Views Monthly 2004/03/01). In a sense, Yulon was re-embedding the capability that it developed in developing the new car to another and less demanding environment. The challenge was how to find a niche inside Nissan's global flagship network and how to continue the evolutionary learning of its accumulated capability. In response to this challenge, the engineers of Yulon started to focus on remodeling the interior design and external appearance of the car models that Nissan offered so that they could be better suited to the local market. By employing so-called "differential R&D," popular models such as the March (1993), the Cefiro (1996), the Verita (1997), the Sentra 180 (2000), and the Teana (2005) successively sold very well, and Yulon's market share became re-established.

Ironically, as Yulon started to recover by stretching and polishing the experience that it had gained in Nissan's regional production networks, Nissan on the other hand experienced seven consecutive years of serious deficits after 1993, accumulating debts of over 22 billion US dollars. Nissan had to reduce the number of its platforms from 20 to 5 and also had to slow down the speed of its model changes. The situation that intuitively seemed disadvantageous to Yulon, as it now returned to a dependent position, turned out a good chance for it to bargain for more autonomy and better opportunities for expansion. Both in the learning and control dimensions, the weakening of the principal firm created an opportunity for Yulon to grow within Nissan's global flagship network. The negative correlation of growth rates between the client and the parasite firm reveals the power-dimension of, and the potential conflict in, the cooperative relationship.

In 1997, Nissan announced its alliance with the French automaker Renault, an initiative that was meant to rescue Nissan from the brink of bankruptcy. In 1999, Nissan launched its subsequently famous "Nissan Revival Plan" (NRP), which successfully achieved a V-shaped recovery within the short period of four years. At the time, compared with Mitsubishi, which was also launching restructuring, the case of Nissan-Renault was not evaluated very highly by the press. As part of the NRP, Nissan asked Yulon to take over its poorly performing Nissan Philippine plant in order to cut back its scale of operations. In the meantime, in 1998, based on its experience of successfully applying the abilities that it had learned in the previous period in re-designing Nissan models, Yulon restructured its design center and upgraded it into the Yulon Asia Technology Center (YATC), a participant in Nissan's Asian car

development network. After taking over Nissan's Philippines plant, in 2000, Yulon introduced a remodeled Sentra HV to the Philippines market. The model was well received and quickly made profits for the company.

In 2001, continuing the momentum of its regional expansion, Yulon cooperated with the Chinese automaker Dongfeng to set up the Fengshen joint-venture plant at Guanzhou in Guandong Province. Dongfeng is China's third largest automaker and has its headquarters at Wuhan in Hubei Province. Dongfeng had joint investments with Honda, Peugeot, and Citroën and had been active in searching for other partners overseas (Marukawa and Takayama 2004). Nissan of course is Dongfeng's preferred business partner. However, trapped as it was in deep financial crisis, Nissan could not take the risk of expanding in China. But neither could it afford to delay entrance into the Chinese market. This dilemma gave Yulon, which had recently enjoyed success in both the domestic and the Philippines markets, a niche in playing a middleman role between Dongfeng and Nissan. In other words, it offered a regional cooperative platform for all three parties.

The process went ahead in stages. Yulon first remodeled Nissan's sedan Altima for Dongfeng and proved that the differential R&D could successfully lead to the production of a popular car for the Chinese market. Then the company's impressive performance in the Philippines further strengthened the confidence of Nissan and Dongfeng in Yulon, and this in turn encouraged the company to accelerate the realization of its plans. Dongfeng and Yulon jointly established Fengshen auto plants at Guanzhou. Fengshen was at the beginning a very small investment project located in southern China and at locations distant from Dongfeng's home base. The experimental nature of this investment was obvious.

With the models licensed from Nissan, Yulon was responsible for redesigning and developing the cars so as to better satisfy the demands of the local market, while Dongfeng basically took care of manufacturing. It turned out that in only one year, Fengshen succeeded in selling over five thousand vehicles and was unable to meet the market demand. After that, the investment scale kept expanding and in 2002, half of Yulon's annual revenue came from Fengshen. In a sense, Yulon was no longer a domestic player but a critical one in competition for the Chinese auto market, as least as far as Nissan was concerned. Fengshen sold over 70,000 vehicles in one year in 2005, an expansion 14 times greater than its initial investment four years previously. It is now the fastest growing component of the Dongfeng Group.

The simple fact that the weakening of Nissan gave Yulon an opportunity to grow within the former's regional network reveals a power control issue that lies beneath the cooperative relationship. Managing dependency is the core issue for late-developing firms who learn to grow in embedded networks because that ultimately influences the niche for their survival. In other words, while dependency theory is correct in emphasizing power issues within the international economy, it would be wrong to assume that local firms enjoy no maneuvering space for managing dependency for their own benefit and that they can rely only on the state to negotiate a survival space.

Now, to deepen our firm-level analysis of embedded learning and managed dependency, the above discussion of Yulon logically should lead us to the following two contrasting questions: what if the principal firm recovered from the recession and would not Yulon's presence between Dongfeng and Nissan become redundant and, therefore, would not its window for further growth be closed? But what would happen if the principal firm continued to suffer recession? Would not the symbiotic relationship lead both parties to extinction? The two imagined scenarios again show the ambiguous interplay between economic competition and cooperation. Fortunately for the researcher, the former case applied to Yulon after 2004 while the latter scenario was relevant to China Motor Corporation, which will be discussed in the next section.

After the success of the NRP, Nissan announced the "Nissan 180" plan which had the threefold aim of increasing annual sales to one million units, raising profit rates by up to 8%, and reducing debts to zero by the end of 2005. The plan proved so successful that Nissan reached its targets by September of 2005, earlier than had been anticipated. Having rapidly recovered, Nissan was ready to assume fuller and more direct control of its plan for expansion in the Chinese market. The Taiwanese middleman seemed unnecessary. In 2004, Nissan announced that it would tighten cooperation with Dongfeng by building a new company called "Nissan-Dongfeng" with each side holding 50% of the assets.

In the terminology of network analysis, this move means that the "hole" between Nissan and Dongfeng, which allowed Yulon to derive profits from its role as middleman, would soon be filled up and closed (Burt, 1992). A direct tie between Nissan and Dongfeng would inevitably make the Fengshen plant a redundant node in the regional production network. In a sense, with regard to the tie with Dongfeng, Yulon and Nissan were implicitly in competition, with Yulon obviously in a weak

position. Facing the possibility of its niche disappearing, Yulon had to respond quickly to cope with a crisis of network management. Again, exactly because learning is a process embedded in market networks, dependency management becomes a crucial challenge.

**Table 2: Evolutionary Trajectory of Learning and Control (Yulon Case)**

Year	Events	Control	Learning
1981-1990	Develop New Cars/ Heightened Tension with Nissan/ Disconnect Cooperation with GS	Tension tightened along chain/ Internalize retailing function/ deterioration of learning platform	Pushing the ball from its inside/Improving quality against time/Noises in market information feedback/
1991-1995	“Yulon” brandname abandoned, merging of manufacturing plants and administrative office	Ease tension with Nissan/ negotiate autonomy for remodeling	Applying design capability developed earlier to remodeling (Differential R&D)
1995-2003	Establishment of YATC/ Yulon-Philippine/ Fengshen Auto/ NRP & Nissan 180	Overseas Investments/ expanding niches inside Nissan’s regional production network	Learning to coordinate R&D with marketing and production management in China
2003-	Nissan’s V-shape revival/ Nissan’s direct link with Dongfeng/	Division into Yulon and Yulon-Nissan/ establishment of Yulon-GM/ Yulon turns into an OEM car maker serving two competitors	Learning to involve in the regional design networks of Nissan and GM. Learning to manufacture models of different companies under one roof

Yulon’s response was a plan to divide itself into two parts. A new company, "Yulon-Nissan," was established with Yulon holding 60% and Nissan holding 40% of

the shares. Through the joint investment of Yulon and Nissan, Fengshen, a company that was already running well and proving competitive, was smoothly transformed into joint venture run by Yulon, Nissan and Dongfeng. Meanwhile, Yulon became an independent company 100% owned by the Taiwanese Yulon Group. In 2006, Fengshen expanded its production volume to 200,000 vehicles per year and became the biggest single offshore production facility in Nissan's world production network. In other words, through this changed control strategy, Yulon stabilized its niche in the Chinese market and continued to take part in a vital frontier in the world car industry competition.

In the domestic market, meanwhile, the potential tension between Nissan and Yulon was finally dispelled. Nissan now has more incentive to introduce its latest models and technology by way of its offshore design center in Taiwan and to cultivate the capability that Yulon has accumulated over the years. For its part, Yulon has achieved its dream of full managerial autonomy (gone for good is the time when it had to conceal its design center while developing its own-branded new car).

Taking advantage of its managerial autonomy, in the April of 2005, Yulon almost replicated the same network configurations as those operated by Nissan and established a new company called "Yulon-GM", with the General Motors side holding 49% of the shares. The CEO of GM China, Kevin Wale, was appointed as vice president. The Yulon design center and the GM Shanghai design center (PATAC) work together to design new models to be sold in Taiwan and China. GM is obviously trying to copy and refine the Nissan-Yulon regional network model to support its production/marketing strategy, using a Greater China concept (Economic Daily News 2005/07/31). The independent Yulon has now turned into a specialized motor manufacturer producing cars for both "Yulon-Nissan" and "Yulon-GM." Not only that, but Yulon has achieved full-scale production capability and with regard to learning, Yulon benefits from its involvement in the development stage of two competing global flagship networks. In a sense, Yulon now can profitably re-occupy, at a higher competitive level, a "hole" that exists between Nissan and GM, and this allows it to maneuver its cooperative ties to further enhance its learning experience.

### **Comparing Yulon and China Motor Corporation (CMC)**

Yulon and the China Motor Corporation (hereafter CMC) belong to the same business group and they share many organizational similarities. At the same time, their

respective partners Nissan and Mitsubishi are both Japanese automakers which suffered periods of crisis and which underwent the same kind of restructuring. But while Nissan's recovery was a model of restructuring, the Mitsubishi case was almost a disaster. We have here an almost perfect quasi-experiment in the real world with basic variables being controlled except the critical variable of the external network environment. In other words, by comparing the two sets of alliance relationships, namely Nissan-Yulon and Mitsubishi-CMC, we can further confirm and elaborate the thesis about embedded learning and managed dependency and we can also grasp more precisely the ambiguous tension between cooperation and competition within a regional economy.

In the earlier years, CMC faced challenges similar to those encountered by Yulon. Because its technological parent company Mitsubishi was trapped in deep financial trouble and hence had to delay making model changes, CMC had no alternative but to redesign old models such as the Lancer and the Galant to maintain competitiveness in the local market. Just as we saw in the Yulon case, because of loosening control by its parent (Mitsubishi), CMC's design center (CARTEC) was able to enjoy more freedom in practicing "differential R&D" and, like Yulon, achieved record sales in the domestic market.

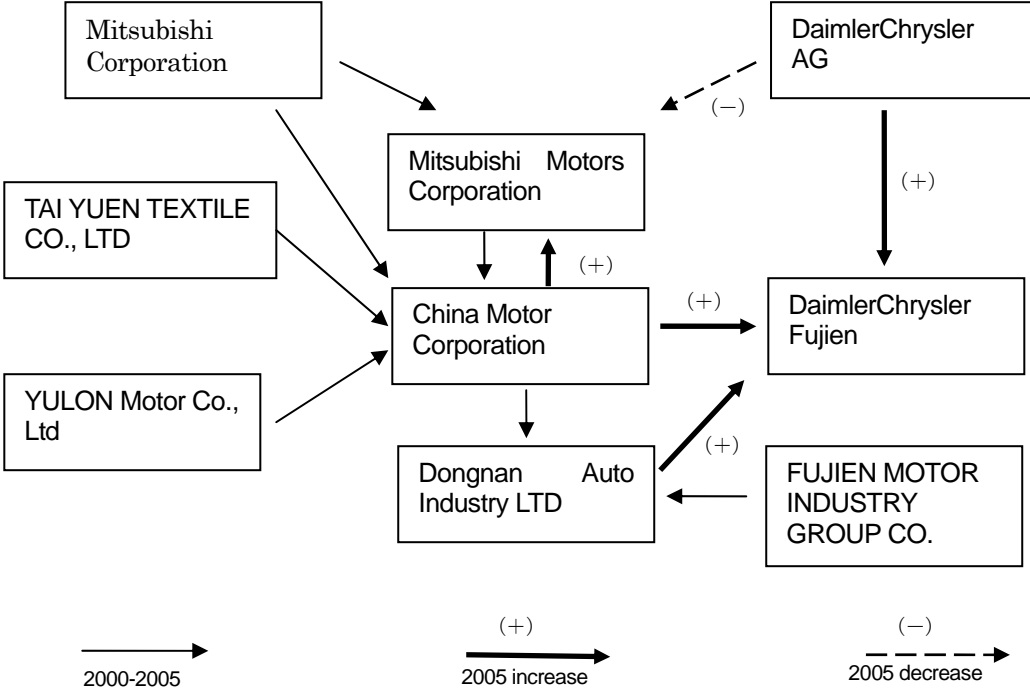
CMC was actually more aggressive in entering the Chinese market than the group's main enterprise Yulon, partly because it was subject to less public attention. With Mitsubishi's agreement, CMC teamed up with 35 other component factories and negotiated with relatively small Chinese auto plants at Dongnan in Fujian Province to set up a new auto assembly plant and a surrounding industrial cluster of car parts makers. With the input of CMC's development capacity and production management, the Dongnan Automobile Company quickly strengthened its competitiveness and market demand grew beyond CMC's limited capacity. As was the case with Yulon, in order to enhance brand recognition while expanding its production scale, CMC finally decided to yield 10% of its shares to Mitsubishi in exchange for brand usage.

The fundamental difference between Yulon and CMC lies in the circumstances of their external linkages. In sharp contrast with the link between Nissan and Renault, the alliance between Mitsubishi and DaimlerChrysler (hereafter DC) was widely seen as a highly positive initiative at the beginning, but the results of its restructuring plan turned out to be much worse than the former. A series of scandals in 2004 even pushed Mitsubishi to the brink of bankruptcy. DC, which owned 37% of the shares of

Mitsubishi Motors, surprisingly declined to stand by its original promise to invest 300 billion yen and this caused the situation to deteriorate even further. Let us now return to one of the questions posed in the previous section: if the principal firm continues to recess, will the symbiotic relationship lead both principal and client to extinction? Mitsubishi-CMC found itself in this situation.

After losing the financial input from DC, Mitsubishi Motors could survive the crisis only by requesting a capital injection from inside the Mitsubishi Group and by cutting back its scale of operations. This situation was a serious threat to CMC because if Mitsubishi continued to weaken, it might possibly cut CMC’s lifeline (in other words supplies of future models) as part of a survival strategy. In response to this tough challenge, CMC took a bold move by announcing that it would invest 3 billion NT\$ in Mitsubishi and that it would participate in Mitsubishi Motors’ new restructuring plan. So far, this has proved to be a clever move as Mitsubishi Motors is now gradually recovering and CMC, in its new role as strategic partner, is enjoying a closer and more egalitarian relationship with Mitsubishi (China Times 2004/0/22).

**Figure 1: Network Restructuring of CMC**



The new plan of Mitsubishi Motors focused on the Asian market, aimed at 80% growth in three years, and envisaged shifting some production and development to a trustworthy business partner elsewhere in East Asia. CMC was the obvious candidate as it now occupied a seat on Mitsubishi's board of directors. Mitsubishi itself planned to focus on maintaining excellence in three major areas: design, marketing, and platform construction. The development of the Grunder model can be seen as a sign of CMC's enhanced standing in Mitsubishi's global flagship network (Commercial Times, 2005/07/04). In 2005, the Grunder, a new model developed by CMC, was introduced to the world by Mitsubishi in Tokyo and was seen as a car that could be exported to Japan.

On the other hand, DC which stopped investing in Mitsubishi, was active in consolidating an alliance with CMC aimed at enhancing DC's presence in the China market. Chinese Fujian Motors gave consideration to building a new factory in partnership with DC to make Benz cars in Fujian Province, but this time without the participation of CMC. However, DC insisted on inviting CMC to participate in building the new plant so as to ensure its smooth running and competitiveness. The new plant was established in 2007 on the basis of tripartite cooperation between DC, CMC and Dongnan (which companies held respectively, 34%, 16%, and 50% of the shares). So far as the Taiwanese market was concerned, DC also strengthened its cooperation with CMC. A new company CMC-DC was set up with a 51% share held by CMC and a 49% share by DC to market Chrysler and Jeep cars, which will be produced domestically by CMC. 2

As was the case with Yulon, changes in the network environment, namely the loosening of ties between Mitsubishi and DC and the strengthening of ties between CMC-Mitsubishi and CMC-DC actually created a "hole" which benefited CMC (Figure 1) and CMC was able to embark on making full use of its production capacity to simultaneously supply Mitsubishi and DC. From Nissan, GM, to Mitsubishi, and now DC, the triple alliance investment platform involving Taiwanese auto makers began to emerge from an accidental event to become a practicable pattern of international cooperation and competition. Both Yulon and CMC must continue to find new ways of developing capability along the chain (not just design and development, but manufacturing and marketing) so that the lessons they have learned (the "learned advantages" in the jargon) can strengthen their bargaining and enable them to dilute their dependent position. At the same time, they must carefully and skillfully maneuver

their network relationships so that the former learning process can be embedded and developed in a supportive environment. It is hard to tell how stable this pattern of survival can be in an industry as competitive as motor vehicles manufacture. However, what this comparative study suggests is that beyond the anonymous market and the omnipotent state, corporate strategies on both learning and control matter (even though they may be confined to the micro-level) especially with regard to their significance for competition and cooperation related to the regional division of labor.

### **Conclusion: Micro-Processes of Competition and Cooperation**

This article does not deal with Chinese market per se and has focused on cases that have been hitherto been ignored in the literature. The first section deals with the methodological issues that the paper raises. The paper applies the flying geese model, a classic contribution to the regional division of labor literature, to world-system issues and then proceeds to examine the relevance of the seemingly semi-peripheral case of Taiwanese firms to the central concern of regional economic restructuring. The empirical realities of the Taiwanese motor industry are then introduced, and the theoretical importance and empirical curiosity of the Taiwanese case is highlighted by contrasting its surprising development during the last ten years with the pessimistic histories and forecasts given in the earlier literature.

The empirical evidence offered by the paper illustrates the shortcomings of both the efficiency model of the anonymous market, as featured in the mainstream literature of economics, and the domination model of left-wing dependency theory. Both of these approaches tend to overlook the agency of local firms, especially as regards the way that local firms manage to control the network environments in which capability learning is embedded. The dynamics discussed by the paper operate at the level of the firm, and the case of Yulon is chosen to illustrate and elaborate the arguments put forward. It is hoped that the case study, which was outlined in chronological fashion, will illustrate in concrete terms the complex dynamics of competition and cooperation. Theoretically, the analyses are grouped around the two key concepts that underlie the entire discussion, namely "embedded learning" and "managed dependency."

The anonymous market model suggests that the survival niche of firms reflects the advantages they possess, but tends to overlook the more dynamic learning process by which the advantages are created (or, have failed to be created) (Amsden, 2001).

This paper emphasizes in particular one dynamic dimension of the learning process, that is its being “embedded” in the surrounding networks, which are stretched along the value chain but not limited to that chain (ex. Kenney and Florida 1993). Of course, there is always an intrinsic part of learning that is not an isolated process either. Meanwhile, the dependency theory model suggests firms in the developing countries are in a dependent situation through their linkages with global firms from the core countries. As is the case with the advantage issue emphasized by its right-wing counterpart, dependency theory is correct in pinpointing the critical importance of the control issue. However, it places too much emphasis on the state per se. It is to be hoped that this paper has successfully shown the complications of the control process of dependency management at the firm level.

Finally, let us consider two related questions. The paper is based on a comparative review of the two Taiwanese motor vehicles makers Yulon and CMC. But how far can these firms be taken to be representative, and what happened to the other Taiwanese motor manufacturers? Table 3 shows the changes of market share among the major Taiwanese motor vehicle makers from 1994 to 2003. The Table shows that Yulon and CMC together occupied between 40% and 47% of the market share during the period concerned. Clearly, they are significant players in the domestic market. If we take the global firms from the core countries as a reference point and adopt Williamson’s terminology (1985) to draw a spectrum from externalized to internalized positions, the five companies in the table can be grouped into three categories. Because Ford and Toyota have majority control of Lio Ho Motor (hereafter LH) and Kuozui Motor (hereafter KZ), these two Taiwanese firms can be seen as an “internalized part” of the two global companies. By contrast, Sanyang Industry aggressively pursued an independent policy and tried to build its self-branded and self-designed cars from scratch (very much as Yulon tried to do between 1981 and 1990) and therefore can be placed at the “externalized” end of the spectrum. Sanyang went through a difficult struggle with Honda and tried very hard to develop independently but finally failed to survive. As a result, both Sanyang and Honda abandoned the Taiwanese motor vehicles market. Yulon and CMC have been investigated in this paper, instead of LH and KZ, because they have been local companies but have managed to survive between externalized and internalized extremes. They are network players, positioned neither hierarchically nor with respect to domination of the market.

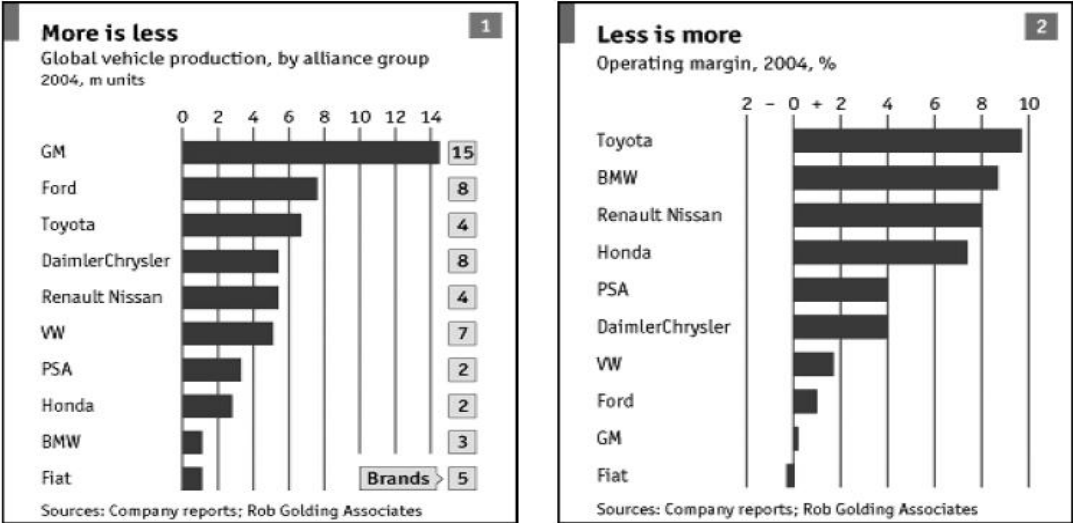
**Table 3. Market Share of Major Auto Makers in Taiwan (1994-2003) (%)**

	Yulon Motor Co., Ltd.	Ford Lio Ho Motor Company Ltd.	China Motor Corporation	Sanyang Industry Co., Ltd.	Kuozui Motors Ltd.	OTHERS
1994	13.6	21.0	26.6	10.9	16.4	11.5
1995	15.5	24.0	25.1	9.7	16.7	9.0
1996	17.8	21.6	21.2	11.1	22.1	6.2
1997	20.9	19.0	26.9	7.1	18.9	7.2
1998	20.8	18.7	27.4	8.5	18.9	5.7
1999	19.5	15.0	27.8	11.2	21.8	4.7
2000	20.1	16.5	25.7	9.9	23.0	4.8
2001	19.4	16.0	27.6	6.0	24.1	6.9
2002	16.4	17.4	29.3	2.6	27.2	7.1
2003	18.0	18.4	23.8	1.8	27.3	10.7

Source: Ministry of Communication (<http://www.ttvma.org.tw/cht/information.php>)

However, the survival pattern that was increasingly apparent during the discussion of the Yulon and Chonhua cases is not confined to these cases. Economic sociology has shown how firms that compete to survive in an uncertain market imitate each other and thus form a recognizable pattern (DiMaggio and Powell 1991). CMC established an Asian R&D center in 1999 to develop car models suitable for the Asian market through cooperation with Mitsubishi. In the same year, Ford LH also established a design and technology center which expanded into a development and design center in 2001. Toyota likewise established a technology and engineering center inside KZ in 2000 and actively involved KZ in the early development stage within its global development networks. KZ is also assisting Toyota's expansion in the Chinese market. In other words, the findings of this article are applicable to other Taiwanese cases as well. What needs to be adjusted is the degree of internalization and the different organizational settings served by middleman companies. Yulon and CMC are more suitable candidates for revealing the process of emergence and the control dynamics of the pattern because they, unlike LH and KZ, enjoyed more autonomy from the very beginning and, unlike Sanyang, they managed to learn, to control, and to survive.<sup>3</sup>

**Figure 2, Neither Scale Nor Scope: the Reality of the Global Car**



(Source: Economist 2005/09/08)

This paper has investigated why and how the Taiwanese motor vehicles makers have survived in an environment that, given its limited domestic base, the need for scale economies in the industry, and the Chinese government’s leverage power, must be considered an unwelcoming one. Although corporate strategies in control and learning have so far been the paper’s main concern, they do not exhaust all the possibilities. Here, let us turn the previous question around, and consider what can we learn about the nature of competition and cooperation in the motor industry from the survival of the hitherto neglected Taiwanese firms. This is in fact the question that was asked at the very beginning of this paper.

The paper suggests that Fujimoto’s (1997) view of the nature of competition and cooperation in the world auto industry is essentially correct. The motor industry has long been seen as one that is overwhelmingly ruled by the search for scale economies. It was almost an industry-wide consensus that any company that could not reach an annual output of 4 million units would not be able to survive. The argument justified the waves of merger movements in the 1990s and ironically was in turn “evidenced” by them. Salient examples include Ford’s investment in Mazda in 1996, Toyota’s merger with Daihatsu in 1998, GM’s incorporation of Suzuki in 1998, Renault’s merger with Nissan in 1999, and DC’s investment in Mitsubishi in 2000. For the same reason, the alliance between Nissan and Renault was not highly thought of by

authorities on the motor industry because of its small scale compared with the agreement between DC and Mitsubishi. However, a retrospective report (see Figure 2) on what happened to the world auto industry over the last ten years clearly rejected the thesis of global oligopoly. The fact is that profitability has nothing to do with either scale (that is, the scale of production) or scope (that is, the number of brand names).

At an early stage, Fujimoto advanced the contrary belief that the “thesis of global oligopoly” was over-exaggerated and that the true nature of the globalized motor industry should be sought in “multi-layered cooperative networks.” According to his calculation, the minimum production scale for a platform should be around 250,000 units. On this view, a company that runs with four platforms needs 1 million units to survive. A smaller company could run on two platforms with 500,000 units and the improvement in production and development efficiency could even lessen the scale requirement. A company that plays a middleman role inside the “multi-layered cooperative networks” can survive at lower levels of production. The more important question of competitiveness, Fujimoto argues, is the learning capability of firms and the extent to which they can strengthen each other inside the same global cooperative network. That is why Fujimoto (2001) predicted that the Nissan-Renault alliance would perform better than its counterpart.

Our research provides additional evidence to support the importance of this network perspective of competitiveness. In economic terms, the world has indeed changed dramatically beyond what Akamatsu could have envisaged when he introduced the flying geese model all those years ago. Surprising aspects of the motor industry, which has been very falsely assumed to be ruled by the efficiency measurement of scale economies, solidly refute the theory that assumes the market as an anonymous force of competition, intangible and invisible. Competition and cooperation go hand in hand in the car-making world where multi-layered cooperative networks compete with each other, a complicated situation but one that is the reality (Fujimoto 1997). In order to grasp the dynamic processes, a sociological network perspective at the level of the firm that focuses on embedded learning and on dependency management can be of very considerable help as we explore the uncertain future of regional economy.

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1 We will return to this issue in the conclusion, after our case studies of the car market.

2 Chonhua Benz was a dealer in imported Benz cars, performing the marketing and after sale service for Mercedes Benz. Not to be confused, the company has no relationship with Chonhua Auto. DC terminated the dealership in 2006 and sales of Benz cars in Taiwan are now under its direct control.

3 About flexible usage of Taiwanese middleman in entering Chinese market, Ito (2005) and his paper in this issue could be helpful.