

**PART I : COLLABORATE / COMPETE :
RETHINKING INTER-FIRM RELATIONS
IN THE JAPANESE AUTOMOBILE INDUSTRY**

A/ Traditional views : dualisms empirical and analytical :

Until the 1980s the prevalent Western analysis of assembler-supplier relations in the Japanese automobile industry portrayed a dualistic structure; on the one hand a few large and powerful assembly firms situated at the head of supplier chains, on the other hand myriad small and weak components and materials manufacturers feeding parts to each other and finally to assemblers. The latter held the reins of control over the suppliers, perhaps through partial ownership, or because the latter were sometimes spinoffs from the former, or because a widespread system of single sourcing of parts and of long-term relationships effectively closed alternative markets for those suppliers was normal practice, particularly during periods of market weakness when reduced costs could be forced down into the supplier chain. Moreover the situations of employees at assemblers and suppliers reflected the positions of their employers; at assembly firms, life-time employment and relatively high wages were defended by enterprise unions (even while employees worked very long hours and took few holidays), at suppliers, part-time work or family firm sweatshop exploitation were rife. This dualistic exploitation structure is reflected in the widespread use of the word "subcontractor" - - implying a very uneven relationship - - to describe Japanese supplier firms.

If this portrayal of a dualistic exploitation structure was by and large accurate during the 1950s and 1960s, during the 1980s it began to disappear from view as analysts abroad searched for the secrets of Japanese success now more to emulate than to criticize. A revisionist interpretation developed, in which Western analysts - - aided by Japanese counterparts now finding a willing western audience - - argued that the dualist exploitation model no longer characterized the main thrust of innovative developments in the Japanese automobile industry. Indeed revisionism has spawned a new orthodoxy which overturns the old explanations. Thus, as far as workers were concerned, while it had been argued that assembly firms exploited docile workers in order to hold down costs, the new orthodoxy emphasized how the Japanese automobile industry in general had deployed flexible technologies, new modes of work organization, and had

encouraged workers to actively participate in improvements to production processes. And success for Japanese products was due no longer to low-cost imitations of Western products, but to large investments in research and development that resulted in innovative products.

Mirroring firm-worker relations, the new themes in analyses of relations between assembly and supplier firms have become :

- **collaboration** rather than exploitation
- the crucial role of supplier firms in **product development**.

Dynamism in the production structure as a whole is no longer attributed to a relentless pursuit of lower costs but rather to a systemic and collaborative tendency to innovate new products and processes by supplier firms as well as assembly firms.

After the new orthodoxy made its appearance, the lessons that many western automobile manufacturers sought to learn from Japan regarding assembler-supplier relations comprised a rejection of their own typical relationships - - based on organizational distance, relentless price-cutting, dual sourcing, superficial relationships - - in favour of a more integrated and systemic view of the overall production structure in which the full potential role of supplier firms to innovate products and processes could be realized.

However, in this **analytically dualist** shift from the old orthodoxy to its opposite, the new orthodoxy, we run the danger that the truth lies in between, that typical assembler-supplier relations in the Japanese automobile industry have in fact only moved along a continuum towards the revisionist interpretation, and even so only in certain respects. Recent empirical analyses point to the continued reproduction of a sector of small firms that are true subcontractors; ie they simply receive instructions on what to produce, and often receive their materials too, from another firm, and seem to possess little innovatory capacity. Indeed most innovation along the lines suggested by the new orthodoxy seems to have been focused upon first-tier (ie direct to assemblers) supplier firms, with these evolving to become designers and assemblers of modular components (ie complete assembled components) in their own right.

If we are to avoid the pitfalls of exaggeration and one-sided interpretations that characterize analytical dualism (note this approach also characterizes many studies comparing Japanese and North American automobile industries), we need to construct an alternative model of Japanese automobile industry assembler-supplier relations. Here we will propose, as a more balanced characterization, a tight organizational structure designed to ensure maximum benefits from both **collaboration and competition**

among firms. In this model, that we will call for convenience the "CC model", both the old and the new orthodoxies retain their truths. The innovatory capacities described in the new orthodoxy are transposed to the collaboration element of the CC model, while the competition element captures the stresses and strains pictured in the old orthodoxy. The result is a more complex but more dynamic model than each orthodoxy alone could provide.

B/ The CC model : organizational aspects

Several organizational features - described in the CC model - define a fine and sharp double blade of collaboration and competition which provides a twin dynamic to the system, thus enabling daily assembler-supplier relationships to function most efficiently.

Collaboration :

1. **Long-term relations** : The reproduction of relations between particular firms over long periods enables not only development of the high degree of trust between firms but just as importantly promotes development of the specific forms of **knowledge** that allow inter-firm relations (and hence the division of labour) to be deepened and made more complex while still functioning efficiently as a whole. Thus individual people can understand the capacities and constraints of their opposite numbers in other firms, the overall capabilities of the partner firms are reciprocally understood, and the implications of particular idiosyncracies are factored in advance. This helps greatly to diffuse innovations - new products and processes - smoothly. Another result is that each firm knows how it should best react immediately when difficulties arise elsewhere in the system, without having to consult its partners.

2. **Limited numbers of direct relationships** : Maintenance by each firm of relations with only a limited number of other firms enables externally-oriented firm resources to be highly concentrated on understanding and dealing with each partner. Moreover relations with other firms can be understood and acted upon by a single person or by a small team - rather than by whole (eg purchasing) departments - who / which are then in a position both to react more rapidly to difficulties when necessary and to reflect more deeply upon improvements to the firm's external relations.

3. **Formal ties** : The more formal tying of firms to each other takes forms such as cross-equity holdings or various kinds of business associations such as **keiretsu**, the "family" structures of conglomerates. Some automobile firms have spun off supplier

units to become institutionally separate firms with their own management, but remaining closely tied to their "parent". **Kyoryokukai** are associations that group suppliers of particular assemblers, and many suppliers belong to several of these simultaneously. The kyoryokukai function actively to channel information on new schemes (eg for product quality improvement) that assemblers want to disseminate down their supply chain. Membership of such an association also formalizes an intention to maintain a long-term relationship. All Japanese automobile producers except Honda are linked to a keiretsu and / or maintain kyoryokukai.

4. Exchange of personnel : Towards the end of their career, engineers and managers at assembly firms may be retired and decanted to supplier firms of their career paths become blocked or if others are selected for higher positions. When they leave, they take with them intimate knowledge of the firm they have left, not only of its functioning but of personal contacts built up over the years. Firms also station their own personnel at partners' factories temporarily or semi-permanently, for all sorts of reasons ranging from joint research and development to aid in adopting new technologies to smooth introduction of new models.

5. Multiple tiering and vertical disintegration : That each firm maintains a relatively small number of direct relationships to other firms does not imply a small number of firms in the production structure as a whole, because each supplier firm occupies a niche in a multi-tiered pyramidal structure with an assembler at the apex, and incorporating and often very complex division of labour. There may be up to ten tiers of supplier firms, each undertaking specific tasks of materials production or subassembly. Over 10,000 supplier firms may directly and indirectly supply a single assembler. Only 500 of these are first-tier (direct) suppliers, and much recent product and process innovation in Japan appears to have been concentrated at this level. Firms become smaller in size further down the supplier chain, but the layers are said to remain clearly delineated.

This systematic tendency towards a vertical disintegration of production into long supplier chains implies a high degree of "outsourcing" of components and therefore a low level of value-added - around 30 percent - by the final assembler, which in part explains why Japanese assembly firms are able to make so many cars with so few employees of their own. According to the old dualistic orthodoxy, moving production of particular components and production processes back and forth between firms and subcontractors was explained in terms of a lack of capital at many supplier firms. But while this may have been the correct explanation many years ago, such continuing restructuring of the division of labour continues today, providing a high degree of

flexibility for the system as a whole to incorporate quite rapid shifts in quantitative and qualitative demands from higher up the supplier chain.

Indeed it is in part the existence of multiple tiers within pyramidal production structures that explains the crucial role of - and hence the importance of analysing - inter-firm relations in the Japanese automobile industry. For while each firm may have maintain relations with few other firms, systemic disintegration means that each assembler's production structure taken as a whole involves myriad such relations. And since high levels of outsourcing from assembly firms means that 70 percent of the value added in each automobile is due to firms in the supplier chain, the activities of Japanese supplier firms become even more central to industry strategies for increasing product quality, decreasing costs and increasing general innovatory capacity.

Competition :

1. **Competition between assemblers :** Japan's domestic market for finished automobiles is fiercely competitive, with nine assembly firms supplying final markets. Some of these firms are relatively new entrants; neither Honda, Suzuki nor Daihatsu manufactured automobiles thirty years ago. While some of the smaller firms are dependent upon their links to larger firms (eg Toyota-Daihatsu), powerful competitive tendencies remain which filter into the supplier chain as each assembler seeks to marshall its overall production structure into the competition with the structures of its rivals.

2. **The outside threat to long-term relations :** Long-term relations are maintained not for their own sake but because they continue to produce required results. Strict conditions can be set by the purchasing firm, in terms of annual price reductions or of improvements to product quality, with the implicit threat that there are alternative suppliers waiting in the wings to be awarded future contracts. Loss of a major contract may be fatal to a supplier firm given that other potential customers are likely to be hooked into long-term relations with satisfactory suppliers. And knowledge that a contract was not renewed by one purchaser customers. Thus even if non-renewal of contract in fact happens infrequently the penalty - and hence the threat - is still very severe.

3. **Dual sourcing Japanese-style :** Commentators comparing Western with Japanese firms have drawn attention to patterns of what they call "single sourcing" - ie each part is bought only from one firm - in the Japanese automobile industry. In contrast, dual sourcing of components is said to be more common in the west. In western-style dual sourcing a contract is awarded to more than one firm, each of which

tools up to make the same part. In this latter system competition between suppliers is evident for all to see, as any dissatisfaction on behalf of the purchaser can be signalled by a shift of orders to a second firm. Moreover, disruptions to production - due to employee strikes, for instance - can be either warded off or mitigated because a second source is immediately available.

But the notion that "single sourcing" is prevalent in Japan is not entirely accurate, for it takes the western definition and then assumes (in typical analytical dualist fashion) that Japanese structures are **opposite** to western ones. Behind what - from a western perspective - may appear to be a cozy form of single sourcing there lies in fact a **different form of dual sourcing** which is indeed central to the enforcement of competition within supplier chains. This form of dual sourcing involves awarding contracts for the same part (eg a wheel) for different models (eg Toyota Corolla, Toyota Carina) to different firms. One advantage lies in avoidance of wasteful duplication of capital equipment investments since each model-part is supplied by only one firm, and a second advantage lies in realization of economies of scale. But more importantly, this system allows purchasers to collate comparative data on cost, quality and delivery which can be used to secure better bargains in future, since each supplier knows full well that it does indeed have a competitor, even if less directly than in western style dual sourcing. This **Japanese-style dual sourcing** provides an important framework for constantly reinforcing competitive pressures.

The competitive aspect here explains why Japanese analysts have stressed the positive aspects of the system even while western firms worry about the risks of reliance upon one firm from adoption of Japanese-style "single sourcing". Moreover, the average number of suppliers of each kind of part to assemblers increased steadily during the 1980s as assemblers increased their number of relations with suppliers. Indeed while each assembler's *kyoryokukai* contains one supplier of each kind of part, it is common practice also to purchase this part from a firm that does not belong to the association. And conversely, even suppliers closely affiliated with a particular assembler may also supply several other assembly firms.

C/ Spatial Organization of the Automobile Industry

(These arguments are developed more fully regarding transport infrastructures in: Andrew Mair (1992 forthcoming) "Just-in-Time Manufacturing and the Spatial Structure of the Automobile Industry : Lessons from Japan. **Tijdschrift voor Economische en Sociale Geografie** vol. 83).

Many commentators have remarked upon the particular spatial organization of production found in the Japanese automobile industry. Geographical concentration of production structures, the creation of regional spaces of production, the role of proximity and transportation infrastructures, the influence of the historic legacy of spatial organization in determining present patterns, continuing "ruralization" of production, all are important to understanding the vital part played by spatial organization in influencing the daily functioning of Japanese automobile firms.

The geographically concentrated form of the Toyota City production complex outside Nagoya is often held to be exemplary of a specifically Japanese form of spatial organization in the automobile industry. At this location Toyota exerts a large measure of control over the reproduction both of its workforce and of the substantial portion of its supplier chain that is also situated there.

Japanese automobile firms have created "regional spaces of production" in which ties among firms in the production structure are so close that the assembly line has essentially been stretched out over regional space. The production structure is spatially focussed on central assembly plants, with the hierarchy of tiers in the supplier chain finding a counterpart in spatial organization: first-tier suppliers are usually physically closest to assemblers, second-tier firms are farther away, and so forth.

This concern with spatial organization reflects the prime role geographical factors play in facilitating close physical ties between firms, whether movements of personnel on a daily basis - which allows for development of complex **evolving** relationships far more efficiently than mechanical or electronic information exchanges - or flows of components or materials (see Aoki's H-form discussion). geographical proximity between firms is highly prized, and longer distances can cause considerable problems in maintaining close daily relationships. However, geographical proximity is important not in itself but because it is one means to ensure proximity in **time**, eg the possibility of working with short lead times between orders from purchasers and delivery of parts by supplier firms.

Thus the importance attached to proximity is mediated by the **nature** of the distance, which in turn determines the time taken to traverse space. Moreover, poor physical infrastructures and transportation logistics disrupt even short distance relationships, making the time of deliveries unpredictable. Hence logistical planning in the Nissan production structure, for instance, which is regionally concentrated and focussed upon metropolitan Tokyo, nevertheless suffers considerably from debilitating traffic congestion in the Japanese capital.

The historical-geographical development of industrialization in Japan continues to influence contemporary patterns of spatial organization. Toyota, which has actively moulded its own spatial structure at Toyota City, in fact remains exceptional rather than typical. And even Toyota's production structure remains firmly rooted in past patterns of industrial location. Thus many of its lower-tier suppliers are located in the closest metropolitan region of Nagoya. And a significant portion of its direct purchases still originate in the Tokyo region, much further away, but the historic heart of the automobile industry in Japan and retaining a wealthy infrastructure of supplier firms. Such past patterns have also influenced the spatial structures of firms smaller than Toyota and Nissan. Thus Mazda's Hiroshima base in western Japan remains spatially isolated from most important suppliers, while Mitsubishi's origin as a conglomeration of different producers is reflected in the location of its assembly plants in various cities. Other firms are located in smaller cities surrounding the main industrial complexes of Tokyo and Nagoya but are not strong enough in terms of market power to draw many suppliers to their vicinity so as to effectively create Toyota City style production complexes.

Finally we should note a continuing tendency to shift production to rural areas for reasons related to labour force availability and "quality". Toyota City itself was still a largely rural area as recently as the late 1950s, where recruits of peasant stock were viewed as ideal production workers. By the late 1970s firms further down the supplier chain were opening their new plants in rural districts where they could hire cheaper part-time peasant labour. And Toyota's first assembly plant outside Toyota City, due to open in 1993, will be located in a greenfield area on the island of Kyushu some 600 kilometers from Tokyo City.

D/ Daily inter-firm relationships

Daily inter-firm relationships refers to **practices**, analytically distinguished here from organizational and spatial **frameworks** (B and C above). Daily relationships involve linkages of information, personnel and semi-finished goods among firms, exchanges either directly related to production or in activities like collaborative research and development. The organizational and spatial frameworks discussed above are intended to support these daily relationships (and also to support other activities internal to each firm).

1. Just-in-time strategies for inventory and delivery : Just-in-time strategies of inventory control and parts delivery require close organizational and time-space linkages if they are to be implemented effectively. Firms must be familiar with each other organizationally, be well versed in each other's needs and know how to react if problems arise. In cases where kanbans are used to communicate fresh orders to suppliers the need for time-space proximity is doubled since delays in return transit (of kanbans) will either magnify disturbances to smooth production at supplier firms or enforce a system of buffers antithetical to just-in-time principles.

Kanbans are not, however, necessary; an electronic data transfer system can communicate orders without regard to spatial proximity, thus already halving lead times compared to a kanban system. Nevertheless Nissan, for instance, despite its spatial concentration in the Tokyo region, has found that continued reduction of stocks towards just-in-time deliveries impedes production planning since the congested metropolitan environment causes all sorts of unpredictable delays.

It is important to recognize that there are different forms of just-in-time planning, appropriate to different components and materials, and therefore requiring different organizational and spatial structures. The oft cited "classic" case of a "total" just-in-time system, involving manufacturing of parts simultaneously with the automobiles into which each part will be inserted, is production and delivery of seats by a supplier company. Here the purchaser orders seats only hours in advance of their assembly into automobiles, which requires the seat supplier to manufacture exactly the seats ordered and deliver them directly to the production line in small batches and in exactly the right order for them to be fitted into automobiles on the assembly line. Logistical tasks are complicated when the automobiles and hence the seats are lined up in a certain order - varying by colour, variant and often model - that is only known a few hours in advance. problems in the assembly plant with a particular paint colour may mean short -notice changes in orders for parts like seats which match body colours. Clearly in this situation very close organizational and spatial ties are necessary to avert problems.

By contrast with this "total" just-in-time system, supply of sets of small bolts which only vary by model, are simple to store and cheap to transport (but only in bulk), by no means requires a close daily relationship among firms so long as high quality parts are assured. This example, in many respects the opposite of the seat example, warns us not to suppose that a total just-in-time system makes sense for all automobile parts. Here, organizational and spatial proximity are far less relevant.

When problems of parts quality, delivery timing and so on do arise purchasers take a keen interest in their resolution. This can entail immediate provision by the supplier of replacement parts and also the despatch of trouble-shooting engineers from the assembly firm to discuss resolution of the problem. Larger-scale manufacturing restructuring projects - such as introduction of new logistical systems demanded by the purchaser - may be difficult for supplier firms to undertake without outside assistance. Managerial and technical teams from the purchaser may again be despatched (rather than calling in western-style consultants). In these cases too spatial proximity is beneficial, not only for speedy delivery of replacement parts but also for short-term changes to employee commuting patterns necessitated by collaborative inter-firm problem-solving techniques.

2. Research and development : The role of supplier firms in actively researching and developing both new production processes and new products has been increasingly emphasized in literature on the role played by the supplier chain in Japan. Development of new products has become vital to the global competitive strategies of all firms in Japan, with models now systematically replaced every four years.

Assembly firms have increasingly passed responsibilities for design of components along to supplier firms, effectively **integrating research and development into the production structure**. The possibilities of "design for ease of manufacture" are thereby much enhanced because the designer and manufacturer of the part are one and the same. Lead times for new products can also be reduced by parallel research efforts (ie suppliers are given overall parameters within which to work, and detailed design can thus continue on several fronts at once). At the same time, purchasers may inject an element of competition into the system by requesting more than one supplier to participate at certain stages of the development process.

This form of **systemic** research and development clearly requires a high degree of collaboration among firms, as well as trust that confidential ideas and designs will not be leaked to other firms. It also implies that suppliers maintain sufficient resources to mount effective research and development programmes and are not overly "exploited" by purchasers. Supplier firm engineers may participate as guests in assembly firm research and development teams, gaining the relation-specific knowledge that is enhanced the longer the relationship continues. Close personal contact is greatly facilitated by geographical proximity of firms sufficient to allow flexible daily commuting patterns for employees.

3. Product innovation and flexible divisions of labour : The pattern of demand for particular components and materials is frequently altered by model changes and other product innovations such as new types of components (eg electronic, electrical) and new materials (eg plastics, aluminium). Moreover, the relative advantages of different supplier firms in different types of production (eg capital intensive or labour intensive, different supplier firms in different types of production (eg capital intensive or labour intensive, different materials) may be quite variable. Nevertheless there is considerable benefit from maintaining existing inter-firm relationships over time instead of chopping and changing as needs shift, which would introduce a measure of uncertainty related to product change rather than a firm's performance.

In this potentially contradictory context divisions of labour within the supplier chain must be flexible. For instance, it is not uncommon for a supplier firm first to outsource a particular part or sub-process to other supplier firms but later to bring it back in house while a different part of the process is outsourced. The supplier chain begins to function more as a flexible network than as a rigid hierarchy. In this network form the organizational and spatial frameworks discussed above come into play as mechanisms of **governance**, ensuring that divisions of labour can efficiently be altered without impediment or resistance.

4. Attacking costs : There is constant pressure to reduce prices of parts, usually at least once per year. However, the focus is usually on how supplier firms can reduce costs of production rather than profit margins. And the reward for meeting targets is near certainty that future contracts will be awarded indefinitely. Dual sourcing Japanese style acts as a means of comparing prices to ensure competitiveness without seeking to gain confidential information on prices at other firms or demanding open bidding for new contracts. "Competition in the North American automobile market is going to become very tough by the early 1990s. The firms which succeed will be those with the best supplier network" (Honda engineer seconded to Japanese automotive supplier in Ohio, 1988; author's interview).