

‘Flexible Specialization’ Revisited: A Case Study of Denim Jeans Production in a Japanese Industrial District

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ABSTRACT

This paper describes a case study of denim jeans production in the Sambi district of western Japan and discusses the relevance of ‘flexible specialization’ in order to characterize the production capabilities of industrial agglomeration displayed under conditions of uncertainty. In spite of the general belief that flexible specialist networks provide adaptive production capabilities, a vertical integration strategy accompanied by heavy capital intensification can continuously develop high quality products as well as spread risk. The case study of a denim fabric factory, Kaihara, shows how vertical integration circumvented voluntary but costly coordination and collaboration amongst network members and functioned to construct an infrastructure for communal learning by linking different types of customers. It is also reported that these seem to be merely unintended effects of actions taken for short-sighted motives.

Key words: flexible specialization, industrial district, vertical integration, denim jeans

INTRODUCTION

This paper reports on a case study of denim jeans production in a specific industrial district in Japan which has been known as a traditional production venue of cotton fabrics and related final products. It also discusses the relevance of ‘flexible specialization’ as an analytical concept to understand the production capabilities which industrial agglomerations are deemed to display under a post mass production paradigm. The conclusion will be that, in spite of the general belief that flexible specialist networks provide adaptive production capabilities, especially when faced with unforeseeable consumer needs and volatile demand, sometimes a vertical integration strategy accompanied by heavy capital intensification can create various opportunities to continuously develop high quality products by spreading risk. In this respect, the denim fabric factory, Kaihara Corporation, is a good example. It has been known for its vertical integration strategy involving cotton spinning, dyeing, weaving and finishing processes, and also for continuously developing high quality product prototypes for segmented markets that serve various types of consumers.

The next section below explains the purpose of this paper. The third section describes the competitive

environment of Japan's denim jeans industry in general, and gives an overall picture of the Sambi industrial district. The fourth section sketches how Kaihara adapted to new business environments. In the last section, a theoretical elaboration is attempted.

RESEARCH QUESTION

Since Piore and Sable claimed that in a post-Fordist paradigm more flexible manufacturing philosophies supplied not so much standardized commodities to mass markets as a wide variety of quality products to rather diversified consumers, industrial agglomerations composed of small sized firms with specific manufacturing capabilities have attracted the attention of more and more researchers [7].

Although the authors are known for their terminology 'flexible specialization' in order to characterize the emergent organizing principle of manufacturing efforts in emerging countries which began to threaten American economic hegemony worldwide in the post-war period, they were not the inventor of the term. There was a common theoretical and empirical ground where people's beliefs had been weakened at a metaphysical level concerning the systematic predictability and controllability of phenomenal worlds on the basis of positivistic intellectual traditions in both natural and social sciences [8]. So called 'adaptive complex systems' show indeterministic or non-linear reactions to outside stimuli in contrast to the way positivist views anticipate them; these can be observed in a wide range of phenomenal worlds from neuro-systems and cellular tissues to animal and human societies. Flexible specialization is one of the features which such adaptive complex systems demonstrate. As is observed in the human brain, autonomous neurons (agents) interact with each other without any central controlling mechanism and the individual neuron network (sub-system) localizes or lateralizes its functions (functional specialization) within the whole brain (self-organized system). In an analogy of this conception, Piore and Sable attempt to caricature the mass production and consumption paradigm which had a strong inclination toward central control of economic activities through relatively bureaucratic governance mechanisms. On the other hand, German mechanical engineering, Italian textiles and Japanese automobile industries were regarded as providing alternative benchmarks to the traditional American counterparts.

Piore and Sable suggested that capital investment in large factories characterized by a thorough division of labor, unskilled workers and highly integrated automation systems would not disappear completely, but would be gradually replaced by flexible networks of highly skilled professionals who own special purpose production facilities and work on a contract basis. Collaboration based on the expectation of long term contracts was expected to strengthen mutual trust and would, therefore, lubricate information flows and facilitate knowledge creation processes amongst these professionals.

Ten years later, Saxenian empirically supported this rosy image of industrial agglomeration by reporting on IT clusters in San Francisco, which had allegedly become a strong booster for the bearish US economy at that time [9]. 'Virtual organization' and 'open innovation' became buzzwords for a management system which was assumed to excel when compared to the bureaucratic 'big elephants' of large corporate organizations [3]. It

was in 1996, in its white paper on small businesses, that the Japanese government emphasized the importance of restructuring national production systems [4]. Through the 1980s, keiretsu production networks of large assembly firms and hierarchically organized affiliate companies joined by long term contracts were known for their rigid quality and cost control compared with their American counterparts. Competition amongst affiliate companies on the same hierarchical level was loosely controlled by the parent companies' 'visible hands' but at the same time was modestly counterbalanced by the links between affiliates to a number of keiretsu. This resulted in creative bottom-up problem-solving strategies and scale economies which the affiliates could not have enjoyed if they had relied too much on a single keiretsu. However, faced with the globalization of the economy and the rise of other Asian countries, the Japanese keiretsu systems were adaptive only as long as the value added per employee remained at a high standard; but in sectors which produced relatively standardized commodities, the 'robust but stubborn hierarchical order' gradually lost its competitive meaning. The Japanese government recommended further R&D efforts to satisfy more diversified consumer needs, and also demanded that the keiretsu systems 'must be reformed into more flexible horizontal networks' that were supposedly characteristic of Silicon Valley in the US or the European benchmarks provided by Piore and Sable.

Interestingly, however, many management scholars who emphasize field research point out that a certain hierarchical aspect of specialist networks still remained. Ever since Seki, one of the most influential scholars in this research area in Japan, shed light on prototype producing companies as central players linking local specialist networks with potential customers outside local districts, a great deal of research effort was directed toward structural analyses of how successful industrial agglomerations functioned throughout Japan [10]. Such retrospective explanations pointed out that network-central actors contributed to linking local districts with the outside world and to balancing the creative aspects of flexible networks and scale economies. It seemed that networks would not benefit from seemingly incompatible factors as long as they relied on numerous random small lot contracts between mediocre SMEs.

This paper will now try to sketch such hierarchical aspects from a different perspective. It is assumed that central players must face ambivalent strategic options, one of which is, of course, to be central and the other is to become an expert member of the network. Instead of acquiring many functions within a large corporation which tend to accrue substantial fixed costs, a preferred strategy for many firms involved in global competition is to narrow their activity to the functions which they are best at. But why do they have to be central even though it looks superficially disadvantageous? Through a construction of the business history of a denim textile manufacturer in the Sami district in Japan this paper will try to uncover what sort of decisions central players have taken in order to occupy their present position.

Before going into the details of the case, it seems useful to borrow a framework from existing research and to summarize one hypothetical understanding. About 90 years ago, Knight ascribed profits from economic activities in modern market economies to the 'uncertainties' which entrepreneurs daily faced in their business environment [6]. This was in contrast to the 'risks' which, theoretically, commodity and financial futures markets could completely absorb and could, therefore, never be the source of profits.

Traditional production networks can be understood from the perspective of ‘risk.’ In Japan, specialists were organized within keiretsu networks where parent companies initiated product definitions in order to limit product line varieties and minimize accidental defects, inventory and sales losses and other general expenses. Whether the manufacturers could gain profits or not was simply a matter of ‘risk’ which meant that the volatilities of market demands and keiretsu networks were best suited to function like fraternal insurance communities.

As the global environment changed and parent companies looked for new production venues worldwide, the keiretsu dissolved and the specialists faced ‘uncertainties’ for the first time. Many of the specialist affiliate companies gave up continuing their family businesses and the remainder who had the will to survive were urged to form flexible networks among themselves. This was mainly to replace decreasing orders from the original parent companies with those from newer and more remote customers. This was not a simple task; affiliate companies had to sell their professional skills to potential customers and coordinate amongst themselves to put various ideas into practice. This kind of collaboration and partition of responsibilities and potential profits took substantial time and energy. The reality of the flexible specialization of a district was such that the rationale for doing everything alone, namely a vertical integration strategy in order to avoid coordination costs, became relevant. In this context, Kaihara became known for its vertical integration strategy involving cotton spinning, dyeing, weaving and finishing processes. As a result it continuously developed high quality product prototypes for various types of customers.

CASE: KAIHARA

Since 1965, when the very first denim jeans in Japan were produced in the Sambu district of Okayama and Hiroshima, recurring booms brought wealth into the limited reclaimed lands along the Inland Sea. However, the collapsed bubble economy in 1992 and the devaluation of the Chinese yuan in 1994 had a big impact on local economies throughout Japan. Moreover, in 2000, the First Retailing Company introduced Chinese made low price men’s denim jeans which attracted a substantial number of consumers away from traditional local manufacturers. Since then, relatively large national brand manufacturers at the top of their respective keiretsu networks have shifted their sales to women’s clothing where consumers change their styles seasonally. The competitive environment is very tough; women’s fashion markets are very uncertain in terms of both consumer needs forecasts and demand volatilities. National brands have also shifted their production venues to foreign countries. It is said that roughly 70% of the whole manufacturing process has been transferred to China. In contrast, relatively small sized firms that have lost orders from parent customers have been trying to form more horizontal networks. Some of them started trying to develop new styles for sales promotions outside of their district and the more active firms are trying to establish their own quality brands. Such players are often OEM manufacturers or textile trading companies which receive orders from merchandisers of national brands, downstream apparel conglomerates or specialty chain stores.

There is also less pessimistic data as the Sambu district has experienced a successful restructuring of industrial

organization relative to other districts throughout Japan. Since large national brands shifted their production venues away from this district many affiliate companies have closed down but the added value per business establishment or per employee has improved. One of the reasons for this is the concentration of firms that carry out chemical and physical processing of raw denim jeans, which is called 'damage processing.' Originally, consumers bought raw denim jeans and changed them to their taste by damaging them on purpose, but new processing techniques to add value to such raw jeans were said to be first invented in this district in the 1980s. Piecework fees for damage processing tend to be higher than more traditional processes such as sewing. Firms cannot claim more fees for traditional processes than in the past due to the fact that prices are generally rigid upward and because the 1980s, which was the most prosperous age in Japanese economic history, provided the benchmark for piecework fees. Furthermore, since these processing techniques are now so important in the design of final products, the concentration of expert companies attracts and retains development and planning teams from the final product manufacturers in this district. Overall, although the total number of businesses in the apparel industry in Japan has been decreasing year by year, the number of establishments and annual turnover in Kojima in the Sambu district has shown a slight increase.

Turning our eyes to more upstream denim textile production, the market is composed of three players, two of which, Kurabo Industries and Nisshin Denim, have their origins in the cotton spinning industry and the other, Kaihara, stemmed from the traditional kasuri textile industry. Kurabo originated before World War II in the city of Kurashiki, of which one area is the above mentioned Kojima. Later it shifted its headquarters to Osaka, but the cotton spinning factory for denim fabrics existed in Okayama which is to the north east of Kurashiki until recent years. Nisshin Denim is an affiliate company of Nisshinbo which is also one of the biggest spinning companies in Japan. It began in Tokushima Prefecture in Shikoku which is on the opposite side of the Inland Sea to Kurashiki. Kaihara's location is in Fukuyama in Hiroshima Prefecture, sharing the west border of Okayama Prefecture.

Traditional kasuri textiles are unique in terms of their manufacturing process. Usually, textiles are woven from raw fabric and then designs are dyed on and printed. In contrast, when producing kasuri, the process is the other way around. First, hundreds of threads are bound very tightly with other threads at calculated intervals. Next, these are soaked in indigo dye and squeezed. After repeating this process a few times, the washed and dried threads are untied creating patterns on the original threads since the areas tightly tied are not dyed and remain white. These threads are then set on the weaving machines so that the indigo-white patterns of threads create two dimensional mosaic patterns on the fabric. Denim fabric production methods are similar to kasuri because dyeing comes before weaving.

There is an acute distinction amongst the top three denim jeans companies. Kaihara is known for its vertical integration strategy involving cotton spinning, dyeing, weaving and finishing processes. The other two companies have developed in the opposite direction, which means that they have leaner production facilities and take advantage of affiliate company networks.

Generally speaking, material industries tend to pursue vertical integration strategies and build integrated production systems in order to make the most of scale economies. This is especially true in the case of the

textile industry. Further, in addition to marketers from apparel manufacturers and distribution businesses, most upstream spinning companies demonstrate leadership throughout the product planning and manufacturing process because the quality of spinning has a major impact on how final apparel products look and feel. Denim jeans are typical in this regard since the final look and texture of the jeans after chemical and physical processing depends on the characteristics of the threads such as the blend of cotton fibers, the thickness and intensity of the twist of threads and the degree of dye penetration. Therefore, strategic actions possibly taken by spinning companies can be positioned in a relatively formalized manner as follows. Namely, two extreme cases are possible; one is for the spinning companies to outsource everything but spinning to expert affiliate companies, and the other is to internalize all the processes of the whole value chain continuum as far as final product manufacturing. Realities should exist probably between these two extreme cases.

Capital intensification and aggressive vertical integration do not necessarily signify that the companies concerned play the same roles as played by central actors in the network structures. The discerning point here is the variety in customer bases which the competing spinning companies serve. By definition, the central network players must serve various types of customers but sometimes less welcome customers enter the networks. Some customers are cost sensitive and are not willing to pay premium prices for higher quality, punctual delivery and custom built products. Others have innovative ideas to realize quality final products but their lot-sizes are too small. It is an important point to make as to whether the players accept such less willing customers in their networks or let potential deals with them go.

The textile industry used to be the driving force behind Japanese economic growth after World War II but it soon became the target of trade conflict with the US. It is still believed that in exchange for the Okinawa islands in 1972, the Japanese government forcefully consolidated the domestic industry. The phrase, 'Japan bought ropes by threads' (the Chinese character 縄 (nawa) of Okinawa means a rope) meant that spinning companies with enormous fixed capital, including large production facilities, bureaucratic managerial organizations and complex trade and distribution networks which had been developed since the Meiji era, started on the long process of scaling down and diversifying their founding business in order to improve their capital utilization. The original spinning departments concentrated their efforts on diversified quality products such as thinner and/or blended spinning. They collaborated with apparel manufacturers for new product planning but the actual textile production processes were outsourced to reduce production costs. Nisshin Denim buys cotton yarn from its parent company and sells denim textiles to apparel manufacturers. Kurabo actively utilizes expert networks and has established its own weaving and final production processes outside Japan. In order to be competitive against cheaper imports, these outsourcing policies are unavoidable but the reality is that Kurabo's high quality denim is said to be the most expensive in the world and only established national brand manufacturers can afford it.

Kaihara was established in 1893 and has been a specialized denim producer since the 1970s. Traditional Japanese textiles are narrow in width and sell by tanmono, which is a long rolled-up cloth approximately 40 cm wide. Wide weaving machines enabled this local company, whose markets were seriously shrinking due to the modernization of Japanese society, to use traditional kasuri for western clothes. It also exported colorful kasuri

to Middle East countries for women's clothes. Under the Bretton Woods system, defeated nations in World War II received economic support including fixed currency exchange rates advantageous for exports, which meant that a small local textile manufacturer could earn more than they had lost due to the changing life styles of the Japanese people. However, there were also a number of negative influences from abroad. In 1967, Britain devalued its currency by 14.3% against the US dollar and in 1971 President Nixon announced the end of the American gold standard system with the result that the US dollar was reduced by 16.8% against the Japanese yen. Kaihara's profits instantly decreased since exports to the Middle East were settled in British pounds, and as they also suffered from large inventory losses they turned their eyes to the domestic market again. In the 1960s, US army surplus denim jeans were sold in Tokyo and became a staple of young people's fashion. The first Japanese denim jeans in Kojima were made of grade B fabrics imported from US weaving mills. Kaihara decided to enter these markets.

Kaihara had much more experience of dyeing and weaving compared with other denim fabric producers. Furthermore, they started to pursue the integrated automation of their production facilities. The rope dyeing machines purchased in 1970, the air weaving machines in 1978, the final processing machines in 1980, and the air spinning machines in 1991 created the newest fully automated denim textile production lines in Japan at that time. The company had extremely high productivity and quality control even after the depreciation of the Chinese yuan in 1994 and the impact of the skyrocketing Japanese yen in 1995, which was about 80 yen per US dollar. Both these currency events delayed Japan's recovery from recession during the 1990s and had a destructive impact on local economies.

A dramatic increase in Kaihara's sales came around 2000. This was when First Retailing introduced low price denim jeans with materials supplied by Kaihara. Kaihara's turnover in 2007 was 35 billion yen and its domestic market share was estimated at 50%. Concerning its segment sales ratios, one third was for First Retailing, one third was for domestic sales, and the final third was for exports. Since First Retailing produced denim jeans in Chinese factories, Kaihara was very dependent on foreign exports. It is interesting to note that, according to one national newspaper (Asahi Shinbun, October 3, 2008), Kaihara quality products are not cheap but are comparable with other denim jeans producers. Amongst its quality advantages, especially its quality stability derived from its expertise in dyeing and its integrated production lines, are preferable differentiating features for its customers who have established production facilities in China. These customers tend to have two problems, i. e. labor and quality control. They must make continuous efforts to improve production efficiency and increase yields by employing unskilled, often young, female rural migrants with resulting high job turnover rates. In order to track defective production processes, the input raw materials must be stable in terms of quality at the highest standard.

Tax exemption and the depreciation of production facilities are also important. Generally speaking, annual profits from business activities tend to be spent on capital improvements since average corporate tax is as high as 50%. In order to prompt further investment, especially in the small business sector, the government has various kinds of favorable treatment. For example, in the first year of the depreciation period of a facility, 30%

of the acquisition cost of the facility can be included in expenses as a special depreciation. Further, before the corporation tax law was revised in 2007, the salvage value of a facility must be 5-10% of the acquisition cost, but it is now only 1 yen which means that a capital investment creates a free cash flow of almost the same amount as the investment itself. On the other hand, expenses for assets that cannot be depreciated such as land are not recommended. For example, Kaihara's newest production establishment was built in the center of an inland hilly district which Kaihara developed by itself in order to save on construction costs.

Kaihara has enough production capacity to cope with current orders, although new spinning lines are under construction in order to satisfy unmet in-house demands. Small lot orders are welcome because they can be fitted in between the widely fluctuating large lot orders. Approximately 400 prototypes per year are developed for sales promotions from the infinite combinations of techniques of each production process. Outside of Kaihara, such combinations are initiated by large spinning companies or so-called converters, i. e. textile trading companies, who arrange appropriate teams from their network of experts. Such teams can take advantage of flexible membership but always run the risk of breaking up due to difficulties in delegating responsibility and profit.

Theoretically, small lot orders are from quality apparel manufacturers who pursue differentiation strategies targeting relatively limited market segments. Such segments are fashion conscious and lead market trends, and so are willing to pay for experimental products. On the other hand, volume zone consumers are cost conscious, prefer the functionality of commodities and tend to be slow in adapting fashion trends. The time lag between 'innovative' customers and 'latecomers' can provide Kaihara with a portfolio of the best performing quality prototypes from the previous season which can then be transferred to the volume zone as the largest source of revenue in the next season.

ANALYSIS

As has already been said, flexible specialist networks attracted attention based on the expectation that they would outperform bureaucratic hierarchies. This has been especially true in the case of Japanese keiretsu networks, whose mass production capabilities of standardized products became obsolete when faced with the globalization of the economy and the rise of Asian countries. Industrial organizations were required to restructure themselves with an emphasis on workers' high quality expertise and flexible self-organization, which were allegedly suited to satisfy diversified consumer needs. Nonetheless, empirical research has emphasized certain hierarchical aspects of 'horizontal' networks. In this respect, many functional explanations can be drawn from a retrospective analysis of successful specialist networks but there are still questions to be answered. That is, reasonable decisions must have been made before the central players occupied their present positions and this is what this paper has tried to show.

The purpose of the distinction which Knight made between 'uncertainties' and 'risks' was to explain the existence of profits within a microeconomic theoretical framework. Under hypothetically perfect competition there is no room for the existence of profit; namely, the market price is equal to the cheapest point on the

average production cost curve which the best manufacturers can perform. Because it was premised that nothing prevents competing economic actors from entering into and exiting from markets in which they are interested, the existence of profits attracts market entrants who accelerate price competition until profits become equal to zero. Profits, however, do exist in reality because market competition is not always perfect. One of the reasons for this is the existence of uncertainties which make economic actors hesitant to choose appropriate economic actions that they would otherwise be able to. It is often the case in reality where necessary capital investments are insufficient even when more efficient ways of production are known to exist. Because some conditions are unknown, most economic actors hesitate. Some do, however, take action for personal motives. Such actors are called entrepreneurs. They do take risks but in theory 'risks' can be diversified completely by forming appropriate portfolios of commodity and financial futures options through the markets, and profits are not created as long as the markets are efficient. Therefore, when entrepreneurs receive profits as a sort of risk premium, the risks in usual terms must be differentiated from being 'risky' in strict terms and complete 'uncertainty' under which nobody can, or is not likely to, take action. That is, when things are at 'risk,' some aspects of reality, which take the form of probability distributions of events related to certain aspects of phenomena, are known beforehand. Weather forecasting is a good example. A database of past weather can provide a specific probability of tomorrow's weather as long as meteorological charts are available.

In different terms, when such databases are not available, things are uncertain. The annual sales of a product can be interpreted as a risk because usually firms have sales records. Furthermore, an estimate of probability distribution can be statistically accurate when sales volumes are large and the recording period is long. On the other hand, diversified consumer needs are difficult to estimate. First, the size of a respective market segment is relatively small. Second, as seen in the apparel industry, the lifecycle of a product is very short. Third, the diversification of consumer needs essentially takes root in people's tastes which are difficult to analyze and therefore make it difficult to build meaningful databases. Such less than reliable databases make economic actors feel consumer needs are 'uncertain.'

Traditional production networks can be understood from the perspective of 'risks.' Specialists were organized like keiretsu and parent companies initiated product definitions to limit product line varieties. Traditionally domestic markets absorbed as many products as the manufacturers could produce and the standardization of denim jeans was the best choice in order to minimize accidental defects, inventory and sales losses, and other general expenses. Whether the manufacturers could gain profits or not was simply a matter of 'risks' which meant that the volatilities of market demands were derived from literally unforeseen factors. Keiretsu networks were best suited to function like fraternal insurance communities. In reality, there was no futures market to absorb risks and socially institutionalized mechanisms were developed in order to spread necessary capital investments within local districts, and the sharing of profits, if available, depended on each company's contribution. This mechanism was welcome as Japanese companies tended to suffer from high bankruptcy risks due to their dependence on indirect financing from commercial banks and debts owed to trading companies. What was worse, the debts were often collateralized with a company owner's private property.

The co-existence of keiretsu within a district contributed to minimal varieties of products which assured the survival of the whole district. Usually different keiretsu were not friendly with each other and affiliate experts were not recommended to switch between different keiretsu or to sign contracts with them; but this tension was functional in terms of the variety of survival routes as a whole when market environments experienced relatively big changes.

As the global environment changed and parent companies looked for new production venues overseas, the keiretsu dissolved and the specialists faced 'uncertainties' for the first time. Many specialist affiliate companies gave up continuing their family businesses, and the remainder who had the will to survive were urged to form flexible networks among themselves; mainly in order to replace decreasing orders from their original parent companies with those from new customers who were often very far away from the original district. When specialist networks were required to satisfy diversified market segments, such flexibility looked advantageous on the surface. Coordination and collaboration, however, to put various ideas into practice and to divide responsibilities and available profits required special capabilities.

Even if identical resource pools of expertise are available to two different parties, their success depends on such factors as the speed and cost of combining available resources and finding appropriate markets. Any horizontal relationship demonstrates its power when collaborative efforts bear clear economic fruits. Otherwise the negotiation process amongst experts will become fragile. To avoid such circumstances, players need to go through collaborative experiences and build trust with each other. To circumvent this lengthy experiential learning, especially when market environments are uncertain due to unforeseeable consumer needs and volatile demands, one option is to acquire as many experts as possible and become an integrated organization of large scale. Collaboration becomes obligatory rather than arbitrary and efficiency can increase as long as good middle managers are available to supervise the collaboration processes. Furthermore, this integrative approach can link available combinations of resources with as many market needs as possible and create stable revenue streams. In the case of Kaihara, the time lag between 'innovative' segments and 'latecomer' segments created time series cash flows and experimental prototyping cycles within product portfolios. Needless to say, Kaihara's automated production system saved on paying wages for unskilled workers and succeeded in saving corporate tax.

The argument so far has shown an ex post rationale for becoming central in expert networks, especially under recent conditions of fierce global competition. Whether Kaihara intended to become a central expert or not is unclear, but what it did clearly intend was to establish a robust business model to protect itself against repeated radical devaluations of foreign currency. Traditional kasuri markets had shrunk irreversibly and the company became highly dependent on exports. In order to avoid such foreign exchange risks, it started denim jeans production in the nascent domestic market but export dependency has become high again. The abrupt appreciations of the yen were so harsh that thorough production rationalizations were ceaselessly carried out. Therefore, it seems that adaptability to new market environments such as diversified consumer needs and volatile demands were only an unintended byproduct.

Another byproduct is that Kaihara occupies a central position within denim jeans production networks in the

Sambi district. Traditionally, spinning companies tend to have a strong influence on product planning in the apparel industry and Kaihara is no exception. The point to make here is that Kaihara's reliability and stability in running its business is based on revenue from core customers such as First Retailing and other national brand firms. This reliability and stability is likely to create a field of experiential learning in collaboration with small lot 'innovative' customers, and the knowledge learnt here will become advantageous in negotiations with large clients for the next season. This looks like a beneficial circle of knowledge development but capital investments are not shared within a community as they used to be, although for the time being core customers seem willing to pay premium prices. Although the superior production capabilities which Kaihara has established are the robust basis of the customers' learning community, there may be a secret financial wisdom acting as a true source of competitive advantage which outside observers cannot easily access.

CONCLUSION

This paper describes a case study of denim jeans production in the Sambu district and discusses the relevance of 'flexible specialization' in order to characterize the production capabilities which industrial agglomerations display when faced with unforeseeable consumer needs and volatile demand. In spite of the general belief that flexible specialist networks provide adaptive production capabilities, a vertical integration strategy accompanied by heavy capital intensification could continuously develop high quality products as well as spread risk. This case study of a denim fabric factory shows how specialist companies were forced to form flexible networks to replace decreasing orders from the original parent companies with those from newer and more remote customers. Before the Japanese keiretsu system dissolved parent companies had limited product line varieties and created a hypothetical fraternal insurance community to cope with demand volatility. During the adaptive process after dissolution, a rationale for capital intensification became relevant since facing 'uncertainties' needed voluntary coordination and collaboration amongst network members; a process which accrued substantial costs. Vertical integration was one way to avoid such costs but this seemed to be merely an unintended effect. Kaihara's initial motive was to circumvent foreign exchange risks and in order to do that it had to achieve the highest possible production efficiency. Its capital intensification also functioned as an infrastructure for communal learning by linking different types of customers.

In order to organize the empirical findings so far, Fig. 1 suggests a tentative framework to describe the institutional diversity of industrial districts under high uncertainty. The vertical axis signifies a generic strategy to approach uncertainty. Economic players either reduce uncertainty to the level of 'risk' as explained in Section 2, or face uncertainty as it is by enhancing their production capabilities through communal learning. The horizontal axis stands for a pattern of inter-corporate coordination. There can be two options between hierarchy and horizontal networking. The second and fourth quadrants are ideal types, each of which can fit traditional keiretsu systems and current flexible networks. In order to illuminate the essence of the organizing principles of the two quadrants, they are called a 'communal insurance system' (or I mode system) and a 'communal learning system'

(or L mode system) respectively. The first and third quadrants are hybrids of the two ideal types. While any ideal type is a pure abstraction of a group of phenomena and is composed of its essential elements, their composition and operating principles, it is not assumed that the ideal type has an empirical fit with the phenomena. As Kanai explained, ideal types may fit with extreme cases amongst all potential phenomena [5]. It may be difficult for them to exist in reality because actual economic players are not monolithic enough to fit in to a pure abstraction of the empirical world. Our empirical findings seem to fit with the hybrid modes of the two extreme modes and let us call them ‘I > L mode’ and ‘I < L mode’ respectively, depending on the weights of the two extreme modes. Fig. 2 shows our empirical highlights based on the framework in Fig. 1.

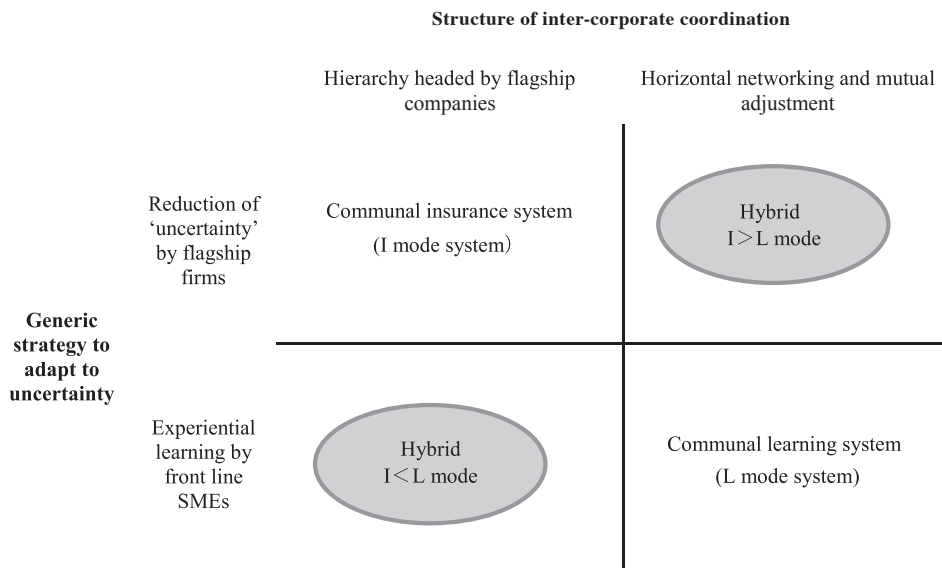


Fig. 1 A tentative framework to describe the institutional variety of the Sambi District

Fig. 2 Details of the hybrid modes of adaptive systems

I > L mode system		I > L mode system
Out-of-the-district flagship apparel companies reduce ‘uncertainty’ of denim jeans production.	Basic organizing principle	Scale merits are pursued by upstream core companies. Backup is provided to down-stream small manufacturers.
Recent ICT applications for efficient SCMs to collect market information.	Production management techniques	Vertical integration with heavy capital intensifications.
Compared to pure I mode, newer version of traditional keiretsu system. Easy to implement.	Advantages to individual companies	Compared to pure L mode, creative prototyping by front line young apparel manufacturers without financial backing (who are often new entrants) is active.
Due to the lack of flagship companies within districts affiliate companies are required to have more discretion.	Advantages to the district	Core companies can form portfolios of different market segments. SMEs can share prototyping capabilities.
The destiny of the district can be taken over by out-of-the-district flagship companies.	Shortcomings	Enormous financial risks and long term commitments required.

In more general terms, it is suggested that the advancement of technology can be promoted or impeded by social settings which are influenced by the advancement. The case study in this paper has tried so far to analyze this interactive cycle within an industrial district where production techniques are affected by a shift of consumer orientation from function to quality and the improved production capabilities based on adaptive organizations have accelerated the market fragmentation of apparel products. It has also attempted to explain the exogenous pressures on districts from various factors including the globalizing economy, volatile foreign exchange markets and rising economies in Asia. This cycle has been named 'co-evolution' and has attracted a certain amount of research which can be traced back as far as Abernathy and Clark and Abernathy and Utterback [1, 2]. These researchers compiled a research agenda for those interested in R&D management and technical innovation with an emphasis on the cyclic advancement of technology and industry. For example, Abernathy and Clark predicted that a mature industry achieves technical versatility to serve various customers at reasonable cost. This is because technical and market knowledge is abundantly and cheaply available through interactive learning across both supply and demand sides, and production facilities at the highest level of efficiency attain flexibility and are fully depreciated.

This paper supports Abernathy and Clark's predictions. However, it is argued that although the existing literature has tried to describe a co-evolutionary process it has failed to build a sensible theory concerning the process. This paper views a theory as a tool to manage natural and social phenomena through purposive explanation, prediction and control. One of the reasons why only description is available is presumably due to the concept of evolution. In the field of biology, when a creature evolves random mutation is the source of nascent properties of the creature. Because it is random outside observers assume there is no voluntary aspect in the mutation process. Such observations, therefore, can only describe arbitrary happenings, or at best, grasp the probability of mutation occurring. This idea may be relevant in the field of biology but is not so in social science because human beings can act voluntarily. Most human actions in our discussion are also intentional since business is a purposive activity for the sake of economic gains. Even accidents are deemed to be intentional in that the actors involved originally had different intentions from the consequences of the actions taken. The complication can be settled by introducing into the argument the distinction between *ex ante* and *ex post* analyses of actors' motives for actions. The following will serve as an example. Kaihara established integrated production facilities with an expectation that they would contribute to robustness against exchange rate fluctuation rather than technical versatility of the production system. It is also probable that capital intensification may be a direct consequence of tax saving motives. These original intentions seem to have only the slightest connection with the cyclic advancement of product differentiation and a superior production system with a view to higher economic performance. In effect, however, the actions taken did contribute to them.

Once the cyclic mechanism between technical and institutional advancements is acknowledged, the cycle can become an object of purposive management. As far as performance targets can be set, any deviance from the targets based on either intended or unintended consequences of actions taken can be corrected by reflective corrective actions. Apart from the description of *ex ante* motives of actions taken, feedback from *ex post*

analyses on what has been done so far contributes to restrain performance fluctuation. To determine empirically whether Kaihara tried such purposive controls in the learning cycle or not is one thing but discussing the potential of such controllability in general terms may be of greater importance. Further, the ex post analyses of the cycle may provide an interesting hypothesis worthy of empirical testing. Namely, capital intensification in comparison with other available strategic options may provide a deep and wide learning basis for better performance through better services for segmented customers. Metaphysical arguments concerning communal learning have been attracting the attention of many researchers these days [11]. This paper may provide a working hypothesis in order to put empirical flesh on the theoretical bones with a view to middle range theory construction.

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DISCUSSION QUESTIONS

For instructional purposes such as class room discussions it may be useful here to provide a few questions. Students may reach a deeper understanding of the case and prepare an analysis of their own.

- (1) Recent theoretical advancement suggests that recent major technological breakthroughs should be called 'open innovations.' The term presumes flexible and fluid social bases of R&D activities in place of in-house R&D institutions within large corporations which used to be a major driving force of technical advancements. Carry out research on the term and explain the context where such social movements became prevalent by replacing traditional ways of thought about how R&D activities should be organized.
- (2) Kaihara is NOT a good example of 'open innovation' because it vertically integrates a wide range of production processes within their fully automated factory. As has already been explained, such an option can contribute to the competitive advantage of the firm in a certain way but it also requires heavy capital intensification which often increases 'sunk costs' and decreases strategic flexibility in many ways. Imagine that you are a middle manager of a company which can enjoy the fruit of capital intensification of the same sort but senior management are worried about potential financial failure on a devastating scale. How can you convince the worried senior management that they should move toward open innovation? Identify the nature of the industry you are in and provide a rationale for the strategy.

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