Dynamic Process of Cluster Formation and the Role of Traders: A Case Study of a Garment Town in China

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In China industrial clusters consisting of small and medium enterprises have been proliferating in areas where private sectors have successfully developed. This study inquires into the process of forming a new industrial cluster in the garment industry in China. We found that the local marketplace, where enterprise managers can easily purchase materials from and sell products to local traders, plays a critical role in stimulating the entry of new enterprises in the early stage of cluster development. As a cluster develops, however, entrepreneurial ability in producing improved products and marketing them to urban traders plays a more significant role.

I. INTRODUCTION

It has been increasingly recognized that industrial clusters play a significant role in industrial development, not only by economists interested in the economic geography of industrialization but also by development economists [Henderson, 1988; Krugman, 1991; Hayami, 1998; World Bank, 2000]. Industrial clusters in developing countries tend to be formed by small- and medium-sized enterprises (SMEs) [Schmitz, 1995a; Schmitz and Nadvi, 1999]. Humphrey and Schmitz [1996, p. 1859] argue that SMEs "become one of the main targets of policies aimed at creating growth and employment in developing countries."

What are the major factors affecting the competitiveness of industrial clusters consisting of SMEs? According to Marshall [1920], industrial clusters have three major advantages: (1) information spillovers among enterprises; (2) the division and specialization of labor among enterprises; and (3) the formation of skilled labor markets. Thus, enterprises located in the industrial cluster can easily imitate new technology developed by other enterprises, purchase (or sell) parts and intermediate products from (or to) other enterprises, and hire workers with required skills. We expect that the relative importance of these three advantages will change in the process of cluster development. For example, information spillovers will be particularly important when

new technologies are actively developed in the early stage of cluster development, whereas access to skilled labor will become important in the later stage of cluster development when high-quality products are produced. Yet, the existing econometric studies on the geography of industrialization generally analyze the role of industrial clusters or agglomeration in employment growth for a given time period using cross-sectional data [Glaeser et al., 1992; Henderson et al., 1992]. In order to obtain a proper understanding of the role of industrial clusters, the dynamic process of cluster formation and subsequent development must be explored in depth.

It is interesting to observe that industrial clusters have rapidly been formed in various places in the Zhejiang province of China, where private enterprises have mushroomed in the last two decades [Zhang, 1999; Tang and Cheng, 2000].[1] Such a phenomenon provides rare opportunities for economists to trace the process of the development of industrial clusters and to identify the factors affecting the advantages of industrial clusters. Yet, to our knowledge, no rigorous empirical study on the development of industrial clusters in China has been attempted.

This study reports the results of our own case study of small, privately owned garment enterprises in Jili town in the Zhejiang province of China, which is located 140 km southwest of Shanghai.[2] Major products used to be low-quality garment products

for children, which are relatively simple and homogeneous. In the early stage of cluster development, the marketplace was established by the township government, where producers purchased standard parts from and sold their simple products to local traders. At this stage of cluster development, price competition among enterprises was intense. In the 1990s, however, leading enterprises began to upgrade the quality of their products and, hence, the quality competition intensified. This quality improvement partly represents a response to the increased demand for high-quality garment products in the domestic markets of China associated with the rapidly rising income levels.

An important question is how the industrial cluster achieved the quality improvement. It is found in the cluster literature that vertical cooperation through the specialization and division of labor among enterprises is strengthened when the quality of products, as well as speed and flexibility of production, is improved [e.g., Schmitz 2000]. In the case of Jili, such vertical inter-enterprise cooperation has developed only gradually between garment enterprises and embroiderers as well as supportive service industries, such as printing, machinery repairing, packing, and shipping. More importantly, close cooperation between local manufacturing enterprises and urban traders has developed. According to Humphrey and Schmitz [1996], the establishment

of marketing channels capable of responding to changes in the outside market is important in the cluster development. Knorringa [1999] points out that outside traders are the prime source of demand information for producers in the cluster. Furthermore, the role of global buyers in the upgrading of manufacturers in the cluster is hotly debated in the recent literature on industrial cluster [Schmitz and Knorringa, 2000; Humphrey and Schmitz, 2000]. Thus, it will be of utmost interest to explore how the structure of the garment cluster in China interacted with the emergence of marketing opportunities brought about by outside traders. A major new finding of this study is that local entrepreneurs, who had previously been local traders or engaged in marketing activities, have superior abilities to produce and sell higher-quality products directly to urban traders. This finding suggests that industrial clusters that have internal capacity to respond to outside market opportunities tend to grow well.

The major purpose of this study is to trace the process of the formation of an industrial cluster with special focus on the role of traders, using the survey data of 98 garment enterprises in Jili. The organization of this article is as follows. Section II specifies empirically testable hypotheses, while Section III describes changing characteristics of our sample enterprises. Section IV estimates regression functions explaining the performance of enterprises in terms of the proportion of direct marketing

to outside traders, the quality of the product, and value added per worker. Finally, we summarize our major findings and implications for future studies in Section V.

II. TESTABLE HYPOTHESES

Jili was a poor rural town endowed with meager arable land. The name of the town literally means "weaving village," as Huzhou city to which this village belongs produced woven silk products in the distant past [Ji, 1998]. In the 1970s, local traders of Jili traveled throughout China to sell simple hand-made products, such as pillowcases and bedspreads, produced by female members of farm households. It is these traders who introduced the new business of producing children's clothes to Jili around 1980. In the early 1980s, many people in the locality began producing new products, and the town became famous, first in the large market in Beijing in the early 1990s and later in other urban markets as well, for the production of children's clothing with embroidery. To use the term of Ranis and Stewart [1993], "Z-goods" were replaced by "modern Z-goods." According to the local government office of Jili township, there are about 5,000 garment enterprises exclusively producing garments for children in this town as of 1999.

How to procure required materials and sell products is always a major problem

for a new industrial cluster formed in rural areas. Jili is no exception; moreover, given the suppressed marketing sectors under the socialist system, marketing was a critical bottleneck for the development of the garment industry in this town. A major innovation to overcome this constraint was the establishment of a marketplace for garment products and materials in 1983 by the township government, which replaced roadside vending. In the marketplace, manufacturers could easily purchase all the necessary materials, including cloth, thread, buttons, and zippers, and sell their finished products on commission to local traders, who, in turn, sold those products to traders coming from other regions. It is important to emphasize that anonymous transactions through marketplaces are efficient when standard and homogeneous products are produced using standard materials. The number of marketplaces increased over time and reached eight in 2000, when our survey was conducted. Local traders also went to other areas to sell garment products, but they were successful primarily in poor rural areas as they did not possess relevant market information in more affluent urban areas.

There is no question that the establishment of the marketplace by the local government facilitated the emergence and subsequent development of the garment cluster. This is interesting, because in the case of European clusters, the emergence of the industrial districts did not result from a consciously pursued local or regional

industrial strategy [Humphrey and Schmitz, 1996]. In our view, the government decision in Jili intended to foster the cluster development, as many specialized marketplaces had already been established in a large number of burgeoning clusters in Zhejiang province, where small private enterprises prospered. It seems to us that the importance of the marketplace in facilitating the development of clusters was common knowledge in this province in the early 1980s.

Since the establishment of marketplaces significantly reduced the entry barrier to this industry, even inexperienced people in the garment business, including farmers, could enter the industry and, hence, garment production was diffused from the center of the town to its suburbs. The low barriers to entry, however, led to "excessive" entry, which eroded the profitability of producing standard products. This seems to have induced garment enterprises to improve the quality of their products. As the theory of contracts implies, the upgrading of product quality would have an impact on the mode of transaction [Klein and Leffler, 1981].

According to our informal interviews, the upgrading of the products tends to be faster at garment enterprises where managers have production experience, including the experience of producing low-quality products, and intense interactions with other enterprise managers. With product quality being upgraded, anonymous market

transactions are no longer efficient, because visual inspection alone cannot be relied upon to check the quality of sophisticated products. Instead, face-to-face and long-term direct transactions between local manufacturers and traders coming from urban areas have developed, which aim to guarantee the on-time delivery of products free from defects. As in other industrial clusters, the extended trust was created between the local enterprise managers and the urban traders [Humphrey and Schmitz, 1998]. Those enterprises producing higher-quality products generally operate not only factories but also wholesale garment shops facing main streets in the center of the town.[3] Thus, we postulate the following hypothesis:

Hypothesis 1: *The importance of transactions through local traders and marketplaces declines, while that of direct transactions with outside traders increases over time, as the product quality improves*.

It is interesting to ask what the role of the industrial cluster is in the transition from anonymous market transactions to direct transactions with outside traders. In this transition process, garment enterprises producing higher-quality products actively sought outside traders, who are primarily urban wholesalers coming from large cities, such as Shanghai and Beijing. Urban traders also looked for local garment enterprises that can produce high-quality products. These urban traders bring information about

urban demand to the locality, but as in the case of global buyers, they do not seem to contribute to the upgrading of the design and marketing capacity in the cluster [Schmitz and Knorringa, 2000; Humphrey and Schmitz, 2000]. In our observation, an important role of industrial clusters is to make scarce information on urban markets available to a large number of enterprises in the cluster. Search costs would be especially low in the central location where enterprise managers and outside traders can easily meet. Therefore, it seems reasonable to postulate the following hypothesis:

Hypothesis 2: *The locational advantage of the central location is pronounced in the quality-upgrading stage of development, when the direct transaction with outside traders assumes greater importance.*

Schumpeter [1912] argues that a manager who commences a new business, introduces new products and production methods, and develops new markets plays the role of an entrepreneur, who earns sizeable profits in the beginning and who is subsequently followed by imitators. While it is unclear exactly who initiated the new garment business and earned the Schumpeterian profit in the early stage of cluster development in Jili, it is clear that the establishment of marketplaces enabled inexperienced people to become followers by facilitating transactions of materials and finished products. In the qualitative-upgrading stage, where direct transactions with

outside traders became important, both technical and marketing expertise seem to have become critically important.[4] In fact, the transition into this stage entailed another wave of innovations, and as such the reward for the useful expertise must be considered as entrepreneurial profits in the sense of Schumpeter. Thus, the following hypothesis is worth testing:

Hypothesis 3: *Those entrepreneurs who are adept at factory production and marketing are more successful than other entrepreneurs in the quality-upgrading stage.*

III. CHARACTERIZATION OF SAMPLE ENTERPRISES

We conducted a random survey of 120 enterprises in the greater Jili area in the summer of 2000. In accordance with the actual geographical distribution of garment enterprises in the area, 60% of the sample enterprises were selected randomly from the township of Jili and the rest from four nearby villages, which were also selected randomly. After the survey, we eliminated 18 enterprises because their production and cost data were either incomplete or highly suspicious, and another four enterprises because they had operated for less than one year at the time of our survey. Thus, the sample actually used in the analysis consists of 98 enterprises.

In order to identify the changing characteristics of the garment cluster in Jili, we

collected recall data on changes in (1) the relative importance of different marketing channels, (2) the quality indicators of products, such as product price, by marketing channel, and (3) enterprise performance by location of enterprises and the previous occupation of enterprise managers in the 1990s. Since such statistical data are seldom provided by cluster studies, their careful examination is expected to shed new light on the development of industrial clusters.

General Characteristics

As is clearly shown in Table 1, the number of enterprises increased over time, as many of our sample enterprises entered the industry in the 1990s. It is also clear that the average size of enterprises, in terms of the quantity of production and the number of workers, gradually increased during the same period. However, it remained relatively small even in 1999; on the average, only 17 workers were employed per enterprise in this year.[5] This indicates that there are no significant scale economies in the garment production in Jili. Indeed, each worker produces products individually using relatively simple sewing machines without any division and specialization of labor among workers within an enterprise, with the possible exceptions of finishing processes using specialized sewing machines and the embroidery process for which the service of

specialized manufacturers using high-tech machines is available.

Both nominal product price and nominal value added per piece of product increased slightly from 1990 to 1995 and then declined to 1999. The price index of garment products in China as a whole increased by 8.5% from 1990 to 1995 but declined by 15% from 1995 to 1999 [State Statistical Bureau, 2000]. The prices of Jili products rose slightly relative to the national average in this decade. This is likely due to the successful shift from the production of lower quality products to higher quality products that Jili enterprises achieved during this period.

Low quality products were primarily shipped to poor rural areas in China and Russia through local traders and traders coming from northern regions, such as Xingjang. According to our interviews with local traders, the size of the market for such low-quality products was limited. Even in markets for higher quality products, competition among enterprises in Jili and elsewhere increased over time. Consequently, average value added per enterprise increased only slightly from 1995 to 1999. On the other hand, wage earnings per hour under piece rate contracts increased steadily, resulting in continued increases in the factor share of labor in value added. We gathered information from a large number of producers through interviews that they have been losing profits due to increased competition. Of the 120 enterprises that we

interviewed, 16 enterprises suffered from deficits in 1999, whereas no enterprises and a small number of enterprises reported deficits in 1990 and 1995, respectively.[6]

Marketing Channels

Table 2 exhibits the proportions of products sold through local marketplaces, direct transactions with outside traders, and local traders and others. It is clear from this table that the proportion of direct transactions rapidly increased at the sacrifice of marketing through local traders as well as local marketplaces.[7] Some local traders became managers or were employed as marketing specialists in successful garment enterprises. These changes are consistent with Hypothesis 1.

In order to identify the differences in the quality of products transacted through different marketing channels, it is instructive to compare product prices, material cost or value added per piece of product by marketing channel. It was, however, difficult to obtain such data from enterprises using multiple marketing channels. Table 3 shows the average producer price of products, material cost and value added per piece, by major marketing channel, using the data of enterprises exclusively using only one marketing channel.[8] It is clear that the average price, material cost and value added per piece of the products transacted at the local marketplace have been consistently and

significantly lower than those directly transacted with outside traders.[9] These findings imply that the lower-quality products were transacted at local marketplaces, which provides added support to Hypothesis 1. Similar findings are reported by Knorringa's [1999] study of the shoe cluster in India.

Another important finding is that the average price at local marketplaces declined more sharply from 1995 to 1999, indicating that more intense competition among producers selling products at marketplaces has taken place. This is expected, since the entry to the lower-quality segment of this industry must have been relatively easy.

Increasing Locational Advantage of the Central Location

The marketplace was originally built near the center of the township, but as the volume of transactions in the marketplace increased rapidly, new buildings of marketplaces were constructed one after another, shifting the center of transactions toward the south. The sample enterprises in the township and two neighboring villages are, on average, 3.7 km and 1.6 km away from the current center of the marketplace, respectively. On the other hand, sample enterprises in the two northern remote villages are, on average, as far as 11.5 km away. Table 4 compares the performances of 28 enterprises in the northern villages with those of the other sample

enterprises in the town and its neighboring villages. This urban vs. rural location issue has not been covered in the existing literature.

Several interesting observations can be made. First, the share of direct transactions with outside traders was far higher for enterprises located near the marketplace than for those in the remote villages, and the difference increased rapidly over time. Second, consistent with the first finding, both material cost and value added per piece were significantly higher for enterprises located near the marketplace, which confirms the hypothesis that products transacted directly with outside traders are of higher quality. These findings clearly indicate that the central locations have advantages in transactions of high quality products with urban traders. Third, enterprises located near the marketplace were much larger in terms of the number of employees. The proportion of migrant workers, who were primarily young female workers coming from poor rural areas, was also higher in the center, which is consistent with Marshall's argument of locational advantages. The remote villages, however, caught up with the center rapidly in the employment of migrants, especially in the early 1990s. This is likely to reflect the development of an integrated labor market, which reduces the disadvantage of peripheral areas. Nonetheless, other findings indicate that the overall disadvantages in peripheral areas increased. Fourth, judging from the

average hourly earnings, the quality of workers seems higher in the center. Fifth, capital-labor ratio was also higher in the center in 1999, reflecting, at least partly, the higher hourly wage earnings of workers in the center. Note that in our analysis, capital stock is measured by the replacement value of equipment such as sewing machines, cutters, and electric irons. The replacement value was obtained by ascertaining the secondhand price of each item of equipment from the enterprise manager. For fear of serious recall errors, we attempted to obtain capital data only for the latest year of 1999, but not for 1990 and 1995.[10] Finally, consistent with the higher capital-labor ratio in the township and the neighboring villages, average labor productivity was also higher there. These observations are consistent with Hypothesis 2 on the advantage of a central location.

Changing Characteristics of Entrepreneurs

In order to examine broadly the validity of Hypothesis 3 about the changing characteristics of enterprise managers, Table 5 shows the timing of new entry to the garment industry by previous occupation of enterprise managers, and their changing levels of schooling and technical expertise. In the existing literature on industrial clusters, the possible importance of managers' previous occupations is not examined.

It is found that the major former occupation of founders of enterprises in the 1980s was farming. Their relative importance, however, declined over time, suggesting that prior knowledge on garment production and marketing was not required in the entry to the garment business in the early stage of cluster development. The share of former factory workers, the majority of whom were spin-offs from the local garment factories, increased in the early 1990s, but then declined in the late 1990s. Consistently increasing was the share of former garment traders and marketing specialists employed by garment enterprises. These new entrepreneurs tend to be more educated and had acquired sewing skills before starting their businesses more frequently than the earlier entrepreneurs, as is suggested by the increasing average schooling and share of new entrants with sewing and related skills. In fact, the ex-farmers had on average only 6.6 years of schooling and almost none of them had sewing skills or working experience in sewing factories. Thus, the observations from Table 5 are consistent with Hypothesis 3 that the importance of knowledge on production and marketing increased over time as the quality competition intensified.

Table 6 compares changes in the performance of the garment enterprises by former occupation of managers. Former marketing specialists performed best, selling most of their products directly to outside traders, producing products with higher value

added, employing a larger and increasing number of employees, adopting the most capital-intensive production methods, and achieving the highest labor productivity. It is also noteworthy that despite the adoption of relatively labor-intensive production method indicated by low capital-labor ratio, managers who used to be factory workers achieved relatively high labor productivity, which suggests that their technical expertise facilitated more efficient factory operations than other managers. Since most workers specialize in sewing at all factories in Jili and receive on-the-job training from managers or senior engineers, such a productivity gain can be attributed to the effect of such training.[11]

IV. REGRESSION ANALYSES

In this section, we conduct regression analyses to test our empirical hypotheses rigorously. Taking into account the fact that garments produced by the sample enterprises range from low- to high-quality products, we consider the following value-added production function:

$$V = (p - m)q = vA\, f(K, L, \theta), \tag{1}$$

where V is value added; v is average value added per piece of product expressed by product price (p) minus unit material cost (m); and q is the number of manufactured

garment products, which depends not only on capital (K) and labor (L) inputs but also on the production efficiency (A) and the simplicity of the production (θ).[12] We assume that q depends on θ, because the simpler the product and production processes are, the larger the number of clothes that can be produced. As a proxy for θ, we use the inverse of material cost per piece ($1/m$) since a more complicated product tends to require a larger amount of higher-quality materials. From the descriptive tables examined in the previous section, it seems innocuous to assume that the production technology exhibits constant returns to scale. If the value-added function shown in equation (1) can be approximated by the Cobb-Douglas form, we may rewrite it as

$$\ln(V/L) = \ln(v) + \ln(A) + \alpha_1 \ln(m) + \alpha_2 \ln(K/L), \qquad (2)$$

where the coefficient of $\ln(v)$ is unity, α_1 is expected to be negative, and α_2 corresponds to the production elasticity with respect to capital. Note that v and m are endogenous variables and, hence, we apply the two-stage estimation technique. Since the coefficient of $\ln(v)$ is expected to be unity, we also estimated the production function, f, after eliminating the $\ln(v)$ term. It must also be noticed that v and m are expected to be determined simultaneously, so that the same reduced-form equations are applied to the first-stage estimation of v and m determination functions.

According to Hypothesis 1, high-quality products, which are characterized by

higher values of *v* and *m*, tend to be sold directly to outside traders more often than lower-quality products. Thus, in order to test the validity of Hypothesis 1, we apply the same reduced-form equations to the estimation of the determinants of the proportion of direct transactions, *v*, and *m*. We expect that if Hypothesis 1 is valid, factors affecting the proportion of direct transactions tend to be the same as those affecting *v* and *m*, particularly in 1999.

Relevant exogenous variables to be considered are classified into three categories: the characteristics of enterprises, enterprise managers, and workers. To represent the location of enterprises, we use two dummy variables (representing remote and neighboring villages) and the road distance between the enterprise and the center of the local marketplaces (*distance*). Although the village dummies may capture most of the effect of location, *distance* will represent the effect of within-township and within-village variations of distance.[13] We expect that the shorter the distance is, the higher the proportion of direct transactions, material cost per piece, and value added per piece will be.

As was suggested in the previous sections, the major characteristics of enterprise managers may be captured by previous occupation, *years of schooling*, and *skill dummy* that is equal to 1 if the enterprise manager has sewing and related skills, and 0 otherwise.

To examine the effects of previous occupation, we use dummy variables for a former *farmer*, *factory worker*, and *marketing specialist*, setting the group of other specialists and managers as default. We expect that the effects of *marketing specialist dummy* and *skill dummy* are strengthened over time as the importance of product quality increases.

Finally, the characteristics of labor force may be captured by *average years of schooling of workers* and *invited technician dummy* which equals 1 if the enterprise invited one or more technicians in the initial year of operation and 0 otherwise. These variables are expected to have positive effects on *v*, *m*, and the incidence of direct transactions.

Let X_i denote the vector of the variables representing these characteristics of enterprise i. We regress the three dependent variables on X_i for 1995 and 1999 separately, because the coefficients are expected to change over time.[14] We employed the two-limit tobit model for the direct transaction ratio since its data are censored at 0 and 1. The results are reported in Table 7.

Judging from the estimated coefficients of village dummies in the first two columns, the advantage of the central location in directly transacting with outside traders increased from 1995 to 1999, which supports Hypothesis 2. Somewhat unexpectedly, however, distance is generally insignificant, which may be taken to imply

that within township and village variations in distance are not critically important in determining locational advantages. The effect of *years of schooling* of manager on the direct transaction ratio is positive and significant in both 1995 and 1999, which suggests that general human capital is important in marketing. This is reasonable in view of the fact that marketing is a knowledge intensive activity requiring the abilities to collect and decode changing market information. Although unreported here, schooling of managers is not significant in the estimation of the production function when ln(v) is included as an explanatory variable, which suggests that schooling does not affect internal organizational efficiency nor the efficiency of cooperation with other enterprises. From these columns, it is also clear that the coefficient of *years of operation* decreased over time, whereas the opposite is the case for *marketing specialist* and *skill dummies.* These findings indicate the increasing importance of marketing and technical expertise in recent years, which is consistent with Hypothesis 3, so far as direct marketing to outside traders leads to higher profits. The finding that the former marketing specialists performed better is consistent with the common finding in the cluster literature that marketing or cooperation in forward ties becomes important in the upgrading stage of cluster development [Knorringa, 1999; Nadvi, 1999; Rabellotti, 1999; Schmitz, 1999].

Qualitatively, the estimation results of the direct transaction ratio functions are not so different from those of material cost and value added functions: *remote village dummy* has negative coefficients and they are more significant in 1999 than in 1995; *marketing specialist dummy* has positive coefficients in both material cost and value added regressions in 1999, and one of them is significant; and *skill dummy* has positive and significant coefficients in both functions in 1999. Also noteworthy is the positive and significant coefficient of *average schooling years of employees*, which suggests the increasing importance of the employment of educated labor. These findings amply support Hypothesis 1 that the quality of products and the incidence of direct marketing are positively correlated.

In order to test Hypothesis 3 directly, let us now turn to the examination of the effects on total value added of *m*, *v*, *K*/*L*, and the observable characteristics of the enterprise and its manager that may affect the unobservable production efficiency, *A*.[15] The endogenous variables (i.e., *v*, *m*, and *K*/*L*) are instrumented with X_i as well as the current value of initial investment.[16] Table 8 reports the results of the two-stage least square estimation of equation (2).[17] In the first column, *v* and *m* are omitted and, hence, the coefficients of *years of operation* and *former occupation dummies* represent their indirect effects through their effects on *v*, *A*, and *m*. The estimate of the

production elasticity with respect to capital is greater than but not significantly different from the average capital share of income, which is estimated at 0.47.[18] It should be noted that *factory worker dummy* and *marketing specialist dummy* have positive and significant effects on productivity, which is consistent with Hypothesis 3. It is also noteworthy that the variable *years of operation* has a positive and significant effect.

In the second column, the coefficients of the predicted values of ln(*v*) and ln(*m*) are found to have the expected positive and negative signs, respectively. In equation (2), while ln(*v*) is supposed to have a unitary coefficient, its estimate is smaller than but not significantly different from 1. The coefficients of *years of operation* and *factory worker dummy* continue to be positive and significant, whereas that of *marketing specialist dummy* is no longer significant. Recall that the coefficient of *factory worker dummy* was significant but smaller than that of *marketing specialist dummy* in the last column in Table 7. In light of these results, we conjecture that experience as a marketing specialist contributes to total value added through enhancing the quality of products reflected in *v*, while experience as a factory worker and ongoing experience as an operator contribute to total value added mostly through enhancing the production efficiency reflected in *A*. The former interpretation suggests that higher marketing knowledge of enterprise managers leads to stronger and more successful cooperation

with urban traders demanding high-quality products.

Thus, Table 8 supports Hypothesis 3 that those entrepreneurs experienced in factory production and marketing are more successful. Finally, it must be pointed out that there are no significant effects of location variables on production efficiency. This result, together with those shown in Table 7, suggests that the locational advantage of the central location is realized only through relatively high value added and material costs per piece of products produced there, which are, in turn, closely related to the relatively high proportions of direct transactions with outside traders. This is an expected result since high-valued products are sold through direct transactions between enterprise managers and outside traders, who usually meet at garment shops located in the center of the town and are run by the managers.

V. CONCLUDING REMARKS

A unique feature of this study was the use of retrospective statistical data on the characteristics of enterprise managers and the performance of their enterprises, which enabled us to trace the process of the formation of a garment cluster and its subsequent development in Jili. We found that the establishment of a marketplace by the township government was particularly important in stimulating the entry of new enterprises in the

early stage of development, when the major products were simple and standard. The entrepreneurs in this stage were largely inexperienced in garment production and relatively uneducated. In all likelihood, the barriers to entry to the garment industry were low owing to the establishment of the marketplace, where entrepreneurs purchased materials and sold their products. As the quality of products improved, however, the role of the marketplace declined and the role of entrepreneurial ability increased. Indeed, successful entrepreneurs in this quality-improvement stage, where the production and marketing of differentiated, higher-quality products became the key to the success in enterprise management, are more educated and experienced than entrepreneurs in the earlier stage. In short, our study strongly indicates the need to focus on the changing nature of interactions among the roles of the marketplace, the product quality, and the entrepreneurship, in order to gain proper insights into the process of industrial development.

Our study has three important implications for the future study of industrial clusters. First, the role of the marketplace, which has seldom been analyzed quantitatively as well as systematically, will have to be taken into account.[19] Second, due attention should be paid to the changing importance of locations in the process of cluster development, i.e., the increasing importance of the center of the industrial town

in the product-quality improvement stage, which would strengthen the tendency for clustering. Third, entrepreneurial ability in marketing in the development process of industrial clusters needs to be focused on, in order to understand interactions between the structure of clusters and the marketing channels with urban and other outside markets.

Needless to say, it is hazardous to draw strong conclusions from a single case study. However, our parallel, ongoing studies on the development of private enterprises in Wenzhou City in Zhejiang province and the garment industry in postwar Japan provide consistent findings. It will be a major challenge for economists interested in the role of industrial clusters to examine the similarities and dissimilarities in the characteristics of industrial clusters across different industries in different countries through additional case studies.

NOTES

1. In China the private manufacturing sector has grown more rapidly than the collective township-village enterprise sector particularly in the 1990s, not to mention the state sector. According to a recent study by Liu [2000] using the 1995 industrial census, for example, the production efficiency of private enterprises was much higher than state-owned enterprises and enterprises owned collectively by township and village governments.

2. We agree with Schmitz [1995b, p. 530] that "the relevance of clustering is brought into focus most sharply by case studies …."

3. This is called "*qian dian hou an*" in Chinese, meaning "shop in front and housing and factory in the back."

4. There are a number of empirical studies reporting the positive relationship between the quality improvement and the establishment of inter-enterprise long-term transactions [Rabellotti, 1995, 1999; Schmitz 1995b, 1999; Tewari, 1999].

5. Collective rural enterprises run by the township and village governments are generally much larger. According to Murakami, Liu, and Otsuka [1994], collective garment enterprises employing more than 500 workers were not uncommon.

6. Profit is defined as the value of output minus paid-out costs of current inputs and

wage payment to hired workers.

7. In contrast to the private market channels used by small private enterprises, collective rural enterprises relied heavily on state enterprises for marketing, at least until the early 1990s [Otsuka, Liu, and Murakami, 1998, chapter 6].

8. Value added is defined as the value of production minus material costs, energy and water costs, and fees paid to local traders when marketing is contracted out to them.

9. In our observation, transactions with outside traders are executed primarily in the center of Jili town.

10. In this study, capital input is defined as capital stock times the number of working days in the year, whereas labor input is the product of the number of employees and the number of working days. Therefore, capital-labor ratio is equal to the ratio of the value of capital stock to the number of employees.

11. Thus, the case of Jili seems quite different from the case of the automobile factory in Mexico reported by Shaiken [1994], where high productivity is achieved despite non-specialization of workers in particular tasks who received off-the-job training.

12. We did not include material inputs in the production function *f*, because it can be assumed that the quantity of material inputs is proportional to the quantity of output.

13. *Distance* ranges from 1km to 6km in the township, 1km to 2km in the neighboring

villages, and 7km to 16km in the remote villages.

14. Since there are only 27 enterprises in the sample for 1990, we used the data only in 1995 and 1999 for the regression analysis.

15. Note that as is properly emphasized by Schmitz [1995], it is not possible to identify the collective efficiency of the industrial cluster arising from local external economies and joint actions from individual enterprise data.

16. We used the initial investment as a predetermined variable, as it has a significant effect on capital-labor ratio. To obtain real values in the 1999 yuan, we deflated initial investment values by the producer price index of the machinery industry estimated by Liu [2000]. However, the initial investment has no significant effects on *m* and *v*.

17. We deleted location dummies in the first three equations for the purpose of identification.

18. This is obtained by subtracting the average factor share of labor shown in Table 1 from unity, while assuming competitive equilibrium under constant-returns-to-scale production technology.

19. The role of both local and urban traders in the development of industrial clusters in rural areas is well known in Japan. See, for example, Itoh and Tanimoto [1998].

REFERENCES

China, State Statistical Bureau, 2000, *China Price Statistical Yearbook 2000*, Beijing: Zhongguo Tongji Chubanshe.

Gleaser, E. L., H. D. Kallal, J. A. Scheinkman and A. Shleifer, 1992, 'Growth in Cities', *Journal of Political Economy*, Vol. 100, No. 6, pp. 1126-52.

Hayami, Y. (ed.), 1998, *Toward the Rural-Based Development of Commerce and Industry: Selected Experiences from East Asia*. Washington, DC: World Bank Economic Development Institute.

Henderson, J. V., 1988, *Urban Development: Theory, Fact, and Illusion*, New York: Oxford University Press.

Henderson, J. V., A. Kuncoro, and M. Turner, 1995, 'Industrial Development in Cities', *Journal of Political Economy*, Vol. 103, No. 5, pp. 1067-90.

Humphrey, J. and H. Schmitz, 1996, 'The Triple C Approach to Local Industrial Policy', *World Development*, Vol. 24, No. 12, pp. 1859-77.

Humphrey, J. and H. Schmitz, 1998, 'Trust and Inter-Firm Relations in Developing and Transition Economies', *Journal of Development Studies*, Vol. 34, No. 4, pp. 32-61.

Humphrey, J. and H. Schmitz, 2000, 'Governance and Upgrading: Linking Industrial Cluster and Global Value Chain', IDS Working Paper 120, Institute of Development Studies, Sussex, UK.

Itoh, M. and M. Tanimoto, 1998, 'Rural Entrepreneurs in the Cotton Textile Industry in Japan', in Y. Hayami (ed.).

Ji, F., 1998, *Huzhou Gongshang Yezhi* (History of Industry and Commerce in Huzhou City),

Huagnshan, Anhui: Huangshan Chubanshe.

Klein, B. and K. Leffler, 1981, 'The Role of Market Forces in Assuring Contractual Performance,' *Journal of Political Economy*, Vol. 89, No. 4, pp. 615-41.

Knorringa, P., 1999, 'Agra: An Old Cluster Facing the New Competition', *World Development*, Vol. 27, No. 9, pp. 1587-604.

Krugman, P., 1991, *Geography and Trade*, Cambridge, MA: MIT Press.

Liu, D., 2000, 'Sengo Chugoku no Kougyo Bukka Shisu ni kansuru Suikei (Estimates of Industrial Price Indexes in Postwar China)', Discussion paper No. D99-27, Institute of Economic Research, Hitotsubashi University.

Liu, X., 2000, 'Zhongguo Gongye Qiye de Suoyouzhi Jiegou dui Xiaolu de Yingxiang' (Effects of Differences in Ownership Structure on Production Efficiency of Manufacturing Enterprises in China), *Jingji Yanjiu*, No.2, pp.17-25.

Marshall, A., 1920, *Principles of Economics*, London: Macmillan.

Murakami, N., D. Liu and K. Otsuka, 1994, 'Technical and Allocative Efficiency among Socialist Enterprises: The Case of the Garment Industry in China', *Journal of Comparative Economics*, Vol. 19, No. 4, pp. 410-33.

Nadvi, K., 1999, 'Collective Efficiency and Collective Failure: The Response of the Sialkot Surgical Instrument Cluster to Global Qualaity Pressure', *World Development*, Vol. 27,

No. 9, pp. 1605-26.

Otsuka, K., D. Liu, and N. Murakami, 1998, *Industrial Reform in China: Past Performance and Future Prospects*, Oxford: Clarendon Press.

Rabellotti, R., 1995, 'Is There an "Industrial District Model"? Footwear Districts in Italy and Mexico Compared', *World Development*, Vol. 23, No. 1, pp. 29-41.

Rabellotti, R., 1999, 'Recovery of Mexican Cluster: Devaluation Bonanza or Collective Efficiency', *World Development*, Vol. 27 No. 9, pp. 1571-85.

Ranis, G., and F. Stewart, 1993, 'Rural Nonagricultural Activities in Development: Theory and Application', *Journal of Development Economics*, Vol. 40, No. 1, pp. 75-101.

Schmitz, H., 1995a, 'Small Shoemakers and Fordist Giants: Tale of a Supercluster', *World Development*, Vol. 23, No. 1, pp. 9-28.

Schmitz, H., 1995b, 'Collective Efficiency: Growth Path for Small-Scale Industry', *Journal of Development Studies*, Vol.31, No.4, pp. 529-66.

Schmitz, H., 1999, 'Global Competition and Local Cooperation: Success and Failure in the Sinos Valley, Brazil', *World Development*, Vol. 27, No. 9, pp. 1627-50.

Schmitz, H., 2000, 'Does Local Co-operation Matter? Evidence from Industrial Clusters in South Asia and Latin America', *Oxford Development Studies*, Vol. 28, No. 3, pp. 323-36.

Schmitz, H. and P. Knorringa, 2000, 'Learning from Global Buyers', *Journal of Development Studies*, Vol. 37, No. 2, pp. 177-205.

Schmitz, H. and K. Nadvi, 1999, 'Clustering and Industrialization', *World Development*, Vol. 27, No. 9, pp. 1503-14.

Schumpeter, J. A., 1912, *The Theory of Economic Development*, New York: Oxford University Press.

Shaiken, H., 1994, 'The New International Division of Labor and its Impact on Unions: A Case Study of High-Tech Mexican Export Production', in J. Belanger, P. K. Edwards, and L. Haiven (eds.), *Workplace Industrial Relations and the Global Challenge*, Cornell International Industrial and Labor Relatiomns Report No. 25, Ithaca: ILR Press.

Tang, R. and L. Cheng, 2000, 'Zhejiang Sheng Dongnan Diqu Nongcun Jingji Fazhang De Diaocha Yanjiu,' (The Survey of Rural Economic Development in the South East Zhejiang Province), *Jingji Tizhi Gaige*, Vol. 113, No.4, pp. 99-103.

Tewari, M., 1999, 'Successful Adjustment in Indian Industry: The Case of Ludiana's Woolen Knitwear Cluster', *World Development*, Vol. 27, No. 9, pp. 1651-71.

World Bank, 2000, *World Development Report 2000*, New York: Oxford University Press.

Zhang, R., 1999, *Zhejiang Nongcun Jingji Gaige Tixi Yanjiu* (Systematic Review of Economic Transition in Zhejiang Rural Area), Hangzhou: Zhejiang Renming Chubanshe.

TABLE 1

GENERAL CONDITIONS OF SAMPLE ENTERPRISES [a]

Year	1990	1995	1999
Production quantity (1,000 pieces)	24	36	71
Number of employees	8.7	11.1	16.7
Product price (yuan)	15.1	18.5	16.4
Value added per piece (yuan)[b]	4.5	5.2	3.3
Value added (1,000 yuan) [b]	114	203	224
Hourly wage earnings (yuan) [c]	1.26	1.60	1.79
Labor share of income [d]	0.39	0.45	0.53
Number of observations	27	66	98

Notes: a. Average per enterprise per year.

b. *Value added* = sales – material costs – energy and water costs – marketing fees paid to local traders.

c. *Hourly wage earnings* = monthly labor costs / (the number of employees) /(average working hours per employee).

d. *Labor share* = labor costs / value added.

TABLE 2

PERCENTAGE COMPOSITION OF MARKETING CHANNELS

Year	1990	1995	1999
Local Marketplace	44.8	38.7	37.7
Direct transactions with outside traders	26.3	48.4	60.8
Local traders and other channels	28.9	12.9	1.5

Note: Average per enterprise by year.

TABLE 3

CHANGES IN PRODUCT PRICES BY MARKETING CHANELL [a]

Year	1990	1995	1999
Prices at Local Marketplace [b]			
Average price	12.3	18.5	13.0
Material costs per piece	8.6	13.1	10.5
Value added per piece	3.3	5.0	2.2
Number of observations	7	10	21
Prices in direct transactions with outside traders [c]			
Average price	15.8	19.9	18.8
Material costs per piece	10.5	14.6	14.6
Value added per piece	5.0	5.1	3.9
Number of observations	4	15	36

Notes: a. Average per enterprise in Chinese yuan.

b. From the sample of enterprises that sell only at the local marketplace.

c. From the sample of enterprises directly dealing with outside traders only.

TABLE 4

PERFORMANCE OF ENTERPRISES BY LOCATION [a]

Year	1990	1995	1999
Proportion of direct transactions with outside traders (%)			
Township and neighboring villages	32.0	56.9	77.5
Remote villages	10.0	26.6	18.9
Material cost per piece (yuan)			
Township and neighboring villages	11.2	14.9	14.1
Remote villages	8.1	8.9	9.7
Value added per piece (yuan)			
Township and neighboring villages	4.9	5.9	3.7
Remote villages	3.1	3.2	2.5
Number of employees			
Township and neighboring villages	9.6	12.4	19.3
Remote villages	6.3	7.5	10.3
Proportion of migrants in employees (%)			
Township and neighboring villages	64.2	88.8	93.5
Remote villages	22.4	73.1	81.4
Hourly wage earnings (yuan)			
Township and neighboring villages	1.3	1.7	1.9
Remote villages	1.1	1.3	1.6
Capital-labor ratio (yuan per person)[a]			
Township and neighboring villages	na	na	1353
Remote villages	na	na	1097
Average labor productivity (yuan per working day)[b]			
Township and neighboring villages	65.6	84.8	60.2
Remote villages	43.5	64.2	49.4

Notes: a. Average per enterprise per year.

b. *Capital-labor ratio* = replacement value of equipment / number of employees.

c. *Average labor productivity* = value added / (number of workers x operation months x average operation days per month).

TABLE 5

TIMING OF NEW ENTRY BY PREVIOUS OCCUPATION, YEARS OF SCHOOLING, AND TECHNICAL EXPERTISE OF ENTERPRISE MANAGER

Year	1980-1990	1991-1995	1996-1999
Occupation (%)			
Farmer	51.9	32.5	32.2
Factory worker	18.5	32.5	22.6
Marketing specialist	3.7	12.5	22.6
Other manager and specialist	25.9	22.5	22.6
Total	100	100	100
Years of schooling	7.1	7.4	7.5
Proportion of new managers with sewing and related skills (%)	25.9	40.0	45.2

TABLE 6

PERFORMANCE OF ENTERPRISES BY PREVIOUS OCCUPATION OF MANAGERS

Year	1995	1999
Proportion of direct dealing with outside traders(%)		
Farmer	51.8	58.9
Factory worker	39.7	47.6
Marketing specialist	60.0	91.5
Other manager and specialist	57.5	60.8
Value added per piece (yuan)		
Farmer	4.6	3.2
Factory worker	4.3	3.2
Marketing specialist	10.4	4.2
Other specialist or manager	5.4	3.2
Number of employees		
Farmer	9.8	14.1
Factory worker	10.0	14.6
Marketing specialist	16.4	26.3
Other manager and specialist	12.8	17.9
Capital-labor ratio (yuan per person)		
Farmer	na	1282
Factory worker	na	1173
Marketing specialist	na	1464
Other manager and specialist	na	1287
Average labor productivity (yuan per working day)		
Farmer	69.2	52.8
Factory worker	78.3	61.9
Marketing specialist	115.9	68.0
Other manager and specialist	87.0	53.1

Note: Average per enterprise per year.

TABLE 7

DETERMINANTS OF DIRECT TRANSACTION RATIO, AND MATERIAL COST AND VALUE ADDED PER PIECE

Variables	*Direct transaction ratio* (two-limit tobit)		ln(*Material costs per piece*) (OLS)		*Value added per piece* (OLS)	
	1995	1999	1995	1999	1995	1999
Remote village dummy	-1.11*	-1.15**	-0.50*	-0.63**	-0.32	-0.52**
	(0.47)	(0.32)	(0.21)	(0.16)	(0.34)	(0.19)
Neighboring village dummy	0.02	-0.70**	-0.02	0.13	-0.10	-0.05
	(0.37)	(0.26)	(0.17)	(0.14)	(0.28)	(0.16)
ln(*Distance*)	0.23	-0.08	0.04	0.25*	-0.08	0.16
	(0.33)	(0.23)	(0.15)	(0.12)	(0.24)	(0.14)
ln(*years of operation*)	0.31*	0.08	-0.01	0.10*	-0.08	0.13*
	(0.14)	(0.09)	(0.06)	(0.05)	(0.09)	(0.06)
Farmer dummy	0.51	0.32	0.01	0.06	-0.06	0.16
	(0.28)	(0.18)	(0.12)	(0.09)	(0.19)	(0.10)
Factory worker dummy	0.06	-0.00	0.04	0.14	-0.14	0.20*
	(0.28)	(0.18)	(0.13)	(0.10)	(0.21)	(0.11)
Marketing specialist dummy	-0.44	0.46*	0.10	0.07	0.31	0.32**
	(0.40)	(0.23)	(0.17)	(0.12)	(0.29)	(0.13)
Skill dummy	0.28	0.37**	-0.10	0.21**	-0.43*	0.18*
	(0.22)	(0.14)	(0.10)	(0.07)	(0.16)	(0.09)
Years of schooling	0.069*	0.044*	-0.006	-0.001	0.003	0.01
	(0.035)	(0.022)	(0.015)	(0.011)	(0.025)	(0.01)
Average years of schooling of employees	-0.01	-0.04	0.04*	0.01	0.06*	0.05**
	(0.05)	(0.04)	(0.02)	(0.02)	(0.03)	(0.02)
Invited technician dummy	0.06	0.24	0.08	0.27**	-0.09	0.25*
	(0.26)	(0.17)	(0.12)	(0.09)	(0.19)	(0.10)
Constant	-0.77	0.69	2.34	1.84	1.59	0.07
	(0.71)	(0.55)	(0.31)	(0.27)	(0.51)	(0.32)
Number of observations	64	98	64	98	64	98
Adjusted R-squared	-	-	0.28	0.26	0.26	0.28

Notes: Numbers in parentheses are standard errors. ** significant at the one percent level, * at the five percent level.

TABLE 8

2SLS ESTIMATION OF PRODUCTION FUNCTION FOR 1999

	ln(*V/L*)	
Variables	(i)	(ii)
ln(*v*) (instrumented)	-	0.67* (0.34)
ln(*m*) (instrumented)	-	-0.59 (0.37)
ln(*years of operation*)	0.15* (0.06)	0.13* (0.06)
Farmer dummy	0.01 (0.11)	-0.04 (0.10)
Factory worker dummy	0.25* (0.12)	0.24* (0.10)
Marketing specialist dummy	0.28* (0.14)	0.14 (0.14)
ln(*K/L*) (instrumented)	0.55* (0.26)	0.56* (0.24)
Remote village dummy	-	-
Neighboring village dummy	-	-
Constant	-0.28 (1.88)	0.43 (1.70)

Notes: Numbers in parentheses are standard errors. ** significant at the one percent level, * at the five percent level.