The Emergence of Industrial Clusters in Wenzhou, China

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Abstract

The development of industrial clusters at Wenzhou has attracted many studies in the past. This paper deals with an aspect of Wenzhou's industry, evident to any visitor, but which has rarely been discussed or analyzed in the literature: its diversity of industrial clusters. Wenzhou industrial clusters range from leather shoes to electric parts, buttons, apparel, automobile parts, valves, cigarette lighters, and many others. The purpose of this study is to examine the diversity of Wenzhou's industries and to grasp the reason why so many industrial clusters have emerged there. Based on a thorough survey of corporations at Wenzhou, this paper shows a comprehensive map of Wenzhou's industrial clusters and reveals that there were 153 industrial clusters beyond a certain size in 2001. The paper describes the development process of some industries, such as leather, shoes, valves and pumps.

Key Words: Industrial clusters, Wenzhou, Map, Emergence, shoes

1. Introduction

The peculiar development experiences of Wenzhou since economic reform have attracted academic interest inside and outside of China (Yuan 1987, Nolan and Dong 1990, Zhang and Li 1990, Shi et. al. 2002, Sonobe, Hu and Otsuka 2004, Sheng and Zheng 2004). Early studies on the Wenzhou economy, such as Zhang and Li (1990) and Shi et. al. (2002), paid attention to the dominance of private enterprises in the city, which was exceptional in China during the 1980s. These studies aimed to demonstrate the effectiveness of "the Wenzhou Model" — which virtually meant a private-sector-led economy — for rural development. However, as the private sector gains more importance in the national economy, the necessity to show the effectiveness of private-sector-led growth becomes smaller. Instead, as the interest in industrial clusters grew in China (Wang 2001, Zhu Huacheng 2003), Wenzhou became known as a case of industrial clustering.

One aspect of Wenzhou's economy, evident to any visitor, but which has rarely been discussed or analyzed in the literature is its diversity of industrial clusters. Wenzhou

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industrial clusters range from leather shoes to electric parts, buttons, apparel, automobile parts, valves, cigarette lighters, and many others. The purpose of this study is to examine the diversity of Wenzhou's industries and to grasp the reason why so many industrial clusters have emerged there. The second section describes the framework and methodology of this paper. The third section shows a comprehensive map of Wenzhou's industrial clusters. The fourth section analyzes the emergence of some typical industrial clusters.

2. Framework and Methodology

Many authors have debated the economy of agglomeration. Marshall (1920) and Krugman (1991) point out that, by the localization of a certain industry, the diffusion of technology will be facilitated, intermediate inputs can be supplied economically by concentrating a large amount of demand, and a labor market for specialized skills will be created. Itami et. al. (1998) point out that an urban industrial agglomeration consisting of firms with various skills and technology, such as the metalworking industry at Ohta-ku, Tokyo, can meet various sorts of demand by flexibly organizing the division of labor among the firms.

The economy of agglomeration, however, takes place only when an industrial agglomeration already exists. It does not explain why an industrial agglomeration emerges in the first place. If an industrial agglomeration generates an external economy that enhances the competitiveness of the enterprises within the agglomeration, then how could the first few enterprises of the agglomeration establish themselves without the help of external economy?

Two types of explanations can be considered. The first is to trace the emergence of the industrial agglomeration back to an era when the market economy was not well developed and the domestic market was not integrated. During such a period, enterprises would not face severe competition with other districts, so it would be relatively easy to establish a business. Once an industry emerges, it would grow through technology spillover within the district, and endure the changes of demand by changing the contents of production. Through technology transfer and technological change, the local industry would grow into a cluster that can survive competition with other districts. For example, in explaining the emergence of the Tsubame cutlery industry—one of the most famous industrial clusters in Japan—Yoshida (1998) traces its history back to early 17th century, when local craftsmen started producing traditional nails. During the Meiji Era, when domestic demand for old-style nails diminished, local firms switched their business to the production of files, copperware, and pipes by applying the nail production technology. Then during the early 20th century, local firms began producing cutlery, and later

Tsubame developed into a large cutlery industry cluster.

The second type of explanation is to ascribe the emergence of a certain industry to the ampleness of a specific resource. For example, to explain the emergence of metal working industry of Ohta-ku, Itami et. al. (1998) cite the proximity of the district to the factories of large automotive and electronics enterprises. In this case, the proximity to the large factories is the key resource. The emergence of Silicon Valley might also be explained by the "location resource" of having universities and research institutions nearby.

In the case of Wenzhou, which lacks natural resources, land, or "location resources," we must, for the most part, resort to the first type of explanation. Most industrial clusters in Wenzhou, in fact, date back to the prewar period or before 1980s, when the domestic market was not well integrated in China.

In Wenzhou, many industrial clusters emerged in a very short period since the 1980s. There seems to be a tendency within Wenzhou's rural society that facilitates the emergence of industrial clusters. Zhu Kangdui (2001) explains the tendency as follows: In Wenzhou, a certain line of business spreads through the network of relatives, neighbors, and friends. This is because the sources of information on business chances are often limited to relatives and neighbors in a rural society. If someone succeeds in a new business, his relatives and neighbors might imitate him, and the whole village might end up doing the same business.

There are, however, a few innovators in the rural society. Here "an innovator" means a person who starts a new business for the first time in the rural society. The "new" business is often simply an imitation of state-owned enterprises or foreign enterprises located outside of Wenzhou, but is certainly something that no one else in the village has ever tried. The innovators create new businesses in the rural society, and their relatives and friends imitate them, so that in a short period of time an industrial cluster emerges. Because of the existence of a few innovators, the diversity of Wenzhou's industry increases, and because of the existence of a large number of imitators, the business the innovators started soon develops into an industrial cluster. Many industrial clusters in Wenzhou seem to have emerged through such repetitions of innovation and imitation.

In the following section, we present a map of industrial clusters in Wenzhou which shows the diversity of industries there. In the fourth section, we describe the emergence of a few industries on the basis of the abovementioned framework. The materials used here are historical studies such as Yu and Yu (1995) and Zhang Zhicheng ed. (1998), as well as interviews conducted by the author.

The author conducted field surveys at Wenzhou five times during the period 1998-2007, visiting 31 enterprises and 16 local government offices and social organizations. The interviews lasted for two hours on average, and many hitherto undocumented aspects of the development process of Wenzhou's industrial clusters were revealed through them. Such interviews, however, have limitations. Because many of the entrepreneurs

interviewed joined the business long after the industrial cluster emerged, they rarely know how the cluster emerged and developed before they started business. Even those who experienced the development process of clusters themselves might not remember correctly the early days of the clusters. In some cases it was difficult to cross-check the interviews with historical documents. Even in such cases we cited the interviews in this paper whenever they seemed reliable. Due to the lack of reliable written materials on the development of Wenzhou's industries, the interviews are often the only source of information on the cluster's history.

3. Distribution of Industrial Clusters

3.1 Surveys Conducted by Zhejiang Provincial Government

In this section we will identify the industrial clusters in Wenzhou and show their locations on a map. Many scholars have reported the existence of various industrial clusters in Wenzhou without being aware of the criterion of identifying an industrial cluster. The only survey with a clear definition of industrial clusters is from the Policy Research Department (2003), which is a thorough survey of industrial clusters in Zhejiang Province. The definition used in this survey is that "more than ten enterprises are producing the same or similar products, and the annual output of the industry exceeds 100 million yuan." No spatial definition is provided in this survey, but it seems that the basic spatial unit is the county (*xian*) level. According to the survey there were 519 industrial clusters in Zhejiang Province in 2001. The same survey was also conducted in 2003 and 2005 by the provincial government, and according to them the number of clusters decreased to 430 and 360 in respective years (Project Unit 2006). The decrease was caused by the change of definition and the decline of some clusters.

It is unclear how many among the 360 clusters that existed in 2005 in the province were located in Wenzhou, but the survey lists six industries as the largest clusters of Wenzhou, namely, leather and shoes, apparel, electric equipments, plastics, automobile and motorcycle parts, and printing. The spatial definition of the 2005 survey seems to be less rigorous than the 2001 survey: While the electric equipment industry's location is identified as Yueqing City, a county (*xian*)-level region, the leather and shoes industry's location is identified as Wenzhou, a prefecture (*diqu*)-level region.

As the high threshold (output exceeding 100 million yuan) for defining a cluster suggests, the purpose of the abovementioned surveys by the provincial government is to identify the leading industries of the province. Therefore, the surveys seem relatively uninterested in small clusters in terms of output value, but nevertheless are important at the township (*xiang and zhen*) level. But the diversity of industries at the township level

is a very prominent feature of Wenzhou. Considering the realities of Wenzhou's industries, identifying an industrial cluster at the prefecture or county level is too rough. For example, the 2005 survey identifies the location of automobile and motorcycle parts industry as Wenzhou, a prefecture-level city with an area of 11,784 square kilometers. However, the industry is in fact highly concentrated in Tangxia, a township with an area of only 15 square kilometers. All the other major clusters in Wenzhou mentioned above are concentrated in just a few townships, so it is necessary to set the level of analysis at the township.

The classification of industries is also too rough in the 2005 survey. The leather and shoes industry, which is listed as the largest cluster in Wenzhou, is actually a generic classification, which includes leather shoes industry, leather processing industry, artificial leather industry, plastic and rubber shoes industry, all located in different townships of Wenzhou. Several industrial clusters with different locations and history are lumped together in the "leather and shoes industry." Therefore we need a finer definition of location and a finer classification of industries than in the 2005 survey.

3.2 Data Source and the Definition of an Industrial Cluster

The data source used here to identify industrial clusters in Wenzhou is *Wenzhoushi jiben danwei ziliao huibian* (Collection of Information on Wenzhou City's Corporations and Organizations) published by China Statistics Press in 2003. It is the outcome of the Second National Corporation and Organization Census held in 2001, and shows the name, address, representative's name, telephone number, zip code, the corporation registration number, and the main product or main activity of each of the 40,686 business corporations in Wenzhou. Though the book is a very useful source of information based on a thorough survey, it has limitations: *The Collection* only has information on firms with legal person status, and hence the cottage industries are largely omitted. However, the importance of cottage industries is not negligible especially in those industrial clusters that are still in the primitive stage of development[1].

The business corporations listed in *The Collection* are classified into 621 industries. Among these, 144 industries belong to the service sector, which are omitted from our analysis. The remaining 477 industries belong to the manufacturing and primary industries. The fine classification of *The Collection* enables us to grasp the realities of

1) The author discovered a socks manufacturing cluster in Bishan, Wenzhou, consisted of more than 200 cottage manufacturers. Each manufacturer had around ten employees and thirty to fifty knitting machines. In The Collection, however, only 14 socks manufacturing corporations are listed in Bishan, because the cottage subcontractors usually do not have legal person status. Because there are fewer than fifteen corporations, this 'socks cluster' does not fit into our definition of industrial clusters.

Figure 1 The Country-level Regions of Wenzhou

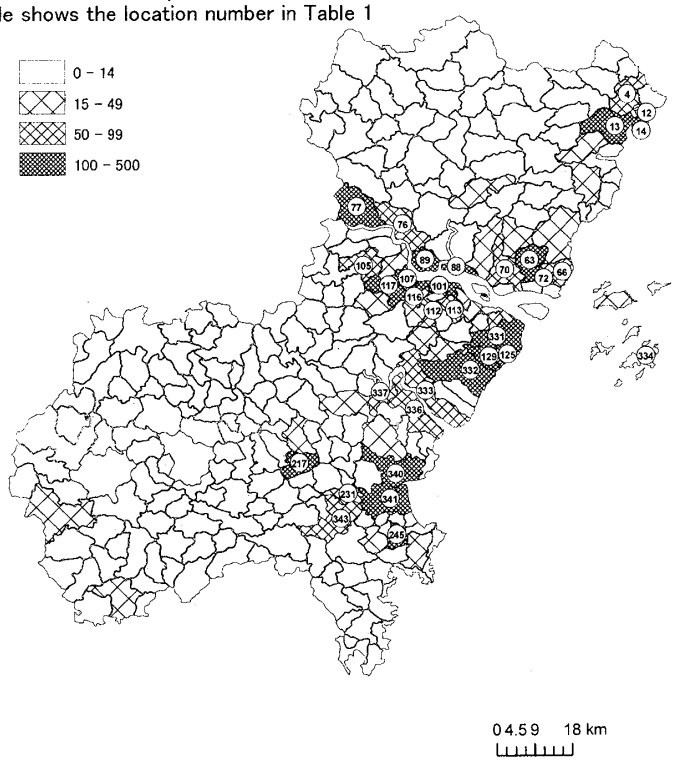
Wenzhou's clusters as being concentrated in a narrow line of business, such as leather shoes, valves, and pumps. However, because *The Collection* lumps together some famous industries of Wenzhou into "other daily necessity production," we subdivided this group into four groups, namely, "cigarette lighters and smoking apparatus," "buttons," "zippers," and "the rest."

Next, we classified the location of enterprises into 283 districts. Wenzhou city, which has an area of 11,784 square kilometers and a population of 7.4 million, is subdivided into 11 county-level regions and 299 township-level regions. Among the latter, we grouped together the 17 subdistricts (*jiedao*) which make up the city center into one region, thus creating 282 townships (*xiang and zhen*) and one city center. Figure 1 is a map of Wenzhou subdivided into 11 county-level regions, and Figure 2 shows the same city subdivided into 283 townships.

Hence Wenzhou's 40,686 business corporations, except for those that belong to the service sector, are subdivided into 480 industries and 283 townships. If a township has more than fifteen corporations belonging to the same industry, and they make up more than five percent of all companies that belong to the same industry in the whole Wenzhou city, we define the township's industry as "an industrial cluster." This definition may be too generous, but fifteen corporations in a single township, which has an area of 43 square kilometers on average, may reveal a severe concentration. For example, the rubber shoe industry, consisting of 17 corporations at *Shatou* (a mountainous township located at the north part of Wenzhou), employs 5000 workers in a township with a population of 16,514.

Figure 2 Location and Size of Industrial Clusters

Size of the largest cluster in the township (Number of firms)
The number in the circle shows the location number in Table 1



Undoubtedly, rubber shoe manufacturing is the most important industry for the township.

3.3 Distribution of Industrial Clusters

Under the above definition, we identified 153 industrial clusters in Wenzhou as of 2001. Figure 2 shows the townships that have more than one industrial cluster and the size—measured by the number of firms—of the largest industrial cluster in the townships. Table 1 shows the clusters with more than 50 firms. Clusters exist in 65 industries (63 of which belong to manufacturing, one to aquaculture, one to pig raising). Among the 283 townships of Wenzhou, 56 have one cluster or more. As can be seen in Figure 2, most industrial clusters are located in the coastal and riverside townships. There is no cluster in the mountainous townships with a population density of less than 400 persons per square kilometer, except for the abovementioned rubber shoe cluster in Shatou, and a stone processing cluster in Shiyang.

Some industries spread over several townships, while some are limited to a single township. The apparel industry, for example, spreads over the city center (No. 101 in Figure 2) and the surrounding townships. On the other hand, the button and zipper clusters in Qiaotou and the ballpoint pen cluster in Puzhou are concentrated within the township. Some industries are scattered around several townships which are located far away from each other.

Table 1 Industrial Clusters of Wenzhou (with more than 50 firms)

Location No	Township	Industry	No of firms	Location No	Township	Industry	No of firms
4	Daji	Molds	70	113	Sanyang	Non-woven cloth	76
12,13,14	Yandang	Electric parts	232	116	Xinqiao	Glasses	52
63	Liushi	Switches	321	116	Xinqiao	Plastic shoes	50
63	Liushi	Electric parts	241	117	Guoxi	Leather shoes	155
63	Liushi	Other power control machinery	70	117	Guoxi	Bolts	66
				117	Guoxi	Pig leather	62
66	Wengyang	Fish cultivation	51	125	Shacheng	Valves	146
70	Beibaixiang	Switches	93	125	Shacheng	Food machinery	108
70	Beibaixiang	Electric parts	87	129	Tianhe	Switches	125
72	Xiangyang	Electric parts	52	217	Shuitou	Pig leather	145
76	Qiaoxia	Stationery	92	231	Xiaojiang	Plastic ropes and cloth	99
77	Qiaotou	Buttons	168	245	Qianku	Package printing	131
77	Qiaotou	Zippers	117	331	Yongzhong	Valves	234
88,89	Oubei	Valves	221	331	Yongzhong	Steel pipes	157
88,89	Oubei	Leather shoes	120	331	Yongzhong	Tiles	57
88,89	Oubei	Pumps	91	331	Yongzhong	Artificial leather	55
88,89	Oubei	Apparel	71	332	Tangxia	Bolts	313
101	City Center	Leather shoes	180	332	Tangxia	Automobile parts	295
101	City Center	Lamps	116	332	Tangxia	Plastic ropes and cloth	111
101	City Center	Cigarette lighters	108	332	Tangxia	Motorcycle parts	105
101	City Center	Glasses	98	332	Tangxia	Water pipes	100
101	City Center	Package printing	96	332	Tangxia	Switches	52
101	City Center	Apparel	86	333	Anyang	Cotton knitwear	64
101	City Center	Electric parts	55	333	Anyang	Printing machinery	50
105	Tengqiao	Apparel	76	336	Feiyun	Shoes	50
107	Shuangyu	Leather shoes	197	337	Xianjiang	Shoes	66
107	Shuangyu	Apparel	61	340	Aojiang	Leather shoes	120
112	Wuting	Apparel	66	341	Longgang	Package printing	345
112	Wuting	Glasses	62	343	Lingxi	Plastic ropes and cloth	54

(Source) Made by the author from the data of *Wenzhoushi jiben danwei ziliao huibian*

The largest cluster in terms of number of firms located within a single township is the package printing industry of Longgang (No.341 of Figure 2), in which 345 companies are engaged in printing packages and labels. In other countries, the printing industry is usually located in large cities, but in the case of Wenzhou, its cluster exists at a township far away from the City Center. Longgang used to be called the "first 'farmer city' in China" during 1980s. This means that the dwellers of the city are ex-farmers who built the city and moved there without changing their household registration status as "farmers" (Jin 2002). Longgang farmers made money by the printing business and transformed their village into a city with a population of 270,000.

The second largest cluster in Wenzhou is Liushi's switch industry, in which 321 corporations are engaged in electric switch production. There are also in Liushi 241 electric parts manufacturers, and the two industries in fact form a huge electric parts industry cluster producing switches, circuit breakers, relays, and connectors. The electric parts industry cluster spreads over Liushi and several neighboring townships as seen in

Figure 3 Location of Electric Parts Industry

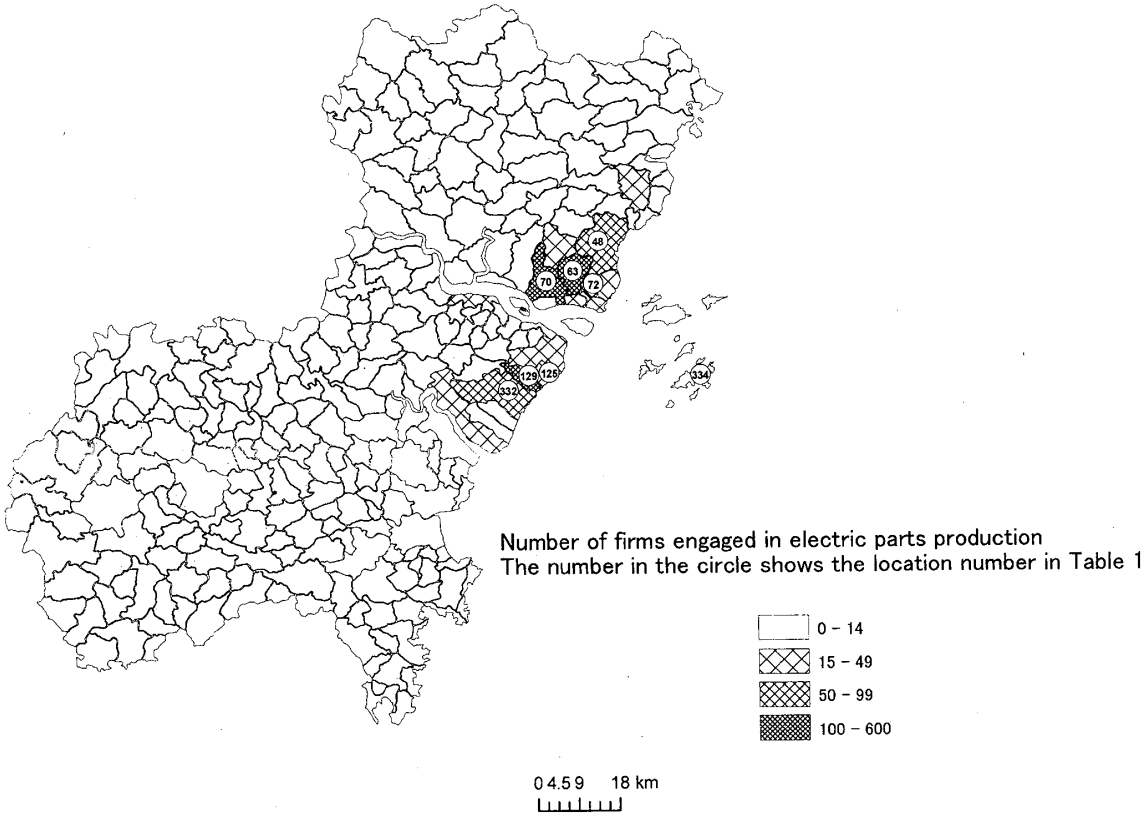


Figure 3, which indicates the townships that have more than 15 electric parts makers. Previous studies on the electric parts industry of Wenzhou, such as Sonobe, Hu and Otsuka (2004) and Project Unit (2006), revealed that the industry existed in Yueqing City, but Figure 3 reveals the electric parts industry clusters also exist in other counties.

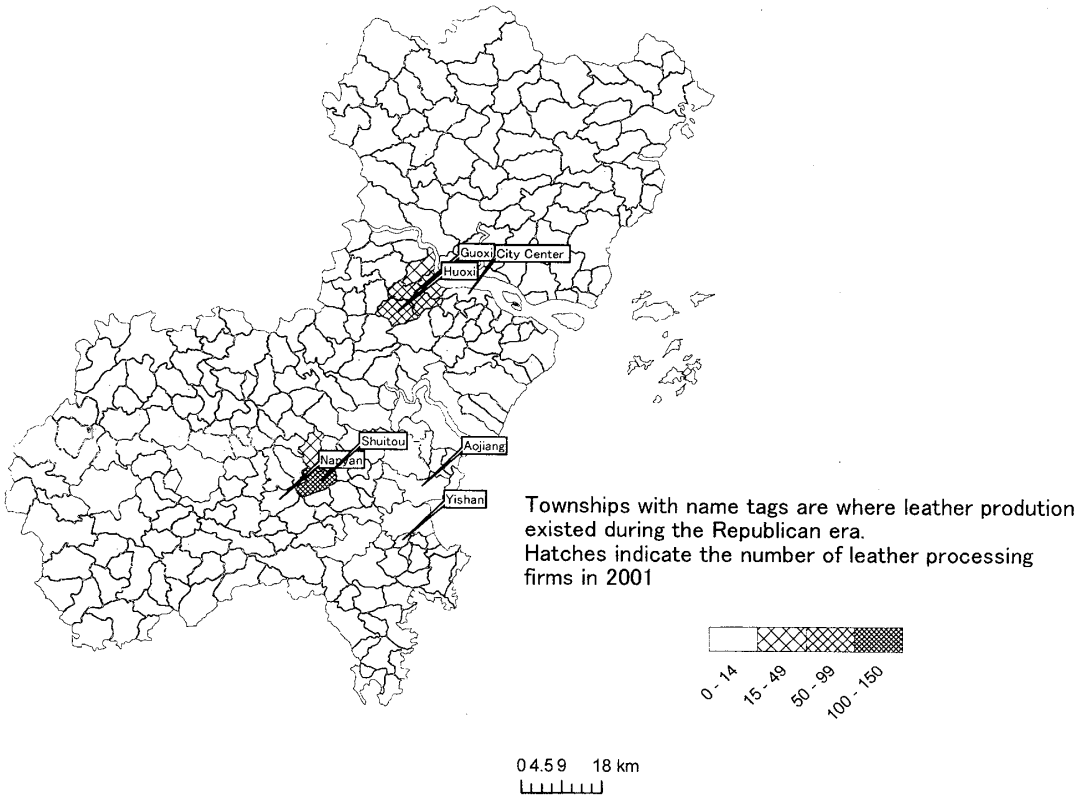
4. The Emergence of Industrial Clusters

As discussed in the second section, the emergence of an industrial cluster might be explained by its history that dates back to the era when market economy was underdeveloped, or by the abundance of a specific resource. Among the various industrial clusters of Wenzhou, only the stone processing industry of Shiyang and the aquaculture industry of Wengyang seem to be able to be explained by an abundance of local resources. Other industrial clusters do not seem to rely on specific local resources. In the following paragraphs, we will attempt to explain the emergence of industries related to leather and shoes, and those related to metal processing.

4.1 Leather

Zhang (1998: 1174) reports that leather (cowhide) production existed in Shuitou during the

Figure 4 Location of Leather Processing Industry during Republican Era and the Present Leather Industry Clusters



Jiaqing era (1796-1820) of the Qing Dynasty. During the late Qing period, cowhide production also appeared in Huoxi, Guoxi and Xiongxi (which is now a part of Huoxi) as a farmers' side business. During the Republican Era, leather processing workshops, which used cowhides produced by suburban farmers, appeared in the Wenzhou City Center. After the outbreak of war with Japan, the leather processing industry in the City Center was stimulated by the increase of demand from the army and developed into a fairly large cluster, having 41 enterprises in the City Center in 1943 (Yu and Yu 1995:47-48). Leather production also emerged in the southern townships of Yanshan (which is now a part of Nanyan), Aojiang and Yishan during the Republican Era.

Figure 4 indicates the townships which have leather processing industry clusters as of 2001, and those which had leather processing industry during the Republican Era. It is clear from this figure that the present clusters date back to the Republican Era. The clusters, however, have not existed continuously between the Republican Era and today. For example, the leather processing workshops of the City Center were integrated and nationalized after the establishment of the People's Republic, and finally there remained only one state-owned leather factory. The industry was maintained but it was no longer a "cluster". After the economic reform started, many workers who worked at the state-owned leather factory retired or resigned, and began running leather factories of their own. In 1981, the number of leather factories in the City Center had reached 210. Hence the once-extinct leather industry cluster revived dramatically. Later, however, the city

government decided to move these firms out of the City Center to Yangyi to eliminate the pollution caused by them (Zhang 1998:1175). Hence leather production in the City Center disappeared, and the neighboring townships to the west, Yangyi and Shuangyu, emerged as a new leather industry cluster.

The leather industry cluster in Shuitou, which had 145 leather workshops as of 2001, has also experienced extinction and a dramatic recovery (Jin 2002: 149). The private manufacturers that existed before the People's Republic were later integrated with the state-owned enterprises in Wenzhou City Center and other cities, and they disappeared from the township. After the reform, workers in state-owned leather enterprises, who had run private leather factories in Shuitou prior to nationalization, retired or resigned from the state-owned enterprises, flew back to Shuitou, and established private factories again. Hence the once-extinct leather industry cluster in Shuitou reappeared.

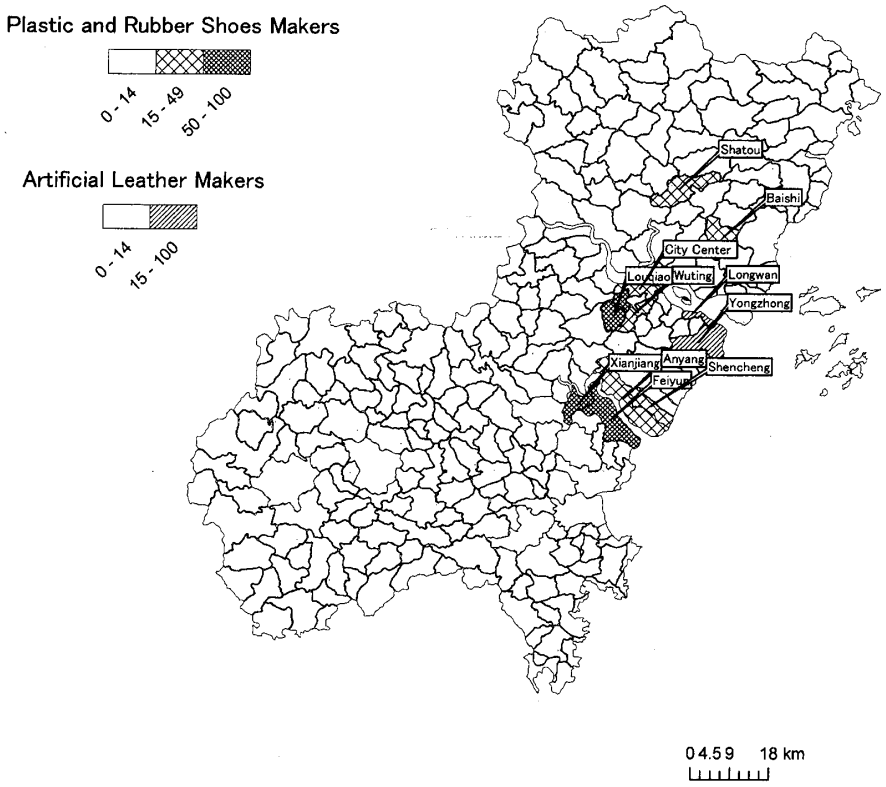
The leather processing clusters of Wenzhou not only revived but also far exceeded the size of the cluster that existed during the Republican Era. Shuitou's pig leather production, for example, is said to be the largest in all of China (Yu and Yu 1995:197-198). The rise of demand from the leather shoe industry in Wenzhou has stimulated the growth of leather production.

4.2 Leather Shoes

Production of leather shoes production started during the 1900s and 1910s in the City Center (Yu and Yu 1995:35). The supply of leather from the leather industry clusters in suburban townships must have influenced the rise of leather shoe production, but there is no evidence to prove the relationship. Leather shoe workshops in the City Center increased to 70 in 1931, and wartime demand from the army stimulated the growth of the industry. But the industry stagnated after the war, and in 1950 there were only 43 leather shoe manufacturers left, with a total of 130 employees (Zhang 1998:1175). During the 1950s, the industrial "cluster" disappeared, because of the collectivization and nationalization of private businesses. After the reform, private leather shoe manufacturers started to proliferate in the City Center and in the neighboring townships of Shuangyu, Guoxi and Oubei. The industrial cluster revived with a scale far exceeding that of the pre-war period. As indicated in Table 1, each of these townships has more than 120 corporations engaged in leather shoe production. In addition, there must be hundreds of cottage industries engaged in shoe production. Shoe production has become the most important industry of Wenzhou in terms of the number of corporations and output value.

The present-day leather shoe industry in Wenzhou inherited the shoe production technology that had existed before the establishment of the People's Republic. For example, Yu Ashou, the president of Wenzhou Jierda Shoe Company, born in 1936, was apprenticed to a shoemaker in 1948 (Shao 2000). When his workplace was collectivized in

Figure 5 Location of Artificial Leather Industry and Plastic and Rubber Shoe Industry



1958, he found employment at a collective shoe factory. After being dismissed by the factory during the 1960s on charges of running a side business, he started mending shoes on his own, and in 1981, he established a shoe company. As his career indicates, the technology and craftsmen of the shoe industry before the People's Republic were inherited and preserved in public enterprises during the planned economy period. Workers of public enterprises resigned soon after the reform to establish their own businesses.

Most of the owners of the major shoe companies of Wenzhou, however, were too young to directly experience the pre-reform shoe industry. The owner of Aokang Group—the largest shoemaker in Wenzhou, born in 1965, entered the shoe business in 1986 as a salesperson[2]. When he entered the business, the leather shoe cluster already existed in Wenzhou.

4.3 Artificial Leather

Artificial leather industry clusters are located at Yongzhong and Longwan, with 55 and 22 corporations, respectively (Figure 5). Artificial leather production is a very young industry compared to the leather processing industry: the first artificial leather factory

2) Interview at Aokang Group (August 29, 2001) and Zhang (1999).

was established in 1991[3]. Unlike the leather processing industry, no public enterprise has ever been involved in the artificial leather industry, meaning it has been led by the private sector from the very beginning.

The founders of the first artificial leather factories thought that, thanks to large demand from the local leather shoe industry, the business would be viable. In this sense, Wenzhou's artificial leather industry is an outcome of a backward-linkage effect of the leather shoe industry. At the same time, however, the founders noted that artificial leather production was becoming more expensive in Japan, Taiwan, and Korea because of the cost of treating sewage. They thought that in Wenzhou, where the regulations on wastewater were not as strict, artificial leather could be produced at a lower cost. This forecast turned out to be correct, and the first artificial leather factory became a great success. The success, however, triggered a conflict between the investors, and the company split into five. Each of the five investors dragged their relatives and friends into the business. In 2001, ten years after the establishment of the first factory, *The Collection* reported that there were 198 artificial leather companies in Yongzhong, Longwan, and neighboring townships. The production volume of these artificial leather industry clusters accounts for around forty percent of the total volume of China[4].

Though the artificial leather industry in Wenzhou serves the same market as the traditional leather processing industry, there is little relationship between the two industries. The owners of the artificial leather industry do not originate from the leather processing industry. Most of them have accumulated the money for initial investment by working as merchants. The initial investment required to establish an artificial leather plant is at least 30 million yuan, too big an amount for a leather dresser to invest.

4.4 Plastic and Rubber Shoes

The plastic shoe industry in Wenzhou derives from the leather shoe industry, and the rubber shoe industry derives from the plastic shoe industry. A "plastic shoe" has a sole made by injecting polyvinyl chloride (PVC) or polyurethane (PU) into a mold, and "rubber shoe" is a shoe with a sole made of rubber. *The Collection* has four classifications of shoe industry, namely, "leather shoe manufacturing," "plastic shoe manufacturing," "rubber shoe manufacturing," and "shoe manufacturing." However, there are many enterprises which produce both plastic and rubber shoes, or have switched from plastic to rubber

3) The history of the artificial leather industry in Wenzhou is based on the author's interview at Wenzhou Tianniu Artificial Leather Company (November 27, 2007).

4) According to Ma and Liao (2003), the artificial leather production in Wenzhou was 280 thousand tons, and Feng (2005) reports that the production of entire China was 725 thousand tons in 2002. Ma and Liao (2003) and Qu (2005) write that Wenzhou accounts for 70 percent of the national production of artificial leather, but we cannot confirm this figure with other sources.

shoes in the past. As a result, it is often difficult to distinguish a plastic from a rubber shoe maker. Additionally, the "shoe manufacturing" category lumps together plastic and rubber shoe makers. Therefore, in our analysis, we treat the three categories—"plastic shoe manufacturing," "rubber shoe manufacturing," and "shoe manufacturing"—as one, which we call "plastic and rubber shoe manufacturing." Figure 5 indicates the spatial distribution of these manufacturers. Several clusters of plastic and rubber shoe industry are scattered around Wenzhou.

The development of the plastic and rubber shoe industry in Wenzhou was initiated by a retired worker named Xu Zhaolin. After retiring a local leather shoe factory in 1979, he started making plastic shoes at his home in Xianjiang (Yu and Yu 1995, Li 1998). He melted waste plastic and shaped it into soles, and used irons to fasten the soles to a leather outer. His plastic shoes sold very well because of their inexpensiveness, so his neighbors started imitating him. The whole village and neighboring villages started imitating them. By 1984, there were 1,500 shoe factories in the township, employing more than 8,000 people. The plastic shoe industry of Xianjiang, however, soon faced stagnation in sales, because of the low quality of its products. The plastic shoe makers jointly invested into injection molding machines and improved their quality, started producing rubber shoes along with plastic shoes, and hence Xianjiang's shoe industry overcome its bad reputation.

After emerging in Xianjiang, plastic shoe manufacturing spread to other townships during the 1980s. In Louqiao, some farmers and merchants, who learned plastic shoe making in Xianjiang, started making polyvinyl chloride shoes in 1982[5]. In Shatou, plastic shoe making was introduced in 1984 from Xianjiang. Shatou's shoemakers later faced a decline in sales, so they switched to rubber shoe manufacturing, and now the township has developed into a rubber shoes cluster, consisting of 17 enterprises employing 5,000 workers[6].

When plastic and rubber shoe clusters emerged in Wenzhou during the 1980s, the shoes produced by these clusters were mostly sold in China. Early manufacturers tried to sell their shoes through state-owned consumer goods wholesalers, which were the main distribution channel under the planned economy. Later, the manufacturers from Wenzhou expanded their sales to the countryside of inland China and even to Eastern Europe and Africa. The ample supply of cheap migrant labor from inland China has made it possible for plastic and rubber shoes made in Wenzhou to be competitive even in inland China and Africa. Recently, however, Wenzhou's shoemakers are facing rising wages and the emergence of inland competitors.

5) Based on interviews at Wenzhou Yisili Shoes Company (November 27, 2007) and Wenzhou Haibang Manufacturing and Trading Company (November 27, 2007).

6) Based on an interview at the Industry Section, Shatou Township Office (August 29, 2001).

4.5 Valves and Pumps

Most of the industrial clusters in Wenzhou either date back to the Republican Era or emerged after the economic reform. But the valve industry clusters located in Oubei (No. 88, 89 of Figure 1) and Yongzhong (No. 331 of Figure 1) emerged during the Cultural Revolution. The first manufacturers of valves which emerged around 1970 were the "commune and brigade enterprises," the predecessor of township enterprises. "Commune and brigade enterprise" usually denotes public enterprises that are run by people's communes and production brigades, but those which existed in Oubei and Yongzhong resembled private enterprises. The "commune and brigade enterprises" produced valves without any instruction from the planning apparatus and sold them outside of the planning system. Because there was plenty of demand that was not fulfilled by the planned economy system, valve production in Oubei and Yongzhong grew rapidly during the 1970s. In 1976, there were 1069 valve manufacturers in the two townships, producing almost the same amount of valves as Shanghai, the largest valve producing city in China then (Yu and Yu 1995: 131).

The central government and provincial government took a hard stance against the valve industry clusters in Oubei and Yongzhong, which disrupted the order of the planning system. The government sent an inspection team and ordered many enterprises to shut down on charges of producing low-quality valves. The number of valve manufacturers soon fell to 400. After the reform, however, Wenzhou's valve industry revived by improving quality, and recently it has grown into the largest valve-producing district in China, accounting for one third of national production. As of 2001, valve manufacturers were concentrated in Oubei, Yongzhong, and Shacheng (No. 125 of Figure 1), with 601 enterprises in total.

Why could the "commune and brigade enterprises" during the Cultural Revolution start producing valves? First, we must point out the existence of a technological basis of metalworking industry as an initial condition for the development of the valve industry. The history of metalworking industry can be traced back to the Republican Era. According to Zhang (1998:1301) and Yu and Yu (1995:23-24), the first metalworking workshop in Wenzhou was established in 1916 by an entrepreneur named Li Shumeng. Initially, he produced a cotton-working machine he had invented. Then during the 1920s the workshop started producing ship engines and moved to the city center. Many other machinery enterprises emerged in the city center, reaching to a total of 47 enterprises with 380 employees in 1947. After the establishment of the People's Republic, these workshops were integrated and nationalized. One such state-owned enterprise established by the nationalization of a private metalworking enterprise was the Wenzhou Metalworking Factory. It had 1676 employees in 1958 and produced various machines for

the local market, such as diesel engines, threshing machines,. pumps, oil extracting machines, and metallurgy machinery (Yu and Yu 1995:106). During the Great Leap Forward (1958-1960), several new metalworking enterprises were established. In 1960, the number of metalworking factories in Wenzhou reached 40. Through the establishment of these public enterprises, the technology and equipment of machining, casting, and forging spread across Wenzhou, forming the technological basis for valve production by commune and brigade enterprises.

It was in 1969 that a commune and brigade enterprise in Oubei started producing valves, and in 1970 an enterprise in Yongzhong followed suit[7]. The reason why these rural enterprises paid attention to valve production was as follows: In the early 1970s, the demand for valves was surging due to the increase in investment to the petrochemical industry. There were, of course, state-owned valve manufacturers in China, but these enterprises could not satisfy the domestic demand for valves. Anyone needing a valve had to apply to the central government one year prior to the actual purchase. After the application was accepted, it took a whole year to make the supply plan, order production to the valve manufacturer, and distribute the product. Because of the rigidity of the planning system and state-owned enterprises, there were plenty of business opportunities left for the rural enterprises. One such opportunity was spare valves for imported chemical plants. The repair valves for imported plants would be expensive if imported, but state-owned valve manufacturers would not take the trouble to manufacture them, so the work was taken up by the manufacturers of Oubei and Yongzhong.

Another reason why the rural enterprises entered the valve business was because they thought that valve production was not difficult. They thought that once they could procure castings, a few lathes would be enough to produce valves. In fact, producing high quality valves was not so easy. Those made in Wenzhou soon became infamous for their poor quality. The bad reputation urged Wenzhou entrepreneurs to invite engineers retired from the state-owned valve manufacturers in Shanghai and Shenyang to transfer technology. The transfer of technology and talent from state-owned enterprises to Wenzhou's private valve manufacturers started in 1972 and lasted until the 1990s. The state-owned enterprises had been deprived of their technology, talent, and market by private manufacturers, and in the end were bought up by private owners.

The pump manufacturing industry cluster of Oubei, which consists of 91 manufacturers, originated from the valve industry. During mid-1980s, the valve manufacturers suffered from a poor reputation and lack of distribution channels because they still had to sell outside of the planning system. Then one entrepreneur in Oubei started producing "water pipe pumps," an apparatus to raise water pressure at the upper

7) The history of the valve industry cluster is based on interviews at Zhejiang Chaoda Valve Corporation (November 28, 2007) and the Labor Office of Yongzhong Township (August 30, 2001).

stories of high-rise buildings developed by a company in Dalian. The product could be easily produced by lathe, and the demand for it was surging because of the increase of high rises in China. Many valve manufacturers in Oubei switched to pump manufacturing, making Oubei a pump industry cluster.

5. Concluding Remarks

During the short period since the reform, as many as 153 industrial clusters have emerged in Wenzhou. This paper has provided a thorough list of industrial clusters in Wenzhou, and explored the development process of the leather, shoe, valve and pump industries based on interviews and written materials. The history of most of the industrial clusters in Wenzhou and in China, however, has been left unexplored.

We confirmed from our case studies that the industrial clusters emerged and the diversity of industries increased through the repetition of innovation and imitation. We speculate that the same mechanism generated many of the other industrial clusters in Wenzhou, and even in other places of China. In Wenzhou, the speed of imitation is extremely rapid, so the emergence of an industrial cluster can be observed in a short period. In other parts of China, the speed of emergence might be slower, but similar processes might be underway.

References

Feng Shujun, 2005, "Renzaoge hechengge hangye fazhan xianzhuang" (Present Status of Artificial Leather Industry), *Guowai suliao*, Vol.23, No.10.

Itami, Hiroyuki, Shigeru Matsushima, and Takeo Kikkawa eds., 1998, *Sangyo shuseki no honshitsu* (The Nature of Industrial Agglomerations), Tokyo, Yuhikaku.

Jin Yongxing, 2002, *Juji yu kuosan: Wenzhou jianzhizhen chengshihua yanjiu* (Agglomeration and Dispersion: A Study on the Urbanization of Townships in Wenzhou), Beijing, Shehuikexue wenxian chubanshe.

Krugman, Paul R., 1991, *Geography and Trade*, MIT Press.

Li Shihui, 1998, "Laizi zhenan 'xiedu' de diaocha baogao" (A Research Report from the "Shoe Town" in Southern Zhejiang), *Zhongguo gaige*, No.2.

Ma Zhangfeng and Liao Zhengpin, 2003, "Pengbo fazhan de zhongguo hechengge gongye" (The Rising Artificial Leather Industry of China), *Keji qingbao kaifa yu jingji*, Vol.13, No.3.

Marshall, Alfred, 1920, *Principles of Economics, An Introductory Volume*, Eighth Edition, London, Macmillan.

Nolan, Peter, and Dong Fureng eds., 1990, *Market Forces in China: Competition and Small Business: The Wenzhou Debate*, London, Zed Books.

Policy Research Department, Zhejiang Committee of Chinese Communist Party, 2003, "Kuaisu zengzhang de zhejiang quyu kuaizhuang jingji" (Rapidly Growing Cluster Economies in Zhejiang District), *Nanfang wang* website.

Project Unit, Commission of Economy and Trade of Zhejiang Provincial Government, 2006, "Fu zhejiang tese quyu jingji: Zhejiang kuaizhuang jingji fazhan baogao" (Regional Economy with Rich

Zhejiang Characteristics: A Report on the Development of Cluster Economy in Zhejiang), Commission of Economy and Trade of Zhejiang Provincial Government website.

Qu Ping, 2005, "Woguo renzaoge shichang xianzhuang, cunzai de wenti ji cujin cuoshi" (The Present Status, Existing Problems, and Promotion Measures of China's Artificial Leather Market), *Zhongguo pige*, No.6.

Shao Zhizhen ed., 2000, *Wenzhou qiyejia chuangye fengyunlu* (The Adventures of Wenzhou Entrepreneurs), Beijing, Zhongyang wenxian chubanshe.

Sheng Shihao and Zheng Yanwei, 2004, *Zhejiang xianxiang: chanye jiqun yu quyu jingji fazhan* (The Zhejiang Phenomenon: Industrial Clusters and Regional Economic Development), Beijing, Qinghua daxue chubanshe.

Shi Jinchuan et. als., 2002, *Zhidu bianqian yu jingji fazhan: wenzhou moshi yanjiu* (Institutional Change and Economic Development: A Study of Wenzhou Model), Hangzhou, Zhejiang daxue chubanshe.

Sonobe, Tetsushi, Hu Dinghuan and Otsuka Keijiro, 2004, "From Inferior to Superior Products: An Inquiry into the Wenzhou Model of Industrial Development," *Journal of Comparative Economics.*

Wang, Jici et. al., 2001, *Chuangxin de kongjian: Qiye jiqun yu quyu fazhan.* (Innovative Spaces: Enterprise Clusters and Regional Development), Beijing, Beijing daxue chubanshe.

Yoshida, Keiichi, 1998, "Kinzoku yoshokki sanchi e no dotei to sanchi kozo henkaku no ayumi" (The Path to the Cutlery Industry District and the Process of Structural Change) in Seki, Mitsuhiro and Junko Fukuda eds. *Henbo suru jiba sangyo: fukugo kinzoku sanchi e mukau Tsubame* (The Changing Local Industries: Tsubame Heading towards a Metalworking Complex), Tokyo, Shinhyoron.

Yu Xiong and Yu Guang, 1995, *Wenzhou gongye jianshi* (A Brief History of Wenzhou's Industries) Shanghai, Shanghai shehui kexue chubanshe.

Yuan Enzhen ed. 1987, *Wenzhou moshi yu fuyu zhi lu* (Wenzhou Model and the Road to Affluence), Shanghai, Shanghai shehui kexue chubanshe.

Zhang Lianjie ed., 1999, *Wenzhou laoban* (Wenzhou Bosses), Beijing, Zhongguo wenxian chubanshe.

Zhang Renshou and Li Hong, 1990, *Wenzhou moshi yanjiu* (A Study on the Wenzhou Model), Beijing, Zhongguo shehui kexue chubanshe.

Zhang Zhicheng ed., 1998, *Wenzhou shizhi* (The History of Wenzhou City), Beijing, Zhonghua shuju.

Zhu Huacheng, 2003. *Zhejiang chanyequn* (Industrial Districts of Zhejiang), Hangzhou, Zhejiang daxue chubanshe.

Zhu Kangdui, 2001, "Wenzhou chanye qunluo ji qi yanjin" (The Industrial Colonies of Wenzhou and Their Changes), in Shi Jinchuan et. als., 2002.