

Evolution of a Small and Medium-sized Enterprise in a Peripheral Area of Japan into a Hidden Champion

Yamamoto, Kenji
Kyushu University : Professor emeritus

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Kenji Yamamoto

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Keywords: periphery, SMEs, evolution, hidden champion, innovation, Kyushu, Japan

Abstract

This paper examines the question of whether it is possible for a small and medium-sized enterprise (SME) to evolve into a hidden champion, even if it is located in a peripheral area and even if it had no special technology when it started up. If it is possible, we should ask how an SME can do it and if there is some special relationship between its evolution and its local environment. This paper examines the evolution of an SME located in a rural area of Kyushu, a peripheral area of Japan, into a hidden champion. The company achieved the innovations supporting its evolution by responding to the voices of its customers and collaborating with other SMEs. While the local environment played an important role in the first stage of its evolution, its role was not as important in the incremental technological developments that were decisive for evolving into a hidden champion. Nevertheless, the local social environment is meaningful for further evolution of the SME, because the SME with good reputation in a peripheral area can recruit talented youth much easier than those in the metropolitan areas. We should, however, recognize that company's evolution is to be realized by interactive learning between its employees and their customers.

1. Introduction

The purpose of this paper is to examine the question of whether it is possible for a small and medium-sized enterprise (SME) to evolve into a hidden champion, even if it is located in a peripheral area and even if it had no special technology at its start-up stage. If it is possible, we should ask how an SME can do it and if there is some special relationship between its evolution and its local environment.

These research questions are worth investigating because many scholars argue that not rural areas, but metropolitan areas can provide people and companies with the social environment needed for knowledge creation and innovation (Jacobs 1969; Scott 2001; Florida 2002; Polèse 2009). I'll reexamine this idea, because Simon (1996; 2012), a German scholar of management, showed that many hidden champions are located not only in metropolitan areas but also in rural areas of Germany and the strong competitiveness of German industry is largely due to the many hidden champions. Ermann et al. (2012) and Audretsch and Lehmann (2016) also showed that many world market leaders are located in rural areas of Germany.

It is well-known that the spatial structure of the German economy is decentralized and that her rural areas are prosperous, especially in its western and southern parts. This is likely attributable to the activities of the hidden champions in those areas. In contrast, the Japan economy is centralized, and her rural areas have suffered from stagnation and even from impoverishment, especially in the peripheral areas since the 1990s, when the bubble economy collapsed. Furthermore, Japan as a whole has faced the problem of population decline since the end of the 2000s. There was even a book published (Masuda 2014) that aroused considerable anxiety about the disappearance of rural municipalities in Japan's peripheral areas within 30 years.

Given this economic and social situation in Japan and the theoretical problem of whether the rural areas can actually develop, I have been investigating since 2006 the two questions posed at the beginning of this paper. Although there is a far greater number of innovative SMEs in the metropolitan areas of Japan, as I show later in this paper, there are also successful innovative manufacturing SMEs in rural areas as well. In the next chapter, I describe the spatial pattern of innovative manufacturing SMEs in Japan. Then, I describe the evolution of a small company in a peripheral area of Japan without a specific technological strength at its start-up stage into a hidden champion in a niche market of the machinery industry on the basis of my interviews with the company president, materials he offered and various information on the niche market obtained through the internet. Finally, I describe the insights I obtained into the possibility of SMEs in peripheral areas of Japan evolving into hidden champions and the possibility of them contributing to the economic and social development of the peripheral area.

2. Geographical distribution of innovative SMEs in Japan

In a press release on 17 March 2014 about “global niche top (GNT)” companies¹⁾, the Ministry of

Economy, Trade and Industry (METI) of Japan recognized 100 Japanese manufacturing companies as GNT companies in accordance with the world market share criteria for a specific product²⁾. The criteria depended on the size of the company. The criteria for large companies were having more than 20% of the world market for a specific product for at least one year between 2011 and 2013 and having a global market size for that product of between around 10 and 100 billion yen³⁾. The criterion for SMEs and mid-level companies was having more than a 10% share of the world market for a specific product for at least one year between the same years. The METI-recognized GNT companies were classified into 3 groups⁴⁾: 6 large companies, 25 mid-level ones, and 69 SMEs. It is possible to get simple information on each of these 100 GNT companies from Ministry of Economy, Trade and Industry (2014).

According to the Division of Manufacturing Industries Bureau of METI (2014), the 69 GNT SMEs are distributed throughout Japan. However, this is misleading as 40 of them are located in the three largest metropolitan areas: Tokyo (19), Osaka (14), and Nagoya (7)⁵⁾ (Fig. 1). This means that 58% of the recognized GNT SMEs are located in the core areas of Japan, those three metropolitan areas. Four of the other GNT SMEs are located in other metropolitan areas, which are characterized as the semi-periphery in the meaning of Wallerstein (1974: 349-350): one in Sapporo, one in Sendai, and two in Fukuoka⁶⁾. Three of the other GNT SMEs are located in smaller metropolitan areas: Hiroshima, Okayama, and Niigata. Thus, 47 of the 69 GNT SMEs, namely 68% of them, are located in metropolitan areas.

Hosoya (2014) is extensive research on GNT SMEs in Japan. He found that excellent “niche top” SMEs comprising not only the METI-recognized GNT companies but also the niche top ones in the Japan domestic

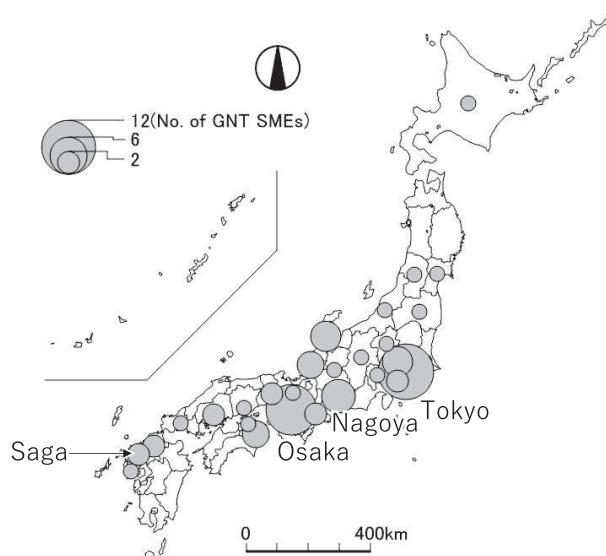


Fig.1 Spatial distribution of SMEs recognized as Global Niche Top by METI (2014).

Source: drawn on the basis of data obtained from Ministry of Economy, Trade and Industry (2014): List of 100 Global Niche Top Companies in Japan (http://www.meti.go.jp/policy/mono_info_service/mono/gnt100/pdf/20140317b.pdf; accessed 4 November 2016).

market were distributed all over Japan (Hosoya 2014:15). He estimated that there were 2000 niche top SMEs in Japan on the basis of data from METI and the Small and Medium Enterprise Agency (2006; 2007; 2008; 2009), and other sources (Bureaus of Economy, Trade and Industry in eight regions of Japan, local governments, and so on) (Hosoya 2014:127-128). Although he did not provide data on the spatial distribution of these niche top SMEs, it is highly likely that there are niche top SMEs in all the prefectures of Japan and that many of them are however located in the metropolitan areas.

Figure 2 shows that many of energetic manufacturing SMEs are located in the three major metropolitan areas and their neighboring prefectures: the central area of Japan. The Tokyo metropolitan area accounts for 20% of the 1200 SMEs recognized by METI and SME Agency as energetic manufacturing SMEs that will sustain Japan in the near future, the Osaka-Kyoto-Kobe metropolitan area accounts for about 17%, and the Nagoya metropolitan area accounts for about 11%. That is, almost half of the energetic manufacturing SMEs are concentrated in the three major metropolitan areas in Japan.

Nevertheless, there are a number of GNT SMEs in peripheral rural areas, e.g., in Saga prefecture in Kyushu, about 1000 km southwest of Tokyo. In the next chapter, I present a case study of a small manufacturing GNT located in the town of Kashima in Saga prefecture. Although Kashima is nominally referred to as “shi” (city) in the framework of Japan’s system of local governments, the area is very rural with only a small shopping street in the central area of the municipality. The rural landscape is evident in the photo on the

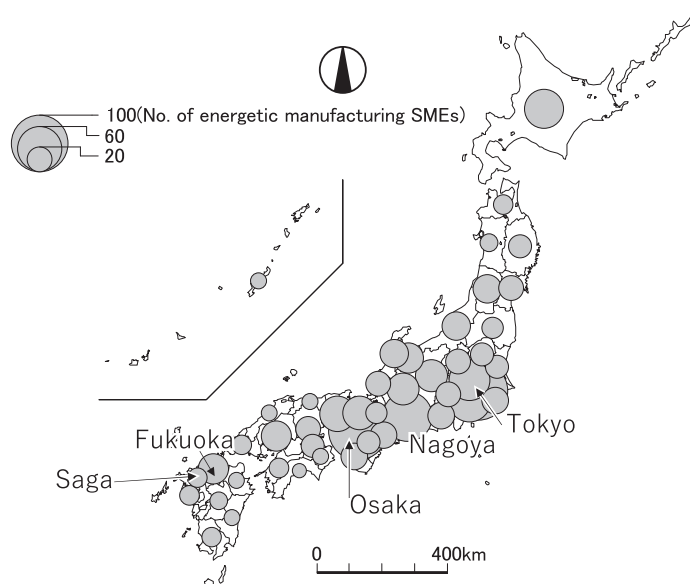


Fig.2 Spatial distribution of energetic manufacturing SMEs recognized by METI and Small and Medium Enterprise Agency as those that will sustain Japan in the near future.

Source: drawn on the basis of data obtained from Ministry of Economy, Trade and Industry and Small and Medium Enterprise Agency (2006; 2007; 2008; 2009) *Energetic Manufacturing SMEs to Sustain Japan in the Near Future*, each year version. Tokyo: Keizai Sangyo Chosa Kai.

frontispiece of Editorial Committee of the History of Kashima-shi (2004).

3. Case study of an innovative SME in a peripheral area of Japan

The target of my case study is Mori Iron Works Co. Ltd., located in Kashima, a city in Saga prefecture. Before describing the company, I'll briefly describe the economic environment of Kashima.

3.1. Economic environment of the town of Kashima

While the easternmost corner of Saga prefecture is included in the Fukuoka metropolitan area⁷⁾, the town of Kashima lies at the southwesternmost corner of Saga prefecture, so it is in the periphery of a peripheral region of Japan, namely Kyushu (See Fig. 3). According to the Population Census of Japan, Kashima had more than 39,000 inhabitants in 1955, and its population has continuously decreased since then, dropping to 29,684 in 2015⁸⁾. The number of daily out-commuters from Kashima was 6,018 in 2015, while 4,963 persons commuted to Kashima from neighboring municipalities. This means that employment opportunities in Kashima were insufficient for the residents, suggesting that it had a weak central place function.

Around 26% of the workers residing in Kashima were employed by secondary industry companies, while about 14% were engaged in agriculture or fishing. And the rest of the workers were engaged in tertiary industries. About 2,300 persons were employed by manufacturing companies. Table 1 shows that more than

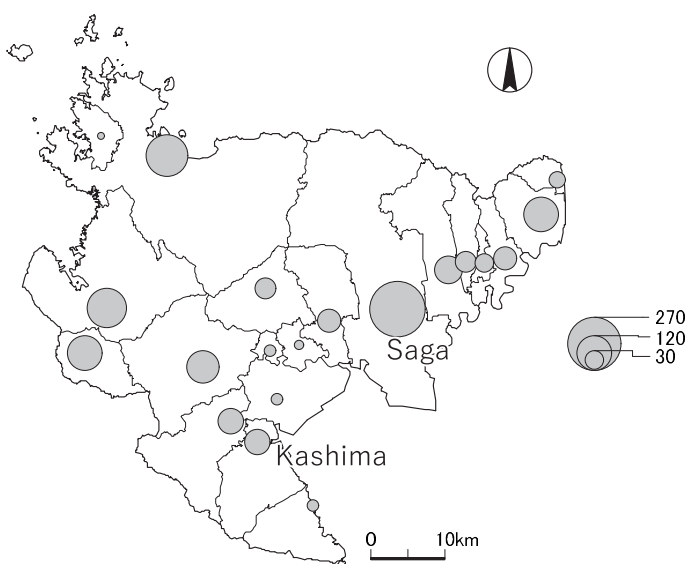


Fig.3 Location of municipality of Kashima and spatial distribution of manufacturing companies in Saga prefecture by municipality in 2014. Capital of Saga prefecture is Saga city; Kashima is located ca. 30 km southwest of capital city.

Source: Statistical survey of manufacturing industries in Saga prefecture by municipality in 2014 (<http://www.pref.saga.lg.jp/kiji00348057/index.html>; accessed 7 July 2018).

Table 1 Structure of manufacturing industry in Kashima, 2017.

	Number of establishments	Number of employees	Shipment value of products (10 thousand Yen)	Shipment value per employee (Yen)
Food	16	481	559,351	11,628,919
Beverages, tobacco and feed	8	209	489,197	23,406,555
Textile	7	262	416,385	15,892,557
Lumber and wood products	4	32	39,219	12,255,938
Furniture and fixtures	1	4	X	
Printing	2	87	X	
Chemical and allied products	2	307	X	
Ceramics, stone and clay products	4	254	297,892	11,728,031
Fabricated metal products	2	20	X	
General machinery	1	5	X	
General industry machinery and equipment	6	231	562,118	24,334,113
Office, service industry and household machines	1	9	X	
Electrical machinery, equipment and supplies	2	89	X	
Transportation equipment	3	267	634,196	23,752,659
Other	2	46	X	
Total	61	2,303	4,653,355	20,205,623

Source: Statistics obtained through homepage of municipality of Kashima ([https://www.city.saga-kashima.lg.jp/html/site_files/file/merumaga/H29toukekashima%20\(1\).pdf](https://www.city.saga-kashima.lg.jp/html/site_files/file/merumaga/H29toukekashima%20(1).pdf); accessed 18 January 2020). Original data source is Census of Manufacture 2017.

Note: these statistics concern manufacturing establishments with four and more employees. X means concealment.

200 employees worked in each of the following sectors: food; beverages, tobacco, and feed; textile; chemical and allied products; ceramics, stone, and clay products; general industry machinery and equipment; and transportation equipment. The higher shipment values per employee were in the beverages, tobacco, and feed sector, the general industry machinery and equipment sector, and the transportation equipment sector. The high shipment value in the first sector was due to the presence of several breweries of high-quality rice wine (*sake* or *nihon-shu*) in Kashima. The object of my own research, Mori Iron Works, belongs to the general industry machinery and equipment sector.

It produces very special metal forming machines with high precision, namely fine-blanking presses. The provision of these machines to parts makers contributes to the development of the Japanese automotive industry. The company's share of the Japanese market is very high, as shown later in this paper. The president of Mori Iron Works is now President of the Kashima Chamber of Commerce and Industry⁹⁾, suggesting that Mori Iron Works is the most successful company in Kashima.

3.2. A previous research on Mori Iron Works

Okada and Miyake (2015) investigated why Mori Iron Works has been successful in the development and marketing of its main product: fine-blanking presses. They concluded that the leadership of the company's executive team and the team spirit of the employees were the keys to their success. Mori's management philosophy is "customer first" as exemplified by the visits of company engineers to customer sites to deter-

mine how best to design a fine-blanking press machine for each customer.

Although Okada and Miyake wrote their article from the viewpoint of management as an academic discipline, their description is not strictly academic because they do not always mention the sources of their information. Nevertheless, it was very helpful in my research. The main source of their information was their three-times interviews with the executive team, which were conducted in 2012 and 2013. These interviews had limitations, however. For example, it is difficult to describe a fine-blanking press simply by means of interviews. Moreover, the article did not refer to any of Mori's competitors. Furthermore, their explanation of the reasons for the company's success should be reexamined from the viewpoint of economic geography, i.e., the relationship between the company's behavior and its social and economic environment.

In fact, without knowledge of the article: Okada and Miyake (2015), I visited Mori Iron Works on 4 August 2015 and interviewed the president. I had obtained information on the company through the Ministry of Economy, Trade and Industry and the Small Medium Enterprise Agency (2007) as well as from the GNT press release on 17 March 2014 mentioned above. I visited this company again on 1 June 2018 and interviewed the president again. The following descriptions are based on these interviews and materials offered by the president as well as on other information obtained through the Internet about fine-blanking presses and Mori's competitors, customers, and collaborating companies.

3.3. Mori Iron Works' key product: fine-blanking press

What kind of machine is a fine-blanking press? When sheet metal is cut with an ordinary press, the surface of the sheared edge is not smooth, so shaving and milling are required. In contrast, when sheet metal is cut with a fine-blanking press, the surface of the sheared edge is smooth (Photo 1). This eliminates the need for secondary processing (i.e., shaving and milling). Furthermore, sheet metal can be molded into complicated three-dimensional shapes, which is traditionally done using a combination of forging, half-blanking, bending, and drawing. A fine-blanking press is thus an appropriate solution to various problems in metal processing¹⁰⁾.

The fine-blanking press was invented by a Swiss engineer, Fritz Schiess-Forrer, in 1922¹¹⁾. It was initially used to process thin metal sheets used to produce precision parts for knitting machines, sewing machines, and so forth. Japan imported a fine-blanking press made in Switzerland in 1964 at the first time. It was used to produce precision parts for watches, cameras, sewing machines, and so on. It was gradually

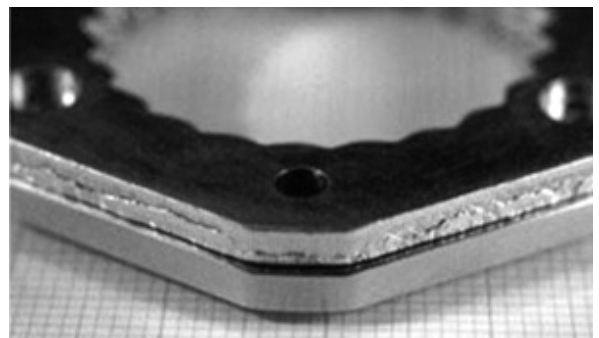


Photo 1 Difference between metal surface processed with fine-blanking press (bottom) and surface processed with an ordinary one (top)

Source: Mori Iron Works homepage (<http://www.moriiron.com/english/technology/fbpt.html>; accessed 4 July 2018)

improved over the years and became able to process metal thicker than 10 mm. Since around 1975, it has been used to produce parts for automotive transmissions, air conditioners, etc.¹²⁾.

According to the Charter of the Committee on Fine Blanking in Japan¹³⁾, which was established in 2006 by parts manufacturers of the automotive and electronics industries, press machine manufacturers, university professors, and so on, there were only eight manufacturers of fine-blanking presses in the world in 2006. Among them, there were five in Japan, and one each in Switzerland, Germany, and the Republic of Korea. About 10% of all fine-blanking presses in the world had been installed in 120 manufacturing companies in Japan as of 2006. About 80% of the presses were used to produce automotive parts, especially parts made of thick sheet metal and formed into three-dimensional complicated shapes¹⁴⁾.

According to the president of Mori Iron Works, there are now only two companies producing fine-blanking presses that have a presence in the world marketplace: Mori Iron Works in Japan and Feintool International Holding AG in Switzerland. Feintool is clearly the market and technological leader in the globalized market for these specialized metal-processing machines. There are, however, a few other companies that produce fine-blanking presses, as described later in this paper. Fritz Schiess AG, mentioned in Note 11), may be one of them.

According to the “Annual Report 2015” of the Feintool Group (Feintool International Holding AG 2016:18), Feintool is the world’s market and technological leader for fine-blanking presses. About 90% of the fine-blanking presses used in the United States and Europe and about 60% of those used in Asia were made by Feintool. Its sales amounted to more than 500 million Swiss francs in 2015, and the number of its employees is more than 2000 worldwide. It has subsidiaries not only in Switzerland and Germany but also in the United States, Japan, and China.

In contrast, Mori Iron Works had only 50 million yen in capital and 134 employees as of 2015, and its turnover amounted to only about 4,100 million yen (about 35 million Swiss francs) as of 2014¹⁵⁾ according to the material offered by the president¹⁶⁾. Although Mori Iron Works is much smaller than Feintool, it is nevertheless a challenger to the Swiss manufacturer. Next, I’ll describe the evolution of this SME in the periphery of Japan.

3.4. History of Mori Iron Works¹⁷⁾

The forerunner of Mori Iron Works Co. Ltd. was founded in 1922 in the former town of Shiota in Saga prefecture as a distributor of fertilizer to farmers in the Saga region. Its name was Mori Kyodo Hiryo Kabushiki-Kaisha, or Mori Cooperative Fertilizer Co., Ltd.¹⁸⁾. The investors comprised not only members of the Mori family but also about 300 farmers in the region. It was established as a challenge to the then local agricultural cooperative. About 60 farmers in the region still own stock in Mori Iron Works.

The company became a sales agent of agricultural machines made by Kubota Iron Works Co. Ltd.¹⁹⁾ in 1944, which gave it the abilities needed to repair agricultural machines. In that year, it changed its name to

Mori Noko Co., Ltd. according to the homepage of Mori Iron Works. The Japanese abbreviated word *Noko* means agriculture and manufacturing industry. In 1948, the Saga prefectural government asked the company to develop a machine for roasting tea, and it could do so. Thus, the forerunner of Mori Iron Works developed into a manufacturing company producing a simple machine. In that year, it relocated from Shiota to the neighboring town of Kashima, in front of the railway station, because it was much more convenient for transport of materials and products.

In 1956, Mori Noko became a subcontractor of Mitsubishi Electric Co., Ltd, which was located in Nagasaki and one of the largest electric companies in Japan. Mori Noko then began producing parts for electric motors by using technologies normally used for manufacturing cans, for which the key technology is welding. It grew larger on the strength of the large number of subcontracting orders it received from Mitsubishi Electric. It produced about 80% of the parts used in the motors procured by Mitsubishi Electric, and the number of employees amounted to more than 200 in the 1960s. This led to another change in its name in 1966 to Mori Iron Works Co., Ltd. along with a capital investment in the company by Mitsubishi Electric in the same year. Although it became dependent on Mitsubishi Electric, its production control capabilities were enhanced through its dealings with Mitsubishi Electric, a pattern similar to that of most of the successful SMEs in Japan²⁰.

However, its status as a subcontractor was not stable and made the company vulnerable to the business conditions of Mitsubishi Electric. If this business results worsened, Mori Iron Works could find itself in survival mode. Therefore, the then president decided that the company needed to develop its own products. Taking the advice of a representative of an industrial machine trading company with which the company had done business, he decided around 1970 to manufacture hydraulic presses. This was an attractive product because many SMEs were producing this type of machine in Japan and the entry barriers were low.

Mori Iron Works was well positioned to make this transition because of the good teamwork of three employees. One of them was an engineer skilled in designing machines and another engineer was an expertise in electrical technology. They had gained their knowledge in engineering through on-the-job training at larger companies in metropolitan areas and had returned to their hometown for family reasons. They had joined Mori Iron Works around 1970. The third worker skilled in the construction of machines had been working at the company since the 1940s. These three employees teamed up and developed a hydraulic press that became a successful product. My interviewee emphasized the collaboration of these three skilled workers or engineers for the change from being a mere subcontractor to becoming an independent SME.

Mori Iron Works began selling its hydraulic press in 1971. During the 1970s, it sold its product mainly through trading companies such as Yuasa Trading Co., Ltd. and Yamazen Corporation to small factories located especially in the northern part of Japan, where there was much larger demand for tin roofs due to snowy conditions, than in Kyushu, where many houses had tiled roofs.

The local market in Saga prefecture also played an important role in the technological development of

Mori Iron Works. For example, it directly sold 150 wet-type powder-forming presses to a subsidiary of a large steel maker, Sumitomo Metal Industries, Ltd., in the second half of the 1970s. This subsidiary was located in a town near Kashima, where a large coal mine had been closed down in the first half of the 1970s. The subsidiary was established to mitigate the impact on the local labor market, and it needed hydraulic presses to produce magnetic material²¹⁾. Generally speaking, large companies have a much higher level of production management, and they demand much higher quality than normally achieved by SMEs. Mori Iron Works was thus able to enhance its technology through its dealings with the subsidiary of Sumitomo Metal Industries. These dealings were mediated by the prefectural government, which sought to revitalize the local and regional economies.

While mechanical presses are produced mainly by large companies such as Aida, Amada, and Komatsu in Japan, hydraulic presses are produced mainly by SMEs, and price competition is very tough, especially for traditional hydraulic presses. It was hard for Mori Iron Works to prosper by producing ordinary press machines because it had entered the business of press machine late, and it did not have any special technology. To address this problem, in 1981, Mori Iron Works decided to change from a traditional hydraulic press maker to a fine-blanking press maker.

This transition was realized in collaboration with Hirata Press Kogyo Co., Ltd. in Tokyo, which was a first-tier parts supplier to Honda Motor Company. Hirata Press Kogyo began using fine-blanking presses made in Switzerland in the 1970s, but it was not easy to handle these machines, and the Swiss manufacturer was slow to respond to requests from Hirata Press Kogyo for maintenance. A company vice-president told the president of Mori Iron Works at the time that his company would buy fine-blanking presses from a Japanese press manufacturer if it could develop one. Hirata Press Kogyo was already a Mori customer, so Mori listened to “the voice” of the vice-president, who had been an employee of Honda Motor Company.

Voice is a very important concept for understanding dealings between companies (Hirschman, 1970), especially in Japan. The market mechanism, namely price competition, is of course important to whether a supplier begins, continues, or ends its business dealings with a customer. Another important concept in Japan is the exchange of information on the development of a new product between companies that already have an established relationship. That vice-president had made the acquaintance of the president of Mori Iron Works on a previous occasion, so they already had a relationship suitable for a collaborative undertaking.

Thus, Mori Iron Works and Hirata Press Kogyo collaborated to develop a fine-blanking press. In spite of the distance between their locations, success was achieved partly because Hirata Press Kogyo had experience in and knowledge about producing press molds and dies for fine-blanking presses, and Mori Iron Works had knowledge about developing various types of hydraulic presses. Engineers from both companies met at each other’s factory and discussed how to solve the problems in development. They interactively learned fine-blanking press and die for it with each other.

The first three fine-blanking presses produced by Mori Iron Works were sold to Hirata Press Kogyo, and

the fourth was sold to another SME, Sera Co., Ltd., which was located in Amagasaki in the Osaka metropolitan area. Sera was supplying parts for braking systems to several first-tier suppliers to automotive manufacturers. Unfortunately, the fine-blanking press it purchased from Mori Iron Works tended to malfunction, so an engineer of this company went to Amagasaki almost every weekend to repair it. This enabled Mori Iron Works to accumulate the experience and knowledge needed to improve its fine-blanking press. Similar situations occurred with other customers, even ones located far from Kyushu. Engineers of Mori Iron Works learned metal-working processes and die for fine-blanking press at the site of their customers, and metal-working companies learned how to use the fine-blanking press. Such interactive learning enhances the knowledge both of the supplier and its customers.

3.5. Market for fine-blanking presses and business policy of Mori Iron Works

Before Mori Iron Works entered the market for fine-blanking presses, a few Japanese companies such as Komatsu, Aida, OKK, and Mitsui-Miike Machinery had produced and sold fine-blanking presses in Japan²²⁾. However, they could not compete with the Swiss and German makers²³⁾, so they stopped production. Although Mori Iron Works was a latecomer to this market, it steadily improved its fine-blanking press by listening to the voices of its customers. To listen to the customers' voices, engineers and managers often visited customer factories to listen to their problems as well as to observe the presses in operation, looking for ways to improve them. This process of quickly responding to customer problems, solving them on-site, and listening to the voices of the customers embodies the guiding principle of Mori Iron Works: behave in a customer-oriented manner, i.e., the customer comes first. Precisely for this reason, the company was able to accumulate the experience and knowledge needed to improve its fine-blanking press and develop other types of press machines such as a hydraulic orbital forging press and a multi-axis servo hydraulic press (a one-shot forming press)²⁴⁾.

Mori Iron Works steadily built its customer base among Japanese makers of automotive parts: Nippon Kinzoku Co., Ltd in Tokyo; Yamamoto Seisakusho, Inc. in Higashi-Matsuyama, Saitama, near Tokyo; Sugawa Kogyo in Tokyo; Hatano Seimitsu in Kanagawa; Akita Fine Blanking Corporation in Shizuoka; and so on²⁵⁾. Its customers also include Toyota Motor Co., Ltd, Nissan Motor Co., Ltd, and Isuzu Motor Co., Ltd. Leading first-tier suppliers to the automotive producers are also customers. They include Aisin Seiki Co., Ltd., one of the largest first-tier supplier of various parts for drivetrains, braking systems, chassis, engines, bodies, etc. to Toyota; Aisin AW Co., Ltd., a large first-tier supplier of transmissions to Toyota; Denso Co., Ltd., one of the largest first-tier supplier of various parts including engines and power trains, air conditioners, steering systems, and bodies to Toyota; Shiroki Kogyo, a member of the Aisin group and a manufacturer of sheet systems, automotive door parts, etc.; Unipres, a first-tier supplier of body parts, transmission parts, etc., mainly to Nissan²⁶⁾.

Partly because the prices of the fine-blanking presses made by Mori Iron Works are much cheaper than

those of presses made by Feintool, they have sold well among Japanese manufacturers specialized in metal forming technology in the automotive and electronics industries. Between 2000 and 2012, 133 fine-blanking presses were purchased and installed by manufacturing companies in Japan. Mori Iron Works sold 100 them. Thus, it owned a 75 % share of the fine-blanking-press market in Japan. The second-ranked provider was SMG (Süddeutsche Maschinenbau Gesellschaft mbH) (Table 2). The lower price was not the only determinant of Mori's success. According to the company president, a much more important determinant was their after-sales service, namely quickly responding to the problems and demands of each customer and finding solutions to their problems.

The production of dies for the fine-blanking press was also an important factor in the success of Mori Iron Works. Since they must be made with a high level of precision, the collaboration with Hirata Press Kogyo was very important. Today, however, Mori Iron Works does not have any connection with Hirata Press Kogyo or its successor, H-One Company Ltd. Instead, it has been collaborating with Showa Seiko (Showa Precision Tools Co., Ltd.) since 2010. Showa Seiko is located in Yokohama and is a specialist in die making. This information was obtained from the homepage of Mori Iron Works²⁷⁾. The presidents of Mori Iron Works and Showa Seiko are both board members of the Research Association of Fine Blanking Technology in Japan²⁸⁾.

Although a die is not usually compatible with different fine-blanking presses, Mori Iron Works sells fine-blanking presses that can use dies the customers already have. Furthermore, it developed a more efficient fine-blanking press on which a worker can change dies much more quickly than on a Feintool press. A fine-blanking press normally had to be operated by a skilled worker, but a press made by Mori Iron Works can be operated by a semiskilled worker because it is controlled electronically.

Until the 1990s, Mori Iron Works sold its fine-blanking presses mainly to Japanese companies, with fewer than ten sold each year. Since 2002, it has sold more than 20 presses almost every year. Since 2009, more than 50% have been exported each year, and the ratio has exceeded 80% recently (Fig. 4). Mori's main markets are the Republic of Korea, China, and the United States (Table 3). It exports fine-blanking presses to

Table 2 Number of fine-blanking presses by press maker installed in manufacturing companies located in Japan between 2000 and 2012

Name of press makers	Number of FB presses
Mori Iron Works	100
SMG (German company)	18
Asai (Japanese company)	5
Schmid (Swiss company)	4
Neagari Shibuya (Japanese compnay)	3
Osterwalder (Swiss company)	2
Kawasaki Hydromechanics Corp. (Japanese company)	1
Total	133

Source: Mori Iron Works.

automotive parts makers located in Asian countries, not only to subsidiaries of Japanese makers but also to local manufacturers.

Moreover, it has obtained orders for fine-blanking presses from European metal-working companies since 2016, and 30% of its sales went to European metal-working companies in 2016. The companies installed the presses mainly in Asian and American

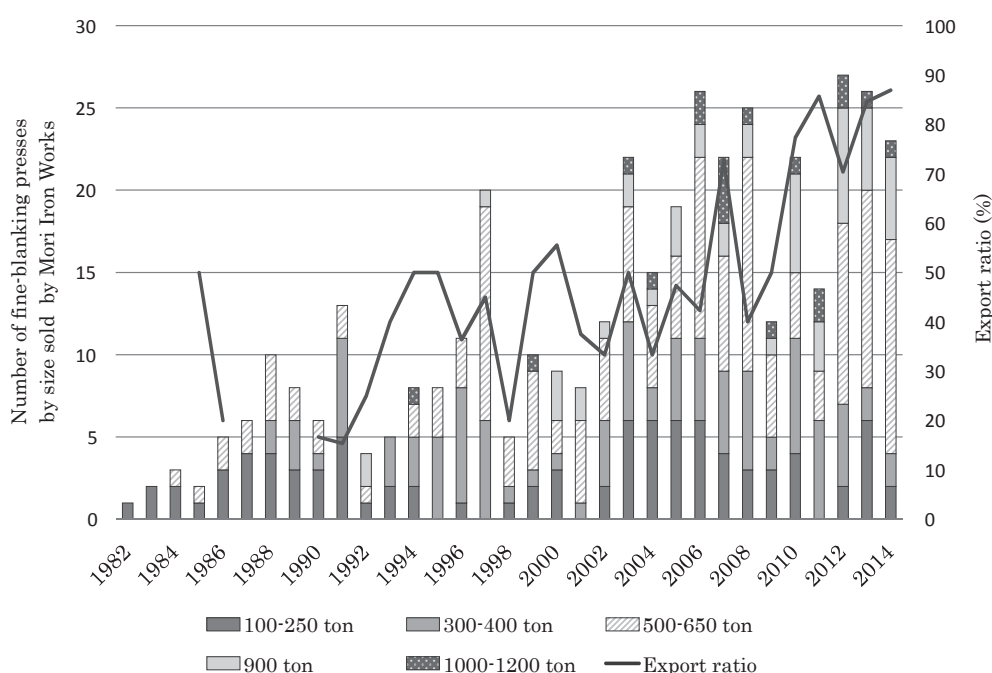


Fig.4 Number of fine blanking presses sold by Mori Iron Works between 1982 and 2014.

Source: Mori Iron Works

Table 3 Main countries to which Mori Iron Works provided fine-blanking presses between 1982 and 2012

Name of country	Number of FB presses
Korea	59
China	30
USA	22
India	9
Thailand	8
Canada	8
Taiwan	6
others	4
Total	146

Source: Mori Iron Works.

countries as well as in factories in Europe. All the European customers requested separate guarantees on each of the important components. Mori's president speculated that the presses produced by European makers contain various components produced by various subcontracting companies rather than the maker itself and that those components tend to cause problems for the customer. If so, the maker's engineers may not be able quickly to handle any problem. In contrast, Mori Iron Works produces all the important components itself, so it can quickly respond to problems. He considers this self-produc-

tion of important components as one of Mori's key advantages.

To sell more fine-blanking presses and other presses and to provide its customers with excellent after-sales service, Mori Iron Works established sales offices in Seoul and Toronto in 1994 and in Shanghai in 2003. It also has a sales office in Bangkok. Within Japan, it has sales and service offices in Tokyo, Osaka, and in Anjo city in Aichi prefecture. Mori Iron Works' network is thus spread not only over Japan but also abroad. It

provides its products to Vietnam, Singapore, Indonesia, Malaysia, Myanmar, Bangladesh, Pakistan, Iran, Iraq, Uzbekistan, Russia, Egypt, Tunisia, Mexico, Australia, the Czech Republic, Italy, and the UK according to information provided by the president of Mori Iron Works. Mori now shares the world-wide market for fine-blanking presses with a giant corporation, Feintool²⁹⁾. We may well regard Mori Iron Works as a hidden champion in the world market of fine-blanking press, although it is not the top company, but a challenger to the Giant: Finetool.

As discussed above, Mori Iron Works operates under a certain principle: develop presses based not solely on an engineer's own idea and complacency but by meeting the needs of each customer. Therefore, a design engineer visits a customer's factory to ascertain the customer's needs. Mori also has a policy of not producing the same press again and again but to develop new and improved presses every year. As a result of this development policy, Mori is now able to adapt to the various needs of its customers and to offer various options for its fine-blanking presses. The prices of its presses are less than those of Feintool ones and have been stable since the mid-1980s. Nevertheless, Mori Iron Works can ask a so high price of fine-blanking press as it expects by adding options to the product.

Mori's sales turnover increased from a little bit more than 2 billion yen in 2003 to about 3.8 billion yen in 2008. Then, due to the Lehman Shock in 2008, it sharply decreased to 2 billion yen. It then began increasing again and amounted to 4 billion yen in 2012 and more than 4 billion yen in 2014 (Fig. 5).

Mori Iron Works does not depend solely on the sales of fine-blanking presses. As mentioned above, it developed a hydraulic orbital forging press, which is suitable for low-volume production with less noise as well as less vibration, in 1992 with a subsidy from the Ministry of International Trade and Industry (the

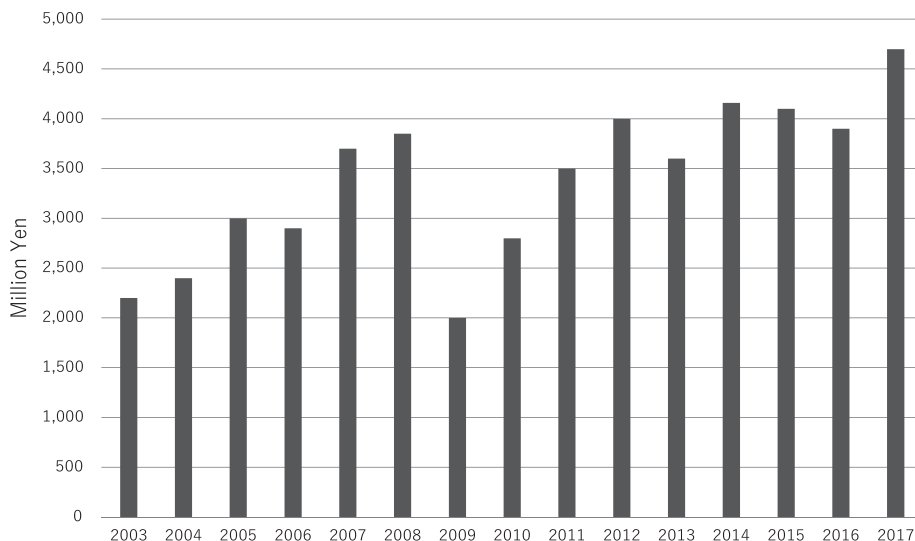


Fig.5 Change in sales turnover at Mori Iron Works from 2003 to 2017.

Source: Mori Iron Works

forerunner of METI). In 2009, it developed a multi-axis servo hydraulic press with energy saving ability, this time with a subsidy from METI. It realized practical use of a double-action-one-stroke press in the metal forming line and processing of clutch hub by double-action-five-axis hydraulic press in collaboration with Aisin AW. The former development was awarded the 2012 Grand Prize by the Japan Society for Technology of Plasticity and the latter was awarded the MF (Metal Forming) Technology Grand Prize by the Japan Forming Machinery Association in the same year. In 2014, it was again awarded the Grand Prize by the Japan Society for Technology of Plasticity for its development of a synchronized integrated press system in collaboration with Denso Corporation and Asahi Sunac Corporation, the latter of which is located in Owari-Asahi in Aichi prefecture³⁰⁾. Mori Iron Works now dominates the market for fine-blanking presses not only in Japan but also in Asian countries, where the automotive and electrical industries have been growing.

Mori Iron Works has assumed an important position on the Committee on Fine Blanking in Japan (i.e., the Research Association of Fine Blanking Technology in Japan as mentioned above). The members of the Association are engineers and researchers who work either at manufacturing companies or at technical universities in Japan; it is located in Tokyo. The president of Mori Iron Works is one of 16 directors of the Association³¹⁾, enabling Mori to obtain various types of information on fine-blanking presses from the various members of the association, most of whom live and work far from Saga prefecture. While Mori continues to collaborate with the Industrial Technology Center of Saga prefecture, it seems that the geographical location of Mori Iron Works is now not so important for the development of fine-blanking-press technology and of other types of press machines because technological development is now achieved through collaboration with various manufacturing companies located not in Saga prefecture but in the Tokyo, Osaka, and Nagoya metropolitan areas.

Since the experimental use of fine-blanking presses and the other new types of presses by customers is very important for Mori Iron Works to obtain the information and knowledge needed to develop and improve products, Mori built a laboratory in 2017 on the site of its headquarters and factory amid an agricultural landscape (Photo 2), where the company relocated from the front of the Hizen-Kashima railway station in the 1980s in order to get wider site area for its factory. Various new presses are set up in the laboratory, and engineers and skilled technicians from current and potential customers, in collaboration with Mori engineers, can conduct experiments using them. “Being there” together is



Photo 2 Laboratory of Mori Iron Works amid agricultural landscape. Building on right above with “ものづくり lab” across the top is the laboratory. It was taken on 1 June 2018 by the author.

decisive for creating the knowledge needed to improve and develop industrial machinery (Gertler 1995). And it is now possible for Mori's engineers to communicate with customers' engineers and technicians on site, even if a customer company is located far from Kashima in the periphery of Japan. The establishment of that laboratory has enabled Mori Iron Works to attract engineers and skilled technicians from both current and potential customers to its hometown from places far away.

Its home region is still important in another way. Mori recruits graduates from local technical high schools and from the few technical universities in the northern part of Kyushu. The age structure of Mori employees is well balanced, with the young and middle generations dominating (Table 4). Such an age structure for an SME generally means that it is innovative and well-known in the local society concerned. Moreover, employee turnover at Mori is very low.

It may well be possible for such an innovative SME to recruit engineers who are employed by large leading companies in the Tokyo, Osaka, and Nagoya metropolitan areas if they have to or would like to return to their hometown in a peripheral area for personal reasons. Employees at large companies in Japan usually have greater engineering and management abilities than those at SMEs. SMEs with vitality in rural areas have a greater chance of attracting such talented employees than SMEs in metropolitan areas.

Nevertheless, according to the company president, Mori Iron Works has not employed returning engineers for the last ten years or more. Rather they have employed talented middle-aged or senior persons with foreign language ability as sales managers in the metropolitan areas.

4. Conclusion

The reason Mori Iron Works has evolved into a hidden champion is its policy of interactive learning with its customers. The experiences of this SME accord with the explanation by Lundvall (1988) of how companies can realize their own innovations. It is common sense among economic geographers that proximity is a key determinant of interactive learning. We should note, however, that proximity is restricted not only to geographical one. Once a company sells an industrial machine to a customer, it is obligated to provide after-sales service. This is the most important means for obtaining information about the customer's needs. Furthermore, once an industrial machinery SME has built a good reputation among metal-working companies, it can attract customers even far from its hometown.

Table 4 Age structure of Mori Iron Works' employees in 2015

Age	Number	%
19	5	4.0
20 – 29	25	20.2
30 – 39	32	25.8
40 – 49	19	15.3
50 – 59	25	20.2
60 – 64	12	9.7
65 and over	6	4.8
Total	124	100.0

Source: Mori Iron Works.

Note: The five who were 19 years old had just graduated high school in March 2015.

Geographical proximity between Mori Iron Works and its customers' factories is no longer a factor in innovations by the company. It is rather much more important for its engineers either to visit their customers' factories and discuss their needs and problems with the customer's engineers or to welcome them to the Mori laboratory in Kashima.

The local environment was an important factor in the first stage of the evolution of Mori Iron Works. However, it was and is not so important in the later stages for the development of fine-blanking presses. It is much more important to obtain new information and to create new knowledge in collaboration with customers. It is vital to listen to the voices of the customers and to provide not only products but also after-sales service for them.

Nevertheless, the local environment is still a factor in another sense because it can easily provide motivated young persons as employees, which is attributable to Mori Iron Works' presence in the local and regional economy.

Therefore, a rural environment in a peripheral region is not a decisive barrier for manufacturing SMEs in the industrial machine sector if they are willing to innovate. It is important for them to obtain meaningful information for improvement of their products and for construction of new machines. They can get such information through communication with their customers on-site. In a highly developed country, such as Japan, businesspersons including engineers can overcome geographical distances so that the rural environment in a peripheral region is not a fetter on innovating SMEs.

However, it is very difficult for a rural community in a peripheral area to be revitalized only through the activities of a few manufacturing SMEs with innovative ability. In Saga prefecture, besides Mori Iron Works, there are several SMEs with high technological abilities and a large share of a niche market. They include Toa Koki Co., Ltd. in Kashima, a manufacturer of cylinders for ship diesel engines; Nishimura Works Co., Ltd. in Ogi, a manufacturer of compact disc dryers for industrial waste water; YBM Co., Ltd. in Karatsu, a manufacturer of soil improvement machinery; and Karatsu Precision, Inc. in Karatsu, a manufacturer of gear-hobbing, -shaping, and -grinding machinery, very large CNC lathes, and mills. All of these SMEs are located in small towns in rural areas of Saga prefecture outside of the Fukuoka metropolitan area. I have visited each of these SMEs and interviewed their executives during the time I worked at Kyushu University.

Saga prefecture is an interesting region, because there are several energetic manufacturing SMEs in various niche markets in spite of its peripheral geographical and economic location. How could such SMEs develop in this region? This is an important research question for economic geography as an academic discipline. There is another important research question for this discipline. It is a problem not only for peripheral localities but also for Japan as a whole since long ago: the continuing population decline. It is not easy to revitalize the economy of peripheral regions and localities simply through the activities of energetic SMEs including even hidden champion. These questions are to be investigated on another occasion.

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Notes

- 1) https://www.meti.go.jp/policy/mono_info_service/mono/gnt100/pdf/20140317a.pdf; accessed 17 January 2017.
- 2) http://www.meti.go.jp/policy/mono_info_service/mono/gnt100/pdf/20140317b.pdf; accessed 4 November 2016.
- 3) It is apparent that the GNT companies defined by METI do not compare with the hidden champion companies defined by Simon (1996). According to the latter, hidden champions either must have the top or the second-top share of the world market or must be number one in the European market. The second criterion for a hidden champion is the amount of sales revenue: less than one billion USD (or ca. 110 billion yen). The third criterion is low public visibility among the populace. We should note that the criteria for GNT by METI does not mean ranking of the world market share. Therefore, it is doubtful if companies recognized as GNT really have the highest share of the world market for some product. The naming seems to be an exaggeration.
- 4) In Japan, SMEs are defined in accordance with Article 2 of the Small and Medium-sized Enterprise Basic Act. In the manufacturing industry, there are two criteria: the amount of capital and the number of employees. If capital is 300 million yen or less and the number of its employees is 300 or less, the company is classified as an SME. All other manufacturing companies are classified as large-sized ones in accordance with the Basic Act. A mid-level company, or *chuken kigyo* in Japanese, is an ambiguous concept, although a renowned economist, Nakamura (1961), depicted such companies as SMEs and mid-level companies with remarkable technology and vitality and not under the control of a larger company. His definition is similar to the German concept *Mittelstand* or *mittelständische Unternehmen* as specified in the Lexicon of Economic Concepts in Germany (<https://wirtschaftslexikon.gabler.de/definition/mittelstand-40165>; accessed 13 January 2020). METI defines a mid-level manufacturing company as a large company with latest annual turnover under 100 billion yen.
- 5) We should be careful when classifying the municipalities in Mie prefecture into metropolitan areas. Municipalities in the north-eastern part of Mie belong to the Nagoya metropolitan area without doubt while those in the north-western part, e.g., municipality of Nabari where a GNT SME is located, do not belong to any metropolitan area. However, another GNT SME is located in Yokkaichi, which is included in the Nagoya metropolitan area. Information on the addresses of the GNT SMEs was obtained from the website of METI (GNT *Kigyo Gaiyou* (*Shosai-ban*): https://www.meti.go.jp/policy/mono_info_service/mono/gnt100/pdf/20140317d.pdf; accessed 17 January 2020). The southern part of Gifu prefecture is included in the Nagoya metropolitan area.
- 6) The three metropolitan areas of Sapporo, Sendai, and Fukuoka are semi-peripheral areas within peripheral areas of Japan: Hokkaido, Tohoku, and Kyushu. Wallerstein (1974: 354) writes: "core-states because of their complex internal division of labor begin to reflect the pattern of the system as a whole". "The system" in this sentence means the

world economy. The central urban municipalities of those semi-peripheral areas in Japan have more than about one million inhabitants and the population in each metropolitan area is more than 1.5 million (Population Census of Japan 2015). On the basis of detailed information on GNT companies (GNT *Kigyo Gaiyou* (*Shosai-ban*)) mentioned above in Note 5), we can find the addresses of the SMEs. The companies in Hokkaido, Miyagi, and Fukuoka are not located in the central city but in its suburbs, and one can reach the central city from each SME within about 30 minutes by car.

- 7) See the map of Fukuoka-Kitakyushu metropolitan area in the Report of the Population Census of 2015. (<https://www.e-stat.go.jp/stat-search/files?page=1&layout=datalist&toukei=00200521&tstat=000001080615&cycle=0&class1=000001110216>). On this map, Fukuoka and Kitakyushu jointly shape one metropolitan area. However, these two urban areas are different metropolitan areas to each other, at least from the viewpoint of the local people.
- 8) [https://www.city.saga-kashima.lg.jp/html/site_files/file/merumaga/H29toukeekashima%20\(1\).pdf](https://www.city.saga-kashima.lg.jp/html/site_files/file/merumaga/H29toukeekashima%20(1).pdf); accessed 28 January 2020. The other statistical information about Kashima in this chapter is derived from this website as well.
- 9) The president told me about his position in the Kashima Chamber of Commerce and Industry when I visited him on 1 June 2018. He was elected again as president in November 2019 (News of the Kashima Chamber of Commerce and Industry, No. 5 <http://www.kashima-cci.or.jp/images/2019116kaihouVol5.pdf>; accessed 1 June 2020)
- 10) <http://www.moriiron.com/technology/fbpt.html?phpMyAdmin=H-cl%2C%2CoWe-fZtmLGf5XiXShQ-94>; accessed 28 October 2016.
- 11) Fritz Schiess-Forrer established his own company (Fritz Schiess AG) in 1920 and developed the first fine-blanking press (*Feinschnitt Presse*); he obtained a patent on the processing method from the German Patent Agency in 1922 (<https://www.fschiess.com/unternehmen>; accessed 2 June 2020). According to the homepage of the Wattwil municipality in Switzerland (http://www.wattwil.ch/de/portraitinfos/geschichte/welcome.php?action=showinfo&info_id=6660; accessed 2 June 2020), where Schiess-Forrer established his company, and the homepage of Fritz Schiess AG (<https://www.fschiess.com/en/home-2>; accessed 2 June 2020), which is now located in the neighboring municipality of Lichtensteig, he was born in 1880 and worked at a leading engineering company in Winterthur, Switzerland (Brown, Boveri Co.) before founding his company (http://www.wattwil.ch/de/portraitinfos/geschichte/welcome.php?action=showinfo&info_id=6660; accessed 2 June 2020). Both municipalities are located in rural areas of the St. Gallen Canton.
- 12) The description in this paragraph is based on the Invitation Announcement for the First Anniversary of the Establishment of the Research Association of Fine Blanking Technology in Japan in 2007 (<http://www.fb-japan.com/news/20071012.html>; accessed 28 October 2016). Although this research association calls itself the “Committee on Fine Blanking” in English, a better translation is the one given about as it clarifies the objective of the association.
- 13) “Committee on Fine Blanking” is better expressed as “Research Association of Fine Blanking Technology in Japan,” as mentioned in Note 12).
- 14) http://www.fb-japan.com/h/gaiyo_02.html; accessed 28 October 2016.
- 15) One Swiss franc was worth about 115 yen in 2014 on average, according to Mitsubishi-UFJ Bank (http://www.murc-kawasesouba.jp/fx/past_3month.php; accessed 19 January 2020).
- 16) After my interview with the president of Mori Iron Works on 4 August 2015, he sent me a brochure entitled “From Kashima to the World: Hydraulic Press with High Technology” (my translation of the Japanese).
- 17) The following description is based on my interview with the president on 4 August 2015, with the proviso that I do not mention other information sources.
- 18) <http://www.moriiron.com/about/history.html>; accessed 2 June 2020. On the factory site of Mori Iron Works, there is a cottage with the name *Mori Hiryo Ten* (“Mori’s Fertilizer Shop”) on the window glass, which I saw during my visit

on 1 June 2018.

- 19) Kubota Iron Works is one of the largest manufacturing companies of agricultural machines in Japan; it is now called Kubota Corporation in English. It manufactures agricultural machines as well as water supply and waste disposal systems and other products (<https://www.kubota.co.jp/company/about/history/index.html> and https://www.maff.go.jp/j/council/sizai/kikai/25/pdf/ref_data3.pdf; both accessed 16 June 2020).
- 20) I have interviewed more than 200 executives of manufacturing SMEs in Japan since 1997. They often told me that they acquired knowledge and skills through their dealings with large leading companies and their companies were brought up by their customers: large companies. The interviews were recorded in Yamamoto (2001, 2004, 2006, 2013, 2017).
- 21) The subsidiary was Sumitomo Tokushu Kinzoku Co., Ltd. This company was amalgamated with a division of Hitachi Metals, Ltd. to form Neomax in 2004. Neomax was merged into Hitachi Metals in 2007, so the company and its factory in Saga no longer exist (<https://www.hitachi-metals.co.jp/press/pdf/2003/n030620.pdf>; accessed 2 March 2020).
- 22) These names of makers of fine-blanking presses in Japan were mentioned by the president of Mori Iron Works when I interviewed him on 4 August 2015. However, according to the Sera Corporation homepage (<http://www.kksera.co.jp/equipment/index.html>; accessed 4 November 2016), a machinery company in Fujinomiya in Shizuoka prefecture sold Sera a fine-blanking press. That company was Amino Co., Ltd., which does not produce a fine-blanking press any longer (<http://www.amino.co.jp/products/24.html>; accessed 4 November 2016). One of the fine-blanking-press makers mentioned by the president of Mori was Mitsui-Miike Machinery. However, it was not Mitsui-Miike Machinery but a subsidiary of this traditional company that manufactured a fine-blanking press. Its name was Toyo Seimitsu Press Kogyo (Toyo Fine-Blanking). According to the homepage of Toyo Seimitsu Press Kogyo, Mitsui-Miike Machinery collaborated with a Swiss machinery manufacturer, Hydrel AG, in 1964 and established Toyo Seimitsu Press Kogyo in Zama in Kanagawa prefecture in 1965 to sell the fine-blanking press and specific dies for it to Japanese automotive parts manufacturers. It began to manufacture fine-blanking presses and metal parts processed with this press in 1966 (<http://www.toyofb.co.jp/company/history.html>; accessed 4 November 2016). Toyo Seimitsu Press Kogyo was merged into Mitsui-Miike Machinery in 2005. According to the homepage of this traditional company, it does not manufacture a fine-blanking press but rather processes metal parts using this specific press and sells them (<https://www.mitsuiiike.co.jp/company/profile/index.html>; accessed 4 November 2016).
- 23) These Swiss and German companies are Osterwalder AG in Lyss, Canton Bern, Heinrich Schmid Maschinen- und Werkzeugbau AG in Rapperswil-Jona, Canton St. Gallen, Hydrel AG in Romanshorn, Canton Thurgau, Feintool AG in Lyss, Canton Bern, and SMG (Süddeutsche Maschinenbau GmbH) in Waghäusel, Baden-Württemberg, Germany.
- 24) <http://www.moriiron.com/english>; accessed 2 June 2020.
- 25) These companies were mentioned in the interview between the president of Mori Iron Works and directors of the Committee of Fine Blanking. This interview is recorded in the journal “Press Seikei Kako (Press Forming Processing)”, Vol. 9, No. 8, pp. 20-29 (<http://www.fb-japan.com/img/2010101502.pdf>; accessed 5 November 2016). Those companies are second-tier suppliers to automotive makers. Akita provides first-tier suppliers to Honda with parts and has two factories in Thailand. Thirteen fine-blanking presses made by Mori Iron Works are installed at its factory in Shizuoka (<http://www.akitafb.co.jp/setsubi.html>).

Hatano Seimitsu employs around 150 workers at its factories including its subsidiaries in Toyohashi and Kagoshima in Japan. It also has subsidiaries in Thailand and the Philippines (<http://www.hatanoseimitsu.co.jp/contents/company.html>).

Sugawa has factories in Saitama, Gunma, and Yamagata. It provides Akebono Brake, Nisshin Boseki, Aisin Kako, AS Brake Systems, NSK Warner, and others with metal parts for braking systems (<http://www.sk-k-sugawa.co.jp/p-1.html>).

Yamamoto Seisakusho provides various first-tier suppliers to automotive companies with metal parts for braking systems. It employs more than 300 in Japan and more than 300 abroad. It has factories in Yamagata and Gifu and a subsidiary in the U.S.A. (<http://www.fb-yamamoto.co.jp/bases>).

Nippon Kinzoku Co. is not simply a supplier for the automotive industry; rather it is a supplier of stainless steel and other difficult-to-cut metal materials. It has factories not only in Tokyo but also in Gifu and Fukushima. It has subsidiaries in Thailand and Malaysia (<http://www.nipponkinzoku.co.jp/corporate/company-profile>).

Sera Co., Ltd. provides various first-tier suppliers to automotive companies with metal parts. The number of its employees is under 100 at its factory in Amagasaki, but more than 200 workers are employed at its subsidiary in Thailand. It also has a subsidiary with ca. 80 employees in Foshan, China (<http://www.kksera.co.jp/corporation/index.html>).

All the websites mentioned in this note were accessed on 5 November 2016.

- 26) All these car makers and first-tier suppliers are listed on the Mori Iron Works homepage (<http://www.moriiron.com/about.html>; accessed 4 November 2016).
- 27) <http://www.moriiron.com/934.html>; accessed 4 November 2016.
- 28) http://www.fb-japan.com/h/gaiyo_06.html; accessed 2 June 2020.
- 29) According to the homepage of the Japan Forming Machinery Association, not only Mori Iron Works and Feintool Japan, but also Amino, Kawasaki Yuko, and Sanki Seiko are makers of fine-blanking presses (https://j-fma.or.jp/members/member-model-specific-manufacturer-home-page#hp_yuatu_03; accessed 5 November 2016). However, Amino does not produce a fine-blanking press now, as mentioned in Note 22).
- 30) The author identified these awards on the homepages of those associations on 5 November 2016.
http://www.jstp.jp/r/updata/47_2012.pdf;
<https://j-fma.or.jp/activities/mf-technology-award/award-winning-products-introduction/2012-2013>;
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- 31) http://www.fb-japan.com/h/gaiyo_06.html; accessed 2 March 2020.

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[Professor Emeritus, Kyushu University; Professor, Teikyo University]