

The Bicycle Industry

In the bicycle industry after World War I, a unique production system known as the “assembly system” was extensively followed. This system has attracted the interest of many Japanese researchers on SMIs. Much emphasis will be placed in this chapter on what it was and on the historical process that led to its establishment. Though bicycle manufacturing is a sector of industry little noted in present-day Japan, it played a very important role in the development of the metalworking and machine industries in the country. Since the independence of the metalworking and machine industries constitutes a significant landmark in the industrializing process of any national economy, the overall history of the bicycle industry in Japan seems to deserve investigation in considerable detail. My analysis will also go into such related areas as the metalworking industry.

The Bicycle Industry before the Russo-Japanese War

Social Changes and Industrious Pioneers

Opinion is divided as to exactly when bicycles first came to Japan. The alleged year of their introduction varies from the 1860s to the 1880s.¹ Whenever it might have been, early bicycles appear to have been entirely new, queer vehicles to the Japanese and were little more than objects of popular curiosity and means of casual amusement until around 1890. Bicycles of those days had many wooden parts (including wooden wheels), and their pedals were directly fitted to the wheels. Many were the so-called ordinary type, having a much smaller rear wheel than front wheel. Bicycles were not yet commonly owned by their users; instead, “bicycles for rent” became popular. Most of the more than 1,000 bicycles registered in Tokyo Prefecture in the 1880s were classified as vehicles for “commercial use.”

Already in that early age, there were a number of interesting facts that

should not be overlooked. One was that some Japanese began to make bicycles for themselves almost at the same time as the import of the first bicycles. Among them was Tanaka Hisashige, a well-known technician of the late Edo period, together with, reportedly, some master craftsmen operating on a very small scale.²

By the 1880s, when the bicycle rental business was prospering, newspapers began to report the manufacture of “wooden bicycles” in more than one place. They were rather rough things to ride, but in Japan of those days “the workmanship of blacksmiths was quite sufficient” to build a bicycle; the skills of Japanese craftsmen were flexible enough to meet the requirements of such a novelty.³

By around 1890 some started producing *darumagata* (ordinary-type) bicycles by merely welding and assembling components consisting mainly of iron parts imported from the West. However, there were a few who tried from the outset to copy the imported products solely by hand or to make what parts they could for themselves.⁴ Kajino Jinnosuke was one of those industrious pioneers.

In this connection, the personal history of Tanaka Hisashige provides a glimpse of the social environment in which these early manufacturers found themselves. Though he was a craftsman in status and, under the feudal rule of the Tokugawa shogunate, theoretically required to live within a prescribed area, Tanaka travelled with considerable freedom and was accepted by different local communities with comparative ease. Further, in spite of the imposed stratification of Tokugawa society into four classes – samurai, farmer, craftsman, and merchant, in that order – Tanaka had opportunities for education and was eventually promoted to the status of samurai. Apparently, he was allowed to serve two fiefs, Saga and Kurume.

His circumstances seem to have reflected the beginning destabilization of feudal rule. Since the feudal system could no longer be maintained by merely relying on conventions and precedents, Tanaka’s skills were used in the administrative reforms and the introduction of Western technology by the Saga fief and others, and the shogunate was obliged to depend on “outer” fiefs, including Saga, for the manufacture of boilers and many other products.⁵

Nevertheless, it requires further consideration to assess how extensively free and uninhibited activities, such as those in Tanaka’s career, were allowed in Tokugawa society, because he was an exceptional man, who happened to appear in the period of social change from late Tokugawa to early Meiji. At any rate, the trend of the times was so quickly developing that it allowed a mere craftsman, born in the countryside, to study astronomy in a nobleman’s residence, be invested with a status of some social prestige by imperial order, have access to Dutch learning and go to Shanghai as a samurai, even though of the lowest level.

It may not have been the case that this process of change in the feudal order expanded after the Meiji Restoration of 1868 to include the rank and file; nevertheless, the case of Kajino Jinnosuke is illustrative of the changes

that were occurring. In the official order of class ranking in the Tokugawa era, merchants were below craftsmen. In reality, however, the former were more powerful than the latter, and there was a persistent tendency for merchants to make light of craftsmen. Accordingly, it seems to have been rare for a merchant's son to engage in a craftsman's job. But that prevailing prejudice did not deter Kajino, a born lover of machines, from venturing on a machinist's career.⁶ The enthusiasm with which he made up his mind to undertake the manufacture of bicycles at the sight of one ridden by a foreigner in Japan reminds us of the spirit of middle-class commoners in the early Meiji period.

Two Streams of Demand Boosting

By the 1890s major changes began to occur regarding bicycles. The number of privately owned bicycles started to increase, as they became a status symbol of the rich along with cameras and hunting rifles.

According to a traffic survey conducted in 1898 during daytime on Honcho Dori in Nagoya, more bicycles were already used on this street than horse-drawn vehicles.⁷

Tōkyō-fu tōkei sho (Statistical report of Tokyo Prefecture) put the number of privately owned bicycles in the prefecture in 1902 at 4,571 against 857 for commercial use, clearly indicating a shift to private ownership.

Most bicycles were imported and, partly because of that, there was a rush in Tokyo and elsewhere to start businesses to handle or import foreign-made bicycles or to serve as agents for their manufacturers or dealers.

Many of the more influential among these entrepreneurs had started as foreign traders of other commodities. They were mostly well educated and often leaders in their respective local communities. One such entrepreneur had been an organizer of a long-distance cycling club of wealthy citizens before beginning to deal in bicycles.

Seemingly exceptional among them was the owner of Jindo Shoten, who had begun his career as a warehouse attendant for a foreign-owned trading house in Yokohama, later opened a bicycle rental store, and eventually became an importer.⁸ By late Meiji, similar instances of social mobility became common, and thus Jindo Shoten's case heralded a trend.

Foreign-made bicycles imported to Japan were all very expensive. Moreover, their dealers enjoyed abnormally wide margins of profit. Nichibei Shoten, the most influential importer then, imposed a price control on retailers so that they would sell at ¥250 what the importer supplied to them at ¥160,⁹ and a certain retailer said he would sell to his customers at ¥200 or so what he bought from the wholesaler at ¥160.¹⁰ The retail price was close to two years' income of a skilled carpenter.

Thus imported bicycles and their dealers continued to enjoy their golden age for some years. In the mean time, what were known as "safety bicycles" came to constitute the mainstream. The safety bicycle had a diamond-shaped

frame and was close to present-day bicycles in appearance, but its pedal mechanism had no free wheel. It also had no brake or stand.¹¹ Metal frames, including wheel rims, were preferred. Partly because of their lag in metal-processing techniques, Japanese manufacturers, mainly producing older types, were obliged to fight an uphill battle.

The Kajino factory of Yokohama nevertheless delivered five bicycles to the Tokyo Central Telegraph Office in 1892. Though they are likely to have used American-made parts to a considerable extent, efforts began at about the same time to produce safety bicycles mainly comprising Japanese-made components.

Miyata Eisuke, a gunsmith, took interest in bicycles as he had been asked to repair bicycles for foreign customers. In 1890 he completed a bicycle, which took him almost a month to manufacture with the help of five or six workers. It is said to have been wholly made of self-supplied parts except the tyres. Miyata continued to build more bicycles upon request. There is even a record of his delivery of bicycles for use by members of the imperial family in 1892.¹² According to another account, however, an article in *Rin'yu* magazine, Miyata's production of a bicycle took a long time to complete, and it was not until 1901 that a "sample product" was completed. By then, it is reported, he could make all the components except tyres, wheel rims, spokes, and ball-bearings in his own workshop. In 1899 he succeeded in improving the metal-hardening technique and thereby substantially increasing the strength of his products, which were based on a direct copy of the basic design of a certain American-built bicycle.

A certain Matsushita Tsunekichi, originally from Nanao Town on the Noto Peninsula, who worked as a mechanic at Ishikawajima Shipyard, the army's artillery arsenal, Tanaka Machine Works, and Shibaura Seisakusho, succeeded in 1898 in building a bicycle on a trial basis and eventually followed after Miyata and marketed his products, under the name Toyo, on a nationwide basis.¹³

Okamoto Matsuzo, who, while engaged in forging at an ironworks in Nagoya, repaired bicycles upon request as a sideline, became an independent bicycle repairer in 1899. While continuing to work hard in his repair business, he attempted manufacturing bicycles on his own and completed a trial model in 1901. Eventually, he also started marketing his products.

Takahashi Chokichi, who in 1894 began manufacturing rickshaws in Tokyo, later began producing spare parts for bicycles. By 1902 he was able to manufacture and market his Zebra bicycles, modelled after a British product.¹⁴

The spread of bicycles in Japan from the 1890s to the 1900s had two contrastive patterns of development: merchants' attempts to expand the market through the sales of imported products, and manufacturers' endeavours to establish their own technological basis while counting on market growth. Though bicycles were more or less a luxury item in those days, the lower retail prices of domestic products, almost one-half the prices of imported vehicles, must have contributed to creation of new demand. At the National

Industrial Promotion Fair in 1903, a bicycle produced at Miyata Seisakusho was highly praised, and this success gave the manufacturer an opportunity to supply bicycles to the army.¹⁵

A New Inclination among Small Producers

In February 1902 the Tokyo Bicycle Trade Association was founded, the first such organization in the bicycle industry. As was usual with Japanese trade associations in those days, both producers and wholesale merchants joined the association. What was unique about the bicycle trade association, however, was the participation even of retailers, who were then difficult to distinguish clearly from wholesalers and manufacturers. This lack of differentiation was one of the characteristic features of the industry at that time. Quoted below is an account from around 1895 concerning the circumstances of retailers.

The initial practice of seeing bicycle retailers primarily as repairers and only secondarily as sellers seems to have established the thereafter long-lasting impression that a bicycle dealer was half mechanic and half merchant. As the bicycle business started with priority on repair service, pioneers in the trade included former lathe operators, blacksmiths, pump technicians, watchmakers and bicycle racers [who, of necessity, were able to repair bicycles], plus persons who repaired bicycles only in their spare time. Some of them, however, had been employed as workers at newly begun bicycle factories in Japan and learned the structure of bicycles and the techniques to handle them before opening bicycle shops of their own. A typical shop would use an earth-floor space as the repair room in which the owner would install a vice and, if he had been a forge worker, a bellows. . . . As a tactic to attract customers to buy bicycles, the retailers competed with one another to offer bicycles for rent. The rental charge ranged from ¥.10 to ¥.15 per hour. The customer would pay it not for going on an errand but for practice in bicycle riding. Therefore, the shop owner had good prospects for getting someone to buy a bicycle once having learned how to ride one.¹⁶

Matsushita Tsunekichi was one of those who started from a rental business. Okamoto Matsuzo, too, is said to have "begun making fender supports, small baggage racks, handlebar posts and so on by himself with little more means than a bellows and a vice."¹⁷ In short, the most conspicuous feature of the bicycle industry in these early days was that while both retailers and manufacturers exhibited characteristics of the small producer, they were gradually differentiating from each other.

On the other hand, there were also bicycle dealers, mainly importers, who came mostly from the stratum of urban merchants or socially prominent families. Their involvement in the bicycle trade also started from a level where wholesaling and retailing were hardly differentiated, but they had far greater financial resources built up as commercial capitalists. Though the retail prices of bicycles were extremely high at the time, their import prices (though available records reveal only their late Meiji level) were far lower, only one-fourth to one-fifth of the retail prices.

The relationships between these merchants and bicycle producers can be seen through the example of Miyata Eisuke. While he was working at the artillery arsenal in Koishikawa, Tokyo, Miyata became acquainted with Okura Kihachiro, a well-known "death merchant" (munitions supplier). Later Miyata became "independent," counting on Okura's commercial activities and assistance. Even when Miyata lost everything in a big fire that swept Tokyo's commercial districts in 1884, he was able to reconstruct his business with financial aid from Okura.

However, in exchange for this aid, Miyata was obliged to deliver all its products to Okura. For a small factory that started in "a two-storey building 3 *ken* [5.4 meters] wide in front, equipped with two vices, one 2.5-*shaku* [75.7 centimetres] bellows, one anvil, and one 2-*shaku* [60.6 centimetre] foot-pedalled lathe borrowed from the Kunitomo factory," this kind of protection by merchant capital, which was one aspect of domination under a putting-out system, seems to have been rather a "good fortune."¹⁸

However, although this relationship allowed Miyata to exert his craftsmanship, it also made it difficult for him to raise his technical standards as modern rationalization demanded. The diversity of the product lines of his factory, though it was supposedly a "gun factory," reflected that circumstance (see table 1). It also indicated the difficulty for smaller private manufac-

Table 1. Product lines of Miyata Seisakusho in the Meiji Period

Year	Product line	Remarks
1881	Murata rifles	Ordered by Okura Gumi
1884	Telephone equipment	
1884	Diver's pumps	Ordered by the military
1884	Underwater lamps	Ordered by the military
1884	Surveying equipment	Ordered by Okura Gumi
1884	Compasses	Ordered by Okura Gumi
1885	Ramrods	Ordered by the military
1886	Jackknives	Ordered by the military
1886	Practice bullets for Martini rifles	Ordered by the military
1886	Rings for holding poles	
1887	Slide calipers	Ordered by the military
1894	Fittings for linking military transport carts	Ordered by the military
1896	Whaling guns and their accessories	
1902	Tabletting machines	
1902	Pharmaceutical machines	Ordered by the military
1904	Stretchers	Ordered by the military
1908	Wheel rims for rickshaws	
1909	Two-passenger, four-wheeled automobiles	

Source: Miyata Seisakusho 70-nen Shi Hensanshitsu, *Miyata Seisakusho 70-nen shi* (70-year history of Miyata Seisakusho) (Tokyo, Miyata Seisakusho, Ltd., 1959), pp. 5-40.

Note: Items related to bicycles are omitted. Every order was placed through Okura Gumi.

urers in Japan at the time to remain in business without relying on military demand. In fact, it was military demand that relieved a number of such manufacturers during business crises. In 1889 Miyata's enterprise was renamed Miyata Seijusho (gun factory) and equipped with several kinds of additional machines, including a seven-horsepower boiler and new lathes. The enterprise further expanded as an authorized supplier to the army during the Sino-Japanese War. The revision of the Hunting Law in 1900 invited a decline of hunting rifle demand. When Miyata planned to shift his emphasis to bicycle production, however, Okura promptly discontinued its relations with Miyata's factory (which had again changed its name, to Miyata Seisakusho [Miyata Works]).¹⁹

Though it had created its own bicycle brand, "Asahi," Miyata was unable to continue the marketing of its bicycles without entering into new ties with wholesale merchants. These merchants demarcated sales territories, and each of them held monopoly in one or another of the territories and accepted the delivery of no product other than those bearing the trade marks they designated. Though direct transactions with some local merchants had begun by then on a very small scale, substantial market cultivation seems to have been impossible before the Russo-Japanese War without relying on Tokyo wholesalers, who were concurrently engaged in foreign trade, and following their instructions on trade marks. Miyata maintained its own brand name somehow, and this fact proved a significant basis of subsequent development, especially its development after World War I.

A similar case occurred in Sakai City. Although the process of development taking place in the city some time later proved a typical instance in the production of bicycles in Japan, only a few bicycles existed in Sakai at the beginning of the 1890s. It was not until 1899 that the first bicycle rental store, Sorin Shokai, jointly founded by Kitagawa Seikichi and Saiki Kozaburo, opened in Sakai. Six months later another rental store, Otsu-ya of Otsu Yoshimatsu, opened. Both subsequently became important bicycle wholesalers, but at this beginning stage they did not differ substantially from early rental or retail stores in Tokyo.

Sorin Shokai soon undertook the production of baggage racks and other parts. Otsu-ya, too, began with the assembly of parts supplied from others and eventually established its own frame factory. Both became pioneers among typical "manufacturer-wholesalers" in the Kansai region. One notable point is that, from the outset, they had subordinate repairers or parts producers under them.

Sakai had a tradition of smithery dating back to the fourteenth century, and many cutlers, gunsmiths, and castors operated there.²⁰ Because of that background, its inhabitants were adaptive to the newly emerging machine and metalworking industries, including bicycle manufacturing. During the early phase of their bicycle business, Kitagawa Seikichi and others depended on gunsmiths for repair and other technical matters.

Partly because there were such large consumption centres as Osaka and Kobe nearby, once given momentum, the manufacture of bicycle parts by

small producers developed quickly. Most of the producers, who emerged from around the turn of the century, were formerly traditional gunsmiths and other craftsmen.

The relationships between these small producers and wholesale capitalists in Sakai and Osaka were gradually regimented. They were affected by such conditions as a rapid expansion of the market and were thus transformed into unique social relationships.

As is evident from what the situations were in Tokyo and Sakai, apart from some merchant capitalists, most of the small producers involved in bicycle production in its beginning phase – when the production of parts, repairing, and retailing of finished bicycles were not yet differentiated functions – had started as craftsmen in the traditional machine and metalworking sectors.

Many of them had a background in the traditional metalworking sector typically found in Sakai. Certainly they did not emerge from where the traditional order still had its grip, but rather they came from among those who were interested in and more adaptive to new techniques imported from overseas. In other words, more or less heretical elements in the traditional community of craftsmen gave the opportunity for a leap. It is true that the occupational leap was restricted in many ways by various constraints in Japanese society, but there is no doubt that these small producers served as prime movers in the development and establishment of a new sector of industry.

Many of the entrepreneurs in Tokyo, meanwhile, had also worked in factories that, like that of Tanaka Hisashige, were a step ahead of traditional smithery. Miyata Eisuke's son Seijiro (who later inherited his father's name and called himself Eisuke, Jr.) worked at Tanaka's factory as did Matsushita Tsunekichi. Not a few followed similar courses and later became independent entrepreneurs.²¹ Notable among the producers in those days were those who had risen from workers in military arsenals. They included Miyata Eisuke and two of his sons, and Matsushita Tsunekichi and Umezawa Jinzaburo. Regarding the military arsenals, there is the following description:

[At the army's Koishikawa Artillery Arsenal] in or around 1901 there were several hundred workers engaged in the production of bicycles, and the output amounted to a considerable volume. Workers trained there subsequently joined private bicycle factories that sprang up, and they became foremen and supervisors as Japan's bicycle industry flourished. Bicycle manufacturing at the artillery arsenal was carried out under the guidance of bicycle instructors from the army's Toyama School.²²

It is difficult to assess the credibility of this account because there is no other piece of literature to endorse its truth. However, it is highly probable that bicycle production was still going on at the arsenal in the second half of the 1890s, with various spin-off effects, and was discontinued after the Russo-Japanese War. Probable because: (1) the owner of Umezu Asahi Shokai, which later handled Miyata-built bicycles, was a former "bicycle instructor" of the army; (2) demand from military and government offices seems to have amounted to a substantial quantity; and (3) supply from Miyata Seisakusho

Table 2. Rifle shop equipment at the army arsenal, 1872–1911

Year	Ordinary lathes				Special lathes			
	Imported	Japan-made	Self-supplied	Total	Imported	Japan-made	Self-supplied	Total
1872	2			2				
1873	6			6	1			1
1874	1			1				
1875	2			2				
1876	7			7				
1877	2			2	5			5
1878								
1879								
1880								
1881					2			2
1882								
1883			18	18			2	2
1884							10	10
1885			3	3				
1886			3	3				
1887								
1888					5			5
1889								
1890								
1891	2			2				
1892								
1893								
1894								
1895								
1896	4			4				
1897			45	45	2			2
1898			52	52	22			22
1899			4	4				
1900		1		1				
1901								
1902								
1903	2	4		6				
1904		22		22	3			3
1905	54	4		58	6	1		7
1906							1	1
1907							1	1
1908	1			1	4	3		7
1909		16	8	24			3	3
1910							9	9
1911							8	8
Total	83	47	133	263	50	4	34	88

Source: Nagasawa Sumito, "Sōritsu 50 yo nen no kōjō ni genson suru kikai no kōnyū sareta toshi to seisakusha" (Year of purchase and manufacturer of machines existing in factories more than 50 years old) *Mashinari* 16, no. 4 (April 1953), pp. 392–397.

Note: Turret lathes, gun-barrel lathes, and automatic lathes are counted as special lathes.

and others began in late Meiji, when bicycle production at military arsenals seems to have come to an end.

The influence of military arsenals on the bicycle industry as well as on the machine and metalworking industries at large in that period did not stop there. Small producers in those days initially worked with simple means of production. Later they began to use locally manufactured or self-supplied machines and tools; the more successful among them equipped themselves with imported machinery. There is good reason to believe that the circumstances of craftsmen in those days and the way in which they responded to modern technology, which underlay their early pattern of behaviour, stemmed from the manner in which military arsenals were managed during the Meiji period. Table 2 is based on a list in an "Inventory of Machine Tools at the Rifle Workshop as of the Day of the Great Kanto Earthquake of 1923," left by an army engineer who long served the Tokyo Army Arsenal. Though the list is incomplete because the number of machines that had been discarded before its compilation is not stated, it reveals that the arsenal in the Meiji period, though relying on imported machinery, did not wholly depend on imports for the supply of new machines but began to copy them at a very early opportunity.²³

Thus, consistent efforts were made not only to operate and partially improve imported machines but also to fabricate similar machines and their accessories. Obviously there was a wide enough range of craftsmen capable of performing such tasks. Those who eventually became independent entrepreneurs, whether in machine or bicycle manufacturing, definitely had developed those capabilities. By late Meiji, as statistical data indicate, private manufacturers of machine tools achieved reasonable success. The manufacturers of bicycle parts designed for themselves what machines they needed and would often pay a personal visit to a workshop of a machine tool manufacturer to supervise fabrication.²⁴ One of the factors for the success of the parts' makers could be traced to the way in which the arsenals were managed.

Trends between the Russo-Japanese War and World War I

Development of the Domestic Market

The Russo-Japanese War marked the start of a rapid increase in the number of bicycles used in Japan. The yearly national increment, which had been at most close to 10,000, often reached tens of thousands (see table 3). Statistics of those years are not fully reliable, and substantial increases were to be observed only in alternate years. Yet there is no doubt that the increase was accelerated. Some characteristic points of the development in those years will be enumerated below.

First, the number of finished bicycles imported into Japan reached its peak from 1906 to 1908 (see table 4).

Second, imports of bicycle parts sharply increased from 1906 on, and their

Table 3. Number of bicycles in Tokyo Prefecture and in all of Japan, 1903–1909

Year	(A) Bicycles in Tokyo Pref.	(B) Bicycles in Japan	(A)/(B) (%)
1903	6,229	57,401	10.9
1904	6,161	66,521	9.3
1905	7,463	86,840	8.6
1906	7,587	89,949	8.4
1907	8,151	124,559	6.5
1908	9,266	128,972	7.2
1909	10,572	192,049	5.5

Sources: (A) Keishi Cho, *Keishi chō kōsū nenkan* (Traffic yearbook of the metropolitan police board) (Tokyo; see yearbooks for years 1904–1910); (B) Naikaku Tokeikyoku, *Teikoku tōkei nenkan* (Imperial statistical yearbook) (Tokyo, Cabinet Statistical Bureau; see yearbooks for years 1904–1910).

Note: The figures under (A) are somewhat greater than the corresponding ones in *Tokyo-fu tōkei sho* (Statistical report of Tokyo Prefecture).

Table 4. Yearly imports of bicycles and related items, 1902–1911

Year	Bicycles imported	Value of bicycles imported (¥)	Value of bicycle parts imported (¥)	Total
1902	15,092	574,159	252,790	856,949
1903	14,521	620,362	352,611	972,973
1904	14,660	558,639	394,561	953,200
1905	19,326	777,827	557,220	1,335,047
1906	26,434	1,001,435	1,041,823	2,043,258
1907	34,523	1,230,006	952,876	2,242,882
1908	32,517	862,917	1,285,722	2,148,639
1909	19,649	667,665	1,700,468	2,368,133
1910	19,680	622,145	1,563,084	2,185,229
1911	20,345	730,172	2,268,537	2,998,709

Source: Ministry of Finance, *Dai Nippon gaikoku bōeki nempyō* (see tables for years 1903–1912).

combined value consistently surpassed that of finished bicycle imports in and after 1908.

Third, the proportion of imported bicycles to total bicycle ownership in Japan fell off steeply from 1910 on.

Fourth, the share of bicycles in Tokyo compared with the national total declined considerably (see table 3), thus, the spread of bicycles was no longer limited to major urban areas but had become more comprehensive.

Fifth, partly because British-built bicycles with 26-inch tyres were widely

accepted, the 26-inch size was adopted for Japanese-made models as well. Most bicycles, including domestic ones, were standardized into the safety type having the external shape usually found today.

Regional Differentiation and Reorganization of the Distribution Process

After the turn of the century, the spread of bicycles gained momentum nation-wide, especially in provincial cities and rural areas. The market expansion manifested regional features or interregional differences, which could be regarded, at the risk of oversimplification, as reflecting a weakness of the forces to build up a unified domestic market or a weakness in the base of the national economy. However, for the moment, observation will be limited to the realities of those who were responsible for the distribution process.

First, regions north of the Kanto region had a common pattern for the spread of bicycles. In the beginning, cycling clubs were organized by prominent local citizens such as landlords, physicians, and big merchants, and at about the same time merchants began to handle bicycles, whose repairs were commissioned to blacksmiths virtually under subcontract.²⁵

Cycling clubs, though established even in small towns and villages in the vicinity of Tokyo, were found, in the Tohoku region, only in former castle towns. A similar difference was observed in the emergence of bicycle dealers as well. In Fukushima City, for instance, a "Western goods" dealer by the trade name of Kamata-ya pioneered the bicycle business in 1902, followed soon after by the paper wholesaler Tomita Kunikichi, rice merchant Yabuuchi Shutaro, saw-smith Saito Matsutaro, explosives dealer Nago Koshichi, and dry-goods store Kozuchi-ya. Thus, most bicycle shops in the city were concurrently run by merchants who were in other lines of trade.

Circumstances in the urban prefectures of Tokyo and Kanagawa and regions west of Tokai and Hokuriku – except large parts of San'in and Kyushu – were somewhat different. The difference partly derived from the marketing pace, which was so fast that preliminary market development through cycling clubs was not required, but the bicycle trade itself was established in a different way. In Kawagoe, Saitama Prefecture, for example, all but Sakurai Shoten, a big merchant who started to deal in bicycles in 1895, joined the trade after the Russo-Japanese War. With only one exception, the bicycle dealers began as craftsmen. For instance, Yokoyama Chotaro, who had worked at Sakurai Shoten, is said to have had a spirit of independence, left Sakurai to become independent, bought a lathe and other machines and began a repair business; Ono Eitaro, a wheel-smith engaged in repair work, and Matsue Sakutarō began with bicycle rentals and later, while taking repair jobs, with machinery they installed in the mean time, also started to sell new bicycles.²⁶

There was a similar, more conspicuous trend in the Kansai region. Otsu-ya of Sakai City is said to have helped dozens of bicycle dealers and repairers in

Sakai, Izumi, Wakayama, and Nara become "independent" entrepreneurs.²⁷ A similar report was made for the Himeji area in Hyogo Prefecture.

In Ishikawa Prefecture, one of Japan's major production centres of silk fabrics for export, the first bicycle dealer was a former blacksmith. Following after him, many craftsmen during the Taisho period left Yamada Sentaro's factory to become independent entrepreneurs.²⁸

This rapid increase of entrepreneurs involved in the distribution of bicycles resulted in their gradual differentiation into specialized wholesalers and specialized retailers. This trend was no isolated phenomenon. The dominating tendency of some capitalists at the provincial level, indeed, was accelerated by their link with large-scale commercial activities in greater geographical dimensions at the national level.

Around the turn of the century, as bicycle dealers began to emerge in the provinces, bicycle importers who had clustered in Tokyo, Yokohama, Osaka, and Kobe immediately started strong efforts to establish their respective local agents. In this period, interestingly, their efforts were concentrated less in the big cities and their vicinities where many small-scale dealers were emerging than in the areas over which traditional big merchants had a strong grip. This trend is evident by the fact that the sum of transactions per store was large in some areas where the prefectural total was rather small. Apart from this regional difference, the establishment of agents made progress in different localities. Agency contracts seem to have been unilateral and stressed the authority of the importer, as the following example suggests.

We express our gratitude for your prompt approval of our request to serve as your agent and will faithfully observe the following conditions:

—We shall present negotiable papers as security, and pay the price of every article we purchase by the end of each month. . . .²⁹

As the organization of a nation-wide distribution network progressed and many retailers emerged at the local level, some contradictions began to manifest themselves, especially in big cities, by late Meiji.

First, a traditional practice among Japanese merchants was to help their employees, who had started their apprenticeships with them, open new stores. According to this practice (known as *noren wake*) a former employee opening a new store often gave the store the same name as, or one similar to, that of his ex-employer's shop, and thus enjoyed his former master's protection. Whereas such a system tends to become scarce when society turns stagnant and to become conspicuous when society is rapidly developing, the middle Meiji years were a honeymoon period between master and employee. The employer-employee relationships began to falter toward the end of the Meiji period, and an increasing number of employers in different parts of the country broke their promises to their employees.³⁰ The number of new entrepreneurs nevertheless increased, reflecting a growing tendency for many former employees to become independent, severing their paternal ties.³¹

As the number of new shops increased, so did bankruptcies. Intensifying

competition steadily widened the gap in financial strength between big-city wholesalers and provincial wholesalers and between the latter and retailers. At the same time, this competition gave impetus to a reorganization of the distribution mechanism. The following features were observed in the successful management of Nichibeï Shoten, a major importing firm, in contrast with the general deterioration of the business climate. Every one of these features reflected the basic character of the company, which had grown mainly in activities typical of merchant capital.

First, its imports consisted mostly of relatively small British models (manufactured by Lodge Co.), which better suited the physique of its Japanese clientele.³²

Second, it entered into a direct contract with Lodge in 1906 to win exclusive agency rights in Japan.³³

Third, it also gained exclusive agency rights from other Western bicycle exporters by direct negotiations.³⁴

Fourth, in 1904 it adopted a policy to set up agents everywhere in the country, and by 1912 succeeded in organizing a network of 100 agents.³⁵

Fifth, it put into practice an incentive system under which best-selling agents were paid premiums "to make the agents compete with one another" while requiring them to pay honoraria and sell prescribed numbers of bicycles.³⁶

Sixth, it had its own products and cyclists participate in bicycle races, which were enjoying growing popularity, and thus won publicity.³⁷

Seventh, as soon as it recognized the changing tide in the market in favour of practical bicycles, it withdrew from cycling races, and in 1913, it disbanded its team of cyclists, and thereby avoided unnecessary and wasteful adherence to an outdated practice.³⁸

Eighth, it made early advances into the Japanese colonies, establishing its presence in Taipei in 1909 and in Seoul in 1914.³⁹

The Spread of Parts Manufacturers

One of the characteristic features of the Japanese bicycle industry after the Russo-Japanese War was the nation-wide spread of production activities – of either finished bicycles or their parts. The 1909 edition of *Kōjō tōkei hyō* (Statistical tables of factories), whose coverage was limited to factories with five or more employees, had an appendix⁴⁰ listing the names of factories, and according to which 33 out of the 246 factories of its "Class 12: Ship-builders and Vehicle Manufacturers" and 2 out of the 471 of its "Class 13: Apparatus Manufacturers" had something to do with bicycle production. The data contained therein indicated that such producers were found in 11 cities, 2 towns, and 3 villages in 10 prefectures of Japan, including rural areas. Many producers had begun using mechanical power, if only on a small scale. Nearly 70 per cent of them had started business after the Russo-Japanese War, and 49 per cent started after 1907. Thus, small producers in this sector were emerging in diverse geographical areas.

Table 5. Developments in the bicycle industry of Sakai City after the Russo-Japanese War

Year	
1906 ^a	Yamamoto Itaro begins producing small items with power-driven machines.
1906 ^a	Handa Zenshichi and Sakagami Kihei set up Hansaka Gilding Factory, a limited partnership.
1906	Takagi Kotaro begins rim production.
1906	Tanaka Tsunejiro begins rim production.
1906	Sorin Shokai produces baggage racks.
1907	Yamamoto Itaro and Fukuse Tomisaburo begin producing US-type coaster brakes.
1907 ^a	Fukuse Tomisaburo and Yamamoto Itaro try joint production of hubs.
1907 ^a	Wada Shigezo begins producing hubs.
1907	Wada Shigezo and Yamamoto Itaro separately develop thermal treatment of steel, indispensable for later processes.
1908 ^a	Wada Katsutarō and Fukuse Tomisaburo try free-wheel production.
1908 ^a	Wada Shigezo and Takagi Kotaro separately try chain production.
1908	Tanaka Tsunejiro begins spoke production with power-driven machines.
1909 ^a	Yamashita Tokutarō tries production of replacement gears.
1911	Fujimoto Michiyo begins a thermal steel treatment business.

Source: Sakai Ringyo Kyokai, *Sakai no jitensha* (Sakai bicycles) (Sakai, 1939), pp. 36–46.

^a Years are approximate in the original sources.

In Tokyo, for example, in contrast to the pre-war years, when more enterprises were inaugurated in the distribution branch, the wartime and post-war years saw the dominance of manufacturers among new enterprises. A particular increase was observed in parts manufacturers and partial processors.

Underlying this development was the circumstance that the imports of parts, especially of kits that could be readily assembled into finished bicycles, rapidly increased. However, already within Japan the production of parts, mainly for repair, was growing. The city of Sakai rapidly developed its production of parts and the acquisition of new technology after the Russo-Japanese War (see table 5). Although some entrepreneurs were frustrated in their endeavours and were unsuccessful in technological development itself or, even if successful, failed to turn the technical success into a profitable business, there were those who gradually began to succeed in overcoming their limitations. The cumulative effect of those fruitful endeavours seems to have constituted the basis of the concentrated successes that eventually came about during World War I. In the Osaka-Kobe area at this time, many rubber-tyre factories were set up and started operation. The biggest among them was Japan Dunlop Rubber Company, which had a foreign financial basis: there were other, smaller enterprises, that often had technical difficulties, but they nevertheless were able to supply the demands of the market and eventually grew to become important export industries.

In Tokyo at this time, there were three factories producing handlebars. The number of plating shops, which were indispensable for bicycle manufacturing, also began to increase.⁴¹

In early Taisho, the Tsuzuki Factory and Koyama Gear Works were established to produce gears and cranks. In the area of free-wheel production, in 1913 only Sanko succeeded in manufacturing frame joints, and it was not until World War I that the first success in producing a complete free wheel was achieved. Tokyo was behind Sakai in this respect.

As for pedals, there were arrangements to have small parts subassembled into pedals by wholesale merchants, and several workshops had been set up to produce pedal parts.⁴²

Bells were made of brass at this time, and their local production began using British models. By the end of the Meiji period, "Japanese-made bells appeared and overshadowed imported products of dubious quality,"⁴³ and they began to be exported even to Europe by the late Taisho period.

Kanaya's and Takadera's factories were established for the production of gear cases, following Nakamura's and Komatsu Chotaro's factories. So many gear manufacturers branched off from the former two and became independent that they came to be classified into "Kanaya-bred" and "Takadera-bred" manufacturers. In addition, Kuroiwa Works was set up in early Taisho to produce head hangers and other small items.

The emergence of bicycle parts manufacturers and processors in Tokyo has been outlined so far. Although circumstances were such that not all of them developed into bigger businesses as in Sakai, improvements in techniques and equipment eventually paved the way for the mushrooming of small producers during and after World War I.

Regarding the systems and techniques of production used in these factories, in both Sakai and Tokyo virtually all work had been done manually before the Russo-Japanese War. Steel plates were cut with chisels and bent around iron rods known as *shino* into semicircular shapes, which were then paired, fixed together with taps, and hammered to make pipes. Their seams were soldered with copper alloy. These pipes were then bent by hand into forks and handlebars. Where there was a danger of fracture, sand or earth was put into the pipe to raise the internal pressure and thereby prevent the local stress of the bend from becoming too great. The lathes used in the factories were run by human power.⁴⁴

After the Russo-Japanese War, power-driven lathes increasingly came into use. Pipes made by the extraction process also began to be used, but it was a common practice to "buy pipes used in torpedo boats scrapped after the war." This practice lasted rather long, and there were even specialized merchants dealing in such second-hand materials. Where there was no fundamental improvement in technology, it was not difficult to find examples of creativity and innovation exerted by small producers. One such example, from the late Meiji period, can be found among factories in charge of the grinding and polishing processes, which became indispensable for the processing of bicycle parts and various other metal items:

As no electricity was available for the factory, it borrowed motive power from a nearby power-lending house. The power-house had steam engines for its own use and supplied its surplus output to 10 or so factories in the neighbourhood by means of wooden pulleys that had three lines of two-inch-thick Manila rope threaded on them.⁴⁵

Eventually, as in the brush industry, there emerged plants solely specializing in power lending.

Some of the wide variety of parts manufacturers rapidly expanded their business activities. Araya Kumakichi, for instance, initially had been a wood-worker in Yamanaka Town, Enuma County, Ishikawa Prefecture, and later made a fortune as a lacquerware merchant. Using the capital he had accumulated, in 1903 Araya started to market wooden rims for bicycles. By the 1910s, he had a monopoly in the domestic market-place. Yet, no one made notable success in the production of metal rims during this period.⁴⁶

Another remarkable feature of this period was the emergence of pioneer manufacturers of subcomponents for such components as forks and pedals.⁴⁷ There were also notable improvements in machinery and technology, though to a strictly limited extent. Machine tools for use in bicycle production began to be imported around 1909, and in some areas improvements were made.

Meanwhile, as more manufacturers, ranging in scale of business from medium to tiny, appeared, there also emerged wholesale merchants dealing in their products. There is a "deed of contract" that gives an eloquent account of the social relationship that these merchants and producers cited in a pre-war document.⁴⁸ The contract, providing for transactions between five producers and one merchant in Osaka, forbade the former from transacting with anybody else and prescribed conditions singularly unfavourable to the producers in the event of any breach of contract.⁴⁹

One final point I would like to touch on is that, even though new achievements in production technology were increasingly won in this period, old equipment was never discarded. Old machines were kept in the factories where they had been installed and remained in use alongside the new equipment. Old equipment that was not kept in the factories was transferred to retail shops – which were quickly specializing and increasing in number – where they were put into full operation. There were also retailers and repairers that would convert to the manufacture of bicycle parts.⁵⁰

The Formation of Modern Factories

Japan Dunlop Rubber, founded in Kobe in 1909, attracted capital investment from its British partner, who took note of the potential of the Japanese market for bicycles.⁵¹ In 1910, a branch factory of Premier Bicycle Manufacturing Company from Coventry, England, was established on the site of Japan Dunlop. It was the first full-scale integrated bicycle production plant in Japan. Except for coaster brakes and three-speed gears, which were imported from England, the new plant undertook integrated manufacturing of all metal parts, including frames, handlebars, rims, spokes, chains, gear

cranks, free wheels, pedals, hubs, non-coaster brakes, and small fittings for the gear cases. The parent company succeeded in transferring to Japan the latest in management and technology. The general distributor of the factory's products was Maruishi Shokai, which was established from the reorganization of Ishikawa Shokai.⁵²

In the same year, a bicycle assembling method known as "set fitting" was extensively introduced into Japan. It was a knock-down system under which foreign trade merchants imported unassembled parts in sets and put them together to form complete bicycles. Older models had been imported by Kajino Jinnosuke in this manner, but the first safety bicycle imported on a knock-down basis was that distributed by Sumi Shokai from 1902.⁵³

In 1907, Sorin Shokai set up an assembly plant in Tokyo for Dayton bicycles, and in 1910, several other assembly plants started operations.⁵⁴

Endogenous Japanese manufacturers of finished bicycles thus found themselves at a crucial stage where they somehow had to cope with these developments or liquidate their businesses.

Okamoto Ironworks, run by Okamoto Matsuzo, had set up in 1904 a network for the regular marketing of "bicycles for everyday use, suited to the physique of the Japanese." Its annual sales grew steadily, reaching 1,000 units in 1905 and 2,500 in 1908.⁵⁵ The rationalization programme the company undertook in 1910 was a model with the best chances of success for many enterprises that attempted improving efficiency under the conditions of the Japanese economy before World War II.

Its success can be attributed, first of all, to its having imported the most up-to-date machine tools from abroad. In 1910, Okamoto made personal visits to Germany, France, and the United Kingdom for the purchase of a number of machine tools. Unfortunately, the details of what he bought and how they worked are unknown, but it is reported that the operation of the new machines resulted in a decrease of faulty products and proved very effective. Okamoto exhibited at an industrial fair some products manufactured using his new machine and won a third prize and some social recognition. At the same time, he reorganized his ironworks into a limited partnership, Okamoto Brothers Ltd., which marketed bicycles of its own, Empire, brand. The factory, occupying a total floor space of 3,025 square metres in a 5,120 square metre site, had 23 staff members, 382 workers, and 5 power generators with a combined power output of 60 horsepower; the factory turned out 6,200 bicycles in 1910.⁵⁶

Success, however, was not achieved merely by virtue of an expanded factory and new machinery. There was a second key element, that "it paid off to have components made by specialized subcontracting manufacturers, as Okamoto himself had already realized."⁵⁷

The combined effect of reorganization and subcontracting was reflected in the annual sales of 30,000 units in the early Taisho period and in the "purchase by the Department of the Imperial Household" of the company's product, which had been exhibited in the Taisho Exposition in 1914.⁵⁸ Unfortunately, there is no literature directly referring to the specific com-

pany policy for fostering its subcontractors or how they were equipped and acquired technical expertise. Only a few hints are provided by a Nagoya wholesaler's record.⁵⁹ According to it, the manufacturers of bicycle parts, though generally small in scale, had the potential for development. This may be the reason they were able to adapt themselves to the trend of the times, which compelled even large factories to undergo transformation.

Let us take the case of the manufacturer Miyata Seisakusho as an example. It was closely tied to the army, and bicycle production was suspended during the Russo-Japanese War. Designated as a special supplier to the Tokyo Artillery Arsenal, Miyata Seisakusho concentrated on the manufacture of fuses and stretchers. Immediately before the war, however, the company had received an order for 400 bicycles from an army brigade, and produced a trial model of a collapsible bicycle for military use. In 1905, after the war had ended, the army issued a special certificate in recognition of Miyata's Asahi brand bicycle, built for messenger and reconnaissance purposes, and the company soon began the regular manufacture and selling of military bicycles.

Until this time, Miyata bicycles had used an American pedal mechanism, which, though chain driven, had neither a free wheel nor a coaster hub. Among the parts used in manufacture, the frame pipes, gear cranks, hangers, heads, seat fittings, handlebars, hubs, gears, and block chains were self-supplied. Parts supplied from outside included wooden rims made by Araya, fenders by Iida Seisakusho, tyres for standard models by Mitatsuchi Rubber Company, and wooden handle grips with leather covers produced by another Japanese firm. Imported U.S. parts included saddles made by the Wheeler Company, spokes by Torrington, and tyres for luxury models by G&J or Goodrich. Steel ball-bearings seem to have been imported from various countries.

However, as British-made bicycles with free wheels became more popular in the early 1900s, Miyata acquired a patent and began production of its British-styled Asahi Coaster model. In 1908, with a view to the convenience of the users of earlier models, the company redesigned the heads and hangers to be interchangeable between the British and American models and thereby facilitated their production and repair.⁶⁰

This sophistication of products was undertaken along with the installation of more new and advanced equipment. In this connection, there are a number of interesting facts:

First, the production of some machine tools by private machinery factories was already underway by this time. Some had achieved the ability to produce friction presses before World War I. Such presses represented the most advanced aspect in the production of small forged parts in those days and had not yet been fully mastered by the machine and metalworking industries.⁶¹ Miyata, however, introduced them earlier than any other domestic manufacturer and succeeded in using them in various processes.

Second, there already was substantial contact between private manufacturers of machinery and producers of related items. A set of automatic machines made by Brown Sharp had been installed earlier by Seiko, which later be-

came a well-known watch manufacturer. The management of Miyata, experiencing difficulties in the production of small bolts, sought the aid of a small-factory owner – previously a worker at Seiko who had become independent and founded Yoshikawa Seisakusho – in buying from Seiko the machinery for bolt making. Yoshikawa Seisakusho also consulted Miyata with regard to planned improvement of its machine tools and to the finish of its products.⁶²

Third, the managers of bicycle factories, who were at the same time craftsmen and technicians, not only would draw a design once they had devised a machine that could meet their need but would even stay day and night at a machine tool factory where the machine would be produced and work out the details with the technicians there.⁶³ It must be pointed out that a new type of entrepreneurship existed to develop technological communication and co-operation.

Thus, new equipment was introduced and, simultaneously, a number of production processes were developed that later came to be regarded as the original techniques of one particular factory or another. These processes included manufacturing racks by pressing steel plates and gears with pressed-out open spaces shaped like Chinese characters. Miyata Toranosuke, who was in charge of reviewing foreign technical journals, is said to have gained hints on these processes from articles in *American Machinist*.⁶⁴ In or around 1907, the limit gauge system was adopted, and quality-control teams were, for the first time in Japan, assigned to bicycle factories.

With the establishment of these systems, partly helped by a sharp rise in demand, bicycle manufacturers entered a new phase of development. However, even though the range of self-supplied parts widened, imported parts still had to be used in predominant proportion for higher quality bicycles intended for urban markets. At the same time, many of the parts that could be self-supplied were ordered from small producers.⁶⁵ Moves to align subcontractors' relationships also began at an early stage. Characteristically, the producers of bicycle parts were relatively more independent than subcontractors under the putting-out system. The Yoshikawa mentioned previously was a personal friend of the manager of Miyata Seisakusho. Umezawa Seisakusho, which later became specialized in bicycle parts, was still producing camera and radio parts in those years, and even acquired some patents for the production of camera and bicycle parts. Its owner and manager, Umezawa Jinzaburo, had a keen interest in new commodities and technologies. He worked his way up from a gunsmith's apprentice.

Quick responses to the latest available techniques, eagerness to develop original techniques, solidarity with related tradesmen, including entrepreneurs with craft backgrounds, motivation to improve techniques and products, and participation in the market for practical vehicles, which was then beginning to expand – all were absent in the assembly plants concurrently run by foreign traders, and their absence seems to have constituted the reasons for the take-over of the leadership by domestic manufacturers of finished bicycles.

Even the aggressive manufacturers of finished bicycles, operating in a large-scale factory production system, had many constraints on their marketing activities. When the "Person" model was first introduced by Miyata Seisakusho in 1906, it was advertised as a "practical, low-priced bicycle," but had to be delivered under wholesaler-designated brands: "Angel" to Okamoto Shoten and "Fast" or "Army" to Terui Shoten. When Miyata entered into a distribution arrangement with Maeda Eiichi of Nagoya in 1907, it was able to maintain its own brand name, but Maeda secured the rights as "sole distributor in and west of the Kansai region," and thus Miyata had to give up its efforts to develop a market in western Japan. Often in newspaper or magazine advertisements, too, the name of the wholesaler and its brand name were given prominent positions, and mention of the manufacturer was confined to small type in a bottom corner. Even the choice of subcontractors was up to the wholesaler.⁶⁶

It was not until the Taisho period that circumstances finally began to change. In the early Taisho period, at the proposal of Miyata, a five-member group called Futsuka Kai, comprising four wholesaling firms and Miyata Seisakusho, started regular meetings for the purpose of "considering various marketing problems."⁶⁷ This and other moves eventually led to the development of a nation-wide marketing network after World War I.

The Mode of Production after World War I

The Change in Market Conditions

A sharp drop in imports, mainly of parts, brought on by World War I stimulated domestic production and gave a major impetus to the development of the Japanese bicycle industry. The import of both finished bicycles and bicycle parts fell off steeply from 1913 to 1917 (see table 6). The rise of parts prices was particularly notable, even from tenfold to twentyfold for some items.⁶⁸

However, the number and total value of imported bicycles quickly picked up after the war was over. The prices of parts became stable, and the annual total number of bicycles imported surpassed its pre-war peak in 1920. This fact discredits the views of many that the discontinuation of imports contributed directly to the establishment of domestic production. Japanese bicycle manufacturers, having developed dependent mainly on small industries, had reached a point where their products, though somewhat inferior in quality, could be substituted for imported models when the supply of imported bicycles was interrupted. Those capabilities built up in the mean time would be used in the course of the domestic market expansion following World War I.

The post-World War I Japanese economy is generally regarded as having suffered a chronic recession. As far as the domestic demand for bicycles was concerned, however, the years immediately after World War I were a phase of growth, and the number of vehicles owned increased by 200,000 to 500,000

Table 6. Yearly imports of bicycles and related items, 1913–1938

Year	Bicycles imported	Value of bicycles imported (¥)	Value of bicycle parts imported (¥)	Total (¥)
1913	14,870	835,049	2,337,933	3,172,982
1914	7,272	390,511	1,076,483	1,466,994
1915	2,667	145,837	248,635	394,472
1916	1,354	91,985	406,548	498,533
1917	277	122,684	592,473	715,157
1918	1,253	277,104	1,224,743	1,501,847
1919	2,856	639,883	1,495,879	2,135,762
1920	15,684	1,873,532	4,840,391	6,688,902
1921	13,387	1,919,275	4,492,121	5,878,980
1922	10,167	1,758,210	4,719,111	5,817,585
1923	9,538	1,786,237	4,043,682	5,153,683
1924	10,991	3,086,523	4,587,513	6,052,535
1925	6,804	2,803,090	3,413,875	4,571,777
1926	6,847	2,782,211	3,141,919	5,111,406
1927	1,681	118,866	1,799,333	1,918,199
1928	790	61,312	1,523,233	1,634,625
1929	537	44,884	1,236,193	1,281,077
1930	14	5,228	596,604	601,832
1931	110	6,727	399,212	405,939
1932	42	3,299	211,820	215,119
1933	10	822	109,899	110,721
1934	6	365	72,943	73,308
1935	23	380	84,665	85,045
1936	24	2,162	24,816	26,972
1937	74	6,582	64,401	70,988
1938	23	1,529	10,457	11,986

Source: Ministry of Finance, *Dai Nippon gaikoku bōeki nempyō*, editions for pertinent years.

units every year for five years (see table 7). This expansion of the domestic market can be attributed to the popularization of the need for a bicycle. In the Meiji period, cameras, hunting rifles, and bicycles were status symbols of the rich. Especially in rural areas, bicycles for amusement were owned by none but “landowners, prefectural assembly members, and physicians.”⁶⁹ After World War I, however, bicycle ownership quickly spread among the masses, though now the bicycle was desired, not as a means of amusement, but as a part of everyday life and business.⁷⁰

In post-World War I Japan, vehicles had to be registered by their owners at local police stations. Therefore, there are reliable statistics available, at least concerning registered vehicles. In 1918 in Okayama Prefecture, a prosperous agricultural district, out of a total of 54,239 horse-drawn vehicles, automobiles, and bicycles, there were nearly 48,000 bicycles registered. Of

Table 7. Increase of bicycle use in Japan, 1916–1930

Year	No. of bicycles	Year	No. of bicycles
1916	867,097	1923	3,208,406
1917	1,072,387	1924	3,675,397
1918	1,287,507	1925	4,700,000
1919	1,611,867	1927	4,597,000
1920	2,051,604	1928	4,844,106
1921	2,319,089	1929	5,111,695
1922	2,812,478	1930	5,602,037

Source: Sakai Ringyo Kyokai, *Sakai no jitensha*.

the total figure, there were only 21 automobiles, and the number of horse-drawn vehicles and rickshaws had decreased by more than 100 each from the preceding year, so that bicycles constituted the principal means of road transport.⁷¹ According to the same statistics, population per bicycle in Gumma Prefecture, another agricultural district not far from Tokyo, was 12 persons in 1926, in contrast to 109 in 1913. Even in Aomori Prefecture, which is located at the northern end of Honshu and is typical among the nation's poor agricultural districts, bicycle ownership significantly expanded over the same years, as the population per vehicle shrank from 300 to 34.

However, there were some limits to this spread of bicycles. Demand increased little from lower middle farming households or below, nor was the spread forceful enough to fill in interregional gaps. As a consequence, in rural areas, bicycles were extensively offered by monthly instalment plans or for rent even in the 1920s.⁷² In the 1930s mutual financing associations known as *tanomoshi ko* became common among farmers.⁷³ An association would be organized by several farmers making equal contributions to accumulate the money necessary to buy a bicycle in several months; the buyer was chosen each time by lottery.

Despite these efforts, the rural demand for bicycles declined, and in the second half of the 1920s, the urban ownership ratio again began to rise, reflecting an increase of enterprises owning more than one bicycle for business use.

Overall, however, there was no change in the dominant trend of bicycles being used for practical purposes instead of for amusement. A decline in the retail prices of bicycles further stimulated demand. To look at the price trends of the products of Miyata Seisakusho, for example, not only was there a significant downswing in the 1920s (see figure 1) but also a distinct gap emerged between the price range of luxury models for amusement and practical-purpose models. Before World War I, imported bicycles and Japanese-made bicycles were sold to different market segments, resulting in a dual market structure. By this period, the dual structure had changed in character: imported and luxury Japanese-made bicycles constituted the upper

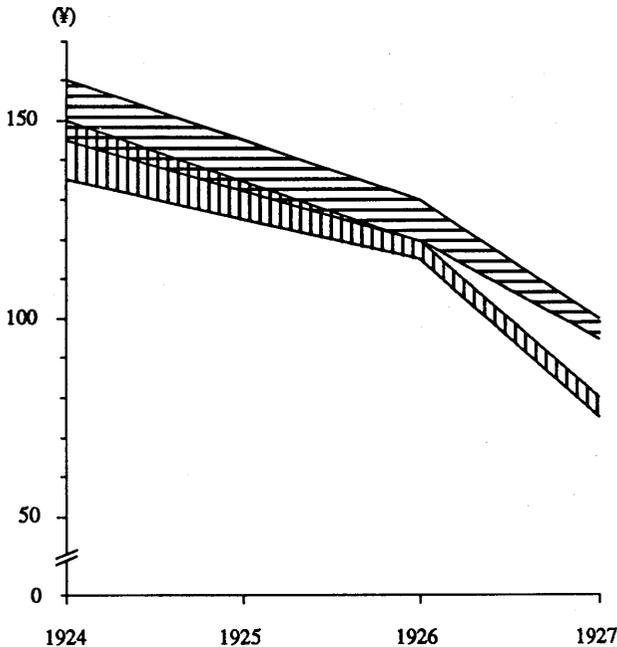


Fig. 1. Retail price ranges of bicycles manufactured by Miyata Seisakusho, 1924–1927

Source: Miyata Seisakusho 70-nen Shi Hensanshitsu, *Miyata Seisakusho 70-nen-shi* (70-year history of Miyata Seisakusho) (Tokyo, Miyata Seisakusho, Ltd., 1959), p. 87.

Note: The upper range with horizontal stripes represents luxury models; the lower with vertical stripes are popular models.

tier, and practical-purpose domestic products made up the lower tier. The latter came to account for an overwhelming market proportion, both in the number of units sold and in their total value. The per-unit price had declined to about ¥35, equal to the monthly pay of an average factory worker.⁷⁴

Along with the expansion of the domestic market, what greatly helped the Japanese bicycle industry was the growth of exports, mainly to other Asian countries. *Nihon gaikoku bōeki nempyō* (Year-book of Japan's foreign trade) included bicycles as one of its export items from its 1917 edition on, suggesting that large-scale bicycle exports began around that year. The exports consisted mostly of components, as revealed by the large proportion of exports of bicycle parts to their overall domestic production (see table 8).⁷⁵ By the 1930s, nearly half of both parts and complete units manufactured in Japan were being exported. The annual sum of exports, which had stood at ¥168,000 in 1917, rose to ¥460,000 by 1923 and jumped to ¥2,296,000 in 1925. The countries importing Japanese bicycles or parts (table 9) were most-

ly those in which tension against Japan rose in subsequent years.⁷⁶

What deserves note here is that the exports were of products priced low even by the domestic standard then prevailing. Export merchants gathered parts from producers in different areas of the country and shipped them out either as they were or in knock-down kits to be assembled in the Dutch East Indies. The export prices of these products reveal how Japanese exporters took advantage of the low prices of their goods to make inroads into the market where advanced nations had held large shares (table 10). The value of bicycles and their parts exported from Japan came to account for the largest proportion among Japanese machinery exports by the mid-1930s.

Production of bicycle parts, especially low-priced parts, was centred in Osaka. The low prices corresponded not to a high level of productivity but to a very small scale of operation and a labour-intensive production system, both of which depended on cheap labour. This aspect will be discussed in greater detail below.

The Development of Parts Manufacture

The variety of bicycle parts increased as product quality improved, and took on substantially the same pattern as that of today by the 1910s (see table 11). A considerable proportion of bicycle parts – though most were intended as spare parts for imported bicycles – began to be produced in Japan during the Meiji period.⁷⁷ However, the hubs, free wheels, spokes, and chains that were produced, including those by a few large-scale Japanese factories, were little more than test products or stopgap substitutes. Many of the rims and gear cranks then produced were still inferior in quality, and the accessories were mostly simple substitutes.

Circumstances began to improve gradually during World War I, thanks largely to the interruption of the inflow of superior products from the West and also to the advent of export opportunities for local products.

Among the accessories, brass bells manufactured by Lucas Company of the United Kingdom were so well known that “Lucas” became a common noun denoting high-quality bells among Japan producers and dealers. By around 1910, a Japanese manufacturer tried to copy the British product, but his attempt did not succeed; though Japanese labour was cheap, the material costs were high, and the production process was inefficient. In 1919, however, Noguchi Kazuo thought of making similar bells of iron. Originally a metal button manufacturer, Noguchi had a surplus plating capacity and expected that iron bells, if plated more thickly, would prove competitive with brass bells. Iron cost less and was more readily processible than brass, and plating techniques, even at small factories like Noguchi’s, were substantially improving. The iron bells were priced far lower than, and proved to be not inferior in appearance to, the Lucas bells. Noguchi’s bells quickly found expanding markets in Asia after World War I. They even began to be exported to Europe, mainly to the Netherlands, where bicycle production was much more advanced than in Japan. The daily output of bells at Nogu-

Table 8. Bicycle production and export in Japan, 1929-1938

Year	Output of finished bicycles	Output of parts and accessories (¥)	Total (¥)	Finished bicycles exported	Value of finished bicycles exported (¥)	Value of parts and accessories exported (¥)	Total (¥)
1929	2,563,051	16,138,063	18,731,114	—	—	—	3,429,684
1930	2,790,331	12,206,374	14,996,705	5,000	—	—	2,901,488
1931	2,005,513	13,743,235	15,769,248	—	—	—	3,300,000
1932	1,315,748	20,666,605	21,982,353	—	—	—	6,000,000
1933	2,142,373	26,606,495	28,771,299	52,000	1,200,000	12,000,000	13,200,000
1934	2,512,376	34,462,225	37,004,601	104,000	2,400,000	17,000,000	19,400,000
1935	2,251,001	38,889,853	41,150,742	118,000	2,500,000	16,000,000	18,500,000
1936	5,115,056	44,044,488	49,254,544	142,000	3,100,000	19,000,000	22,100,000
1937	2,777,815	50,889,157	58,866,372	119,000	3,000,000	23,000,000	26,000,000
1938	4,528,251	48,534,553	53,062,804	51,000	1,600,000	14,000,000	15,600,000

Sources: Ministry of Commerce and Industry, *Kōjō tōkei hyō* (Statistical tables of factories) (Tokyo; see tables for years 1930-1939), and additional data in the possession of Jitensha Sangyo Shinkokai, Tokyo.

Note: The dashes represent unavailable data.

Table 9. Geographical destination of bicycles and bicycle parts exported from Japan, 1926–1930 (%)

Destination	Year				
	1926	1927	1928	1929	1930
China	46	33	36	28	27
Kwantung Province	14	14	15	11	9
Hong Kong	1	1	1	1	1
British India	3	4	8	13	26
Straits Settlements	21	24	6	11	7
Dutch East Indies	9	21	32	34	25
Philippines		1	1	1	1
Siam	1	1	1	1	1
French Indochina		1			
Egypt					1
East Africa					1
Mexico					1
Total	100	100	100	100	100

Source: Nihon Rinkai Shimbun Sha, *Jitensha sangyō no ayumi* (Development of the bicycle industry), vol. 1 (Tokyo, 1957), p. 78.

Note: Rubber tyres and tubes are not included as bicycle parts.

Table 10. Average prices of bicycles exported to the Dutch East Indies during the late 1920s (in rupees)

	1927	1928	1929	1930
Japan	34.10	21.97	23.19	21.23
Netherlands	67.25	57.99	58.89	56.37
Great Britain	51.38	49.58	53.93	56.86
France	49.66	49.84	48.38	52.68
Germany	45.72	43.54	43.41	43.78

Source: Jitensha Sangyo Shinkokai, ed., *Jitensha no isseiki – Nihon jitensha sangyō shi* (Centenary of the bicycle – A history of Japan's bicycle industry) (Tokyo, Jitensha Sangyo Shinkokai, 1973), pp. 282, 283.

Note: The prices are on a CIF basis.

chi's factory is reported to have reached 78 gross in its peak year during the 1930s.⁷⁸

During World War I, local production of chains became full scale. One of the last parts to be produced in Japan was the chain; a specific grade of high-quality steel was required as its raw material and it could not be efficiently produced with primitive machine tools. By 1916 a number of chain-manufacturing firms, including Harita Chain, were established in

Table 11. Classification of bicycle parts

Parts	Subparts
1. Frame	Top tube, down tube, seat tube, head tube, seat stay, head lugs, seat lug, bracket lug, seat pillar pin
2. Front fork	Fork stem, fork crown, solid fork end
3. Handlebar	Handlebar lug, handlebar post, handlebar stem, handlebar expander bolt, expander cone, brake levers, lever springs, brake lever arms, lever clips
4. Mudguards or fenders	Front mudguard, rear mudguard, mudguard stays, stay plates
5. Chain wheel and cranks	Chain sprocket, right crank, left crank, crank pins, bracket axle, transmission gear*
6. Pedals	Pedal rubbers, cap, pedal spindle, outer plate, inner plate, square rod, centre tube, inside bearing cup, outside bearing cup, steel balls, pedal adjusting cone, nut
7. Hubs	Front hub*, rear hub, coaster hub, hub shell, hub cup, hub cone, seat, nut, hub spindle
8. Free wheel	Side plate, inner ring, free wheel pawl, pawl pin, steel balls
9. Brakes	Front brake, rear brake, hub brake, brake shoe, brake block, front brake tube, brake rod, bottom end lug, brake tightening bolt
10. Spokes	Spoke wires, nipples, washer pins
11. Rims	Front rim, rear rim
12. Chain	Outside link, inside link, pins, bushes, rollers
13. Gear case	—
14. Saddle	—
15. Seat pillar	—
16. Luggage carrier	—
17. Stand	—
18. Head parts	Ball head lock nut, locking ring, top cone, head steel balls, top ball head cup, bottom ball head cup, crown cone, lamp bracket
19. Bottom bracket parts	Flanged cup, adjusting cup, steel balls, bracket cotter pin
20. Tyre	Tyre, inner tube, tyre valve
21. Accessories	Dynamo lighting set*, bell, horn, lock, handlebar grip, handlebar grip cap, air pump*, rear-view mirror*

Sources: Based mainly on Commercial and Industrial Economics Research Group of Osaka Prefecture, Osaka Prefectural Institute of Research in Commercial and Industrial Economics, *Osaka ni okeru jitensha sangyō no jittai – Ryūtsū hen* (The situation of the bicycle industry in Osaka – Distribution) (Osaka, 1954). Reference was also made to Tokyo Municipal Office, *Jūyō kōgyō chōsa* (Survey on important manufacturing industries), vol. 1 (Tokyo, 1932), and Osaka Municipal Office, *Osaka no jitensha sangyō* (The bicycle industry in Osaka) (Osaka, 1933).

Note: Asterisk subparts* are not always used; dash denotes the absence of any significant subparts.

Tokyo and Osaka and started production. Their products, however, did not prove strong enough and often snapped while in use, so they earned the unwelcome nickname of "death chains." In the years after World War I, low-priced Japanese chains were still not able to compete with better chains produced in Coventry, England, or elsewhere. Three major Japanese manufacturers – Miyata, Araya, and Maruishi⁷⁹ – joined hands to set up a specialized chain factory named Kokueki (national interest) Chain. The new firm, which later grew into one of Japan's biggest manufacturers of chains for various industrial purposes, was still groping in those days for better ways to use its machinery and raw materials imported from Europe. It was not until the 1930s that Japanese-made bicycle chains became fully competitive in the international market. Even though the necessary machines were imported before the 1930s, the production process was organized in the wrong sequence or the manufacturer was unaware of a number of important supplementary subprocesses.⁸⁰

Local production of free wheels was beset with the most difficult problem, which was a long delay in the manufacture of satisfactory steel ball-bearings in Japan. It was not until the 1960s that Japan became a world leader in the production of steel ball-bearings for various uses, and thus, during the period being considered, the supply of steel ball-bearings was almost wholly imported. Japanese manufacturers nevertheless had become able, during World War I, to produce ball-bearing housings that were not inferior in strength or function to Western products. The bicycle parts manufacturer Sanko, which became the top manufacturer in the Kanto region, was founded in 1916. The Makita Brothers' factory, whose quality products were highly appreciated in the 1920s, was set up in 1917. Shimano Shozaburo, founder of Shimano Industrial Co., Ltd., which is now the world's biggest free-wheel manufacturer, established his factory in 1922. In the same year, free-wheel production was started by Maeda Shikanosuke, founder of Maeda Industrial Co., Ltd., which today holds the second greatest share in the world market after Shimano.⁸¹

As most of the bicycle parts began to be produced in Japan, the bicycle industry achieved a very important position among the machinery and appliance industries in major cities. According to a survey by the municipality of Tokyo in 1932,⁸² the bicycle industry ranked eighth in value of output among 40 such industries in Tokyo Prefecture. The number of patents and utility models relating to bicycles increased sharply from 70 and 120 for the whole of the Meiji period to 113 and 1,340 in the Taisho period, and the upswing became even steeper beginning in 1926, the start of the Showa period.⁸³ By 1937, Japan's bicycle industry had won a one-third share in the world market and become the leader in value of exports among the nation's machinery and appliance industries.⁸⁴

More important than the rise of the bicycle industry in its relative position among the machinery and appliance industries was its impetus in the development of similar industries. This point will be discussed in detail later.

In addition, there was an element of public administration that contributed

to the development of bicycle parts production. In Japan, one of the major automobile-producing nations in the world, law requires automobiles to undergo strict inspection at regular intervals. Japan is among the world's leading nations in the strict implementation of such controls. Until the 1940s, bicycles had also been legally required to undergo inspection. As an example, part of the ordinances of the Tokyo Metropolitan Police Board from 1926 are quoted below.

Article 11. Anyone wishing to use a bicycle shall file an application stating his or her address, name, age, and type of bicycle. The nearest police station will have jurisdiction over the main use thereof, require the bicycle to undergo inspection, and have the registration number thereof designated. . . .

Article 12. Anyone discontinuing the use of his or her bicycle, succeeding the use of a bicycle from someone else . . . or changing the place of the main use thereof shall report such information within five days to the police station by which the registration number thereof was designated. . . .

Article 15. Anyone using a bicycle shall have the bicycle inspected at a place and on a day specified by the designated police station.

Article 16. If, as a result of the inspection under the foregoing article it is deemed necessary to do so, the police station can prohibit the use of the bicycle.

These regulations made it necessary for bicycle owners to replace or repair any faulty parts before the yearly inspection. This necessity further increased the number of stores whose main business included repairs and parts replacements along with the sales of new vehicles; it also gave impetus to the production of bicycle parts.

The Growth of Related Industrial Sectors

Development of the bicycle industry required another element, the steady supply of primary materials. The more sophisticated bicycles became, the more diverse their primary materials. Just in terms of iron and steel, it was common for machinery and appliances to consist of many different metallic parts. The main primary materials of each component of Japanese-made bicycles after World War I are listed in table 12.

Some primary materials had to be imported, while others were already available locally. Ribbon hoop steel was mainly imported from Germany. Factories producing low-priced bicycles noticed the steel belts that were used for binding packages coming in from the West and were able to make good use of them. They seem to have been fairly extensively used because there were even brokers who specialized in dealing in them. The United States was the source of 80 per cent of the supply of the steel wires in use at the time, the rest being imported from Czechoslovakia, Germany, and Sweden.⁸⁵ Oxhide for saddles was mostly imported from North America. While the total quantity of raw rubber had to be imported, sulphur and magnesium carbonate used for rubber processing were available in Japan.⁸⁶

Locally available primary materials included some steel wires manufactured by the government-run Yawata Ironworks and Kobe Steel, Ltd., but their products were inferior in quality to imported ones. Pipes were either seamless or welded. Seamless pipes were made of imported steel by specialized metal works, including Sumitomo Seamless Copper and Steel Pipe Co., Ltd.⁸⁷ Some bicycle factories used part of their facilities for the specialized production of welded pipes, while other factories used pipes of their own make for the frames and other components of their bicycles.⁸⁸ For low-priced bicycles, pipes that had been used in ships were often reused. Much of the cast-iron and soft steel used in manufacturing was produced domestically. Ribbon hoop steel, too, began to be produced domestically in the 1930s by three steel mills, including Nippon Kokan.

As was usual for a late starter, Japan's metallurgical industries were not sufficiently developed in the 1930s. Efforts were made to improve them mainly through the operation of government-run mills, but even when primary materials were producible in Japan, their use by the machinery and appliance industries necessitated secondary and tertiary processings, each meeting the production needs of one sector or another (see figure 2).

To sum up, until World War I, government-run works and some steel mills in Japan were capable of processing only up to the stages of the open-hearth or electric furnace, and shipyards and military arsenals were obliged to build factories for rerolling, drawing, and forging. In contrast to advanced countries in which modern steel mills, supported by the extensive development of the machine and metal-processing industries, were sufficiently well established for the integrated production of all iron and steel items, from pig-iron to steel wires and sheets, in Japan, every factory had to meet its processing needs by remelting what had once already cooled. Tiny mills equipped with cupola hearths for the recycling of scrap iron were operating, but the steel they produced was too impure to be used for anything more than traditional tools or machinery and appliance parts that did not require a high degree of precision. This limitation by the industrial structure underlay the circumstance of the early days when steel bands used for the packaging of imports had to be bought for reuse in the manufacture of bicycle parts.

However, during and after World War I, partly stimulated by the war boom, mills equipped with electric furnaces appeared, and at the same time, smaller enterprises specializing in rerolling, drawing, or forging were established in Osaka Prefecture (see table 13) and throughout the country. In table 13, enterprises surveyed by Dr. Ohashi Takanori of Kyoto University⁸⁹ are reclassified by area of specialization and year of inauguration. According to the Ohashi survey, while *zaibatsu*-affiliated enterprises were mostly founded in the Meiji period, the establishment of smaller enterprises concentrated in the years during and around World War I and in and after 1931, when Japan's military presence in China began to escalate. It was only after the development of these smaller enterprises in the metallurgical sector that the conditions of the processing and supply of diverse metallic materials required by many machinery and appliance manufacturers were substantially

Table 12. Bicycle parts and materials between the two world wars

Main part	Subparts	Materials	Remarks
Frame	Pipe	Hard steel or ribbon hoop	The latter was also known simply as hoop, and was usually imported from Germany
	Fork	Hard steel or ribbon hoop	The latter was also known simply as hoop, and was usually imported from Germany
	Rack	Casting or steel plate	For pressed items, the latter is used
Chain wheel and cranks	Chain wheel	Hard steel	
	Cranks	Soft steel	Usually the product of Yawata Ironworks, having a carbon content of 2 to 3%.
Rim	—	Cold-finished hoop and brass wire	The former alone for some products
Handlebar	—	Drawn or welded tube	Spiral welded tubes were used for standard vehicles
Chain	—	Soft steel	Hoops imported from Germany were often used
Hub	Hub shell	Casting or soft iron plate	The latter is used for pressed items; the former is more common
	Hub spindle	Soft steel	Japanese-made steel was used
Free wheel	—	Soft steel	Japanese-made steel was used
	Saddle	Leather part	
	Metal part	Oxhide	
		Steel made in Japanese way or regular steel	The former was used for standard vehicles
Spokes	Spokes	Steel wire	
	Nipples	Brass	

Source: Osaka Municipal Office, Industrial Affairs Department, Research Section, ed., *Osaka no jūtensha kōgyō* (The bicycle industry in Osaka) (Osaka, 1933), pp. 34–75.

Note: Dashes denote the absence of a need for subdivision.

improved. Their development also enabled imported materials to undergo adequate reprocessing.⁹⁰

In spite of these changes, the quality of steel available in Japan had not yet reached the level in advanced countries. Nevertheless, the development of many machinery and appliance manufacturing subsectors and the formation of small enterprises in the metallurgical sector responsible for the secondary and tertiary processing of iron and steel resulted in an expanded domestic

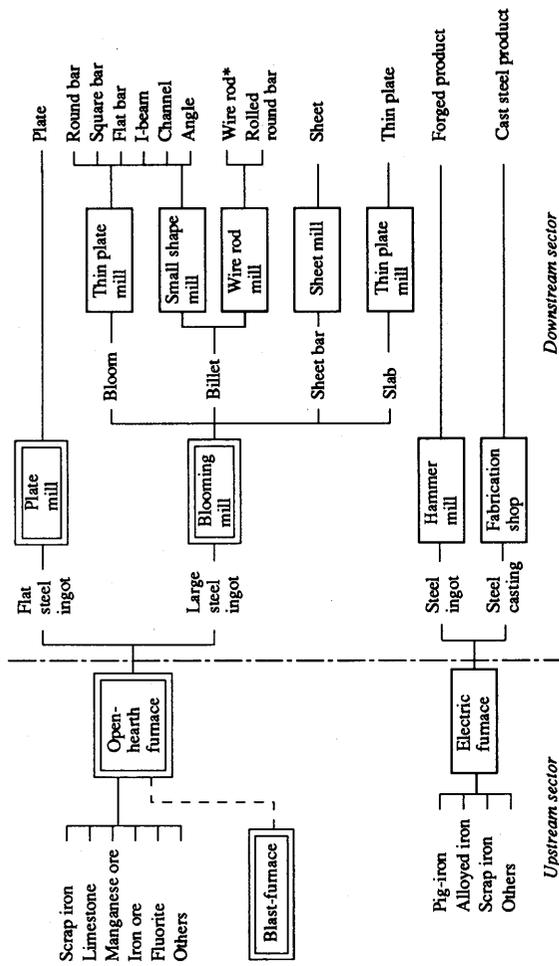


Fig. 2. Organization of Japanese iron and steel production before World War II

Sources: Osaka Municipal University, Economic Research Institute, *Nihon tekkō gyō no seisaku kōzō* (Productive structure of the Japanese iron and steel industry) (Tokyo, Nihon Hyoron Shinsha, 1954), p. 6; idem, *Osaka ni okeru tekkō gyō, men orimono kōgyō no jittai* (The situation of the iron and steel industry and the cotton-weaving industry in Osaka) (Osaka, 1953), p. 69.

*The blast-furnace is mentioned here for the sake of supplementary reference, though it is not the only source of pig-iron supply. The final products are even more diverse than those listed in the far-right column. From the wire rod alone, for instance, galvanized wire and various other wires or nails are produced, but they are ignored for the purpose of this chart.

Table 13. Number of enterprises established in subsectors of the steel industry in Osaka, 1912–1951

Year	Open hearth mill or mono-stage forging mill	Iron rolling mill	Steel casting mill	Forging mill	Total
1912		1		1	2
1913		1	1		2
1914					
1915	1			1	2
1916		1		1	2
1917				1	1
1918		1	1	1	3
1919	1	1			2
1920					
1921					
1922				1	1
1923	1	1			2
1924	1				1
1925					
1926					
1927					
1928		3		1	4
1929					
1930					
1931			1	1	2
1932		3			3
1933				1	1
1934			1		1
1935	2	2	1		5
1936					
1937	1	1	1	1	4
1938		1	1	1	3
1939				1	1
1940		2			2
1941					
1942				1	1
1943					
1944		1			1
1945					
1946		1			1
1947					
1948				2	2
1949					
1950		1	1		2
1951		2		1	3

Source: Osaka Municipal University, Economic Research Institute, *Osaka ni okeru tekkō gyō, men orimono kōgyō no jittai* (The situation of the iron and steel industry and the cotton-weaving industry in Osaka) (Osaka, 1953), pp. 27–29, 38–40, 45–48, 53, 54.

market, which induced even large steel companies to participate in the downstream processing stages and to undertake improvement of the products thereof.

Two Models of Modern Factory

As production rose and conditions facilitating the production rise were gradually improved, big enterprises began to emerge in the bicycle industry, where small producers had been predominant.

There were two types of bicycle manufacturer engaged in large-scale production. One consisted of manufacturers that had equipped themselves with the latest machinery imported from the West in the Meiji period and since had aimed at integrated production from parts to finished bicycles. They were exceptional, as represented by Miyata Seisakusho. The other type comprised bicycle merchants who, taking note of the growth potential of the bicycle industry, set up large factories.

Miyata Seisakusho was well advanced in the installation of new machinery by around 1910 and prosperous enough to discontinue late-night overtime work, although intensive labour and long working hours were common in Japan at the time. The company was well known for its unique personnel management, such as inviting a pastor from a local church on one Sunday or two every month to give a sermon to the entire staff, from the very top to the apprentices, or sending all the apprentices to the municipal industrial education school.

Although Miyata was occupied during World War I with the production of military supplies and bicycles for military use, it resumed the manufacture of bicycles for popular use immediately after the war. Ahead of its competitors, the company attempted mass production and the establishment of an assembly line system. Out of its pioneering efforts came, in 1927, the Gear M model, which became well known as a bicycle for popular use.⁹¹ Although the successful mass production of this model was achieved by a drastic reshuffling of the line-up in the factory, two characteristic points have to be mentioned.

First, the factory's principal machinery was made up almost entirely of the latest models imported from the West. Among the presses, Ferracute machines constituted the majority. Equipment for the screw machine shop were mainly supplied by Brown and Sharpe, Pratt & Whitney, and Warner Swaithey. The machines for the milling shop were purchased from Brown and Sharpe and Potter Johnson.⁹² Many of these imported machines were partly improved at Miyata and supplemented with special attachments devised by their successive users.

Second, especially for the production of luxury models, Miyata relied on imports for the supply of primary materials and important components (see table 14).

The company's production system was organized with these characteristic

Table 14. Major materials imported by Miyata Seisakusho in early Showa

Item	Main supplier	Country
Steel		
Cold-finished bars	American Steel Wire	US
Cold-finished plates	Stanley	US
Butted tube	Reynold	UK
Rods for hot processing	—	US
Special steel for tools	Borel	Austria
Half hard steel for brake and lever	Borel	Austria
Parts		
Steel ball	SKF	Sweden
Chain	Coventry	UK
Saddle	Brooks Saddle	UK
Coaster hub	BSA Cycle	UK
Free wheel	BSA Cycle	UK
Others		
Paint	Berry Brothers	UK

Source: Miyata Seisakusho 70-nen Shi Hensanshitsu, *Miyata Seisakusho 70-nen shi*, p. 84.

features. A number of other remarkable aspects related to its management style bear mentioning.

First was its unique marketing system. During the Meiji period, Miyata's bicycles were produced according to the demand from wholesale merchants and could not be marketed without relying on their capabilities. Every influential wholesale merchant had his own sales territory, within which he had exclusive rights. After World War I, however, a number of these merchants either went out of business or merged with other enterprises; Miyata assumed a leading role in effecting these mergers. In 1920 Maito Shokai, a limited partnership in which influential wholesale merchants in different parts of the country jointly invested, was established as an intermediate step toward an eventual merger. The legal representative of this joint enterprise was Miyata Fukusaburo, a relative of the owner of Miyata Seisakusho. In the same year, Kyushu Maito Kai, in which merchants in Kyushu jointly invested, was set up. As a result of these developments, Maito Shokai fully absorbed in 1923 Miyata's marketing outlets, and a new limited partnership, Miyata Seisakusho Hambai Ten (Miyata Sales Stores), was born. Concurrently, transactions were discontinued between Miyata Seisakusho and Terui Shoten, an influential commercial firm in Tokyo that had enjoyed long-established business relations with Miyata.⁹³ Thus Miyata fully established its hegemony in the marketing of its products.

The company's internal organization was adapted to the expansion of its work-force. The responsibilities and functions of every post in the

organization – from the director (Miyata Eitaro) down to the department managers, section chiefs, foremen, and finally, the assistants – were clearly defined, and regulations concerning treatment and wages were unified (see fig. 3). Most of the foremen and section chiefs were skilled workers. As the regulations were being formulated, the company began holding monthly meetings of foremen; all the foremen and senior executives, including the director, were required to participate to discuss the planning and rationalization of production. Enterprises in the metalworking and machine sectors throughout the country also began to improve vertical communication within their organizations, in both formal and informal ways. Not to be ignored was the presence of paternalistic employer-employee relations, which were highly characteristic of Japanese traditional society. Such relations were often regarded as one of the decisive elements of the stagnant industrial structure in Japan. However, in not a few instances, such as that of Miyata Seisakusho, efforts to improve vertical communication were institutionalized and proved fairly effective. What caused the difference will be explained in the following chapter.

There is another aspect that appears totally contradictory to the points made above and that is, the lower the price range of bicycles, the heavier the dependence of their manufacturers on small subcontractors for the supply of parts. The proportion of such dependence was reportedly close to 75 per cent in the late 1920s.⁹⁴ If these reports are correct, the establishment of the mass production system also meant the alignment of the small subcontracting enterprises. This aspect was crucial.

How bicycle importers established their own factories can be seen through the examples of Nichibei Shoten and Maruishi Shokai, both typical importer-distributors in existence since the Meiji period. Plagued by the interruption of imports during World War I, both took note of the high rise in the prices of parts and finished bicycles and began the production of their own bicycles at a very high level of self-sufficiency in components. Nevertheless, the two differed considerably in the circumstances leading to the establishment of their own factories.

Nichibei Shoten, an agent of the British-made Lodge brand, entered into a loyalty contract with the Lodge company to manufacture Lodge-brand bicycles in Japan and acquired their operation book, when the outbreak of war disrupted the import of British products. By 1916, Nichibei was able to set up its own Greater Japan Bicycle Company (Dai Nippon Jitensha Kabushiki Kaisha), with an initial capital of ¥500,000. The new company took over Araya Chain, established rim and tyre shops, and by 1919 had begun full-scale operation with an increased capital of ¥2 million. Establishing separately Tokai Steel Company (Tokai Kogyo Kabushiki Kaisha) as its steel-supplying division, Nichibei equipped itself with an almost fully integrated production process and boasted of its being "Japan's only fully integrated factory."⁹⁵ Its shareholders included powerful financial figures, and its technical staff, too, had prestigious members; for example, an engineer

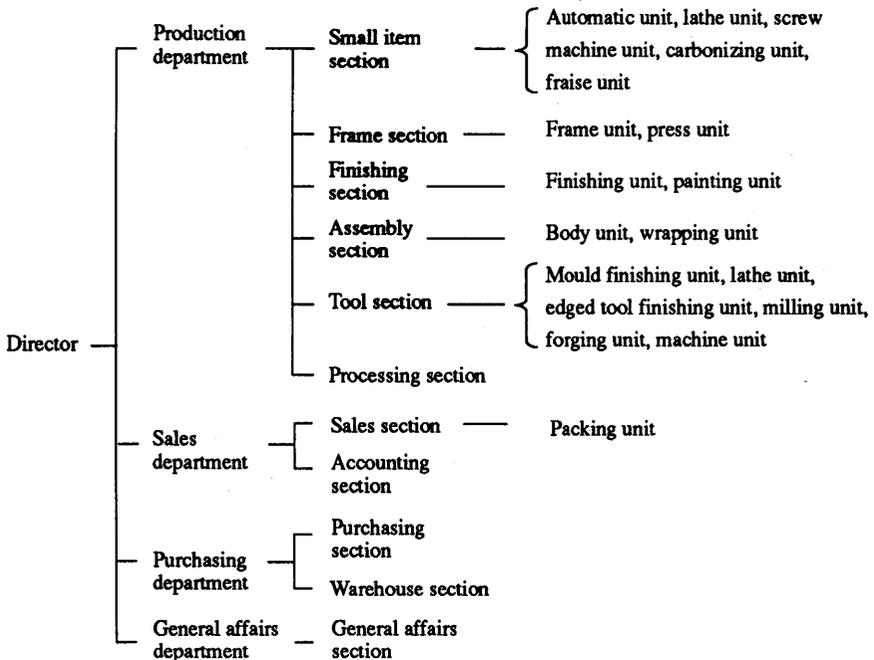


Fig. 3. Organization of Miyata Seisakusho after its 1923 reorganization

Source: Miyata Seisakusho 70-nen Shi Hensanshitsu, *Miyata Seisakusho 70-nen shi* (Tokyo, 1959), p. 81.

Note: The director concurrently served as manager of the sales department in the early Showa years.

appointed by the emperor at the government-run Yawata Ironworks and a department chairman of a polytechnic school.

Maruishi Shokai, the biggest importer of British-made bicycles, began in 1920 to operate a factory (by means of investment and participation in management) of Premier Bicycle Manufacturing Co., Ltd., a British-financed enterprise located in Kobe that was then renamed Anglo-Japanese Bicycle Manufacturing Company (Nichiei Jitensha Seizo Kabushiki Kaisha).

The circumstances of the founding of Premier are outlined below. In 1906 an Englishman by the name of H. W. Greer, the sole agent of Dunlop Tire and Premier Bicycle Manufacturing in the Far East, inaugurated his own trading firm, Greer Shokai, in Kobe. Some British awareness of the potential market in Japan for bicycles led to the setting up of Japan Dunlop Rubber Co., Ltd. in 1909, and in 1910 Premier was established on part of the site of Japan Dunlop. The new factory's parent organization in England is said to

have sent to Kobe 13 technicians and the latest models of automatic machinery and equipment, ranging from welding machines to oxygen cylinders. Premier is reported to have imported coaster brakes and three-speed gears from Birmingham Small Arms Co., Ltd. (BSA)⁹⁶ of Britain; it used Dunlop tyres and saddles supplied by Risetete Company (set up in Kobe at Greer's recommendation by another Englishman), but was self-sufficient in other parts, as its factory "manufactured all metal components from fenders to the smallest bolts."⁹⁷

The factory's ultra-modern equipment attracted the interest and curiosity of Japanese skilled workers, and many applied for jobs in the factory. Of those hired, there were some who not only mastered the use of micrometers and the mechanical principles of the machinery but were able even to render precise sketches of the machines and sell them.⁹⁸ Premier brand bicycles were ranked among the best in Japan at the time, and Maruishi Shokai was the sole domestic distributor.

Nichibei Shokai and Maruishi Shokai launched into the operation of highly sophisticated factories from the very beginning. Both were frustrated relatively soon, however. Greater Japan Bicycle changed its policy in the mid-1920s and began producing only the vital parts for itself and subcontracted the production of all other parts; it even fostered the growth of subcontractors for the manufacture of such important items as coaster brakes.⁹⁹ The Premier factory, succeeded by Maruishi, adhered to integrated production, but in the end it was forced to liquidate by the early 1930s. The social conditions that made the operation of these "state-of-the-art" factories difficult will be analysed next.

The Assembly System in the Bicycle Industry

Increase of Small Producers and Productivity

Production of bicycles was concentrated in the major urban areas around Tokyo, Osaka, and Nagoya. The peak year for the production of bicycles and their parts in Japan before World War II was in 1937 (see table 15). It is difficult to draw an accurate picture of total production because there are few statistics on the tiny domestic industries that were especially prevalent in big cities. However, even reported figures suggest that the number of employees per enterprise was smaller in urban areas. Yet, per capita productivity in Osaka, where the proportion of tiny enterprises seems to have been the greatest, was not only higher than in Tokyo and Aichi (area around Nagoya) but also greater than the national average.

The centre for bicycle production in the Osaka area was Sakai, adjoining the southern limit of Osaka City. Pertinent statistics on Sakai are rather dubious, judging from an oral account by someone who was directly involved in bicycle production in the city.¹⁰⁰ Data available from existing records on the

Table 15. The bicycle industry in 1937, classified by principal producing regions

	(A) No. of factories	(B) No. of workers	(C) Output (¥1,000)	(D) B/A	(E) C/B (¥1,000)
Osaka	349 (41.2%)	5,381 (31.3)	19,204 (35.6)	15.4	3.57
Tokyo	257 (30.3)	5,290 (30.8)	15,119 (28.0)	20.6	2.86
Aichi	149 (17.6)	2,699 (15.7)	6,336 (11.8)	18.1	2.35
Whole nation	847 (100.0)	17,202 (100.0)	53,866 (100.0)	20.3	3.13

Source: Ministry of Commerce and Industry, *Kōjō tōkei hyō* (1937).

Notes: Parenthesized figures are proportions to the national totals. The figures do not include factories with less than five employees.

small producers in Sakai are put together in table 16. As far as one can tell from the data, the number of employees per enterprise in Sakai expanded during World War I; this is thrown into doubt, however, by other reference material; there was an evident trend to the contrary from the 1910s until the 1920s. Nevertheless, considering the fall of individual product prices with the depression in the 1920s, the output per enterprise seems to have increased. The Osaka area, also a centre of Japan's bicycle exports, showed exactly the same tendency. Thus, the bicycle sector exhibited similar characteristics to those already found in the shell-button, brush, and knit-fabric industries.

The bicycle industry, however, had the specific circumstance that its finished product consisted of some 200 different parts, and every process did not have independent small producers.¹⁰¹ Small producers emerged in relation to specific processes or specific components, or as organizers to arrange for the production of parts by combining a number of subparts.

In view of this complex situation, Koichi Isobe, formerly professor of economic policy at Meiji Gakuin University, made the following classification: (1) he cited chains as an item whose production was more or less monopolized; (2) he mentioned spokes, rims, free wheels, and chain-wheel cranks as items that required relatively precise processing and therefore substantial capital and equipment; (3) he referred to handlebars, hubs, brakes, pedals, and saddles as items needing less capital and equipment; and (4) he pointed out the strong influence of relationships under the putting-out system on the frame-producing subsector.¹⁰²

However, his classification does not fit the pre-World War II bicycle industry. For the production of free wheels and chains, factories with only a few employees were not uncommon during World War I, for example, and some of these factories have grown into enterprises that today are competitive in the world market. Generally speaking, during this period, while some producers of chains or free wheels, starting at the bottom level, rapidly grew into large enterprises by providing themselves with technical capabilities, others that depended on low-priced primary materials and labour-intensive production systems floundered and eventually disappeared. Further, in the

Table 16. Annual bicycle output of Sakai City, 1913–1925

Year	No. of enterprises	No. of employees	Output (¥)	No. of employees per enterprise	Output per enterprise (¥)
1913	30	205	90,598	6.83	3,020
1914	31	241	115,420	7.77	3,723
1915	38	423	307,079	11.13	8,080
1916	45	591	567,460	13.13	12,610
1917	53	650	968,973	12.26	18,283
1918	60	823	1,672,452	13.72	27,874
1920	—	—	1,162,452	—	—
1921	—	—	1,915,003	—	—
1922	—	—	1,944,038	—	—
1923	106	455	2,456,000	4.29	23,170
1924	—	—	2,150,719	—	—
1925	89	514	2,284,287	4.85	25,666

Source: Jitensha Sangyo Shinkokai, *Jitensha no isseiki*, p. 247.

manufacture of a greater range of parts, including handlebars, the conditions were not ripe for new techniques to replace the traditional labour-intensive production system.

The diminishing trend in scale ended in the 1920s, and the number of employees per enterprise increased in the following decade. But the reversal was not as profound as implied by the figures for Sakai (table 17). As the contradictions of the war-time economy intensified, the bicycle industry stagnated and even suffered a set-back from 1937. Here again, the accuracy of the statistics is questionable as they concern enterprises with less than five employees, but, notably, an increase in the number of tiny enterprises is recorded. The next section examines the background of the managers of small enterprises and what social relationship was needed to organize the producers of components and turn out finished bicycles.

Social Mobility among Immediate Producers

The most significant proportion of previous occupations of those who became managers of bicycle parts factories consisted of skilled workers engaged in the processing of metals or components the same or similar to those used for bicycle parts. For instance, the manager of the Ogawa factory, a brake manufacturer, had been a worker at Mizugaki Seisakusho, a producer of rims and brakes. The owner of Tokyo Gear Factory, a major gear manufacturer in Tokyo during the 1920s, had worked with Sato Gear, whose manager in turn had been a worker at Koyama Gear. Satake Seisakusho was a well-known Tokyo manufacturer of bicycle stands during the 1920s, and among its skilled workers were those who later became the owners of such manufacturing

Table 17. Annual bicycle production in Sakai City, 1926–1937

Year	No. of enterprises	No. of employees	Output (¥1,000)	No. of employees per enterprise	Output per enterprise (¥1,000)
1926	128	779	2,522	6.09	19.7
1927	117	804	2,458	6.87	21.0
1928	130	1,187	2,768	9.13	21.3
1929	133	1,144	2,192	8.60	16.5
1930	127	1,160	1,965	9.13	15.5
1931	116	1,163	1,654	10.03	14.3
1932	114	1,116	2,417	9.79	21.2
1933	128	1,181	3,668	9.23	28.7
1934	159	2,424	5,873	15.62	36.9
1935	261	3,991	7,121	15.29	27.3
1936	239	4,271	8,675	17.70	36.3
1937	231	3,731	7,435	16.15	32.2

Source: Sakai Municipal Office, *Sakai-shi shi* (A history of Sakai City), Appendix 2 (Sakai, 1971), pp. 331, 666.

Note: Data seem to have been collected in a different way from the data in table 16.

firms as Kawade and Hata. Among the well-known manufacturers of chain cases was Kanaya Factory, which had been a rickshaw producer during the Meiji period, and some of its workers are confirmed to have become case manufacturers; for example, Sobukawa, Yoshikawa, Suzuki, Onuki, and Toyo. Similarly, such small factories as Tokioka and Tanimoto branched out of Takadera Factory. In the chain-case-making subsector, old manufacturers were frequently replaced by new manufacturers, and no enterprise maintained its stability for many years. Welding and plating for handlebar making were vital processes, both of which produced eventual owners of handlebar factories. Handlebar factories begun by former welding operators included Omori Handlebar and Yamagata Handlebar; Nitto Handlebar and Yoshioka Handlebar were established by ex-plating workers.

A similar trend was observed of workers employed by major manufacturers engaged in integrated production from parts to finished bicycles. The following account concerns Okamoto Jitensha in Nagoya:

Okamoto Jitensha, a manufacturer of finished bicycles, reorganized into a joint-stock company in 1919. Manufacturers that separated from Okamoto and became independent enterprises include Satake Seisakusho (1918), a hub maker; Miyata Kogyo (1923), a rim maker; Yamaume Jitensha (1915), a frame maker; and Han'ya Tekkojo, the predecessor of Nittei Kogyo, a maker of small parts for hangers. Others include the pedal maker Sugie Tekko (1919), Nagoya Gear (1916), Goto Grip (1920), the fender maker E-N Kogyo (1919), and the hub maker Robesto Jitensha (1918). Thus, manufacturers emerged specializing in one principal part or another.¹⁰³

Most of the 100 or more manufacturers of bicycle parts located in or around Nagoya City had worked with Okamoto.¹⁰⁴ Founders of other bicycle parts factories came from related sectors engaged in either production or marketing. Still others had their origins in seemingly unrelated fields.

It was not rare for a bicycle dealer to have some stake in production. Many wholesalers had several kinds of parts made in their own or in subcontractor's factories. It was even common for a retailer to be equipped with a lathe for repair use. Out of the employees of wholesalers or retailers came parts manufacturers as well as merchants who set up independent enterprises. The manager of Tamura Seisakusho, a pedal maker, had once worked in the pedal assembly division of the wholesaler Marushin; a certain Karasawa, who became independent around 1918 of his previous employer, Terui Shoten, an influential wholesaler in Tokyo, was a successful producer of a unique type of hub brake, in which he specialized.¹⁰⁵ The trend to set up an independent business was more conspicuous among the employees of retailers, most of whom became retailers themselves, than those of wholesalers.¹⁰⁶ Some ex-employees of retailers, however, proved successful as parts manufacturers.¹⁰⁷ Magariya Seisakusho, a manufacturer of heads and hangers, had been a retail store.

Thus the trend for employees to launch independent enterprises was as conspicuous in the bicycle industry as elsewhere. A similar tendency occurred in the related sector of metal processing. In Kawaguchi City, on the outskirts of Tokyo – well known for its many small iron and steel processors – eight smaller entrepreneurs were reported to have emerged from one small workshop, and there were many other similar instances.¹⁰⁸

Most of the parts manufacturers that became independent started from a tiny scale of business. There was a handlebar maker who opened his workshop with only a simple welding machine. Another manufacturer, equipped with nothing but a treadle lathe, began making heads and hangers as a sideline of his bicycle repair business. Still another, during a recession, mounted his lathe on a Japanese-devised cart with rubber tyres drawn by a man either on foot or on a bicycle, and peddled on the streets, repairing machines for small factories or household furniture. In such an enterprise, the owner-manager was also the principal worker, skilled craftsman, and proprietor of what few machines there were in the workshop. As many of his machines were borrowed, the first thing he would try to do as soon as his business achieved some stability was to buy them from their owners. The work-force, in most cases, at first consisted only of an apprentice or two. Often the entrepreneur's wife, brothers, and children helped, usually without pay. Accepting monetary compensation from one's kin was considered shameful in those days. The newly emerging entrepreneurs had started as apprentices, moving from one place of work to another, and, by their twenties, had usually become highly skilled workers. Though their skills earned them unusually high wages by the standard of the time, they were eager to have small workshops of their own. They were commonly characterized not just by high mobility and enthusiasm for ownership but, above all, by a keen

interest in machines themselves. Their interest was so keen that they were often called "machine bugs" or "machine maniacs." They were so enchanted by their machines that they would disassemble them, attempt improvements, and, unfortunately, occasionally ruin them. Many improvements in machines, tools, and procedure resulted from their efforts and enthusiasm. Success stories are abundant in the history of the development of not only the bicycle sector¹⁰⁹ but also the machine and metalworking industries of Japan generally. As they themselves had once been apprentices, they could be dogmatic at times, but many of the successful entrepreneurs among them were able to sense the psychology of their employees, from skilled workers to apprentices, and were tactful in managing their personnel and in their informal dealings with people.

How was the apprentice system they had experienced organized?¹¹⁰ Apprentices came mostly from farm villages. This tendency was true for many sectors of the manufacturing industries in comparison with apprentice merchants, who came mostly from towns and cities. Apprentices usually found employment through personal connections. If the place of work was a small workshop, the apprentice would live in the home of his employer, who was both the manager of the business and the master who would train the apprentices not only in the skills and customs of his trade but also in personal attitudes. According to the regulations of a trade association in those days, no employee was allowed to change his place of work without the consent of his employer, nor was any entrepreneur allowed to hire anyone in the employment of another. The apprentice was bound in this way until age 20, when he would be drafted for military duty. His daily working hours ranged from 10 to 12, and he had two holidays a month. He had to work until late at night when the workshop was particularly busy. Back from military service, he was required to work for his previous master for another year or two for about the same low wages as before. This additional term of service was known as "gratitude service" (*orei boko*). It was only after this extra term that he would be treated as a skilled worker. He would then become an independent entrepreneur by age 40, depending on his ability and economic conditions. According to my own survey,¹¹¹ the age at which an average worker would become an independent entrepreneur hit its lowest (below 30) during World War I and gradually rose after the war, reflecting the increasing difficulty of setting up an independent business. The ratio of shifts of skilled workers between different places of employment was falling off during the 1930s.¹¹² Most of these characteristics of apprenticeship, however, survived World War II but rapidly changed in the 1950s.

The Formation of the Assembly System

Let us now look at the effect of the increase in the number of small enterprises specialized in one bicycle component or another on the assembly of bicycles into finished products. Even the manufacturers of principal parts used other parts supplied by other manufacturers, including subcontractors, and de-

livered parts kits to be assembled into finished bicycles to wholesalers and retailers. On the other hand, there were wholesale merchants who, although they manufactured few if any parts on their own, marketed under their own brands kits of parts bought from different manufacturers.¹¹³ Analysed below are these wholesale merchants, whose share in the market steadily expanded.

The wholesale merchants would either rely on their subcontractors or make purchases in the free market for the supply of parts they needed. In the former case, the wholesale merchants were able to control the producers. However, since the market for Japanese-made bicycles mainly developed only after the turn of the century, and the development was very rapid, the free market was extensive.

Unique social relationships developed that reflected the way the goods, bought and sold in the free market, were produced. Out of the manufacturers of chain wheels and cranks, for example, barely 50 per cent had plating facilities, and only 25 per cent had presses. Manufacturers had to subcontract any required processing for which they had no machinery. However, subcontractors of the manufacturers of chain wheels and cranks were rarely aligned with the latter, and changes in the terms of transaction were in most cases up to the mutual consent of the two parties. In contrast, the choice of subcontractor for the manufacture of brakes, which involved many subcomponents and subprocesses, was usually fixed. In extreme cases, brake manufacturers merely assembled subparts fabricated by subcontractors or purchased in the market.

A similar trend was observed for handlebar manufacturers. Making a bicycle handlebar required processing a pipe and assembling small subparts. The processing of a pipe involved shaping, grinding, and plating. About 10 kinds of subparts were needed, including levers, a lug, an expander bolt, and supporters. In many cases, handlebar manufacturers produced only the levers and either bought or subcontracted all other subparts, including handlebar expander bolts (see figure 4). The greatest number of subcontractors were grinders. Most of them operated as a cottage industry, relying solely on the labour of the entrepreneur himself and his family. Factories producing small subparts seldom had more than 10 employees.

The most complex subcontract relationships were in the area of frame production. While many of the specialized frame makers were tiny entrepreneurs and relied heavily on wholesale merchants' shares in the market and financial resources, they organized many subcontractors under their own wings (see figure 5). Painters occasionally borrowed funds and equipment. In extreme cases, they borrowed a part of a frame factory site to do their work. As elsewhere, the informal subordination of subcontractors to their clients increased with the variety and intensity of the elements of dependence. Some of the manufacturers of small subparts (e.g. lugs) became subcontractors committed exclusively to one frame manufacturer or another. They, too, had subcontractors of their own for some subprocess or another (see figure 6).

Among these multilayered subcontract relationships, the lower the layer, the smaller the scale of business and the heavier the reliance on family

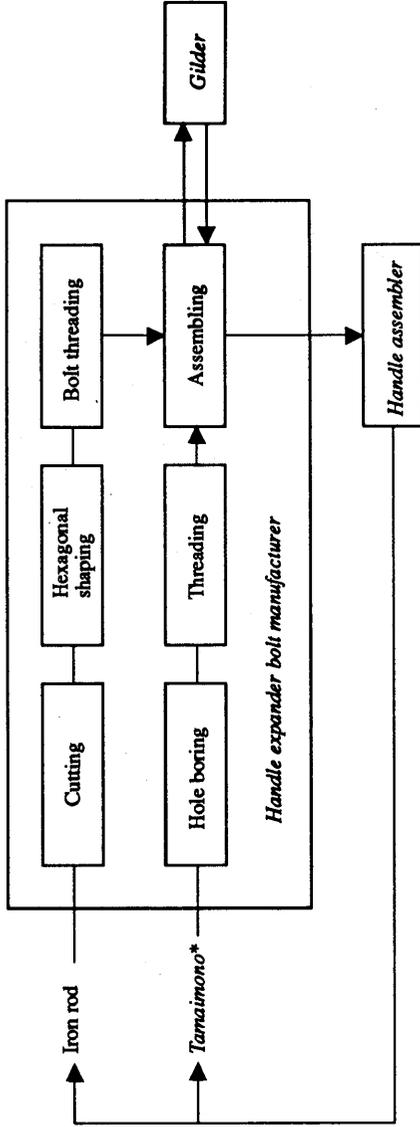


Fig. 4. Production of handlebar expander bolts in the 1920s

Source: Tokyo Municipal Office, *Jūyō kōgyō chōsa* (Survey on important manufacturing industries), vol. 1 (Tokyo, 1932), pp. 34, 35.

* A crude, small lump of iron that could be refined into steel by further treatment. For more sophisticated bicycles, seamless steel pipes, which were manufactured only by major producers, were used instead of oxygen-welded pipes.

Table 18. Bicycle manufacturing costs in 1929

Item	Value (¥)	(%)
Total output of bicycles	19,938,325	100
Raw materials consumed	8,739,004	43.7
Wages paid to workers	4,052,640	20.2
Salaries paid to staff members	701,000	3.5
Power and fuel consumed	696,867	3.5
Total manufacturing cost	14,189,511	70.9

Source: Jitensha Sangyo Shinkokai, *Jitensha no isseiki*, p. 263.

labour. As in other labour-intensive industries, the bicycle industry was characterized by a structure whose bottom layer was made up of sideline jobs performed at home. In these tiny enterprises, not only was cheap labour usual but unpaid labour was often voluntarily offered by family members. As subcontractors' work was paid for on a piece-rate basis, there was a strong tendency to willingly work until late at night. Small business proprietors willing to work overnight were not rare, and their employees rather welcomed late night work to earn more money.¹¹⁴

Because of the workers' willingness to undertake labour-intensive tasks in addition to low wages and long working days, the proportion of personnel costs to the total costs was very low, despite the development of a labour-intensive mode of production in which the production process was divided into many subprocesses. Sano Yuji, journalist and former adviser to Jitensha Sangyo Shinkokai (promotional association for bicycles in Tokyo) estimates that the personnel costs, including even those of white-collar workers, accounted for only 24 per cent of the total costs in 1929, in contrast with the 30 per cent combined share of distribution costs and profit (see table 18). Raw materials represented 44 per cent of total expenditure, or 60 per cent of the manufacturing costs alone. It was because of this circumstance that the prices of chains, for instance, were lower in Germany, from where their raw materials were imported.

It should not be overlooked that, in this labour-intensive way of production, each subprocess required unique skills, and subdividing a process necessitated a corresponding differentiation of techniques. The pains taken by pioneers in the manufacture of chains or free wheels with simple machines are described in detail in several references.¹¹⁵ The entrepreneurs, on their own initiative, improved their production processes or the attachments to their machines in order to compete with the modern machines in use at the major manufacturers. They managed miraculously to overcome the difficulties, which were insurmountable by the normal standards of engineering, with their unusual mastery of machine handling. Many of the technical breakthroughs they achieved, though not innovations in the primary sense of the term, were nevertheless superb adaptations.

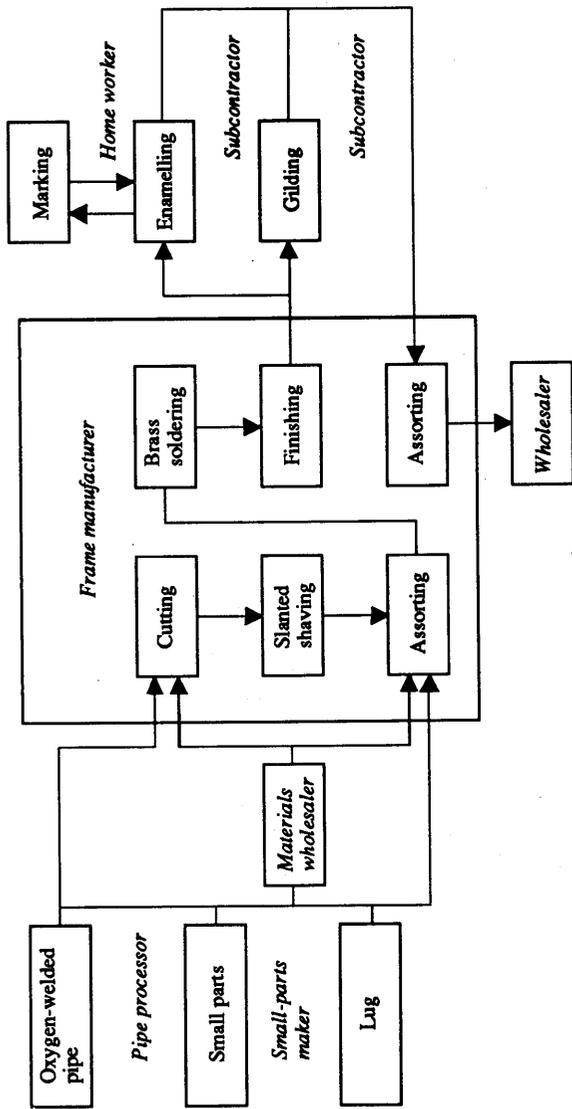


Fig. 5. Production of frames in the 1920s

Sources: Osaka Municipal Office, Industrial Affairs Department, Research Section, ed., *Osaka no jitsusha kōgyō* (The bicycle industry in Osaka) (Osaka, 1933), pp. 34-42; Tokyo Municipal Office, *Jūyō kōgyō chōsa*, pp. 18-20.

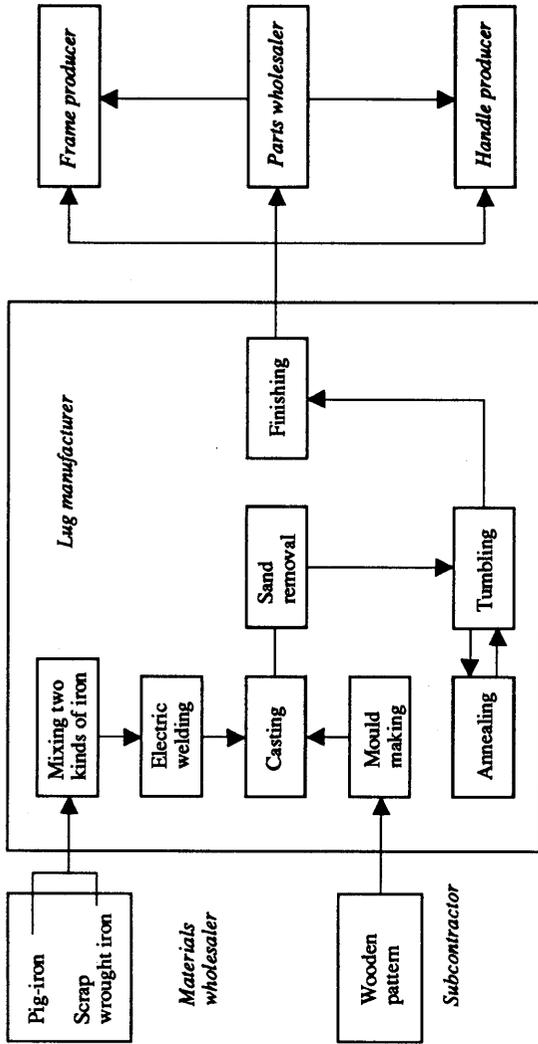


Fig. 6. Production of lugs in the 1920s

Source: Tokyo Municipal Office, *Jūyō kōgyō chōsa*, pp. 26, 27.

Further, once these enterprises and their accumulation of practical experiences had reached a certain level, their enthusiasm for improving machines and processes became unusually intense. Interestingly, the subdivision of processes and the emergence of diverse parts manufacturers, above all in the mechanical industries, facilitated the formation and development of enterprises not bound by the traditional framework of the putting-out system.

Such enterprises developed partly because parts makers, by improving their machining techniques, could produce similar components for other industries and thereby extend their spheres of activity. A company that had been producing chains for bicycles, for instance, began to manufacture chains for other machines. Another company succeeded in developing a new market for its specific precision processing technology that had evolved through the improvement of bolt-making techniques, and grew into a technologically advanced and competitive enterprise. Many such instances were found in the bicycle industry (see table 19). A famous example is that of Matsushita Electric, today one of the world's most successful manufacturers of electrical goods. The company began as a team of three – Mr. Matsushita, his wife, and his brother-in-law – producing dry-battery lamps for bicycles.

Bicycle parts used in Japan became increasingly standardized in the years following World War I. This circumstance gave a number of parts manufacturers opportunities to develop their own markets rather than continuing to rely on principal contractors or merchants. As a result, factories that had started as tiny enterprises grew quickly, especially in areas where production technology was still primitive and there was a need for products of higher quality – products such as chains, free wheels, and steel ball-bearings. A typical example is that of Shimano Shozaburo, who began producing free wheels in 1921 with a borrowed lathe and one apprentice. By 1939 Shimano was the nation's biggest manufacturer of free wheels, equipped with 200 machine tools and employing 200 workers.

Even the technology-oriented growth enterprises were organizing subcontractors under their wings. This organization of subcontractors is an important point in the development of the mechanical industries in Japan. There are several instances in which subcontractors were not adequately organized (especially in localities where a machine industry was set up for the first time), and a new industry was thus obliged to produce on its own a wide variety of parts in small quantities or to buy relatively high-priced parts from merchants in a big city. Often these industries ended up stagnating.

The conditions described so far enabled some of the small producers of bicycle parts to grow into big enterprises. Overall, however, the bicycle industry in Japan began with the production of spare parts, and the parts wholesalers eventually became the wholesalers of finished bicycles and retained their dominance over the producers. It was routine practice among wholesalers to stimulate competition among the producers and to beat down the latter's prices. The wholesalers could, because of their financial resources, restrict the freedom of the producers by controlling working funds and raw materials, monopolizing excess profit when the market was active

Table 19. Diversification of bicycle parts manufacturers

Name of company	Location	Bicycle parts produced	New product lines
Araya Kogyo	Osaka	Rims	Special steel pipes, welded pipes
Daido Chain	Osaka	Chains	Chains and conveyors for general machine tools
Kyokuto Seisakusho	Osaka	Pedals	Precision bolts
Yoshimi Kikai Kinzoku	Osaka	Brakes	Automatic control devices
Mori Kogyo	Osaka	Front forks	Stainless steel pipes
Meda Tekkosho	Sakai	Free wheels	Parts for spinning machines, looms, and agricultural machines
Masuda Seisakusho	Osaka	Gear cases	Locks
Satake Seisakusho	Nagoya		Hubs for automobiles
Yanagihara Kogyo	Nagoya		Agricultural machines
Ohashi Tekko	Tokyo	Pumps	Automobile parts and large pumps
Takagi Tekkosho	Sakai	Chain wheels and cranks	Automobile parts

Sources: Takeuchi Johzen, "Jitensha gyōkai sōgyōsha chōsa" (Survey of founders of the Japanese bicycle industry), *Keizai Ronso* (Hiroshima University, Faculty of Economics), vol. 4, no. 2 (1980); Osaka Prefectural Institute of Research in Commercial and Industrial Economics, *Jitensha kōgyō no teitaisei to kōzōteki henka* (Stagnation and structural changes in the bicycle industry) (Osaka, 1961), chapter 3.

and, during recessions, passing the burden on to the producers by forcing them to cut the prices of parts they supplied. The wholesalers also tended to speculate when the market was dull and thereby made business fluctuations even wilder.¹¹⁶

As a result, many intellectuals and bureaucrats were inclined to think that the merchants were essentially parasitic and that the conditions of production could not be modernized without regulating their activities. Certainly the merchants did create problems, but some of their other activities, especially those of the large wholesale merchants, deserve some attention.

One such activity was their role as co-ordinators of production. As confirmed in the cases of, for example, wholesale merchants in Tokyo, including Miyazawa Shokai and Marushin, many such merchants offered advice and support to help producers successfully manufacture products with many sub-parts, such as pedals and free wheels. Able merchants who had an eye for quality products gave strong impetus to product improvement and further had the creativity to conceive of ways to make products more marketable. Several of the enterprises that later grew into major manufacturers improved on production planning thanks to the stringent requirements of the wholesale merchants.

Second, the merchants had a far superior planning ability in market development than the producers. Miyazawa Shokai, for instance, developed a market for second-hand bicycles, stimulated the emergence of a parts replacement demand for new bicycles, and penetrated into rural markets by means of a mail-order system. The merchants also were almost wholly responsible for the development of overseas markets, even though their aggressive efforts to do so often intensified international tension.