

Production Organizations in Japanese Economic Development

Edited by
Tetsuji Okazaki

Production Organizations in Japanese Economic Development

In this important new book, a bevy of international contributors explore how production was organized in the context of the economic development of modern Japan.

Production organizations are taken to mean the long-term relationships which economic agents create for production, based on employment contracts or long-term transactions. This includes hierarchical organizations such as factories and corporations, but also flexible arrangements such as subcontracting.

Production Organizations in Japanese Economic Development presents the first investigation into the historical development of production organizations in Japan, based on the economics of organization. Contributors provide new insights into several areas including: determinants of organizational choice, governance mechanism of putting-out system, efficiency implication of putting-out system, evolutionary mechanism of organizational development.

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1 Introduction

History of production organizations*

Tetsuji Okazaki and Masaki Nakabayashi

Production organizations in economic development

How are economic activities organized? What kind of organization is chosen to minimize the problem of asymmetric information in transactions? These questions are essential to an understanding of economic development, and in order to devise an approach to answer them, it would be wise to inquire into real experiences of economic development, given that building an economic theory to analyze the issue is still incomplete.

In this volume, we investigate how production was organized in the process of the development of the modern Japanese economy beginning in the late nineteenth century. By “production organization,” we mean the relationship between economic units of production, based on employment contracts or long-term transactions. A manufacturing factory mainly staffed by blue-collar workers is an example of a typical production organization, but at the same time a corporation mainly composed of white-collar employees is also regarded as a production organization in the sense that it produces services which the corporation sells. While the technological characteristics of these two organizations are different, they have a common function in that the manager of the organization intentionally and discretionally coordinates and motivates employees.¹ Meanwhile, the putting-out system, where a putting-outer, a weaving manufacturer for example, organizes sub-contractors, is also regarded as a production organization. In the putting-out system, whereas the relationship between a putting-outer and sub-contractors is mediated by the market, unlike a spot market transaction, the putting-outer has discretion in coordinating and motivating sub-contractors. There have been a variety of production organizations throughout economic history. The purpose of this volume is to conduct a comparative study of the modes of coordination and motivation in the production organizations which worked in Japan and that were transplanted from Japan into China.

Historical studies on production organizations have developed focusing on two basic issues. The first is the emergence and implications of the factory system, the core of the Industrial Revolution that began in Britain. Since Adam Smith and Karl Marx stressed that the factory system emerged in a certain period of history and considerably enhanced productivity, this issue has been a

focus of research in the field of economic history.² On the other hand, when the industrial revolution was transplanted into the New World, it led to a new organizational innovation in the new environment. That is, the emergence of large corporations integrating multiple functions. As Alfred Chandler stressed, these corporations internalized the function of resource allocation which had been carried by the market. In other words, coordination and motivation were carried by the “visible hand” of corporate executives, instead of the “invisible hand” of the market. For these corporations, designing and allocating appropriate tasks as well as giving appropriate incentives to the employees to carry out tasks, came to be the most important determinant of efficiency and therefore profitability. This kind of large corporation diffused to other countries including Japan. The strategies and structure of large corporations have been a focus of research in the fields of business and economic history since the seminal work of Chandler.³

However, the factory system and the large corporation have never dominated industrial production. Particularly in Europe and Japan, small and medium-sized companies have had a large share in such sectors as the apparel and machinery industries, which are competitive in the international market. These small and medium-sized companies form a dense network of division of labor. To put it differently, production organizations have not converged into a single mode, but rather organizational diversity exists. Investigation of this diversity has been another focus of the historical study of production organizations since the 1980s. Piore and Sable (1984) and Sable and Zeitlin (1985) published seminal works in this area.

Economic theory of organizations has developed since the 1930s. The seminal work of Ronald Coase addressed the issue of the boundary of the firm. The background was the emergence of the planned economy in the Soviet Union and development of monopolistic corporations in the US. In this situation, it became essential to understand the boundary between the firm and the market. Are all industrialized economies developing into forms resembling the US economy, where large conglomerates prevail, and finally into an SU-like economy, where the only one firm dominates the national economy? Obviously not. But why? The answer provided by Coase (1937) was simple, and therefore inspired research on the issue. Coase (1937) proposed a view that if the cost for a transaction in the market is larger than the cost for the same transaction inside the firm, the firm is established, and vice versa. The market could be efficient for service transactions whose quality and quantity can be easily specified in advance. However, there are many cases where it is difficult to specify the quality and quantity of the services in advance. In those cases, the buyer and the seller of the service make a contract that the seller gives a certain discretion in using the service to the buyer in advance, and then the buyer orders the specific service within the contract. This is the employment contract, which is the prototype of the firm.⁴

From Coase (1937), two branches of research have developed, assuming a situation where a complete contract cannot be written in advance. These two

branches are the contract theory and Transaction Cost Economics. The former focuses on the design of *ex ante* contract, while the latter focuses on the *ex post* governance of transactions. Transaction Cost Economics considers that under the uncertainty and bounded rationality, transacting parties make a basic contract which prescribes the procedure when a situation not specified in the contract occurs, and they sequentially adjust their behaviors as the situation develops. Various organizations including the firm are interpreted as patterns of the basic contracts, which are chosen referring to the attributes of the transaction including asset specificity, uncertainty, and frequency.⁵

The contract theory focuses on the *ex ante* incentive scheme, which induces the agent to take actions desirable to the principal voluntarily. For example, given the situation where a manager cannot observe the actions of employees, if the manager makes a contract, linking the observable and verifiable outcomes correlated with their actions, with wages, then the manager can induce them to take desirable actions. The basic questions of the contract theory are to what extent a principal can achieve efficiency by designing an appropriate contract.⁶

The economic theory of organization, briefly surveyed above, has developed through the interaction between the theoretical researches and researches in business and economic history. It is well known that in establishing Transaction Cost Economics, Williamson was deeply influenced by the historical research conducted by Chandler.⁷

Meanwhile, the controversy on the efficiency of hierarchy provoked by the article by Stephen Marglin, a central person in a group of radical economists, greatly contributed to understanding the nature of major production organizations in economic history, the putting-out system and the factory system. Marglin argued from a Marxist standpoint that the hierarchy was devised not for efficiency but for controlling and exploiting workers.⁸ Williamson and David Landes criticized Marglin's view,⁹ stressing efficiency of the hierarchy, but they shared a common perspective with Marglin in the following sense. They argued that the hierarchy was devised to save transaction costs, but the transaction cost as presented by these economists is basically composed of moral hazard by workers. Actually, similar to Marglin, they considered that the major function of the hierarchy was discipline and supervision.

Contract theory stemmed from Cheung (1969), which focused on the distribution of tenancy contracts using historical data from China. Cheung investigated why the geographical distributions of fixed rent tenancy and share tenancy were different, and concluded that transaction cost and risk determined the contract choice. The transaction cost here is the cost of moral hazard of the tenant under the share tenancy, caused by the difference between his marginal revenue and marginal productivity, namely Marshallian inefficiency. Cheung (1969) has also come to be a starting point for a series of empirical studies on the choice of tenancy contract. In terms of the Japanese experience, Arimoto, Nakabayashi and Okazaki (2004) studied share tenancy, while Nakabayashi (2003a) and Nakabayashi (2005) showed that incentive control had assumed an important role in the rise of the factory industry, based on contract theory.

As stated above, historical and theoretical studies of production organization have developed interactively to provide a basis for understanding the economy. Inspired by this, Comparative Institutional Analysis (CIA), proposed by Masahiko Aoki, Paul Milgrom and other scholars,¹⁰ offered a framework by which the history of institutions and organizations could be analyzed, focusing on coordination and motivation as the major factors constituting the economic system. Based on the game theory, CIA understands “institution” and “organization” as Nash equilibria where no player has an incentive to deviate. Such a solid definition of institution is useful in preventing us from losing our way when inquiring into the complicated reality of economic development. Following Okazaki (1988) who analyzed the wartime economy of Japan from the viewpoints of coordination and incentives, this volume also shares a similar perspective to that of CIA. That is, in this volume, we address the questions: why certain production organizations emerged in certain historical contexts, and what role those organizations played with respect to coordination and motivation.

Choice between putting-out system and factory system in pre-war Japan

Literature

A vast literature exists on the history of production organizations in Japan. In particular, many researchers in Japan have been interested in the transition from the putting-out system to the factory system. This is mainly because of the profound influence of Marxism on Japanese academics in the field of social sciences. Marx proposed a schema of historical development of “modes of production,” i.e. putting-out system \Rightarrow manufactory \Rightarrow factory system.¹¹ Many articles and books were written on whether this schema was confirmed in Japanese history or not, and which period in Japanese history corresponded to each stage. While the body of literature contributed to understanding production organizations, it lacked the viewpoint of organizational choice. This is basically because the Marxian stage theory is not consistent with the concept of organizational choice. In Marxian theory, production organizations were determined by historical inevitability, and not chosen by people.¹²

On this issue, following Mendels (1972), Saito (1984) brought a new perspective to Japanese circles examining economic history. He pointed out that “while mechanization was mainly an inevitable historical change, emergence of concentrated workshops was a result of choice which was repeated in the process of industrialization.” This had a strong impact on Japanese researchers. As a determinant of the choice, he referred to “the problems inherent in the putting-out system” (Landes (1969)) with respect to the cotton weaving industry in the 1900s. That is, according to Saito (1984), as the geographical range of sub-contractors expanded, it became difficult for a manufacturer, a putter-outer, to monitor them, and consequently sub-contracting weavers lowered the quality

of their work and embezzled the raw materials, which, in turn, compelled the manufacturer to choose the factory system.

The view of Saito and Abe (1987) is slightly different from that of Saito (1984). Whereas they also pointed out the problem of embezzlement in the cotton weaving industry in Osaka, it was interpreted as not so much a problem inherent to the putting-out system but more a consequence of labor shortage. And they argued that in order to cope with the labor shortage, the manufacturers introduced power looms, a labor-saving technology. Meanwhile, there was substantial scale economy to using power looms, because they were driven by the steam engine. Therefore, the manufacturers chose the factory system as a result of choosing power loom technology. By taking into account of the constraint in technology choice, they proposed a view that the factor price condition determined the organizational choice by way of technology choice. The view that the putting-out system was based on the low wage pool in rural areas was presented in Landes (1969). With respect to Japan, Tanimoto (1998) stressed this point.¹³

The contribution of Saito and Abe (1987), who discussed the determinants of production organizations, distinguishing conceptually organizational choice from technology choice,¹⁴ is to be stressed, but there are still some shortfalls. If introduction of power looms in the 1900s necessitated the choice of the factory system, the inverse was not true. Actually, Hashino (1997) found that there still existed factories without power looms in the Kiryu area in the 1910s. Also, as Saito and Abe (1987) pointed out, in the 1920s, sub-contractors equipped with power looms emerged as a result of diffusion of electric power, and Abe (1989) presented the case of Harima, a region of West Japan, in which small weaving factories equipped with power looms composed a weaving district. These facts indicate that we cannot fully explain organizational choice by the choice of technology based on factor price.

Hashino (1997) discusses the advantages of the putting-out system using the report prepared by Gunma Prefecture Government. One point stressed is that the putting-out system could flexibly adjust production according to the changes in the market. Based on it, Nakabayashi (2003b) examined the sources of the flexibility of the putting-out system. In general, the sources of flexibility are, i) making the sub-contractors share the cost arising from market fluctuations, and ii) the economy of industrial agglomeration. Nakabayashi argued that in Kiryu, the major source of flexibility was ii). Fabrics in Kiryu were produced through many processes, each of which had scale economy to some extent. Each of these processes was carried out by a specialized sub-contractor. Furthermore, each sub-contractor received orders from multiple manufacturers. According to Nakabayashi, through this division of work, the weaving industry in Kiryu achieved efficient production.

In Chapter 1 of this volume, Hashino makes it clear that piece-rate workers called “tan-ori ko” played a substantial role in the first stage of factory production in the Goto Factory in Kiryu. It suggests that the choice of the factory system was influenced by the availability of a labor force that was suitable for use in the factory. As emphasized by Marx and Coase, discretionary use of labor

for a considerable period of the day is the key of modern employment, and Hashino's analysis directly addressed this point. This is the point that Marx (1988) stressed in the chapter "Original Accumulation of Capital,"¹⁵ and what is implied by the discussion on the putting-out system in Tanimoto (1998). This point is arguably a part of a more general issue. Naito (2005) argues that in the petroleum industry in early twentieth-century Japan, the essential condition for a refining factory to be successful was to secure a stable supply of crude oil. This is consistent with the discussion on the factory system in Chandler (1977). Chandler stressed that in order for a factory based on mass-production technology to work, it was necessary to secure stable throughput.¹⁶ Compared with the putting-out system, the factory system was relatively inflexible, using more fixed factors including equipment and full-time workers. Therefore, the condition on the supply of throughput is one of the determinants of organizational choice. This implies that organizational choice is determined not only by what is assumed by transaction cost economics, but also by wider-ranging factors including institutions and other organizations.

Determinants of organizational choice: an empirical analysis

We can roughly see what proportion of industry the factory system represented in pre-war Japan. Furushima (1962) attempted to measure the proportion of the factory system by comparing two series of statistics, Kojo Tokeihyo (Manufacturing Census) and Noshomu Tokeihyo (Statistics of Agriculture and Commerce). Kojo Tokeihyo is the direct predecessor of the present manufacturing census, which started in 1909. Kojo Tokeihyo covers all of the factories in Japan that employed no fewer than five workers. On the other hand, Noshomu Tokeihyo covers all of the workshops in Japan including those that employed fewer than five workers. Therefore, dividing the production or the number of workers in Noshomu Tokeihyo by the production or the number of workers in Kojo Tokeihyo, we can arrive at the proportion of the factory system in terms of production or number of workers. Using the data of the number of workers in 1909, Furushima (1962) found that the factory system represented only a small part of Japanese industry.

Here, in order to see the change over time, we select four data points, 1909, 1914, 1919 and 1924, and compute the proportion of the factory system in terms of production amount by industry (Table 1.1). This table reveals some interesting facts about the historical evolution of production organizations. First, there were industries where the factory system continuously represented almost 100 percent of production, such as clock, glass, cement and woolen weaving. Second, there were industries where the share of factory production continued to be very low, such as lacquer ware, matting, and tatami mats (thick straw mats). Third, in some industries, the proportion represented by the factory system declined over time (brush, wax and tile). Finally, there were industries where the share of factory production went up over time, such as soap, flour, and cotton weaving. The fourth group is consistent with the conventional wisdom on the

Table 1.1 Proportion of factory production

	1909	1914	1919	1924
Pottery	0.309	0.357	0.369	0.512
Brick	0.825	0.641	0.386	0.690
Roof tile	0.121	0.107	0.178	0.077
Japan ware	0.066	0.052	0.048	0.058
Tatami mat	0.011	0.005	0.014	0.021
Straw mat	0.001	0.001	0.006	0.044
Oil	0.425	0.625	0.930	0.793
Wax	0.370	0.080	0.194	0.311
Soap	0.680	1.000	1.000	1.000
Paper	0.610	0.687	0.774	1.009
Flour	0.538	1.000	1.018	1.000
Starch	0.199	0.300	0.459	0.521
Matches	0.783	1.000	1.000	1.000
Leather	0.513	0.761	0.652	0.868
Fertilizer	0.287	0.377	0.700	0.597
Wheat straw	0.041	0.030	0.026	0.015
Clock	1.087	0.580	0.738	1.040
Glass	0.896	0.968	0.819	1.020
Brush	0.332	0.450	0.571	0.322
Knitwear	0.564	0.650	0.625	0.903
Cement	0.936	1.000	1.000	1.000
Silk weavings	0.461	0.537	0.601	0.598
Silk and cotton weavings	0.260	0.386	0.348	0.375
Cotton weavings	0.532	0.779	0.764	0.849
Hemp weavings	0.425	0.552	0.584	0.759
Wool weavings	0.997	0.683	0.942	0.958

Source: *Noshomu Tokeihyo*, *Kojo Tokeihyo*, various issues.

development of production organizations, but, as we have just seen, they were a small part of industry as a whole.

The heterogeneity of the proportions of the factory system implies that we cannot fully explain the diffusion of the factory system by the macro conditions across industries. Hence, we analyze the determinants of the choice between the factory system and the putting-out system using the data on the weaving industry, on which we have a rich supply of literature. As outlined in the previous sub-section, there have been three alternative hypotheses on the determinants of the organizational choice, namely i) transaction cost (embezzlement), ii) factor price, iii) product mix, and in addition to these three we have proposed iv) a hypothesis of the institutional and organizational conditions needed to secure throughput, based on Chandler (1977).

It is difficult to test these hypotheses rigidly, but here we approach the task using prefecture-level panel data on the weaving industry. The *Noshomu Tokeihyo* contains data on the number of workers, number of power looms, and

number of handlooms, by production organization. The production organizations are classified into factory, independent domestic weaver, putter-outer, and sub-contractor. From the original data, we constructed the following variables. FACTORY is the number of workers in factories divided by the total number of workers. POWER is the number of power looms divided by the total number of looms. PLAIN is the ratio of plain silk cloth, plain cotton cloth and plain hemp cloth to the total weaving output in terms of production amount, which is to capture the characteristic of the product mix. SILK, SILK-COTTON, COTTON, and HEMP refer to the ratio of silk cloth, silk and cotton mixed cloth, cotton cloth and hemp cloth to the total weaving in terms of production amount, respectively. Concerning these variables, we constructed panel data for 47 prefectures \times 4 years (188 observations). The data points are 1905, 1910, 1915, and 1920, which are taken from 22nd, 27th, 32nd, and 37th editions of the Noshomu Tokeihyo. The basic statistics on these variables are shown in Table 1.2. In addition, we made two dummy variables. URBAN6 equals 1, if the prefecture is Tokyo, Osaka, Kyoto, Aichi, Hyogo or Fukuoka, and 0, otherwise. URBAN2 equals 1, if the prefecture is Tokyo or Osaka. These dummy variables are to capture the effect of institutional and organizational conditions in urban areas. Specifically, we assume that in urban areas, a developed labor market and marketing organization were available to producers.

In regression analyses, we should be careful about the endogeneity of POWER. As determinants of diffusion of power looms, Minami *et al.* (1982) focused on the factory system and product mix. If the factory system affected the diffusion of power looms, POWER is an endogenous variable. Hence, we estimate the coefficients using an instrumental variable (IV). The instrumental variable is the factor price (user cost of capital/wage). Although it is desirable to use the panel data of the factor price, we used the national level data of each year, because prefecture-level factor price data are not available. The

Table 1.2 Basic statistics

	<i>Average</i>	<i>Standard deviation</i>	<i>Maximum</i>	<i>Minimum</i>
FACTORY	0.212	0.226	0.945	0.000
POWER	0.163	0.232	0.929	0.000
PLAIN	0.299	0.270	0.979	0.001
SILK	0.333	0.335	0.994	0.000
SILK-COTTON	0.054	0.089	0.476	0.000
COTTON	0.552	0.347	0.997	0.000
HEMP	0.048	0.152	0.996	0.000

Notes

FACTORY: Number of workers in factories/total workers.

POWER: Number of power looms/total looms.

PLAIN: Production amount of plain cloths/total production amount of cloths.

SILK: Production amount of silk cloths/total production amount of cloths.

SILK-COTTON: Production amount of silk and cotton mix cloths/total production amount of cloths.

COTTON: Production amount of cotton cloths/total production amount of cloths.

HEMP: Production amount of silk cloths/total production amount of cloths.

user cost of capital is the price index of machinery¹⁷ \times average interest rate,¹⁸ and the wage is average wage of female and male workers in the textile industry.¹⁹

The results are shown in Table 1.3. The coefficient of POWER is positive and statistically significant. Also, its magnitude is very large. As Saito and Abe (1987) pointed out, the fact that owners had the technology choice of introducing power looms had a large positive impact on the decision to choose the factory system. Second, the coefficient of PLAIN is positive and significant. In those prefecture-years where the ratio of plain products was high, the factory system tended to be chosen. This implies that in those prefecture-years where the ratio of complex products was high, the putting-out system tended to be chosen, which accords with the argument presented by Nakabayashi (2003b). Third, with respect to the variable indicating each product, the coefficient of HEMP is positive and significant in both of equation (1) and (2), and the coefficient of COTTON is positive and statistically significant in equation (2). Also, the magnitude is the largest for HEMP. From the transaction cost hypothesis, the implication that the factory system would tend to be chosen where expensive raw materials, namely silk, were used, is derived. However we cannot confirm this implication. Finally, the coefficients of URBAN2 and URBAN6 are both positive and statistically significant, as expected. It is noted that magnitude as well as statistical significance are larger for URBAN6. It implies that the institutional and organizational conditions in the urban area had a positive effect on the decision to choose the factory system, and that those conditions were available not only in the largest central cities but also in other large cities.

Table 1.3 Determinants of production organizations (weaving industry, 1905–20)
Dependent variable: Workers in factories/total workers

Estimated method	(1) <i>IV</i>		(2) <i>IV</i>	
Constant	-0.253	(-1.148)	-0.263	(-1.207)
POWER	0.619	(5.203)***	0.617	(5.229)***
PLAIN	0.131	(2.338)**	0.126	(2.313)**
URBAN2	0.987	(2.184)**		
URBAN6			0.076	(2.514)**
SILK	0.300	(1.346)	0.309	(1.398)
SILK-COTTON	0.324	(1.436)	0.335	(1.497)
COTTON	0.294	(1.236)	0.246	(1.037)
HEMP	0.541	(2.293)**	0.557	(2.376)**
ADR ²	0.767		0.770	
obs.	188		188	

Notes

Heteroskedasticity-robust t values are in parentheses.

*** significant at 1% level.

** significant at 5% level.

* significant at 10% level.

Notes

- * The authors are grateful to Masayuki Tanimoto for his comments. They also appreciate the helpful comments and suggestions made by Matao Miyamoto, Kaoru Sugihara, Takeshi Abe, Minoru Sawai, and other participants of the Economic and Business History Workshop at Osaka University.
- 1 Miligrom and Roberts (1992), pp. 88–247.
- 2 Smith (1937), pp. 3–16, Marx (1988), pp. 331–530.
- 3 Chandler (1962, 1977).
- 4 Coase (1937, 1988). In the theory of the firm, one typical view since Coase (1937) has emphasized the employment relation as the core of the firm, while another influential idea represented by Grossman and Hart (1986) has paid attention to asset ownership in the firm (Putterman and Kroszner (1996)). This book has adopted the former view.
- 5 Williamson (1985).
- 6 Jensen and Meckling (1976), Holmstrom (1979).
- 7 Lamoreaux, Raff and Temin (2003).
- 8 Marglin (1974).
- 9 Williamson (1985), pp. 206–39, Landes (1986).
- 10 Aoki (1988), Milgrom and Roberts (1992), Aoki (2001).
- 11 Marx (1988), pp. 341–530.
- 12 This historical inevitability can be restated as “technological inevitability” (“technische Notwendigkeit”), exactly as it was by Marx himself (Marx (1988), p. 407). To Marx, the “law of history” was the “law of technology.” If the developmental stages are determined exclusively by technology, they must indeed be irreversible on the single track of global history.
- 13 Saito and Abe (1987) and Tanimoto (1998), pp. 263–459, are based on the idea of “supplies of unlimited labor” by Lewis (1958) and its application to Japan by Saito (1998). According to Lewis, if there exists a pool of non-utilized labor in the agricultural sector, then the labor would be supplied at wages fixed at the subsistence level. On the other hand, if the non-agricultural sector grows and the non-utilized labor is exhausted, the real wages begin to increase so that modern economic growth begins in earnest. Lewis called this the “turning point,” and Saito (1998) suggests the “turning point” occurred in Japan after World War I. Saito and Abe (1987) and Tanimoto (1998) found that the putting-out system of the fabric industry declined after World War I, while the putting-out system expanded before World War I, which supports the hypothesis. Lewis pointed out “wives and daughters in the household” as a source of “unlimited supplies,” (Lewis (1958), p. 448). When the number of slack hours is generally limited, the putting-out system would be suitable for this form of labor supply rather than the factory system that needs full-time workers. Tanimoto (1998), pp. 263–459, focused on that point.
- 14 Minami, Ishii and Makino (1982) also clearly separated the choice of technology from the choice of organization and focused on the reverse causality: an organization determines what kind of technology will be adopted.
- 15 Marx (1988), pp. 741–91.
- 16 Chandler (1977), pp. 240–83. If fast and large throughput is realized as the result of innovation, then the cost of administrative coordination becomes smaller than the cost of market coordination, hence transactions come to be internalized in the firm, and, in addition, a multiple-form hierarchy is built in the firm to decrease transaction costs within the firm (Chandler (1977), pp. 6–11). While Chandler’s view basically stands on the idea that a technological change causes an institutional and organizational change, he also paid attention to a different aspect of institutional change: an institutional and organizational change triggers another institutional and organizational change. A typical and important case is interaction between mass production and

mass distribution. While mass production is enabled by the technological change and the relevant organizational change, realization of mass production also needs mass distribution that mainly depends on organizational change (Chandler (1977), p. 240).

17 Okawa, Noda, Takamatsu and Yamada (1967).

18 Toyokeizaishinposha, ed (1929).

19 Okawa *et al.* (1967).

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2 The rise of the power-loom factory in the traditional silk-weaving district

Change in demand and labour market¹

Tomoko Hashino

Introduction

The purpose of this chapter is to explore the reasons why the mechanized factory was established in the domestic market-oriented silk-weaving district in Japan after the First World War. Whereas the export-oriented silk-weaving districts adopted the factory system based on power looms in the early stage of development, the putting-out system based on hand looms was dominant in the traditional silk-weaving districts, whose products were almost all for the domestic market. In the 1910s, some traditional districts upgraded the putting-out system through concentration on out-weaver per clothier (Nakabayashi 2003).

The rise of the factory system has been one of the focuses of the research in production organization. Marglin (1972) provoked a great deal of controversy on the efficiency of the factory system. As Langlois (1999) argues, the discussion of the factory system can be classified into two different dimensions, namely, the origins of the factory system and the nature of the factory system. On the former dimension, i.e. the reason why the organization of production was shifted from putting-out to factory, they viewed the factory as superior to the putting-out system both in terms of organization and of technology. Williamson (1980) and Marglin (1974) regarded the shift as a result of capitalists seeking a new organization which could control workers more efficiently. On the other hand, Landes (1986) and Marx (1867) thought that the major factor was technology. With respect to the latter dimension, there are two views on the nature of the factory system: efficiency and exploitation. According to Williamson (1980) and Landes (1986), the factory emerged because of its relative efficiency, while Marx (1867) and Marglin (1974) saw the factory system as a tool to exploit workers (Langlois 1999: 45–6).

In this chapter, we focus on the origin of the factory system, in the Kiryu district, one of the most famous and oldest silk-weaving districts producing traditional narrow cloth (for *kimono*) and *obi* sash (waist belt for *kimono*, *obi*, hereafter) for the domestic market. As mentioned above, in this district the putting-out system and hand looms were dominant before the First World War. Many putting-outers and weavers congregated there to form an industrial district

in the Marshallian sense. The division of labour or task among the related industries was developed. Many historians have paid attention to the production system in Kiryu (Kimura 1959; Kawamura 1986; Kosho 1962, 1963). This research is basically based on the Marxian view that the putting-out system is less advanced than the factory system, and that the shift from the former to the latter is inevitable. As a result, this is the reason why the historians could not show which factor had a positive effect on the shift of the organization of production even though they had found important facts related to the factors to be discussed in this chapter. Moreover, Sanpei's classical work discusses the development of weaving industry districts as a whole in Japan from various views: the change in kind of textile, progress in weaving technology, development of management and condition of labour force in weaving (Sanpei 1960).

The study on the nation-wide diffusion of power looms was much affected by the above view of linear progression. Development economists tried to find which factors had an effect on the introduction of the power looms. From the point of view that mechanization was crucial in raising productivity in the weaving industry, Minami and Makino investigated the factors that induced the entrepreneurs or managers to introduce the new technology. To put it concretely, focusing on the regional differences in the rate and timing of diffusion of power looms, they analysed three determinants of technological diffusion. According to their analysis, the ratio of power looms increased rapidly after 1910 in regions where (1) the factory system had developed, (2) the products were suitable for production by power looms, and (3) electric power as a cheap power source was available (Minami and Makino 1983: 6). Under the framework of Minami and Makino (1983), the factory system was one of the determinants of the introduction of new technology, and it was regarded as exogenous. However, the causal relationship between the factory system and the introduction of power looms seems to be more complicated. For example, Abe (1989) found out-weavers equipped with power looms in the Sen-nan and Banshu areas in the West of Japan.

Therefore, it is necessary to investigate the factors of mechanization and centralization separately and consider the relationship between them, as Abe and Saito (1988) did. Was the introduction of power loom a sufficient and necessary condition for the centralization of production? One important fact I found was that in the Kiryu district of the 1910s there were centralized workshops without power looms, in other words, 'manufactories' or hand-loom factories (Hashino 1997). At the same time, those factories had out-weavers for absorbing fluctuations in demand. The major functions of the workshop production were to provide on-the-job training and to produce higher quality products.

If mechanization in the weaving process had been essential for the development of the modern textile industry in Japan, the districts based on the putting-out system and hand loom would have gone on declining. However, recent studies have made clear various patterns of development in weaving districts, which depended upon the products, as well as the importance of product innovation, including utilization of imported cotton yarns and chemical dyeing (Uchida

1988). In particular, Tamura (2004) made it clear that the characteristic of the Ryomo (Kiryu and Ashikaga) district was their ability to produce varieties of articles in fashion. Unlike the export-oriented districts specializing in *habutae* (the plain silk fabric) Kiryu produced a variety of articles. Taking these characteristics into account, we should consider the organization of production and technology in Kiryu from the perspective of 'flexible specialization' in the sense of Sabel and Zeitlen (1997). In Chapter 6 of this volume, Nakabayashi claims that the putting-out system in Kiryu was an efficient production organization which enabled 'flexible specialization' and long-term transactions between the clothiers with a high ability in product development and the skilled, full-time out-weavers. Such out-weavers were desirable for the clothiers because they enabled them to save the cost of training workers when the demand shifted from one article to another. In other words, the major advantage of the putting-out system was its flexibility to adapt to a shift in demand. Also, it is worth noting again that the putting-out system in Kiryu was supported by the division of the production process from yarn to product. In other words, the industrial cluster in the Marshallian sense was formed and changed (Hashino 2007).

Then, new questions arise: Why did producers in Kiryu eventually shift from putting-out to factory and why did they introduce power looms? One possible answer is to combat embezzlement by out-weavers. Landes (1969) regarded embezzlement as an inherent problem of the putting-out system, and Abe and Saito (1988) found embezzlement was a problem also in Japan. Otherwise, the production organization and technology in Kiryu would not have changed for a long time. Hashino (1997) examined three possible factors which might work for the introduction of power looms in Kiryu, namely, the institutional, technological and market factors. First, the institutional factor refers to the centralization of production, but this factor was rejected because manufactories or hand-loom factories were found in Kiryu. Second, the technological factor was confirmed not only by the development of power-loom makers in the local area, but also by the availability of cheap electric power that had positive effects on mechanization.

Third, the market factor was not fully explored in Hashino (1997), and it is the main issue to be investigated here. By the market factor we mean that the change in the relationship between the cost and price and demand shift affected the marketing strategy of the producers, and thereby the technology and production organization. Although many studies have been conducted on mechanization and centralization in the weaving industry in Japan in the last few decades, what has been lacking is an investigation into how the change in the demand affected those phenomena. After the Panic of 1920, the traditional silk goods suffered from declining prices and increasing labour costs, and were replaced by cheaper products made of rayon. Many of the silk-weaving districts had to change their raw material from silk to rayon in the 1920s. In this chapter, we try to investigate how technology and the choices of the production organizations were affected by the above change in the product market.

For this purpose, we focus on the case of Goto Sadakichi's Factory (Goto Factory, hereafter) in Kiryu. Goto Factory, established in 1870, is one of the

oldest weavers in Kiryu, and it has mainly produced *obi* to this day. According to the surveys by the government, Goto Factory produced *obi* before the Second World War. Table 2.1 shows the major products, scale of production, number of workers and motive power. While their products did not change substantially the yarn changed from silk and cotton to rayon in the 1920s. As shown below, their production organization and technology also substantially changed in this period.

Goto Factory and the weaving industry in Kiryu from late Meiji to the Taisho Period

The trends at Goto Factory

Some important features of Goto Factory in Table 2.1 are as follows: (1) the workers decreased from the late 1900s to the 1910s, (2) hand looms were installed in the 1910s, and (3) factory owners changed the raw materials (yarns) from silk and cotton to rayon. Concerning these facts, a preceding study on Goto Factory pointed out that Goto Factory began to prepare for introducing power looms in the autumn of 1919, and it came to be a factory installed with both power looms and hand looms in 1920. Then, around 1925, it became a complete power-loom factory (Kameda 2002: 14).

The changes in the production organization are reflected in the number of workers. Figure 2.1 shows the average number of workers at Goto Factory from 1903 to 1934. The number decreased from the 1900s to the 1910s, and then increased rapidly in the 1920s. The changes in the numbers were generally

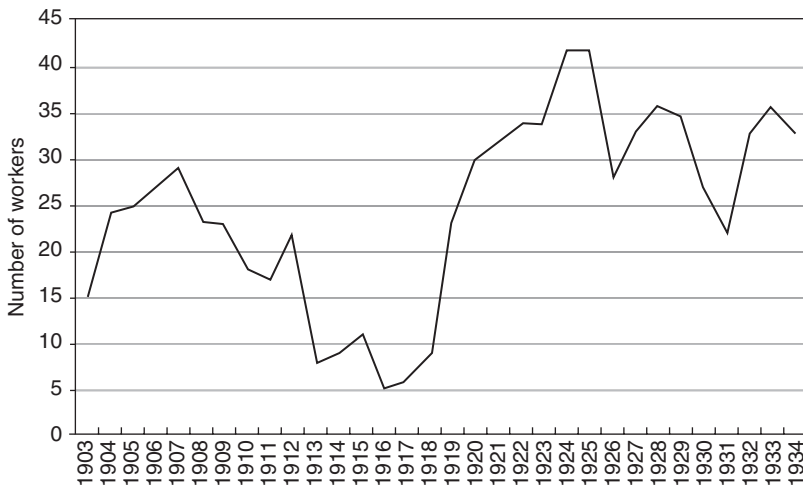


Figure 2.1 The average number of workers in Goto Factory: 1903–34 (source: Goto (1903) *Shokko Meisai ki*, Goto (1907) *Shokko jinmei*, Goto (1911) *Manki bun no houmei cho*, Goto (1919) *Homei kiji*, Goto (1930) *Homei kiji*).

Table 2.1 Profile of Goto Factory in published data by local government

Name of resources	Survey year	Product	Male worker	Female worker	Total	Motive power	HP	Hand loom	Power loom
Factory Survey (1904)	1902	union fabric, silk and cotton	6	26	32	—	—	—	—
Factory Survey (1906)	1904	union fabric, silk and cotton	5	18	23	—	—	—	—
Factory Survey (1909)	1907	union <i>obi</i> , silk and cotton	3	10	13	—	—	—	—
Factory Survey (1911)	1909	union <i>obi</i> , silk and cotton	3	8	11	—	—	—	—
Census of manufactures (1916)	1914	women's <i>obi</i>	5 (0)	14 (2)	19	other	1	—	—
Factory Survey (1918)	1916	women's <i>obi</i>	6	11	17	other	2	—	—
Gunmaken seishikojo ichiran	1917	<i>obi</i>	7	11	18	electric	n.a.	6	0
Census of manufactures (1919)	1918	union <i>obi</i> , silk and cotton	7 (2)	8 (3)	15	other	2	4	0
Factory Survey (1919)	1918	union <i>obi</i> , silk and cotton	5	13	18	other	2	—	—
Factory Survey (1920)	1919	union <i>obi</i> , silk and cotton	7	8	15	other	2	—	—
Factory Survey (1921)	1920	union <i>obi</i> , silk and cotton	6	11	17	other	2	—	—
Factory Survey (1931)	1929	women's rayon <i>obi</i>	—	—	—	—	—	—	—
Factory Survey (1932)	1930	women's rayon <i>obi</i>	—	—	—	—	—	—	—
Factory Survey (1933)	1931	<i>obi</i>	—	—	—	—	—	—	—
Factory Survey (1934)	1932	women's rayon <i>obi</i>	—	—	—	—	—	—	—
Factory Survey (1935)	1933	wide women's <i>obi</i>	—	—	—	—	—	—	—

Source: Factory Survey, Census of Manufacture and Gunmaken seishikojo ichiran (Survey of silk-reeling factory in Gunma, in *Guma kenshi*).

Notes

‘Other’ in motive power means electric power supplied by outside of workshop.

Figures in parentheses are the numbers of 12–14 year-old workers.

amongst female workers. Kameda (2000) found that out-weavers at Goto Factory increased to 66 in 1908, from six in 1899 and 18 in 1906, respectively. In contrast, the number of hand looms installed in the factory declined sharply from 16 in 1899 and 24 in 1900 to six in 1906. In this period, the weaving process at Goto Factory mainly depended on out-weavers, and in this way the factory was able to cope with increase in demand in the First World War boom. The organization of production at Goto Factory tended to be decentralized toward the end of the 1910s, and after that it became centralized.

A brief history of the weaving industry in the Kiryu district: from late Meiji to the Taisho Period

It is useful to summarize the changes in the production organization and technology in the Kiryu district to confirm that the experience at Goto Factory was common in the district.

Kiryu Town was a part of Yamada County before 1920. After 1921, Kiryu Town and its surroundings were incorporated into a new city, Kiryu City, which was separated from Yamada County. In Figure 2.2, ‘Whole Kiryu’ refers to Yamada County before 1920, and Kiryu City and Yamada County after that. Power looms spread rapidly in the 1920s in Kiryu district as the s-shaped curve of ‘Whole Kiryu’ indicates. However, the s-shaped curves of Kiryu City and Yamada County suggest that there existed regional difference in the diffusion process. In the centre of the district (Kiryu City in Figure 2.2) power looms started to diffuse before the 1920s, which suggests that the production organization was different between ‘urban’ and ‘rural’ areas.

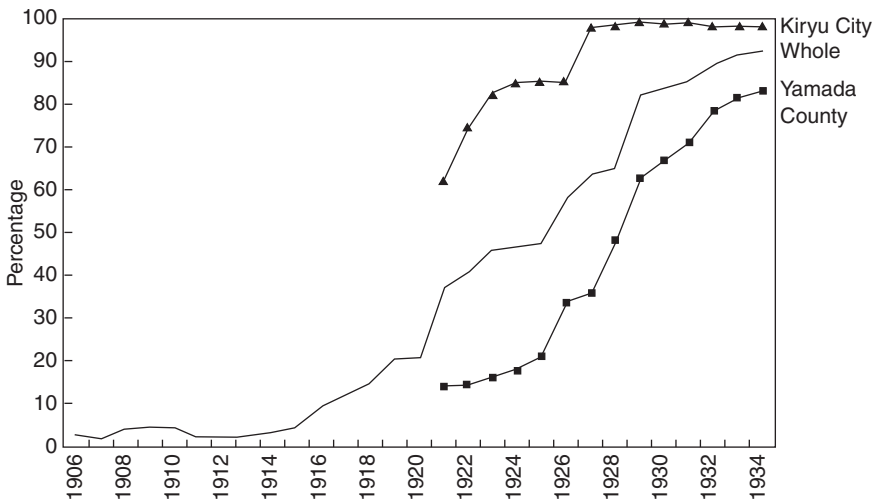


Figure 2.2 The diffusion rate of power looms in Kiryu: 1906–34 (source: *Gunma-ken tokei sho* (Gunma Prefecture Statistical Papers)).

Looking at the number of weavers by type, it is found that out-weavers sharply expanded from the late 1900s to the 1910s (Figure 2.3). In contrast, the numbers of the other types of organizations, namely, factories, domestic weavers and clothiers were stagnant.² It implies that the number of out-weavers per clothier increased (Nakabayashi 2003: 42). Also, the number of workers in the factories increased after 1915 (Figure 2.4).

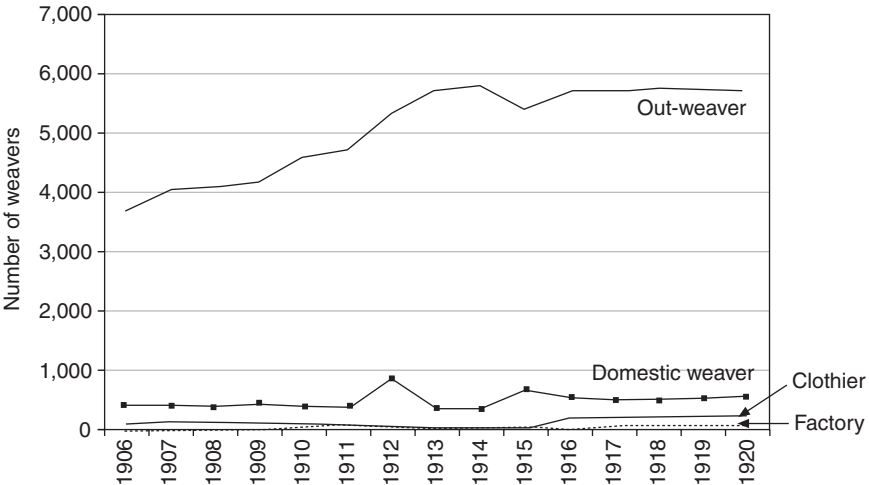


Figure 2.3 Number of weavers by organization of production: 1906–20 (source: see Figure 2.1).

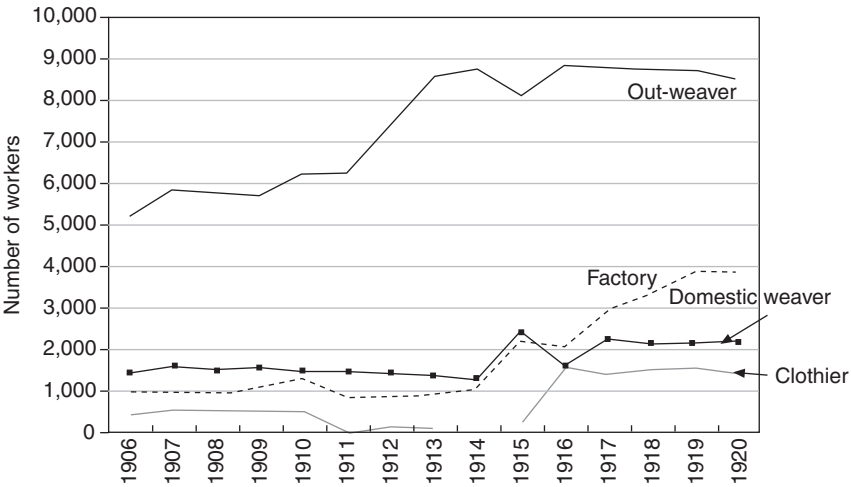


Figure 2.4 Number of workers by organization of production: 1906–20 (source: see Figure 2.1).

It is difficult to see how such organizational and technological trends in Kiryu came to be in the 1920s due to the data problem. The data by type of organization are not available for this period. Instead, the data are classified by scale in terms of the number of workers and looms. The number of looms installed in the weaving workshop seems to be more appropriate for seeing the change in the production organization (see Figures 2.5 and 2.6). ‘Out-weaver’, ‘domestic-weaver’ and ‘clothier’ in the data in the earlier period are supposed to be the workshops equipped with fewer than five looms, the number of which peaked in 1928 both in Kiryu City and Yamada County. In Figure 2.5, the workshops which had five to nine looms and 10–49 increased in Kiryu City. On the other

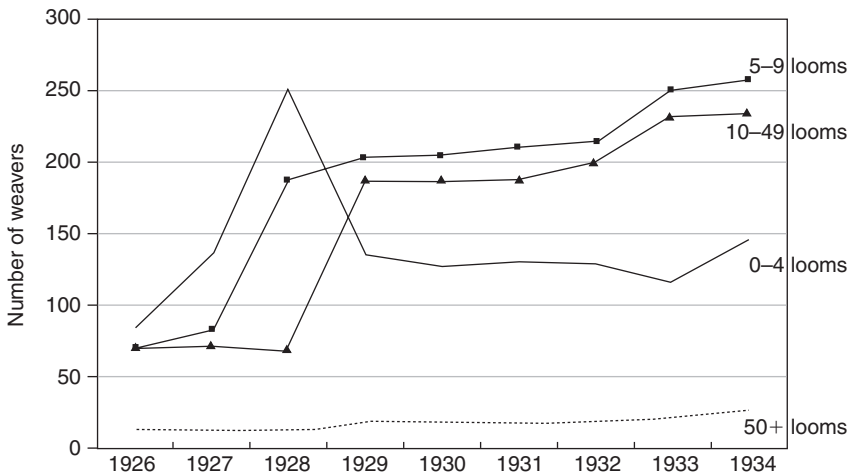


Figure 2.5 Number of weavers by scale (by number of looms installed) in Kiryu City: 1926–34 (source: see Figure 2.1).

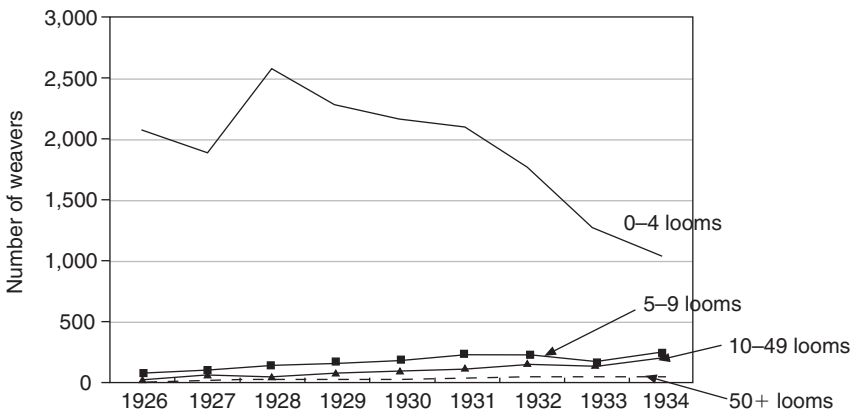


Figure 2.6 Number of weavers by scale (by number of looms installed) Yamada County: 1926–34 (source: see Figure 2.1).

hand, it is notable that the workshops equipped with less than five looms, located in ‘rural’ areas in the district, decreased rapidly in Figure 2.6.

As we have seen above, while the putting-out system was dominant and expanding until the end of the 1910s in Kiryu, in the middle of the 1910s it gave way to factory production. In other words, the period from the 1910s to the 1920s was the period of organizational transition in the Kiryu silk weaving industry, and both old and new production organizations coexisted.

Investigation into the organization of production from workers

As stated earlier, the production organization of Goto Factory changed from a decentralized one to a centralized one around 1920. It should be noted that even at the peak of the putting-out system, Goto Factory had some workers inside. For example, there were 23 workers (male 4, female 19) in 1908, when Goto employed 66 out-weavers. In *Shokkonin daicho* and *Homei kiji* (Register Book of Workers), we can find the words ‘*Kyukin*’ (wage) and ‘*Shikise*’ (wage in kind, including clothes, shoes and socks) which were paid to workers who were being trained inside the factory or who stayed to work there after that.

Figure 2.7 shows the number of workers whose period of apprenticeship was less than one year.³

For on-the-job training, trainee workers came to work for Goto Factory every year except in 1913. At the beginning of the training, they had to learn the names of colours and kinds of yarn and how to wind the weft on the bobbin, all of which enabled them to understand the whole process of weaving. Male apprentice workers did not weave but engaged in warping or the preparatory process for weaving, and in ‘*chinbata-mawari*’ jobs, namely the job of going to out-weavers to deliver *hata-dama* (warped yarn for warp) and wound weft and

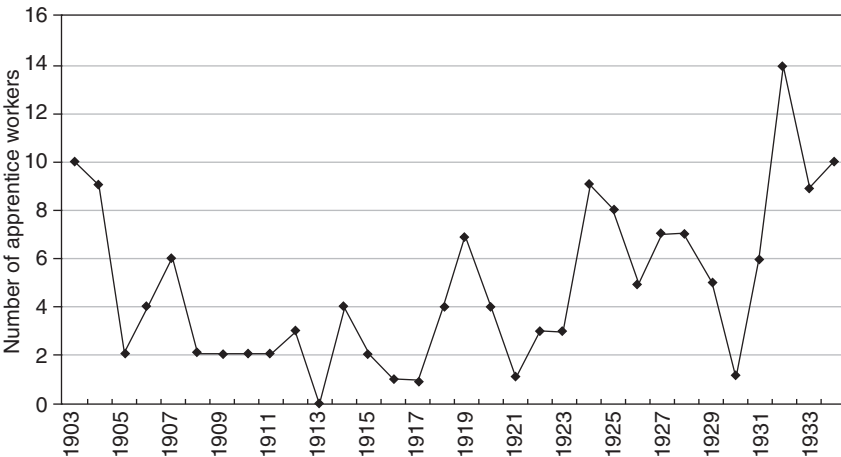


Figure 2.7 Number of apprentice workers less than one year’s experience in Goto Factory (source: see Figure 2.1).

to collect products woven by out-weavers. Skilled workers who worked for a long period are supposed to engage in the trial weaving of new products as well as in the training of new workers.⁴

Next, by examining 224 workers (male 52, female 172) who were registered at Goto Factory from 1902 to 1934, I will consider how the production organization changed in this period. Out of 224 workers, 140 workers (male 36, female 104) were '*nenki*' (apprentices). In Japan, even after finishing the apprenticeship period, a female worker was not recognized as an artisan but just as a skilled worker. More than half of registered workers started their career as apprentices. In general, the term of apprenticeship was decided in advance before a worker started the service.

Table 2.2 shows that with respect to 86 out of 104 female workers the terms of apprenticeship were from four to five years. Meanwhile, relatively long terms of six to seven years can be found in both male and female workers. The register book tells the ages when workers started apprenticeships, with respect to 123 workers (male 30, female 93) out of 140 (Table 2.3). Half of the female workers started at the age of 12.

Table 2.2 Period of term of apprenticeship (per person)

<i>Period of term</i>	<i>Male</i>	<i>Female</i>
More than 3 – less than 4 years	1	4
More than 4 – less than 5 years	16	73
More than 5 – less than 6 years	10	14
6 years	4	9
7 years	5	4
Total	36	104

Source: see Figure 2.1.

Table 2.3 Starting age of apprentice

<i>Starting age (years old)</i>	<i>Male</i>	<i>Female</i>	<i>Female (%)</i>	<i>Total</i>	<i>Total (%)</i>
7	1	1	1.1	2	1.6
8	0	0	0.0	0	0.0
9	0	1	1.1	1	0.8
10	1	1	1.1	2	1.6
11	3	5	5.4	8	6.5
12	8	45	48.4	53	43.1
13	8	17	18.3	25	20.3
14	7	9	9.7	16	13.0
15	1	9	9.7	10	8.1
16	1	2	2.2	3	2.4
17	0	2	2.2	2	1.6
18	0	1	1.1	1	0.8
Total	30	93	100.0	123	100.0

Source: see Figure 2.1.

It is noteworthy that the average term of apprenticeship and the average age when starting an apprenticeship changed over time. In the 1920s, the average term became shorter and the average starting age came to be lower. As shown in Table 2.4, the distributions of the terms of apprenticeship were different between the sub-periods. In the first period in Table 2.4, the percentage of up to five years was very high both in the male and the female workers, but in the last period the majority shifted to four to five years. In particular, the term for female apprentices came to be around four years on average after 1920. The shortening of the term arguably corresponds to the introduction of power looms, which substantially changed the task of the workers. Also, the starting age decreased from 13.2 years to 12.4 years (Table 2.5).

Furthermore, the workers' hometowns changed at the same time. We have the hometown data of 186 workers. Before 1920, only 20 per cent of the workers came from Kiryu Town and Kiryu City. Also, the other parts of Tochigi Prefecture excluding Ashikaga district accounted for only 20 per cent. The rest of the workers came from distant areas including Ishikawa Prefecture, Niigata Prefecture and Ashikaga district. However, after 1920, many workers came from areas close to the Kiryu district (Table 2.7).

Further investigation of Table 2.7 clarifies the changes in the local labour market through the period. Comparing with two sub-periods (1902–19, 1920–34), we find that while 30 per cent of the workers came from Kiryu district (a and b in Table 2.7) in the first sub-period, the ratio increased to 70 per cent in the second sub-period. Thus, workers, including apprentices, came to be supplied from the areas closer to the Kiryu district. It seems to reflect the changes in the conditions of the local labour market in Kiryu as well as that in

Table 2.4 Period of apprenticeship: by period (per person)

<i>Period</i>	<i>Male</i>		<i>Female</i>	
	<i>1902–19</i>	<i>1920–34</i>	<i>1902–19</i>	<i>1920–34</i>
More than 3 – less than 4 years	1	0	2	2
More than 4 – less than 5 years	1	15	12	61
More than 5 – less than 6 years	8	2	13	1
More than 6 years	8	1	12	1
Total	18	18	39	65

Source: see Figure 2.1.

Table 2.5 Average age of starting age of apprenticeship (years old)

<i>Period</i>	<i>Male</i>	<i>Female</i>	<i>Total</i>
1902–1919	12.2	13.5	13.2
1920–1934	13.0	12.3	12.4

Source: see Figure 2.1.

Table 2.6 Hometown of workers by period (per person)

Region	1902–34	1902–19	1920–34
Gunma Prefecture			
Kiryu City	26	3	23
Maebashi City	1	1	0
Yamada County			
Kiryu Town	23	22	1
Aioi Village	7	4	3
Umeda Village	2	0	2
Kawauchi Village	9	4	5
Hirosawa Village	3	3	0
Fukuoka Village	6	0	6
Omama Town	22	1	21
Nitta County	2	2	0
Seta County	3	1	2
Tano County	4	3	1
Kita-kanra County	3	2	1
Tone County	4	1	3
Tochigi Prefecture			
Ashikaga area	19	8	11
Other area	29	27	2
Akita Prefecture	1	1	0
Toyama Prefecture	1	1	0
Ishikawa Prefecture	9	9	0
Niigata Prefecture	7	7	0
Ibaraki Prefecture	3	3	0
Saitama Prefecture	1	1	0
Kanagawa Prefecture	1	1	0
Total	186	105	81

Source: see Figure 2.1.

Table 2.7 Proportion of workers come from near/inside Kiryu district (%)

Group	1902–34	1902–19	1920–34
1 Kiryu Town and Kiryu City	26.3	22.8	29.6
2 Yamada County	26.3	11.4	45.6
3 Ashikaga County	10.2	7.6	13.5
1 + 2	52.6	34.2	75.2
1 + 2 + 3	62.8	41.8	88.9

Source: see Figure 2.1.

other areas. As the wage data in *Noshomu Tokehyo* (Statistics of the Department of Agriculture and Commerce) suggest, until the middle of the 1910s, the wages of female weaving workers (daily, nominal wages) in Takasaki City (Gunma Prefecture) were higher than those in Kanazawa City (Ishikawa Prefecture) and Niigata City (Niigata Prefecture). However, as the labour demand increased in Ishikawa and Niigata in the middle of the 1910s, the weaving wage rate went up

in these prefectures, and the workers there were able to find jobs in places close to their hometowns. Meanwhile, in Gunma Prefecture, as the weaving wage rate rose relative to the wages of farmers or silk-reeling workers, the manager of a weaving factory was able to recruit apprentice workers in the same prefecture more easily than before. In the 1910s, it became more difficult for clothiers to find lower-paid out-weavers as the condition of the labour market changed. The wages of out-weavers increased because it was the period when the demand for textile goods in the domestic market expanded. At the same time, the sericulture and agriculture sector in Gunma Prefecture developed (Kameda 2003: 3). Therefore, the labour markets got tight in this period. As out-weaving costs for clothiers got higher, the clothiers had to go farther to find lower-waged out-weavers, and the geographical expansion of the putting-out system peaked in 1920 (Kawasaki 1939: 31).

The real wage data in Figure 2.8 confirm the above explanation on the changes in the labour market.⁵ As the sharp rise in the real wage in Maebashi and Takasaki indicates, the local labour market got tight in the late 1910s. Also, recruiting labour from other prefectures came to be difficult. It is true that the silk industry in Gunma Prefecture of the late 1910s recruited workers from such prefectures as Fukushima, Niigata, Toyama, Saitama, Tochigi and Kagoshima (the Department of Agriculture and Commerce 1922: 66, 114–17, 191–2), but approximately 90 per cent of the workers in the sericulture industry came from inside the prefecture in the late 1920s (Chuo shokugyo shokai jimukyoku 1929: 8). This means it became difficult for the clothiers in Kiryu to find low-waged

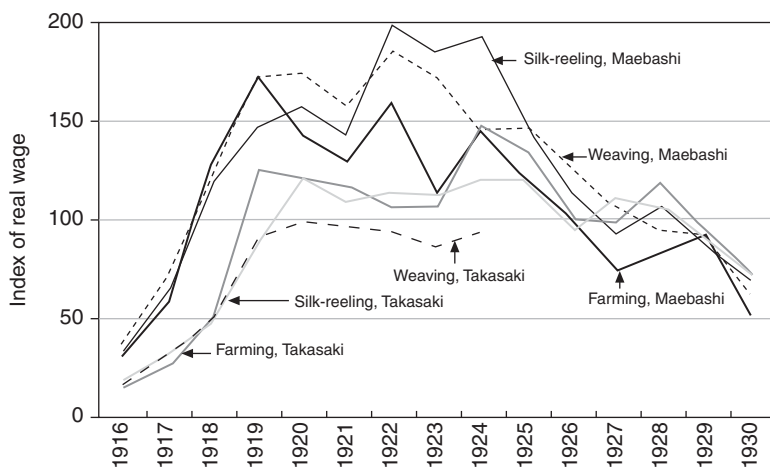


Figure 2.8 Change in the real wage of female workers in Maebashi and Takasaki City, Gunma Prefecture (source: *Gunma-ken Tokei sho* (Gunma Prefecture Statistical Papers), LTES 8).

Note

Index of real wage = the wage data in *Gunma-ken Tokei sho* realized by consumer price index in LTES 8, 135–6.

out-weavers by geographical expansion because the seasonal migrants inside the prefecture were employed in the south-western area of the prefecture, in the centre of the sericulture industry. This suggests that similar conditions in the labour market emerged in Kiryu of the late 1910s, which previous studies have identified as the period of the introduction of the power loom.

In addition to the changes in apprentices, a new type of worker called *tan-oriko* (piece-rate weaver) emerged in the 1920s (Figure 2.9). Two kinds of piece-rate weavers can be found in *The Register Book of Workers*, namely live-in piece-rate workers and commuting piece-rate workers. The former were the workers who finished the apprenticeship. Many of the live-in workers were paid annually or monthly. The commuting piece-rate workers increased in the 1920s. The emergence and increase of the commuting piece-rate workers symbolize the shift in the production organization at Goto Factory from the putting-out system to the centralized factory system.

Introduction of the power loom and the adoption of the factory system

Change in the products at Goto Factory: 1910s to 1920s

The purpose of this section is to explore the relation between the centralization of production organization and the change in the products at Goto Factory. In general, division of labour among producers is effective in absorbing the frequent demand changes both in quantity and quality, which is the advantage of the industrial district in the Marshallian sense. In fact, the division of labour inside the Kiryu district was highly developed (Kawasaki 1939: 12). And Goto

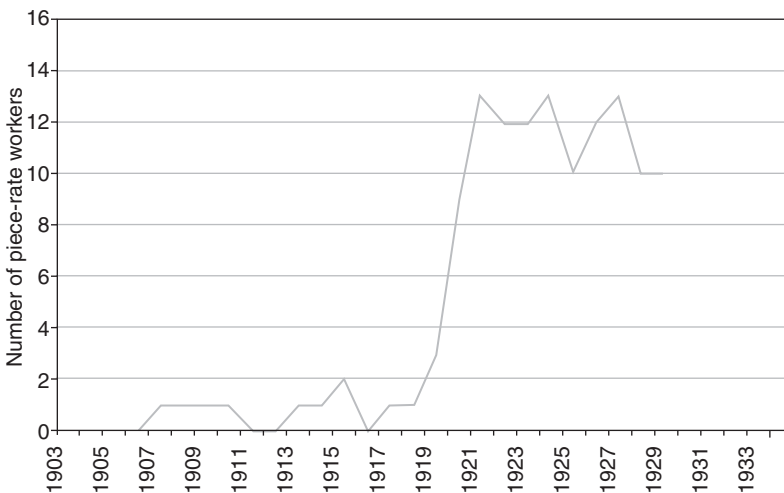


Figure 2.9 Number of *tan-oriko* (piece-rate workers) in Goto Factory (source: see Figure 2.1).

Factory depended on out-workers in weaving, twisting and finishing processes (Kameda 2000: 41).

Then, what kind of products did they make? The major product at Goto Factory was *obi*. Though their major product had been ‘*Baransu-ori*’ (an *obi* made of satin, a union fabric of silk and cotton), the factory stopped producing them in the late 1910s when out-weavers increased and the production organization changed (Kameda 2001: 40). To clarify the change in products at Goto Factory from the 1910s to the 1920s, I have carefully explored the *Orimono Seizo Hikiwatashi Cho* (The Trading Records between Goto Factory and Merchants). As shown in Figure 2.10, no records are available from April to August 1918.

In Figure 2.10, it is observed that the composition of the major products changed frequently and the yarn of the *obi* changed from silk and cotton to rayon. Also, short-term volatility in the sales of each item was very high. While Goto Factory basically focused on *obi*, in some periods narrow fabric for *kimono*, *koshoku mon omeshi* (figured crepe woven by silk and cotton) and *kitachi-omeshi* (crepe before being degummed) were produced. This is a general observation of the whole period, but if we look at Figure 2.10 more closely, we can find some other important features.

First, Figure 2.10a indicates the sales (production) by item under the putting-out system. In 1913–14, three to five items are found in this figure and their sales substantially fluctuated. In 1915–16, only one item was produced (*kyoka*

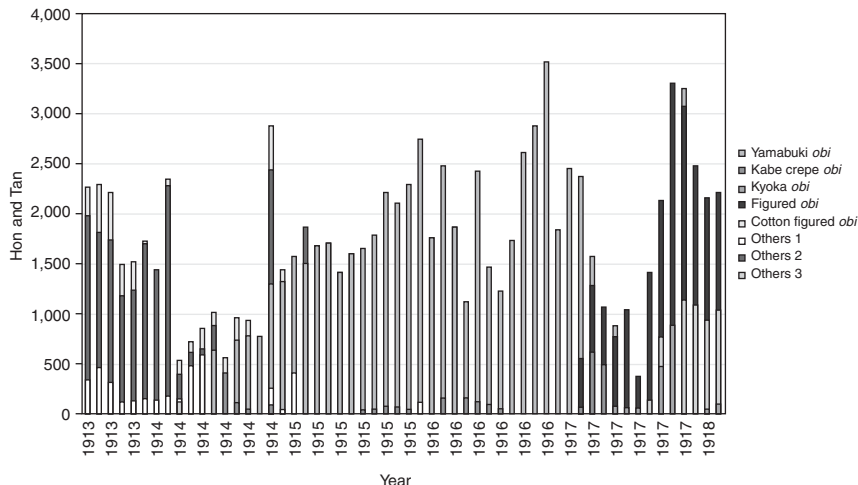


Figure 2.10a Kinds of product in Goto Factory: August 1913 to March 1918 (source: *Orimonoseizo hikiwatashicho* (Trading Records of Fabrics), 1913, 1918, 1921 and 1924).

Notes

Others 1 includes kabe-yamabuki *obi*, kabe crepe *obi*, bunmei *obi*, narrow satin damask and silk crepe. Others 2 includes spun *obi*, thick fabric, cotton *kyoka obi* and *yoryu* crape. Others 3 includes figured *obi*, figured cotton *obi*, figured union crepe and union crepe.

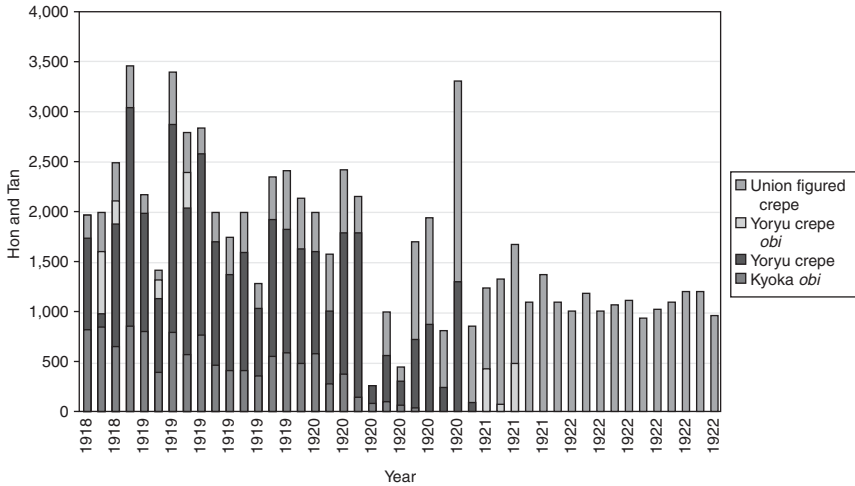


Figure 2.10b Kinds of product in Goto Factory: September 1918 to December 1922.

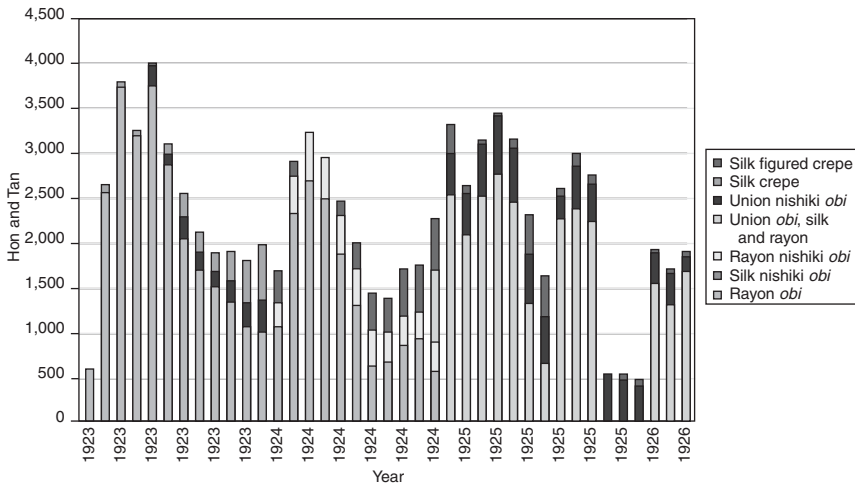


Figure 2.10c Kinds of product in Goto Factory: January 1923 to March 1926.

kyusun, *kyoka obi*). It seems that the owner enjoyed the advantages of the putting-out system, not from flexible adjustment of the products portfolio but from flexible adjustment of total production. In 1917, the major product became the *mon kyusun* (figured *obi*) with half or two-thirds of total production, but in addition to it various kinds of items were also produced.

Second, Figure 2.10b indicates that the composition of the products shifted in early 1921. From September 1918 to December 1920, various items, as well as a couple of major items, were produced. In this period, Goto Factory heavily

depended on the out-weavers. Actually, out-weavers produced four or six times as much as in-house production (Kameda 2003). On the other hand, from August 1921 to the end of 1922, only one item, namely *koshoku-mon-omeshi*, was produced, and monthly fluctuation in production came to be very small. It is notable that between these two periods, Goto Factory introduced power looms.

Third, when factory owners introduced power looms and changed the product portfolio in 1921, the yarn was changed at the same time. They introduced rayon to produce *jinken kyun* (rayon *obi*) and *koshoku bunka kyun* (*obi* made of silk and rayon) as the major products. In this period, the major products accounted for 60 to 90 per cent of the total products. *Chingin Keisan* (Wage Data Book) in this period shows that these major products were woven by power looms, while a few other items were produced by hand looms inside the factory. In other words, Goto Factory shifted its production from multi-kinds and small lots production of high quality goods to mass production of standardized low-priced goods.

The change in the composition of Goto's products seemed to be common in the Kiryu district. While the share of silk fabric and union fabric of silk and cotton for the domestic market, which had accounted for a large share until the end of the 1910s, gradually decreased, the share of rayon fabric for the overseas as well as the domestic market increased in the late 1920s. This shift implies that the factories in the Kiryu district tended to produce lower-priced and lower-quality goods under the prolonged recession in the 1920s.

The way from putting-out to mechanized factory

As mentioned above, the advantage of the Kiryu district used to be production of a wide variety of goods using the putting-out system. At Goto Factory, the

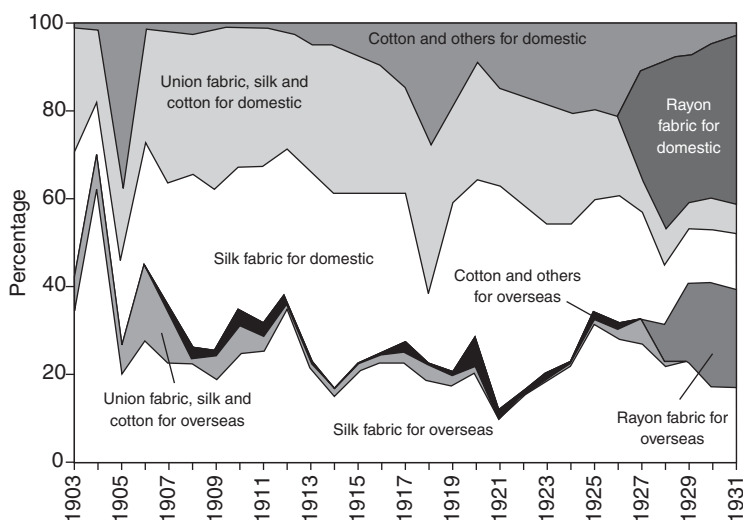


Figure 2.11 Products of Kiryu district by article, by market (source: Hashino 1997).

preparatory process for weaving and on-the-job training was done in the factory, and weaving, designing and finishing were outsourced. However, the environment changed substantially in the recession after the First World War boom, and it seriously affected Goto Factory, as Table 2.8 indicates.

In the 1920s, the demand for high quality goods like *omeshi* (silk crepe) fell. People did not buy such high-priced goods during the recession. According to the report of the trade association in Kiryu, ‘Rayon *obi* and the fabrics for the overseas market sell pretty well, but “*omeshi*”, “*meisen*” (low quality, popular silk fabric) and “*junken kohaku obiji*” (pure silk taffeta *obi*) hardly sell due to the recession. Since demand for dyeing and finishing processes has declined, the processors have to close their shops (my translation)’ (Kiryu orimono 1964: 134). In 1925, the producers in Kiryu completely shifted their products from pure silk *obi* to rayon *obi*. The Kiryu district was the first place to apply rayon for weaving *obi*, and rayon *obi* was regarded as Kiryu’s special product because no other region produced it. Mr Matsuzawa, the manager of the Kiryu Branch of Mitsukoshi Gofukuten (Mitsukoshi Draper’s Shop), noted that ‘in this year (1923) rayon *obi* accounted for about two-thirds of the total sales, although it is the first attempt to apply rayon to weaving’ (my translation) (*Kakiage Times*: April 1923). Corresponding to such a change in demand, Goto Factory pursued a strategy of shifting their production to more popular low-price goods. Introduction of power looms was a key for this strategy.

In 1907, Yuhei Hori, a ribbon weaver, applied rayon in Kiryu for the first time (Kiryu orimono 1964: 570). At the beginning, the producers in the Kiryu district applied rayon mainly to the products for the overseas market, but

Table 2.8 Some indicators before/after the 1920s Panic

	Unit	January 1920	June 1920	Fluctuation
Electric power	HP	1,220	608	–612
Number of weavers	–	886	133	–753
Number of twisted-yarn plants	–	393	7	–386
Number of power looms	–	2,413	1,279	–1,134
Number of hand looms	–	9,819	2,026	–7,793
Workers	person	22,329	2,208	–20,121
Output of textiles for overseas	hiki	13,685	8,812	–4,873
	yen	1,069,777	684,249	–385,528
Output of textiles for domestic	ten	421,087	51,534	–369,553
	yen	3,988,942	481,835	–3,507,107
Volume of domestic textiles in market	ten	280,155	166,310	–113,845
	yen	2,556,899	705,153	–1,851,746
Dead stock of raw silk	koori	1,895	1,895	0
	yen	4,737,500	1,516,000	–3,221,500
Dead stock of textiles	ten	281,305	237,277	–44,028
	yen	2,917,344	307,932	–2,609,412

Source: *Kiryu orimonoshi zokukan hensankai* (1964), pp. 306–7.

Note

This survey was done by Kiryu orimono dogyo kumiai (Kiryu trade association).

gradually they developed various products for the domestic market, applying cotton yarn and silk-spun yarn as warp, and rayon as weft. Application of rayon was not difficult because the process for rayon weaving was similar to silk weaving, and production equipment for silk weaving could be used for rayon. In addition, rayon was more uniform in quality than silk (Saito, Yamaguchi and Oyama 1935). The last characteristic of rayon was advantageous for introducing power looms. Rayon was not only cheap, but it could also be efficiently woven. For example, it took only two days to weave a rayon *habutae*, whereas it took a week for a silk *habutae*. The quality and variety of rayon products was improved year by year, and cheap but beautiful rayon products came to be popular in the market.

The introduction of power looms was crucial for producers because people preferred cheap rayon products to expensive silk products. In the previous studies, it has often been argued that *obi* was not easily produced by power looms. However, the factory owners eagerly introduced power looms for weaving *obi* in Kiryu. Improvements in the power loom technology seemed to enable them to weave *obi*. According to the survey by the Kiryu Branch of the Experiment Station of Gunma Prefecture at the end of 1923, 3155 out of 5459 power looms in the Kiryu district were multiple shuttle power looms (*Kakiage Times*, May 1924). In this period, the power looms which could produce figured weavings as well as plain ones were in use in Kiryu. Out of a total of 5459 looms, 1080 were dobby machines (19.9 per cent) and 1359 were figured machines (24.9 per cent). The introduction of power looms at Goto Factory can be explained by the tightness of the labour market, as discussed in the previous section, and the demand shift in the product market. In short, the aim of Goto in establishing a factory equipped with power looms was to mass produce low-priced rayon *obi* given the decline of the demand for high quality products and the rise in wages.

We can derive some implications for the research on production organizations from the case of Kiryu. The putting-out system has been considered to be a less efficient production organization than the factory system. However, in Kiryu, the putting-out system prevailed until the end of the 1910s. One of the major sources of the inefficiency of the putting-out system is supposed to be the embezzlement of raw materials, but embezzlement was not profitable for out-weavers because in small districts it was important to keep long-term transactions with a clothier. In the Kiryu district, famous for figured fabrics, clothiers could not employ distant out-weavers because it was difficult to carry jacquard machines, in contrast to the Ashikaga district (Kawasaki 1939: 136). A preceding study argues that the Kiryu district could be divided into two areas: the western and northern areas where *kiginu* (narrow plain raw silk fabric) was produced with simple technology, and Kiryu City and its surroundings where producers wove yarn-dyed fabric with sophisticated technology (Saito 1964: 6). Besides, in the case of weaving dyed figured-yarn fabrics, it seemed that the out-weavers could hardly pilfer weft because the design or pattern of the fabric was distorted if they did. To carry already warped yarn to out-weavers seemed to

have the same effect as when the production process in the Danish putting-out system was standardized to prevent the out-weaver from cheating (Raaschou-Nielsen 1993: 9). The clothiers in Kiryu City preferred long-term relationships with close out-weavers because they wanted to keep the quality of fabrics and prevent embezzlement. That is why they did not employ distant out-weavers (Ueno 1989: 51).

Thus, leading clothiers maintained the quality of the products using out-weavers who had long-term relationships and lived close to them before the First World War. On the other hand, during the First World War, Goto Factory increased production, increasing out-weavers. Back in Figure 2.10a, production declined during the busy farming season, which suggests that the owner of Goto Factory used many part-time out-weavers. Concentration of production in a small number of simple products made this strategy feasible, but production came to be constrained by the availability of part-time out-weavers. It might be a serious problem for clothiers to miss business opportunities because seasonal fluctuation of output depended on out-weavers. As the demand for silk fabric became popular and the fashion market was developed, they had to respond to the market immediately. Under these new conditions, the existing production organization became inefficient, since it could increase production only through geographical expansion of out-weavers, which caused higher transaction cost without productivity improvement. Hence, the clothiers chose mechanized production, which enabled them to increase production independently of seasonal fluctuations of agricultural labour demand.

In the Kiryu district of the 1920s, the factory equipped with power looms, mass-producing low-price goods, became more profitable. As a result, production was not constrained by the availability of out-weavers any more. That was a part of the strategy of mass producing low-price goods using rayon as raw material.

The piece-rate workers and the male workers who emerged at Goto Factory in the 1920s were needed to cope with the change in the production organization at Goto Factory in the 1920s. It is they who drove and maintained the power looms in the factory. Although the records are not available, it is possible that piece-rate workers at Goto Factory were ex-out-weavers. In general, maintenance of power looms was done by male workers. Ex-piece-rate workers being skilled must have been more valuable than apprentice workers, unskilled in the face of the introduction of new technology. Besides, the roles of the male worker, which had been increased in the 1920s, came to include those of mechanic as well as supervisor.

Kosho (1965) described the emergence of employed workers in Ashikaga district. According to him, organizing manufacturing was very difficult there because the workers went back to their farm homes to be part-time out-weavers after the acquisition of skills when the term of service expired (Kosho 1965: 102). Therefore, the establishment of the power-loom factory broke the putting-out relationship, which made it easier to hire skilled workers inside the factory. In the case of Goto Factory, the situation was common. After the introduction of the power loom, the period of apprenticeship was shortened, the

starting age of an apprentice was lowered and apprentice workers were recruited near Goto Factory. In the short term, they were expected to become skilled workers in the factory. That was the rational strategy for Goto Factory in the 1920s. From the point of change in the labour market and marketing strategy as mentioned above, the combination of technology and production organization which was desirable for factory managers changed in the 1900s, 1910s and 1920s.

Concluding remarks

In this chapter, we investigated the relationship between the introduction of power looms and the centralization of the production organization, focusing on the dynamic changes in the product market and the labour market. After 1920, as a result of the new strategy of mass-producing lower-price goods, Goto Factory chose a new combination of production organization and technology, namely the factory system with power looms.

There are two issues to be explored in future research. The first one is to investigate the structure of the industrial cluster in Kiryu. Goto Factory conducted the weaving process inside the factory, and put out the other processes including dyeing and finishing. The total structure of division of works and its governance mechanism should be explored.

The second issue is the division of labour inside the power-loom factory. The wage data at the Goto Factory would be useful material for studying this. As Suzuki (1994) argued, organization in the early twentieth century must have been more fragile than we imagine in the twenty-first century. How did the traditions and rules of the local society affect factory production? How were they interdependent of each other? These are the questions to be addressed.

Notes

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- 2 In *Fuken Tokeisho* (Statistical surveys by local government), weavers were divided into four groups but this way of division raises a serious problem (Hashino 1997: 5–6). A factory was defined as a workshop with more than ten workers and a cottage as one with less than ten workers. On the other hand, the clothier was to put raw material out to out-weavers and the out-weaver was to weave for others. It is possible that the investigator got confused when categorizing because of two such criteria.

- 3 In Figure 2.7, I used the total number of workers, or workers who could be found in the year.
- 4 Some works in addition to weaving can be found in *Chingin keisan* in 1925; 'itokuri' (winding) for female workers, 'senshoku' (dyeing), 'seikei' (warping), 'kikai' (repairing machine or mechanic), 'zatsu' (miscellaneous) for male workers, and so on.
- 5 As real wage data in Kiryu district (Yamada county and Kiryu City) are not available, those in Maebashi City and Takasaki City are used here in substitution.

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3 The Registration System and the Grade Wage

From cooperation to a market for human capital? A lesson from the Japanese silk reeling industry¹

Ryo Kambayashi

Introduction

At the end of the nineteenth century, following the Industrial Revolution, labour demand in Japan's manufacturing sector, which centred on the silk reeling and cotton spinning industries, increased substantially (Nakamura 1993: 35). However, this increase did not immediately absorb the large labour supply pool that had built up in rural agricultural areas. The substantial mismatches apparent in terms of, for example, location and labour hours,² were a fundamental problem in the functioning of labour markets, especially at the initial stage of industrialization.

This chapter examines how problems in the labour market were resolved, using as a case study a private institution in the silk reeling industry in the Suwa district at the beginning of the twentieth century. Specifically, we represent Pareto-inferior allocations in the labour market as a problem of sharing the fixed costs incurred in attracting an adequate supply of labour from rural areas. We then look at two private organizations that were dealing with this problem, namely the *Tôroku Seido* (hereafter, the Registration System) formed by the *Suwa Seishi Dômei* (the Silk Reeling Alliance of Suwa, hereafter the Alliance), which formally operated between 1903 and 1926, and the *Tôkyû Chingin Seido* (the Grade Wage System, hereafter the Grade Wage). Through an examination of primary and secondary sources, we show empirically that these institutions complementarily achieved a Pareto-superior outcome in the labour market.

The next section examines the fundamental problem – the poaching problem. The third section discusses the relevant literature and explains the empirical strategy. The first half of the fourth section is devoted to a theoretical discussion in which we hypothesize that the Registration System played the major role in encouraging cooperation under imperfect information. As this cooperation required that the voluntary turnover of workers be limited to some extent, the Alliance introduced the Grade Wage, through which the workers' wages were determined *ex post* according to their productivity. In the second half of the fourth section, we look at the mechanism of the Grade Wage, drawing on Kambayashi (2000). We examine the above hypothesis empirically by

(i) investigating the formal rules, (ii) conducting a statistical overview, and (iii) observing the actual disputes.

In summarizing, we explain that at the beginning of the twentieth century, two institutions stabilized the labour market in the Suwa silk reeling industry by suppressing voluntary labour turnover on the supply side and by controlling incentives to poach labour on the demand side. Based on these findings, the final section provides a discussion and conclusion.

The problem: the labour market in the silk reeling industry in Suwa

Following France's economic crisis in 1882, Japan ceased exporting its raw silk to Europe, the United States then becoming the main destination for the product. The silk reeling factories of Suwa successfully adapted to the stricter requirements on volume and uniformity imposed by the new market (Ishi'i 1971: 41),³ and stepped up production from the latter half of the 1880s.

The labour demand of the silk reeling mills in Suwa increased immediately and continuously with the increase in production.⁴ This sustained growth absorbed the labour slack in the district, and until the early 1900s, Suwa factories obtained their workers from the outskirts of the district and even from more remote areas on the other side of the mountains (Ishi'i 1971: 261–4; Saitô 1998: 121–30).

By the end of the nineteenth century, because of increasing labour demand, poaching among employers was common. Indeed, as early as 1878, factory managers around the Suwa district appealed to the prefectural governor to establish rules about recruitment (Ishi'i 1971: 286–7). The 1903 government report, *Shokkô Jijyô* (The Condition of Factory Workers), also referred to the poaching in the Suwa area. This report pointed out that many factories suffered because advance (or deferred) payments aimed at preventing labour turnover were not being effectively enforced (Ministry of Agriculture and Commerce 1903: 178–80). Yamamoto (1957) documented several interviews that were conducted at the beginning of the twentieth century with both employment agencies and factory managers about the poaching problem. The agencies and managers reported that before contracting, they had to prepare a piece of cloth as a 'gift' for each worker. This was sometimes valued at as much as 15 yen (the average wage for working 75 days) and did not have to be returned even if there was no contract. The managers explained the importance of securing employees and that even after signing employment contracts they worried whether these workers would arrive at their factories (Yamamoto 1957: 117–20). Takizawa (1978) reported that in 1912, one factory expended at least 23 yen (the average wage for working 115 days) in addition to transportation and administration costs, in employing one female worker (Takizawa 1978: 407).

As a result, the retention rate of workers in Miyasaka Kiyonojyô's factory, for example, was no more than 20 per cent in 1890, 26 per cent in 1891 and 39 per cent in 1899 (Ishi'i 1971: 271),⁵ while in the entire district, 53 per cent of

workers had no more than two years' tenure in 1901 (Ministry of Agriculture and Commerce 1903: 187).⁶ This illustrates the difficulties experienced by employers in retaining their workers in the developing stage of the industry.

Two questions arise: first, how can we explain poaching in labour markets; and second, was there any inefficiency?

With respect to the first question, it was necessary for a factory to incur costs *ex ante* to recruit a worker from a rural area, costs that were not fully protected *ex post* by the public court. Thus, employers always had an incentive to poach workers from other factories rather than recruiting themselves.

There are at least two interpretations of the *ex ante* costs. First, we have to assume that the location of home production differed from that of factory work in both time and place. Therefore, the initial employers incurred additional expenses well above the market wage, such as costs of transportation and communication and of maintaining recruitment.

Second, there was the cost of preparing pre-industrialized workers for factory labour (Gerschenkron 1962; Field 1976). For example, in her diary Wada (1973), who worked in the Tomioka Silk Reeling Factory, explained that superstitions about, and misconceptions of, factory labour were so widespread among villagers that factory managers could not easily secure the required labour force without providing introductory training. Nakabayashi (1999) pointed out that there were substantial differences among workers about how to respond appropriately to the incentive schemes. Other documents suggest that it was necessary for factories to train workers for two or three years before they were 'standard' (Fuji'i 1921: 15). In fact, at the end of the nineteenth century, Ina factories, which were adjacent to the Suwa area, were considered to 'have turned into girls' training schools for Suwa' (Eguchi and Hidaka 1937, Vol. 2: 1158–9). Taking into account liquidity constraints in rural households, factories had to bear considerable productivity losses during the training period.

However, these *ex ante* sunk costs were not fully protected *ex post*, because there was a commitment problem. At the beginning of the twentieth century, it was still difficult to maintain commitments to stable employment. As female workers at that time were legally minor, the employment contract for a girl was usually made between the factory manager and the head of the household. Consequently, despite a legally effective contract, it was impossible for a contracting party to restrain a girl physically and force her to work simply because she had moved voluntarily to another factory. The most that could be claimed against the breach of an employment contract was a pecuniary sanction against the parents. However, claims were not easily carried through, even if breaches were admitted by the public courts. The imposition of a large fine might financially ruin a household and the resulting poor reputation make it difficult for the factory to recruit from surrounding areas. Moreover, as farmers tended to apply this bad reputation to the whole system, all factories faced increased recruitment difficulties once any one factory had collected a fine (Ministry of Agriculture and Commerce 1903: 187; Oishi 1972: 83; Iwamoto 1970: 79).⁷ In other words, the investment in households by factories continued to be threatened by other

factories because of the lack of enforcement of labour contracts by the public courts.

We can assume, therefore, that incurring *ex ante* sunk costs without commitments would lead to poaching, which implies underinvestment in workers and, at most, the Pareto-inferior outcome of the labour market, even though the invested human capital was by itself portable within the industry. This is the answer to the second question.⁸ Poaching might not have been problematic in terms of efficiency if there had been a technological diffusion through labour mobility (Autor 2003). In fact, however, technological diffusion in the Suwa area was achieved either through the communication of managers or by the public institution. Moreover, from the end of the nineteenth century to the second half of the 1920s, there were no fundamental technological innovations in the silk reeling industry. The skills of the female workers, most of whom worked at the reeling or re-reeling process, were not attributable to technological knowledge but were innate abilities, such as quickness and toughness, that they acquired when they adjusted to factory labour.

What is thought to have been behind the poaching at the end of the nineteenth century was a major conflict of interest over the payment of *ex ante* sunk costs for factory labour. To overcome the poaching problem, in 1903, factory managers in the Suwa district formed two private institutions that prevented poaching, namely, the Registration System and the Grade Wage.

Literature and empirical strategy

There are three strands of research that relate to the Registration System: general investigation of private institutions in the field of theoretical and empirical economic history, the work of labour historians on labour market structure focusing on sharing fixed costs, and specific articles about the Registration System, which have been provided mainly by traditional studies in Japanese economic history.

Private institutions

Since North and Thomas (1973) pointed out the importance of institutions for economic growth, institutions have attracted considerable attention from researchers as a stimulant to economic growth or modernization.⁹ Indeed, theoretical considerations derived from work in the field of repeated games have provided rich insights into the economic mechanisms of historically important institutions. Based on the simplest and most widely used framework, we can assume a sufficient long-term relationship between two particular agents in which a sort of grim-trigger strategy achieves cooperation. However, since economic activities do not always remain within a particular bilateral relationship, it is necessary to construct strategies to govern transactions appropriately even under multilateral relationships. Because circulating and sharing information within a coalition is crucial, the administrative function of a standing third party such as the Alliance is important.

Despite the seminal work of Milgrom, North and Weingast (1990), as well as Greif (1993), the economic role of the third party in a coalition has not been sufficiently examined either theoretically or empirically.¹⁰ This omission has prevented us from further investigating the role of institutions in economic development. The establishment of a third party is evidently one of the main characteristics of a well-established market that has seemed necessary for modern economic growth since the nineteenth century.¹¹ This article further examines the economic role of the third party in economic growth.

Historical investigation on labour market institutions

Researches on the historical development of labour markets have focused on institutions, particularly on the sharing of the labour costs of training workers during the initial period of industrialization. In North America, research on immigration and apprenticeships has addressed this issue. With regard to emigration from Europe to North America in the eighteenth and nineteenth centuries, the bearing of navigation costs was problematic because the potential immigrants generally did not have enough money. At first, they migrated in exchange for indentured service contracts in America. Grubb (1994) pointed out that the 'runaway problem', combined with reduced navigation fees and increased immigrant wealth, led to the disappearance of the indentured servant in the 1830s. Instead, immigrants used informal institutions such as a *padrone* or a family network linking America and their country of origin (Peck 1996).

Elbaum (1989) examined why the apprenticeship system declined in nineteenth-century America but persisted in and dominated skilled labour markets in Britain. He pointed out the commitment problem over indenture obligations due to, for example, a lack of occupational certification, contractual enforcement by laws and support by unions.¹² The institutional inability to sustain apprenticeships in North America led to the development of internal labour markets on the one hand and a union-based labour market on the other (S. Jacoby 1985; D. Jacoby 1991a; Sundstrom 1988). At least in part, research on the evolution of labour markets in the United States has been from the perspective of remedying the commitment problem by constructing private or public institutional arrangements.

Contrary to the research on labour markets in the United States, most of the studies on Japanese labour history have ignored the role of market institutions, arguing that labour markets were structured according to technological characteristics, entrepreneurial personalities and government intervention, and stressing the formation of industrial relations.¹³ In effect, although these studies construct a plausible model of human resource management within a typical large-scale manufacturing firm, this model does not address strategic interactions between workers or employers in labour markets and has not paid sufficient attention to labour market institutions such as the Registration System.

Research on Japanese economic history

Economic historians in Japan have focused on the monopsonic aspect of the Registration System. For example, Ishi'i (1971) regarded it as a monopsonic cartel that prevented workers from moving into other factories, allowing wages to be reduced to subsistence levels even in an era of tight labour markets (Ishi'i 1971: 277–90). Recently, Nakabayashi (2000b, 2001) has suggested that the purpose of the Registration System was not to prohibit labour turnover but to establish ownership over employees and to hire them out to employers in order to manage the labour market efficiently. We follow in part the first argument, that the Registration System achieved cooperation among employers with regard to not poaching workers, which successfully suppressed labour turnover in the Suwa district. We also pursue the argument that, considering the existence of poaching externalities, this institution was not an efficiency-distorting cartel but was one of efficiency-enhancing cooperation. Consideration of the relationship between these two arguments may indicate the fundamental problem in the labour market.

This chapter takes a different view of the government's role in enforcement. Studies in Japan assume the effectiveness of public legislation. However, although the Japanese government introduced the Civil Code in 1890 based on the Western legal system, it seems unreasonable to assume that these laws were immediately effective in regulating economic behaviour (Ishi'i 1971: 277–90).¹⁴ In fact, as explained in the following section, substantial gaps between the design of public legal institutions and the required economic regulations remained. Thus, we should not neglect private institutional arrangements in the history of the labour market in Japan.

Analysing the Registration System is therefore a useful study of private 'experiments' designed to establish order in the labour market. Of course, such experiments had been attempted in other industries, because poaching was a common feature of labour markets during the process of industrialization in Japan at the turn of the century for the reasons discussed above.

Among cotton spinning factories in western Japan, *Bôseki Rengôkai* (the Cotton Spinning Union) agreed to prohibit mutual poaching following its establishment in 1883. Because it was ineffective, this agreement was revised in 1888 and 1892, and abandoned in 1893. As a result, in 1896, a major dispute occurred between *Kanegafuchi Bôseki* and some factories in Osaka over the poaching of more than 1,000 workers, which escalated and involved banks and wholesale merchants. Saxonhouse (1977) reported that in 1897, almost half of the workers in cotton textile industries had less than one year's experience and that this proportion did not change until the 1920s.

Similar approaches were attempted in munitions factories and shipyards. In 1896, the Navy's factories agreed not to employ each others' workers. Yawata Steel also cooperated with some factories, including the Yokosuka Navy Factory, all agreeing not to poach each other's workers, but these agreements soon lapsed, to be repeatedly re-established until the 1920s. In addition, *Dôgyô*

Kumiai (the Trade Associations) that had been established in the latter half of the Meiji era often used agreements to prohibit poaching.

However, these approaches were ineffective despite repeated attempts, and it is interesting to compare them with the Alliance. The final section of this article returns to this point.

Empirical strategy

Institutional analysis has been widespread not only in economic history but also in applied economics, yet empirical analyses have been few. On the one hand, because the theory of repeated games often provides the theoretical background to institutional analysis, we cannot determine which particular equilibrium was chosen. On the other hand, macroeconomic empirical studies have faced such difficulties as the availability and endogeneity of data. Hence, as reduced-form estimation does not always allow robust interpretations about economic causality in history, we sometimes have to adopt a structural approach to trace the specific economic mechanisms behind institutional effects through a context-specific model (Greif 2005).

Although institutions are broadly defined as sets of strategies and beliefs of economic agents, we can observe only formal statutes or rules of actual behaviour, not the agents' beliefs.¹⁵ This may make it difficult to trace the economic mechanism behind the institution's effects, but as long as we are concerned about understanding the static effects of a concrete institution, it may be reasonable that the main empirical interest of researchers has been devoted to a correspondence between hypothesized agents' strategies and the characteristics of the institution.

We have described the historical context surrounding the Registration System and specified the problem to be solved; that is, the poaching problem. In what follows, we deduce a concrete equilibrium strategy, considering the specific context. Comparing the characteristics of the deduced strategy and the formal agreement of the Registration System, we can confirm that the Registration System was formally qualified to solve the problem. Next, we attempt to test the predicted effect of the Registration System statistically by using aggregated data, but given limited data availability, we can provide only indirect statistical evidence. To offset this, we observe actual arrangements in the Registration System in terms of the resolution of disputes and thereby empirically confirm a correspondence between the deduced strategy and the actual behaviour of the Registration System.

The theory: cooperation and relative performance

Poaching externalities and the possibility of collective punishment

In labour economics, the problem of poaching has been referred to as a 'poaching externality', and institutions to regulate poaching have been investigated empirically as well as theoretically, typically through the well-known example

of the dual system established in Germany.¹⁶ Contrary to the experience of modern European countries, at the turn of the century in Japan, the suppression of poaching must have been achieved not through public courts and/or the price mechanism, but through private cooperation between mutually interested parties. This is because it was hardly possible to use specific performance to settle employment conflicts, and also because it was not easy to measure financially the loss of profit and the damage caused by poaching. Whatever the reason, at the beginning of the twentieth century in Suwa, employers were largely unable to enforce pecuniary transfer, despite the existence of the public courts. Hence, it was scarcely possible to govern the poaching externality through the market mechanism and/or the public courts, as is implied by the Coase Theorem. As a result, a private institution was used to control poaching incentives in the Suwa silk reeling industries.

We can abstract the situation into the following Prisoners' Dilemma Game. First, employers in Suwa had to get trained workers to undertake profitable production. They had two choices: to invest in training a worker, or to poach a trained worker from another factory. By successfully poaching a worker, an employer could obtain profit without incurring investment costs. Because the incurred cost was occasionally as much as the average wage for working 75 days, employers could not ignore the additional profit to be gained from poaching. In fact, the poaching of an able worker could increase profit substantially (Strong 1924: 106–7).¹⁷ On the other hand, although the factory from which workers were poached could bring an action in the public courts to collect a contracted fine from the villagers, the subsequent bad reputation of the factory would have prevented not only that factory but also the other factories in Suwa from recruiting workers from the village.

If the expected forfeit did not fully cover the investment costs, the players of this game would choose to poach regardless of the actions of the others. Without appropriate mediation, factories did not want to invest in workers but tried to rob others of their investments, despite the public courts.

Of course, when factories transacted repeatedly for a sufficiently long term within a particular bilateral relationship, they learned to cooperate and would not poach from each other. They would be deterred by the credible threat of not being able to transact with each other once poaching had occurred. Nevertheless, we should note that a specific relationship between two factories accounted for only part of the factory owner's entire business, because not only did silk reeling factories usually have multiple transactions with various factories but also there were frequent closures and new openings.¹⁸ Therefore, the damage that could be inflicted on the other factory through the bilateral relationship might not have been sufficiently large to prevent the factory owner from poaching. To ensure cooperation when punishment is limited and relationships are short term, it is necessary for participants in the market to share information about each other's behaviour and to construct multilateral relationships, so that they can punish offenders collectively (Kandori 1992). If a factory from which workers have been poached was able to isolate the poaching factory from various transactions

in combination with other factories in the Suwa area, it could inflict a sufficient amount of damage on the perpetrator.

The ordinary transactions between the Suwa factories implied a potential capability for multilateral coordination. First, many factories in Suwa had to join groups to access the United States market. Because the silk market in the United States had strict requirements on the uniformity and volume of products, several Suwa factories had to ship their silk jointly because of the small scale of their production (Nakabayashi 1999: 60; 2000a: 6).¹⁹ To homogenize and ship their products jointly, in the second half of the 1880s, some factories combined and formed the *Seishi Kessha* (Silk Association). This association collected each member's raw silk and re-reeled it into a larger reel, sorting it by its quality.²⁰ Without joint shipping and the cooperative quality control provided by silk associations, the products of silk reeling factories were recognized as *Ha-Ito* (leftover silk) and transacted at a 'pretty low price' in the market (Nakabayashi 2000a: 6).

Silk associations also offered financing facilities. In the Japanese silk industry, at least until the 1920s, cocoons were exchanged for cash. To obtain the large amounts of money needed to pay for materials, factories raised substantial funds on the security of future products, mainly from wholesalers. Silk associations played an important role by mediating between factories and wholesalers, taking advantage of the large scale of their transactions (Nakabayashi 2000a: 16–17).

During the material transportation phase, factory managers bargained collectively for workers, cocoons and raw silk. Although Okaya, the production centre of the Suwa district, was connected directly with the exporting port of Yokohama by rail in 1905, the carrying capacity that Suwa factories could use was limited. Sometimes, to get the railway lines extended or a fee reduction, factories collectively negotiated with carrying companies. Silk associations or other groups of factories often acted as the negotiating party (Nakabayashi 1997).²¹

As factories in the Suwa district were concentrated geographically, factory managers generally cooperated, exchanging information on many aspects of the business. These multilateral relationships may have assisted in preventing poaching externalities. However, it is empirically obvious that before the Registration System, the above collective repeated mechanism under perfect information did not work well in the silk reeling industry in the Suwa district.

The next question to arise is: why could the factory owners not achieve cooperation, despite the possibility of collective punishment?

Context-specific reasons for the ineffectiveness of collective punishment

As context-specific reasons in the Suwa area, we should consider the imperfect information about the actions of factories and the possibility of strategic behaviour by workers or workers' parents.

At the end of the nineteenth century, communication between factories and farming households was imperfect, owing to long distances and underdeveloped means of communication. Thus, it was difficult for an outsider to confirm

exactly when and where a worker had worked before. In effect, a factory often employed a worker 'by mistake' in terms of non-contracted employment or unintentional double booking.²² With this imperfect information, one factory could not observe exactly what the others did. In addition, when we consider the possibility of voluntary labour turnover by workers themselves, even though the labour turnover was publicly observed, it was difficult for other employers to distinguish whether that turnover was due to poaching or to voluntary movement by workers. Hence, although poaching implies labour turnover, labour turnover does not always imply poaching.

This imperfect information and the ambiguous interpretation of labour turnover may have been further complicated by workers' strategic behaviour, motivated by the desire to take advantage of the complicated legal aspects of the situation and to steal the advance payments. For example, because employment contracts in the silk reeling industries were essentially made between a factory and the worker's parents, a household could simultaneously make separate contracts with different factories in the names of the father and mother, leaving the other factory uninformed. In addition, a household could sign an employment contract with one factory by using the casual seal and simultaneously sign a contract with another factory by using the certified seal. Therefore, multiple factories could book the same worker. Likewise, in the case of labour turnover, factory managers could not confirm whether the other factory had initiated this double booking. That is, the turnover, which was initiated by employees, was uncertain in terms of its interpretation and exogenous for employers.

In order to make collective punishment sufficient to ensure cooperation, factory owners had to judge whether the turnover was due to poaching or to a mistake. However, in these circumstances, the interpretations made by each manager about the action of the other factory were essentially private. This is because each manager may have had different private information about the worker or her family. At the least, it would be difficult to share the interpretation with a manager who had nothing to do with the turnover. If collective punishment was called for, but the guilty verdict was not shared by the coalition members, this 'mistaken punishment' would be too costly to them. Rather, the factory that was mistakenly punished would realize the punishing factory to breach the rules. Therefore, private interpretation undermined the credibility of collective punishment, so that collective action was unlikely to be an equilibrium situation, thereby reducing the motivation of factories to train workers.

For collective punishment to be effective, a public signal regarding deviation – that is, a commonly acknowledged interpretation – is needed. This was provided in the Suwa district at the beginning of the twentieth century by the Registration System.

Third-party judgements as a public signal

The literature investigating the coordination problem provides two possible interpretations of administrative organizations such as the Alliance. In the

seminal article by Milgrom, North and Weingast (1990), the role of the administrator of markets is to circulate information. In contrast, according to Greif (1993), the coalition of Maghribi traders cooperated to obtain a common interpretation of observed actions as well as to circulate information, even though they had not established a standing third party, and judgements about other members' deviations depended solely on the individual decision making of each trader. He pointed out that '[t]he operation of a coalition is based on uncoordinated responses of merchants located at different trade centres. Hence, for the threat of collective punishment to be credible, "cheating" must be defined in a manner that ensures collective response'. He particularly noted the role of the Merchant's Law, which 'promoted efficiency by providing a coordination device necessary for the functioning of the coalition, economizing on negotiating cost and enabling flexibility in establishing agency relations' (Greif 1993: 542).

The Merchant's Law is expected to provide the frame of reference for accepted behaviour among traders. However, if each member interprets the unobservable aim of other members differently, it might not be sufficient to set up a statute book. Instead, it would be necessary to form an organization with the ability to register information, to fill in the gaps and share information among coalition members, to verify the aim of actions, and to apply the rule with agreement.

A theoretical investigation of imperfect monitoring suggests that any factory manager who believed that all other managers who would follow the strategy outlined below would follow the same strategy, and thus the factories could then achieve cooperation as an equilibrium.²³

- 1 *Initial phase*: Invest in workers.
- 2 *Cooperation phase*: Continue investing as long as the result of this stage of the game indicates that your opponent is cooperating. Any time that you observe labour turnover in your factory, bring the action to the Alliance and obey the decision of the Alliance.
- 3 *Mediation and transfer by the Alliance*: The Alliance publicly verifies the situation, classifying it into one of the following three categories, and offers mediation according to each case.
 - a *Procedural misconduct*: The Alliance finds that the cause of labour turnover is simply procedural misconduct, such as double booking at the time of the contract.
 - b *Non-entitled employment without poaching*: The Alliance finds that the cause of labour turnover is voluntary during the contracted period.
 - c *Poaching*: The Alliance finds that the cause is poaching.
- 4 *Ignoring the apparent poaching*: Continue (2) as long as the Alliance does not call for collective punishment against the opponent, even though you know there is labour turnover.
- 5 *Punishment phase*: The Alliance calls for collective punishment against the party that disobeyed its decision. Any factory that has such an opportunity

to transact with the accused party should subsequently poach workers from its opponent.

- 6 Even though the party is being punished by the others, continue (2).
- 7 The amount of transfer and fine varies according to the situation and the classification of (3).

As there is no ambiguity about whether the opponent obeys the Alliance or not, factories may agree to cooperate, not to poach, and to report any labour turnover to the Alliance. This strategy not only will achieve higher long-term profit from cooperation than from cheating, depending on the parameters, but also will achieve Pareto-improving allocation by specifying pecuniary transfer rather than the simple collective punishment. This increases the value to each factory of following the strategy. Of course, it was costly for factories to participate in the Alliance because its administrative services were financed by members' fees, which were proportional to the number of registrations and the scale of the factory (Tôjyô 1990: 117).²⁴ However, the possibility of partial compensation for damages in cases of apparent poaching, and the suppression of poaching by the Alliance, ensured a net profit for participating factories.

Suppressing voluntary turnover: the Grade Wage

Although the public signal by the Registration System certainly provided one necessary condition for internalizing the poaching externality, the factories could not cooperate with each other if voluntary turnover occurred frequently. Because the Alliance could not determine the complete truth through private information, it was possible that a party was forced to pay unreasonable transfer costs when the turnover was voluntary. Therefore, frequent labour turnover might undermine any gain obtained from joining the Alliance. To maintain cooperation, the Alliance encouraged the parties to suppress their own voluntary turnover as much as possible. Through the Grade Wage, the factories were able to control the turnover rate and thus retain their profitability.

This wage evaluation system has the notable characteristic that factory managers evaluate each worker's performance *ex post* by comparing it with that of other workers in the factory. This comparison was on the basis of various factors, such as labour productivity, material productivity, and so on. During the 1900s, this system spread throughout the silk industry in Japan but was not adopted by any other industries. Economic historians have traditionally concluded that the system generated miserable working conditions entailing long hours and low wages that exploited workers.

However, in theory, Pareto-superior resource allocation can at times be achieved under relative performance evaluation. For instance, if worker performance were to depend on the quality of raw materials provided by the factory rather than on the workers' own efforts, then a more efficient allocation could be achieved by evaluating worker performance relatively. Since relative evaluation of performance can take into account common shocks that affect the

reliability of the input supply of the workplace, the calculation can relate effort to evaluation more accurately, and in effect, workers supply effort more efficiently. In the context of the silk industry at that time, there were good reasons to adopt relative performance evaluation. For instance, the cocoon cooking process had been separated from reeling and brought under the direct control of the factory manager.

Furthermore, to evaluate product quality, the market for silk applied a range of criteria, such as breaks, evenness, cleanliness, elasticity, tenacity, and so on. Hence, maintaining all aspects of product quality was so important that factory managers had to introduce different elements to the evaluation process in an attempt to control various aspects of worker effort. Thus, the Grade Wage is interesting as it is one of the few examples of an explicitly hedonic approach to evaluating manual workers' performance.

Kambayashi (2000) pointed out that relative performance evaluation may affect labour turnover and confirmed analytically as well as empirically that the Grade Wage had such an effect. Specifically, this evaluation could inhibit workers from quitting their jobs because of non-linearly advantageous situations that were biased in favour of more productive workers.

Because the Grade Wage suppressed labour turnover, the condition required for the Registration System to function effectively was satisfied, and the Alliance was able to stabilize the labour market.

The mechanism of the Grade Wage

In addition to the introduction of specific human capital, deferred payments were usually used to discourage workers from leaving their jobs. In modern labour markets in Japan, we sometimes observe upward-sloping age-wage profiles and lump-sum retirement allowances, and the Grade Wage included the mechanism of deferred payments in the respect that the wage was determined and paid *ex post*.

However, because of the lack of enforcement of the implicit contracts, we must not overestimate the imposition of deferred payments. First, the public court could not enforce the implicit contracts. Second, as female workers usually left the labour force after several years, firms could not maintain relationships with workers long enough to build reputations. Workers were therefore reluctant to accept deferred payment from firms that they knew little about. Thus, given the excess demand in the labour market and the practice of payment in advance, we cannot conclude that the Grade Wage affected labour turnover negatively because it was a system of deferred payments.

To understand the function of the Grade Wage, we have to realize that evaluation favoured the most proficient workers and thus could prevent such workers from quitting as effectively as could deferred payments. While this bias also provided incentives for inefficient workers to quit, managers could accept this if they attached more importance to keeping those workers who could contribute more effectively to profits. However, in turn, this indifference to inefficient

workers reduced their incentive to quit, because such an action no longer allowed them to improve their bargaining position. As a result, the Grade Wage succeeded in suppressing labour turnover overall.

Kambayashi (2000) examined this mechanism, using a two-period classical principal-agent model between a firm and two workers. In the first (trial) period, the worker, who accepts the contract to work, expends effort in the production process, which is unobservable by others, and in the interim the worker observes the outcome of the trial, which is public only within the factory. The worker can decide to quit or to stay at the end of the trial period, given the results of both workers. If both workers stay for the second (production) period, the production is repeated in the same way as in the first period, except that in this period, both workers know their opponent's past performance and can revise their expectation of their opponent's ability. Each worker earns a wage at the end of the production period that depends on the relative productive performance. If either worker quits, an anonymous worker who has left another factory randomly fills the vacancy without undergoing a trial period; that is, the new worker has no information about the opponent, while the incumbent worker knows that the new worker has quit another factory.

Kambayashi (2000) takes into account the workers' quitting behaviour. In this model, the opponent's outcome (that is, the revised expected ability of the opponent) creates three different situations that may generate labour turnover at the end of the trial period. First, if both workers choose to remain in the same factory, they can revise expectations about their opponent's ability according to the past outcomes. Second, a worker who quits will have no additional information about the opponent in the new factory since it is not known whether the new opponent is also a quitter. Third, a worker who chooses to stay while the opponent quits has the information that the new opponent is a quitter. The worker in the model chooses behaviour to maximize the expected payoff in each case.

The behaviour chosen by workers in equilibrium depends on the following parameters, the most important of which is (1) how workers estimate the expected ability of quitters in relation to the average ability of workers overall, and (2) how a worker estimates the expected ability of an opponent in relation to the average ability of workers overall.

For example, let us examine the case in which workers anticipate that the expected ability of quitters is below the average ability of workers overall (Case (1)). Based on the past performance of the opponent, the worker can revise expectations about the ability of the opponent. When this expectation is below average and the opponent also anticipates the expected ability of the worker to be below average, it will be too risky for the worker to quit and find a new opponent. This is because, with the current opponent, the worker is quite likely to win and very unlikely to lose. Since the opponent's reasoning will be the same, both will choose to stay in the same factory in this situation. This is, therefore, the Bayesian Nash equilibrium.

Labour turnover in the market changes completely depending on how workers anticipate the expected ability of quitters in relation to the overall average. In

Case (1) The expected ability of quitters is anticipated to be below the average ability of workers overall

	<i>The opponent anticipates the expected ability of the worker to be below average</i>	<i>The opponent anticipates the expected ability of the worker to be above average</i>
The worker anticipates the expected ability of the opponent to be below average	(stay, stay)	(stay, move)
The worker anticipates the expected ability of the opponent to be above average	(move, stay)	(stay, move) or (move, stay)

The behaviour of the worker and the opponent (in that order) is in parentheses.

Case (2) The expected ability of quitters is anticipated to be above the average ability of workers overall

	<i>The opponent anticipates the expected ability of the worker to be below average</i>	<i>The opponent anticipates the expected ability of the worker to be above average</i>
The worker anticipates the expected ability of the opponent to be below average	(stay, stay) or (move, move)	(move, move)
The worker anticipates the expected ability of the opponent to be above average	(move, move)	(move, move)

The behaviour of the worker and the opponent (in that order) is in parentheses.

Case (2), where workers believe the expected ability of quitters to be above average, workers belonging to one factory will simultaneously quit in virtually every situation. This case indicates a fluid labour market. In contrast, in Case (1), in which workers believe the expected ability of quitters to be below average, simultaneous resignations from one factory will not occur. Moreover, as the less able worker will quit if either of them tries to quit, this belief of workers will be confirmed *ex post*. The labour market in this case will be comparatively stable.

The empirics

The formal agreement of the Registration System

We now have a theoretical possibility that the Registration System and the Grade Wage together control the poaching externality by producing public

signals and suppressing voluntary turnover. In this section, we seek the empirical evidence to confirm the hypothesis. With regard to the Registration System, our first task is to examine the formal agreements of the Alliance to ascertain whether the Registration System was a true public third party, which the theory suggests.

Iwamoto (1972) and Takeda (1970) studied the formation of the Alliance, the organization that provided the Registration System. In the silk reeling industry in Suwa, a number of silk mills formed associations. Because the agreements between these associations date from the latter half of the 1880s, it is difficult to say exactly when the Alliance was actually formed. While researchers agree that the Alliance was formally established in 1901, it is generally thought that it began to function effectively in 1903, because until the implementation of the Registration System in that year, it was based solely on a gentlemen's agreement (Tôjyô 1990: 20).

Its purpose was to provide an annual register of the employer of each employee, especially females who worked at the reeling and re-reeling processes. To prevent employees from working for any other employer, the employment contracts were registered and were then recognized as a type of 'property right' within the Alliance. Any contractor (hereafter worker) who had been previously registered was known as a *Kyû Kenri* (Former Right Worker), and any worker who had never been registered was known as a *Shin Kenri* (Fresh Right Worker). If a factory employed an unauthorized worker, the secretary of the Alliance initiated a procedure to settle the violation of the property right (Tôjyô 1990: 24).²⁵

Formal rules for settlement were established. First, because the Registration System was a private agreement, it was assumed that conflicts would be settled principally within the Alliance, and there were strict prohibitions on taking problems into the public courts (Nakabayashi 2000b: 20).²⁶ Second, to resolve a conflict promptly within the organization, after 1907, the secretary of the Alliance was allowed to investigate and interview interested parties (Tôjyô 1990: 25, 47–9).

Third, when labour turnover occurred, a 'loan bill' was issued by the *move-in* factory to the *move-out* factory. As it usually did not contain the name of the particular worker, there was no guarantee that the worker in question would return to the original factory. Rather, the loan bill committed the *move-in* factory to cancelling future worker turnover in the opposite direction by guaranteeing to cancel any contract registered under the name of the *move-in* factory. Therefore, under this rule, the investment costs that the *move-out* factory had previously incurred would be compensated by another investment, which the *move-in* factory would incur in the future. Thus, the investment that had been appropriated by other factories would not be compensated at once but would be settled through the long-term relationship between the two factories. The loan bill rule institutionalized the strategic characteristics of *ignoring apparent poaching*, as described in the previous section.

This loan bill rule was essential to constructing a cooperative equilibrium strategy under private information. It seems to have been a consequence of trial

and error, as revealed in the changing process of formal agreements until 1908. In fact, when the institution was established, the agreements strictly prohibited the turnover of workers, and the Alliance determined in principle to force the *move-in* factory to discharge the worker in question and return her to the *move-out* factory.²⁷ However, in practice, the forced return of poached workers soon ceased and was replaced by the mutual loan bill rule (Tôjyô 1990: 28–46). Gradually, conflicts were settled by transactions under this loan bill, usually without pecuniary transfer, and the Alliance formally introduced the rule in 1908. Taking into account the ability of reinforcement by the secretary, we can recognize the learning process of formal rules in the Alliance, which had almost reached an equilibrium situation by around 1908.

The last feature of the formal procedures was that punishment was at the discretion of the Alliance. If the objective of the agreements had been to prevent poaching, the mediator should only have decided whether poaching had occurred, the Alliance then automatically applying the pre-determined punishment to the transgressor according to the mediator's decision. In reality, however, the Alliance applied the penalty at its own discretion, as explained below (Ishi'i 1972: 290).²⁸

Thus, the features of the formal agreements imply that, to maintain incentives for members to cooperate, the Alliance had to use loan bills to settle disputes and to apply its own discretion outside the public courts. Compared with the equilibrium strategy introduced in the previous section, the development of the formal agreements of the Registration System after 1908 was consistent with its strategic characteristics. In particular, the characteristic of overlooking transgressions using loan bills corresponds to the Alliance's practice of not immediately regarding labour turnover as a deviation from the agreements.

After the Agreement of 1908, the Alliance did not formally impose penalties on the *move-in* factory simply because labour turnover towards that factory was observed. Instead of enforcing pecuniary or human transfer, the Alliance introduced a loan relationship between the *move-out* factory and the *move-in* factory concerning workers, which substantially ignored labour turnover. Thus, parties punished their opponents only for offences about which they were certain, and they adjusted punishments according to how sure they were of those violations.

The statistical effect of the Registration System

Ishi'i (1971: 271) and Tôjyô (1990: 26) evaluated the Registration System's effectiveness statistically after it had been equipped with the appropriate formal agreements. First, Ishi'i reported increased retention rates of workers in some factories after the introduction of the System. For example, the retention rate of workers in Miyasaka Kiyonojyo's factory increased to 50 per cent in 1909, 62 per cent in 1910 and 59 per cent in 1911, compared with 20 to 30 per cent during the 1890s (Ishi'i 1972: 271).

Second, in the Suwa district overall, the average length of service of workers increased after the establishment of the Registration System. In 1901, the

proportion of workers whose tenure was shorter than two years was around 53 per cent. We cannot find figures for the years between 1901 and 1917, but after 1917, this proportion decreased drastically to around 20 per cent (Ministry of Agriculture and Commerce 1903; Nagano Prefecture 1917–31).²⁹

Third, by 1908, factories had largely adopted a stable employment adjustment method, decreasing the magnitude of aggregated labour turnover in the labour market of Suwa; this is now common in Japanese manufacturing. Kambayashi discovered several aggregated characteristics of employment changes in the silk reeling factories in the Suwa district between 1908 and 1933 by analysing job creation and destruction (Kambayashi 1999; Davis, Haltiwanger and Schuh 1996). In particular, he noted that the aggregated changes in employment in the existing factories, on average, were of a similar magnitude to those in manufacturing during the last quarter of the twentieth century in Japan, which is widely characterized as being stable. This is consistent with the micro behaviour of firms that were reluctant to poach.

Fourth, Figure 3.1 denotes ratios for short-tenured female workers, comparing the Suwa district with other districts in the Nagano prefecture. The figure shows that before 1923, the Suwa district had experienced a statistically significant reduction in the proportion of short-tenured workers (23.3 per cent on average) in comparison with the reduction in other districts (31.8 per cent on average).³⁰ In addition, at least until 1923, the pattern in the Suwa district was statistically independent of that in other districts.³¹ An investigation of a silk reeling factory in the Tokyo prefecture reported that the proportion of girls with less than two years' tenure was 30.6 per cent in 1919, which is as high as the proportion outside the Suwa area (Kyôchôkai 1921: 81). The peculiar trend in the Suwa district before 1923 reflects the unique factor there, namely the Registration System.

Although other factors, such as the presence of several large factories in the Suwa district, might partly explain the decline of the short-tenured workers in

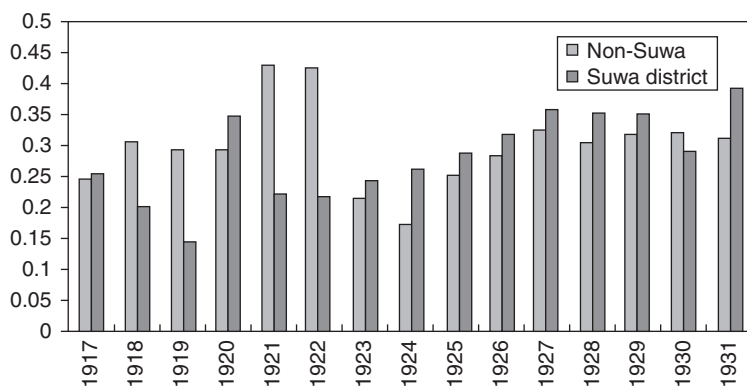


Figure 3.1 The ratios of short-tenured workers in the silk reeling industry of Nagano (source: Factory girls with less than two years' tenure in 'Nagano-ken Tokei Sho (Statistics of Nagano Prefecture)' (Nagano Prefecture 1917–31)).

Suwa, these cannot explain movements after 1923: the silk reeling factories in the Suwa district no longer had a distinctly stable work force compared with other areas. Between 1923 and 1931, the average proportion of short-tenured girls was 32.5 per cent in the Suwa area compared with 28.5 per cent outside the Suwa area.³² Moreover, these two time series were highly correlated over this period.³³ In addition, while the Registration System was formally abolished in 1926, some historians recognize that this system had become ineffective a few years before its official termination; that is, around 1923 (Tôjyô 1990: 38). This is consistent with the evidence presented in Figure 3.1. Overall, the statistical evidence does not reject the hypothesis that the labour market in Suwa had stabilized in the latter half of the twentieth century, and thus the Registration System was surely significant.

The Registration System covered a large proportion of female workers in the Suwa district. Table 3.1 shows the number of member factories and the estimated number of registrations in the Suwa district compared with available public statistics such as *Seishi Kôjyô Chôsa Hyô* (the Investigation Reports on Silk Reeling Factories).

From 1908, when the formal agreements provided sufficient tools for cooperation, the Alliance covered 80 to 90 per cent of factories and facilities and had registered at least 60 to 70 per cent of workers in the district.³⁴ At the same time, Suwa factories had gradually taken on a major role in production and in the labour market in the whole of the Japanese silk reeling industry. In 1917, no more than 101 workers were involved in conflicts in which a factory was publicly blamed for offending, which was less than 1 per cent of the number of registrations up to the repeal of the institution (Tôjyô 1990: 36).³⁵

In addition, there were few mistakes under the Registration System through the process of registration. Although employers could register contracts at any time during the year, most (70 to 90 per cent) did so between December and March. Until around April, the secretary of the Alliance checked for *Kenri Chôfuku* (Double Booking), when several employers simultaneously applied to register the same worker. Acknowledging the double booking, the secretary notified both employers by sending a *Chôfuku Tsûchi* (Notice of Double Booking).

Notices prepared by the secretary in 1903, 1904, 1905 (only until February) and 1909 reveal that the number of double bookings was 79, 72, 530 and 619 in these years, respectively. As the total number of registrations until March was 3,973, 3,756, 6,543 and 13,070, respectively, the corresponding rates of overlap were 2.0 per cent, 1.9 per cent, 8.1 per cent and 4.7 per cent.³⁶ These figures may display a somewhat upward tendency, but considering the small coverage of the Registration System in 1903 and 1905, which is indicated in Table 3.1, these figures imply that double bookings, which were mainly made by mistake, played only a minor role in relation to total employment. This evidence shows that the level of complaints about poaching was low after the Registration System was established.

Table 3.1 The coverage of the alliance in the Suwa District

The alliance in the Suwa district				The investigation reports on silk reeling factories ^a				The coverage of the alliance			
Factories	Cauldrons	Registration	Factories	Cauldrons	Workers	Factories	Cauldrons	Workers	Factories	Cauldrons	Workers
1900	—	—	n/a	11,607	8.9 ^c	13,097	10.5 ^c	—	—	—	—
1903	47	7,127	3,336	10,109	8.3	11,180	9.5	—	—	0.71	0.30
1904	63	8,229	3,376	—	—	—	—	—	—	—	—
1905	58	8,550	5,379	128	13,731	10.7	11.1	0.45	—	0.62	0.38
1906	64	9,616	7,969	—	—	—	—	—	—	—	—
1907	75	11,189	8,879	—	—	—	—	—	—	—	—
1908	71	12,236	10,772	127	17,683	11.5	11.8	0.56	—	0.69	0.57
1909	75	13,322	11,690	—	—	—	—	—	—	—	—
1910	114	15,826	14,236	—	—	—	—	—	—	—	—
1911	135	18,466	16,950	160	22,402	12.2	12.2	0.84	—	0.82	0.72
1912	157	22,209	19,620	—	—	—	—	—	—	—	—
1913	169	23,914	19,738	—	—	—	—	—	—	—	—
1914	186	26,235	22,729	—	—	—	—	—	—	—	—
1915	196	26,803	19,170	205	29,717	15.1	15.1	0.96	—	0.90	0.61
1916	207	28,600	26,080	—	—	—	—	—	—	—	—
1917	220	39,592	40,778	—	—	—	—	—	—	—	—
1918	218	33,614	26,204	262	39,586	14.8	14.8	0.83	—	0.85	0.62
1919	214	33,641	25,532	—	—	—	—	—	—	—	—
1920	204	34,417	30,673	—	—	—	—	—	—	—	—
1921	182	33,737	21,305	—	—	—	—	—	—	—	—
1922	185	33,045	25,168	254	38,199	13.1	12.8	0.73	—	0.87	0.67
1923	172	32,134	22,142	—	—	—	—	—	—	—	—
1924	173	31,896	19,319	—	—	—	—	—	—	—	—
1925	169	31,978	18,517	255	37,215	14.3	13.6	0.66	—	0.86	0.47
1926	183	32,176	8,621	—	—	—	—	—	—	—	—

Sources: The number of factories, cauldrons and registrations in the Alliance comes from Hirano Village (1932: 254–5).

Notes

a The statistics for silk reeling factories cover all factories larger than 10 cauldrons in Japan. See Kambayashi (1999: 56).

b Because only the whole number of registrations was reported, the registration figure for the district was estimated by multiplying the overall registration by the proportion of cauldrons within the Suwa district.

c National share.

The turnover rate and the Grade Wage

Kambayashi (2000) used data from the 'Tinginbo (Wage Book)' to determine which of the two cases actually prevailed in the Suwa district at the beginning of the twentieth century.

Table 3.2 depicts the result of the Wilcoxon rank sum test. This illustrates that since 1908, when the Registration System prepared the formal Agreements concerning loans and had begun to function effectively (as shown in the previous section), turnover rates had decreased and the average ability among quitters was below average.

This empirical result implies that relative performance evaluation successfully suppressed labour turnover, which suggests that the Grade Wage System laid the foundation for coordination by the Registration System.

An example of the penalties

We have shown that the formal rules provided the strategic characteristics for cooperation and that the statistical evidence suggests the effectiveness of the Registration System and the Grade Wage. However, the proposed statistical evidence is at most *indirect*. To reinforce the argument, we now provide historical

Table 3.2 Comparison of workers' ability between stayers and quitters: Wilcoxon rank sum test

		<i>Number of observations</i>	<i>Average rank</i>	<i>Z value</i>
1904*	quitters	28	69.11	-2.32
	stayers	151	93.87	
1905	quitters	28	114.63	1.99
	stayers	162	92.19	
1906	quitters	28	65.43	-0.46
	stayers	108	69.30	
1907	quitters	36	95.25	-1.21
	stayers	176	108.80	
1908*	quitters	41	90.23	-2.35
	stayers	181	116.32	
1909*	quitters	75	139.12	-4.01
	stayers	289	193.76	
1910*	quitters	59	144.53	-4.37
	stayers	355	217.97	
1911*	quitters	107	205.20	-2.63
	stayers	363	244.43	

Source: Kambayashi (2000: 135) appendix.

Note

* present quitters who were less able than stayers at 5% significance.

evidence that the actual behaviour of players was consistent with the equilibrium strategy, by examining the process of disputes and their settlement.

Having received a Notice of Double Booking, parties were obliged to seek agreement between themselves, and if they agreed, they were to inform the secretary within a given time which party would renounce its application. If they could not reach agreement, each dissatisfied party had to provide documents outlining its own case to the secretary. If the double booking was successfully resolved at this stage, the non-entitled party simply reported its renunciation and neither the negotiation process nor the terms of the agreement was disclosed to the secretary. However, when a disagreement was reported to the Alliance, the secretary investigated the situation, interviewed concerned parties, suggested voluntary reconciliation, and sometimes applied penalties to the transgressor if evidence of offending was apparent.

Conflicts were misunderstandings about the allocation of rights within the Registration System. Therefore, to achieve a settlement, the first step was to decide which party had the formal employer's right over the worker in question. If the determined formal allocation differed from the actual situation, compensation was negotiated to fill the gap.

When the source of conflict was the Notice of Double Booking, both parties could assert their own rights in the Alliance. Although the agreements gave priority to a factory that had registered first as a Fresh Right or previously as a Former Right in principle, there were conditions and exceptional provisions. For example, the assertion of a Former Right required that the worker had actually worked in the factory for at least five days during the period of the former contract.³⁷ In any case, as a valid employment contract had to be made between a factory and a person having parental authority over the worker, these contracts should have become invalid in terms of employment when parental authority changed; that is, when the worker in question was somehow deleted from the *Koseki* (the public family register).³⁸ For instance, a factory could no longer assert its priority over a worker who was married or who was adopted as a daughter. Moreover, if the entitled factory was closing, the non-entitled factory was free to employ that worker.³⁹

In addition to these conditions and exceptional provisions in the agreements, imperfect information and strategic behaviour made even formal rights allocations vague in many cases, leading to conflict in the Registration System. For example, it was not easy for a factory to confirm that a worker had actually worked in another factory during the previous year. Trouble also arose if a marriage or adoption was hidden by other factories in order to cancel the priority. The Alliance had to verify the situation and determine the appropriate formal allocation of rights.

When conflicts arose, the secretary generally recorded the names of the concerned parties, an outline of the case and the result of conciliation or penalty in the *Kôshô Roku* (the Records of Negotiation, hereafter the Records). At the same time, details of negotiation and investigation in each case were recorded in the *Torishirabe Hikki* (the Notes of Search, hereafter the Notes) (Iwamoto 1969; 1970).

To see how the Registration System worked, it may be useful to look at the following case from 1915, which demonstrates the negotiation process and illustrates the relationship between the Registration System and the public courts. As already mentioned, taking conflicts to the public courts was strictly forbidden in the Registration System: the fact that none of the disputes documented in the Records and the Notes for 1911 was dealt with by the public judicial system, at least by the Kami-Suwa branch of the Nagano District Court (Oishi 1972: 91),⁴⁰ indicates the System's success in keeping conflicts out of the public courts. This case is exceptional in that the parties contested at law in the public court as well as in the Registration System, offering useful experimental material for investigating the relationship between the private and public institutions used to regulate labour markets. This case, which is recorded in both the Records and the Notes for 1915, was contested between factory A and factory B and concerned the employment of Worker N from the Masuda district in the Gifu prefecture.⁴¹

The conflict arose when worker N left factory A and asked factory B to employ her on 10 March 1915. Factory B had already registered the employment of worker N on 23 July 1914, and therefore, according to Former Rights, had priority to employ her in 1915. However, N married on 11 January 1915 and the Alliance cancelled factory B's priority.

Subsequently, factory A made a contract with the representative of worker N, which was registered on 13 January 1915. After all, worker N had left factory A, having worked there for only two months, and was asking the employer originally entitled to employ her to do so. Although factory B initially respected the rights of factory A and hesitated to employ worker N, the worker admitted that her marriage in January had been a sham, conducted simply to cancel the priority of factory B. Informed of the situation, factory B brought an action in the Alliance (see Figure 3.2).

The secretary began to investigate this case according to the appeal of factory B. The Alliance sent a clerk and an observer to worker N's home district of Masuda to interview her parents and relatives and to check the legality of her marriage in the Takayama branch of the Gifu District Court. They found that this case had begun retrospectively on 24 January 1914, when worker N had made an employment contract with factory A in the name of her father, M, with joint and several surety, M'. This contract included a clause specifying a 95-yen penalty for a breach. At the same time, factory A had lent 35 yen to M as an independent loan contract. However, in 1914, N left factory A after having worked there for only a short time and asked factory B to employ her. Because factory A had somehow failed to register worker N, factory B could easily employ and register her (23 July 1914). Although factory A was dissatisfied, the Alliance saw no justification for protecting factory A's contract or assisting in negotiations between factories A and B. Consequently, factory A decided to sue M for the contracted 95-yen penalty in the Suwa branch of the Nagano District Court.

As shown by Nakabayashi, lawsuits brought by factories against workers for contracted penalties were generally decided in the defendant's absence

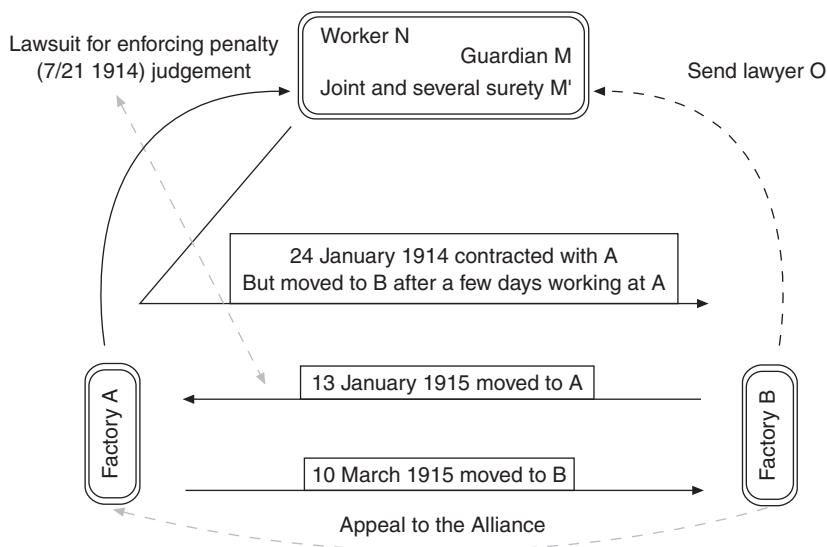


Figure 3.2 The case concerning Worker N.

(Nakabayashi 2001; 2000b).⁴² This case was publicly contested because the defendant claimed, with the help of lawyer O, who was sent by factory B, that the employment contract with factory A no longer applied. In this case, the defence was not accepted, and the court ordered M and M' to repay factory A up to 50 yen as a penalty for the breach.

Although factory A was entitled to repayments from M and M', neither was able to pay. Moreover, factory B did not have sufficient incentive to shoulder the debts at the time when worker N herself had already come to Suwa and actually started to work in that factory. In fact, in negotiations with M', factory B briefly refused to release worker N to factory A (Iwamoto 1970: 75). Distressed by this rejection, M' asked factory A to remit debts incurred as a result of worker N's marriage and her return to work in factory A.

The Notes raise two issues concerning this case: whether N's marriage was a sham, and, if so, whether factory A (or its employment agency) was involved in the cover-up. On the first issue, the secretary concluded: 'The marriage in question was an exceedingly obvious deceit' (Iwamoto 1970: 79). Several reasons were given. Although the marriage was certainly lawful, there was enough evidence that worker N, her mother, her sister and her relatives were all aware of the camouflage, which intended to cancel the priority of factory B. Furthermore, both the father and the husband confessed that they were not at the wedding ceremony. Given this testimony, factory A had to agree that the marriage was invalid within the Alliance and had to begin settlement negotiations based on the premise of non-entitled employment (Iwamoto 1969: 93).

In the negotiation process, the second issue was likely to have been the most

crucial but is ambiguous in the Notes. The employment agent of factory A denied involvement in worker N's deceit and testified as follows.

I did not negotiate to contract in return for the former contract. As a matter of fact, as the father of the husband told me that she had married, I simply believed her. If the marriage had been by guile, I should have been totally cheated by him.

Likewise, the head of the employment agency disclaimed any responsibility for the deception (Iwamoto 1970: 80).

In the end, factories A and B settled this case under the following conditions: factory A would pay 100 yen to factory B, factory A would issue one loan bill to factory B, and factory A would acknowledge the *de facto* employment by factory B of two workers, including worker N. Moreover, factory A had to promise to postpone M's debt of 50 yen for three years. These conditions were as severe as the penalties for intentional breaches of Alliance agreements. The Notes report nothing about the settlement negotiations after interviews with factory A's employment agent. However, we can clearly see that the root cause of this case was factory A's failure to register worker N. This failure led factory A to appeal to the public courts and resulted in an excessively severe sanction against M. Eventually, this heavy debt led the household to pursue the sham marriage. Factory A's behaviour in this sequence of events should have been disallowed at no cost to the Alliance.

This example shows that the Alliance applied a severe penalty once intentional offences had been revealed and that it adjusted penalties in opposition to the public courts with respect to the denials of lawful marriage and the postponement of legally justified debts.

Concluding remarks and discussion

As a private institution established to govern poaching externalities, the Registration System of the Silk Reeling Alliance of Suwa was remarkable in Japanese economic history in its effectiveness as well as in its creation of the loan bill rule. To overcome the poaching problem, which was caused by the necessity of *ex ante* sunk cost as well as the commitment problem that could not be resolved by the public courts, the factory managers had to construct a private agreement not to poach workers from each other and had to introduce some device to suppress voluntary turnover by workers. However, imperfect information and frequent turnover prevented them from using a simple multilateral punishment. To make the collective punishment effective, it was necessary for them to create a public signal to indicate poaching. On the one hand, the Registration System and the rule for settlement in the Alliance institutionalized strategic characteristics such as interpretation by the Alliance and the overlooking of apparent poaching. On the other hand, the Grade Wage generated an environment in which workers recognized that voluntary turnover was expensive.

Clearing-house?

The loan bill essentially played the role of an 'indulgence' for unintentional mistakes, because there was no obligation to pay any money. It was used to guarantee formally the right of employment within a particular bilateral relationship, which naturally led factory managers to want to settle their debts and assets multilaterally or monetarily at any time. However, we could find no evidence of such triangular transactions or monetary transfers within the Alliance. Although the Alliance sometimes tried to settle the stock of loan bills fiscally, its attempts were intermittent and undertaken only three times during its history. It failed to establish a standing clearing-house for loan bills. This suggests that there may be a substantial difference between establishing a right and transacting it.

From the point of view of securing human capital investment, it may have been reasonable to transact the loan bill fiscally to transfer the right to derive profits from investments in workers at the time when those employees moved to another factory. This transaction, if feasible, would have meant that a security for human capital was exchanged to achieve the efficient allocation of human capital. Nakabayashi (2000b) was the first to attempt to apply this idea to the Registration System. While, as he notes, the Registration System may have been the first step towards a human capital stock exchange, the failure of the Alliance to take further steps reveals the fundamental difficulty of trading human capital to achieve the *first-best* allocation, compared with the *second-best* allocation, which is the most that the suppression of poaching externalities would have achieved. Further investigation of the historical evidence may explain the absence of a human capital stock exchange, which seems to be economically efficient, as, for example, is the New York Stock Exchange.

Other examples

Although researchers do not explain why private attempts by other industries to prevent mutual poaching failed, as shown above, the comparison with the Alliance has some implications.

First, in such industries as cotton spinning, the Navy's factories and the steel industry, the geographical location of establishments was widespread, which generated informational imperfections. For example, the main cotton spinning factories that joined in the Central Agreement were scattered across the whole of the Osaka plain and were tens of kilometres apart. The Yahata steel industry was almost 100 kilometres away from the Yokosuka Navy Factory. On the other hand, the factories belonging to the Silk Reeling Alliance of Suwa were concentrated in the Suwa basin, which has a radius of several kilometres.

Second, the agreements were essentially the nexus of bilateral accords and did not establish a standing third party. The Cotton Spinning Union lacked a central registration system, and each factory had to circulate information about newly employed workers to all other factories. As major factories usually

employed over 1,000 new workers each year, these procedures for sharing information would have been costly.

Third, the agreements may not have been enforceable because punishments were insufficient. In fact, during the 1896 dispute between Kanebo and some factories in Osaka, the latter collectively brought pressure on wholesalers and raw material merchants not to trade with Kanebo. However, Kanebo mounted a counter-offensive against the Osaka factories in cooperation with its main bank. The collective punishment by the Osaka factories was not sufficient to cause Kanebo to surrender. This shows the difficulties involved in resolving poaching externalities and the effectiveness of the Alliance in relation to collective punishment and public signals.

Interestingly, the above industries, which had failed to cooperate at the beginning of the twentieth century, contributed to Japan's economic growth *after* the 1920s. Until the First World War, the country's economic growth had depended mainly on the export of silk. A further issue for the above industries, then, is how they solved the problem of cooperation and began to contribute to economic growth.

Abolition of the Registration System

Following government intervention, the Registration System was formally abolished in 1926. After the First World War, the Ministry of Home Affairs, which was in charge of labour issues and was familiar with the concept of the welfare state, supported policies to protect workers. 'Progressive' bureaucrats regarded the Registration System as a feudalistic relic that obstructed the liberal labour market (Takeda 1970).

However, it seems that economic factors also contributed to the decline of the Registration System, which had lost its effectiveness from at least around 1923 (Tōjyō 1990: 71–5). In fact, Figure 3.1 confirms that changes in the service length of the labour force ceased around 1924, from which time the labour market of Suwa seemed to be highly correlated with those of the other districts.⁴³ This figure also shows the rising proportions of short-term workers. Considering the conditions required to maintain cooperation, for example, that the probability of mistakes (the voluntary turnover of workers) should be within a certain range, these observations imply that the Registration System had lost its effectiveness before its formal abolition because of increasing voluntary turnover.

In addition, although the efficient labour transactions governed by the Registration System had provided the foundation for economic competition, these conditions by no means guaranteed the success of Alliance members. As a result, disparities between them may have increased in the 1920s. While three of the largest members of the Alliance shared 36.4 per cent of the cauldrons in 1908, they shared 52.3 per cent in 1926. The largest company in the Alliance, Katakura-Gumi, had grown from 3,536 cauldrons (17.4 per cent) in 1908 to 17,698 (22.8 per cent) in 1926 and had apparently been developing internal labour markets since the latter half of the 1920s. Introducing automatic reeling

machines, resulting from R&D investment, the company gradually converted the piece rate into a fixed wage based on seniority. In effect, some large factories offered apparently superior labour conditions to workers and unilaterally issued loan bills during the latter half of the 1920s. In addition to the popularization of public education, which meant that factories did not have to incur investment costs, biased long-term transactions in terms of loan bills, which derived from the success of the Registration System itself, may have undermined cooperation (Greif 2002).⁴⁴

After the end of the first decade of the twentieth century, labour turnover in the Suwa district declined so dramatically that efficiency in the labour market was achieved. This chapter suggests that the efficiency-enhanced stability in the labour market was due to one institution, the Registration System, which prohibited mutual poaching. Based on an employers' organization, the credible agreement led factories to bear the investment costs of human capital efficiently through the nexus of rules and the ability of a third party to provide public signals.

The twentieth century was certainly the 'human-capital century' in that the wealth of nations depended heavily on 'capital embodied in people' (Goldin 2001: 264). While Goldin stresses the role of formal education in the accumulation of human capital, employers also invested in the human capital of employees. Especially in developing economies, opportunities and funds for employers to undertake human capital investments may be vital as a source of economic development because workers are often prevented from undertaking this investment because of a lack of liquidity. Historical evidence from the Japanese economy shows that, despite laws and political institutions, price mechanisms did not always protect employers' investments, and accordingly, private institutions evolved to maintain economic growth through human capital accumulation.

Notes

- 1 This chapter was written while visiting Stanford University, Stanford, CA, USA. I am grateful for their hospitality, which greatly facilitated this research. I wish to thank Avner Greif, the late Tsuneo Ishikawa, Masaki Nakabayashi, Tetsuji Okazaki and Keijiro Otsuka for helpful remarks. A previous version of this chapter benefited from the comments of participants in seminars held at Stanford University, University of Kyoto, University of Tokyo, Tokyo Metropolitan University, the Statistical Research Center at Shin-bashi, Hitotsubashi University and the University of Osaka. I gratefully acknowledge the support of the Grant-in-Aid for the 21st Century COE 'Microstructure and Mechanism Design in Financial Markets', and for Young Scientists (B) 15730123 from the Ministry of Education, Culture, Sports and Technology (MEXT) of Japan. In this chapter, the pronunciation of the names of persons, documents and institutions are expressed by *Romaji* basically according to ISO3602, with the English translation following in parentheses.
- 2 Many researchers on Japanese economic history have pointed out that aggregate real wages did not increase until the First World War, and that at the same time, there were conflicts over the recruitment and turnover of workers in particular areas and occupations, sometimes involving violence. See, for example, Saitô (1998: 19–20).

- 3 There was a fundamental difference between the markets in Europe and those in the United States in the evaluation of the quality of raw silk. In 1879, *The Silk Goods of America* stated that, 'the contrast between the raw silk used here [the US] and that which serves for making the same kind of goods in Europe, is very striking. What our manufacturers would regard as "poor silk", worth perhaps one dollar per pound less than the best, would be accounted very fair silk for delivery to the European weaver. The reason on the part of our manufacturer for choosing the best raw material, at a necessarily high price, may be very easily stated; his experience has taught him that the best is cheapest. All the processes from first to last by which an inferior article can be made to appear equal to that of a higher grade, are costly in labor' (Wyckoff 1879: 25).
- 4 According to the estimation by Ishi'i (1971: 261), employment in Suwa maintained a growth of almost 8 per cent per annum between 1883 and 1910.
- 5 Because Ishi'i identified personal names of workers on wage accounts, these figures represent exact retention rates. The Ministry of Agriculture and Commerce (1903: 67–8) reported that the retention rate for newly employed workers in two cotton spinning factories in 1900 was 29 per cent and 23 per cent respectively. According to Hyôdô (1971: 126), the ratio of the number of separated workers to the total number of workers at the Mitsubishi Nagasaki Shipyard at the end of the year was 82 per cent in 1898, 67 per cent in 1899, and 60 per cent in 1900.
- 6 This document also reports that in 1901, 70 per cent of female workers in weaving factories (pp. 267–8), 66 per cent of female workers in cotton spinning factories (p. 70), and 59 per cent of male workers in steel factories and shipyards had less than a two-year tenure (p. 11).
- 7 On the contrary, Masaki Nakabayashi argued that the orders by public courts were probably enforced without any commitment problem and hence the Coase Theorem can be used to examine the judicial decision of labour contractual disputes: see Nakabayashi (2001), (2000b) and (forthcoming).
- 8 The poaching problem implies inefficiency in labour markets in terms of underinvestment in workers. However, it was common practice among factory managers to stress publicly that transient workers lowered a factory's output and thus to attempt to regulate these itinerant workers: see Uno (1916) and Hazama (1984). Indeed, through careful econometric analysis of the data on workers in the cotton spinning industry, Saxonhouse (1977) showed that productivity increased in proportion to the length of time worked. Although this evidence does not apply directly to the silk reeling industry, factories might have lost potential productivity gains through frequent worker turnover.
- 9 For a recent investigation, see Acemoglu, Johnson and Robinson (2001).
- 10 Recently, Genesove and Mullin (2001) examined the empirical relationship between communication and collusion in the sugar industry.
- 11 Researchers have investigated the role of exchange markets such as the New York Stock Exchange from the viewpoint of promoting efficiency-enhanced transactions, although they have concentrated on the formal aspects of the institution. For example, see Banner (1998).
- 12 Elbaum (1989: 337) concluded, 'Understandably, U.S. employers refrained from making training investments in potentially mobile apprentices'. However, Hamilton (1995; 2000) questioned the importance of the 'runaway problem', based on the contractual data in Montreal, because employers could use the enforcement mechanism through parents. As for the contractual aspect in the US labour market, see D. Jacoby (1991b).
- 13 For example, some research has addressed the rise and fall of primitive unionism by focusing on insiders and bargaining within single firms, considering just a few factories in heavy industries (which were by no means the leading industries in Japan until the late 1920s): see Hyôdô (1971) and Odaka (1984). Moriguchi (2000) re-examined this thesis, stressing the role of wartime political intervention during the 1930s.

- 14 Although the Civil Code, drafted by French jurist Gustave Emile Boissonade, was legislated in 1890, enforcement was postponed until 1899, primarily because of the controversial treatment of the family law.
- 15 We now have many definitions of institutions (Greif 2002: 3–3). For example, North (1991: 97) defined institutions as ‘the humanly devised constraints that structure political, economic and social interaction’. On the other hand, Williamson (1985: 1) declared that ‘[the economic] institutions have the main purpose and effect of economizing on transaction cost’. Greif (1994: 943) stressed that, ‘Given the technologically determined rules of the game, institutions – the non-technological constraints on human interactions – are composed of two interrelated elements: cultural beliefs and organizations’. While this article concentrates narrowly on a particular labour transaction in one small area during one period and involving one sort of labour, such a narrow focus is empirically significant in observing the private efforts necessary to construct a labour market. Therefore, our definition of institutions seems to be most similar to Williamson’s because the institution that governs particular transactions in the labour market is primarily represented by artificial rules and its organizational enforcement mechanism as to human behaviour, leaving the role of beliefs unclear.
- 16 For example, Booth and Snower (1996) collected several articles that analyse European labour markets in the last quarter of the twentieth century from the viewpoint of poaching externalities. For institutional arrangements in European countries, see Marsden (1990).
- 17 Strong wrote, ‘In spite of the many mechanical devices and improvements brought out in the last few years, the success of the reeling operation is still dependent on the reeling girl’s ability and care. It is particularly important that she be able to judge the number of cocoons of a certain size and texture needed to make a thread of the required denier’.
- 18 According to Kambayashi (1999: 60–2), at the beginning of 1908 there were 127 factories in the Suwa district, and during the subsequent three years, 52 new factories opened and 17 closed. From the beginning of 1911, these figures were 162, 66 and 23, respectively. Between 1908 and 1918, jobs created by newly opened factories accounted for over 50 per cent of the increase in gross employment on average. On the other hand, jobs lost owing to factories closing account for about three quarters of the gross decrease in employment. This underlines the importance of opening and closing activities in the Suwa district.
- 19 Between 1908 and 1918, the average number of workers per silk reeling factory in the Suwa district was approximately 150.
- 20 Apart from advantages in terms of quality control and joint shipping, the re-reeling process had a technological benefit because it dried the raw silk, preventing deterioration in quality during transportation.
- 21 In the Japanese silk industries, the cocoon drying process was generally executed within the reeling factories, because unified drying in bulk affected product quality, especially in terms of uniformity. Therefore, cocoons had to be transported from farming areas to factories uncooked, and a delay in delivery due to crowded conditions may have substantially damaged cocoons.
- 22 For example, the conflict recorded in ‘The Notes (Vol. 1)’ (Iwamoto 1969), pp. 96–7 shows one factory employed a worker, mistaking her for her sister. For similar cases, see ‘The Notes (Vol. 1)’ (Iwamoto 1969), pp. 82, 90, ‘The Notes (Vol. 2)’ (Iwamoto 1970), pp. 51–4.
- 23 Originating in the seminal article by Stigler (1964), this class of game was first considered by Green and Porter (1984) to model pricing by an oligopolistic cartel with an imperfect but public signal. The framework has been generalized, which led Abreu, Pearce and Stacchetti (1990) to prove the Folk Theorem. Recently, the literature has been extended to private monitoring: see Kandori (2001). Kandori and Matsushima (1998) proved the importance of voluntary communication in cooperation.

- 24 Clause 16 of 'The Agreement in 1903' (Hirano Village 1932: 252). The research costs of the Alliance were basically borne by the 'incorrect' party (Tôjyô 1990: 117).
- 25 The Fresh Right was introduced in 1903 by Clause 4 of 'The Agreement in 1903' (Hirano Village 1932: 252). The Former Right was introduced in 1905 by Clauses 2 and 4 of 'The Agreement of the Alliance: enforced in 1905' (Tôjyô 1990: 24).
- 26 Clause 11 of 'The Agreement of the Alliance: enforced in 1902' (Nakabayashi 2000b: 20).
- 27 Clause 4 of 'The Agreement in 1903' (Hirano Village 1932: 252).
- 28 Yamaichi-Hayashi was threatened with expulsion from the organization, the Alliance's severest punishment, once during its history, in 1910. In this case, because the factory apologized and promised to obey the Alliance on the following day of the resolution, the expulsion was not effected. At the time of the apology, an influential bank acted as intermediary, indicating that it was likely that the violator would face bankruptcy if he accepted the expulsion: see the role of the silk associations shown in the fourth section.
- 29 Ministry of Agriculture and Commerce (1903) for 1901 and Nagano Prefecture (1917–31) for after 1917. The figure in 1901 represents the aggregated number of factory girls in Kami-Suwa and Shimo-Suwa. The figures after 1917 come from the aggregated number of factory girls in silk reeling in the Suwa district.
- 30 The p-value for the t-test under the null hypothesis that the averages of the two series are equal is 0.09.
- 31 The correlation coefficient is -0.16 and is not statistically significant.
- 32 The increase of the average in the Suwa area is statistically significant (given a p-value for the t-test of 0.01), while the variation in the non-Suwa area is not statistically significant (with a p-value for the t-test of 0.37). In effect, the two averages do not have a significant difference after 1923. (The p-value for the t-test is 0.02.)
- 33 The correlation coefficient is 0.78 and is statistically significant.
- 34 Although the Alliance limited its membership to the factories in the Suwa district, when members ran multiple factories, managers had to register all of them, regardless of the location. As the number of registrations in the district is estimated from the proportion of cauldrons, these numbers may be underestimated. Compared with factories within the Suwa district, factories outside the district, especially outside the prefecture, may not have had strong incentives to register their workers because of the difficulty of communication and weak competition.
- 35 Unfortunately, the figures on these conflicts before 1908 were ambiguous because of the omission of evidence.
- 36 As the Agreement had not legislated 'the Former Right' until 1905, the numbers before 1905 include only double booking between 'Fresh Rights'.
- 37 Clause 2 of 'The Agreement in 1903' (Hirano Village 1932: 252).
- 38 Clause 3 of 'The Agreement in 1903' (Hirano Village 1932: 252).
- 39 Clause 3 of 'The Agreement in 1903' (Hirano Village 1932: 252).
- 40 Labour contracts usually included a clause that specified the place of courts in case of dispute. In the case of Suwa, they usually used the stylized contractual form, which the Alliance recommended, that specified this branch. Therefore, we can confirm the historical record by comparing the case as documented in the Records and the Notes with the 'Minzi Hanketsu Genpon' (Original Book of Decision), which included all decisions of the branch. The original decision of this case is preserved in the Faculty of Law at the University of Tokyo.
- 41 To protect privacy, real names are not provided.
- 42 In these cases, Nakabayashi inferred there would have been an out-of-court reconciliation between the plaintiff factory and the factory to which the worker had moved. Hence, most decisions of the public courts upheld the plaintiff's claim in the absence of any defence. He concluded that the labour market of the Suwa district could basically achieve the *first-best* allocation only by the public courts following the Coase

Theorem. However, taken together with the rare pecuniary transfer within the resolution in the Registration System as well as the possibility of commitment problems, his premise of efficient out-of-court reconciliation is speculative.

- 43 Figure 3.1 shows that between 1923 and 1931, the average proportion of short-tenured workers in Suwa had risen to 32.5 per cent, while that in other districts had remained at 28.5 per cent. This indicates that after 1923, employment in other districts was more stable than in Suwa. At the same time, the correlation coefficient between the two ratios was as high as 0.73.
- 44 Greif stressed the self-organized dynamics of institutions, using the concept of 'Self-reinforcing and Self-destructing'.

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4 Personnel management and the formation of modern business organisation

The railway industry in Japan before the First World War

Naofumi Nakamura

Introduction

The purpose of this chapter is to present the history of organisational reforms in Nippon Railway Co., the largest railway company in Meiji Japan, focusing mainly on the relationship between the personnel management and the internal organisation of the company. Through this work, I intend to have some insights into the background and implications of the formation of modern business enterprises in Japan.

In the seminal work *The Visible Hand*, which discusses the development of the modern business enterprise in the US, Chandler summarises the characteristics of the modern business enterprise into two points: (1) it consists of multiple distinct operating units; (2) it is managed by a hierarchy of salaried executives (Chandler 1977: 1). Based on those observations, he vividly depicts the process of the emergence of the first modern business enterprise and the class of salaried managers in the US railway industry. In particular, the decentralised divisionalised structure introduced by J. Edger Thomson in 1857 to the Pennsylvania Railroad was an epoch-making event in the history of the modern business enterprise. According to Chandler, the Pennsylvania Railroad was the first American business to work out fully the line-and-staff concept of departmental organisation (Chandler 1962: 38). In the process of development and diffusion of this organisational form, the class of salaried managers was formed in the US, and accounting skills for managing organisations were developed, thus shaping an archetype of the modern business enterprise (Chandler 1977: 105–21).

As Chandler notes, due to industrial characteristics such as the large scale of capital investment, diversity of functions and the complexities in managing them, and sizeable geographical area, the railway industry led the formation of the elements of the modern business enterprise, including salaried managers and hierarchical management organisation, in addition to the use of multiple business units. Consequently, as Oliver Williamson discusses, in order to cut ballooning operational costs incurred by the unitary form (U-form) of functional organisations, multidivisional organisations (M-form) emerged (Williamson 1975: 133–6).

However, as Chandler himself noted, this decentralised divisionalised structure was not universal in the railway industry around the world. It is necessary to note that even in the US the structure was applied only to 'long distance, heavy traffic' railways (Chandler 1977: 106–7), and when strategic management decisions, such as the building of new railway extensions, were needed. In fact, in Great Britain, Germany and Japan, the basic organisation of railway companies was functional organisation, and the decentralised divisionalised structure was not diffused even in the beginning of the twentieth century (Channon 2001: 142–7; Yuzawa 1988: Chapter 6; Kocka 1992: Chapter 6). Hence we need to examine the reasons why a specific company adopted the decentralised divisionalised structure in a specific time period by investigating not only changes in the external environment such as in the market, but also by investigating the internal issues of the company. Regarding these points, Chandler also made a detailed examination of the developmental process of decentralised divisionalised structures, mainly using the case of the Pennsylvania Railroad. However, as many researchers have pointed out, he excluded important aspects of business management, including personnel management and industrial relations, from his analyses; thus he makes no mention of inherent aspects of organisational reform (Lazonick 1990, Suzuki 2000 and Taniguchi 2002). However, as this chapter shows with respect to the case of the Nippon Railway Co., personnel management was one of the determinants of the organisational structure. Nippon Railway Co. adopted an American-style decentralised divisionalised structure in 1903 and became the pioneer of modern business enterprises in Japan.

Nippon Railway Co. was established in 1881, capitalised at 20 million yen with an 8 per cent dividend guarantee from the government. A total of 557 miles of railways was planned, between Ueno and Takasaki, and between Omiya and Aomori. The company contracted with the Imperial Government Railway to construct railways, and to provide engine drivers and track maintenance, from the establishment until the opening of the planned railways. However, taking advantage of the opportunity of the full opening of the railway in 1892, the company cancelled the contract with Imperial Government Railway and gained managerial independence (Nakamura 1998: Part 1). Along with the development of its business, the company implemented several organisational reforms until it was nationalised in 1906, and it continuously led the development of railway company organisation throughout the period. In particular, the development of a hierarchical functional organisation from 1892 to 1899, and the introduction of a decentralised divisionalised structure in April 1903 were innovative organisational reforms, which influenced not only the railway industry but also other industries in Japan. Hence, the development of business organisation in Nippon Railway Co. is an important research subject not only from the perspective of the history of the railway industry but also from the perspective of management history in Japan.

However, we have few studies on organisations in railway companies from those perspectives (Yuzawa 1992: 264–5). Even with regard to the introduction of the decentralised divisionalised structure in Nippon Railway Co., only a

biography of Eitaro Yamada (a section chief of the General Affairs Section in Nippon Railway Co. in 1903), one of the leaders who led the organisational reform, examines the process of the reform and Yamada's role in it (Yamada Eitaro Den Hensan-iinkai (ed.) 1995). Therefore, focusing on the organisational reforms of 1899 and 1903, this chapter attempts to (1) chronologically describe the process of organisational reforms and (2) elucidate trends inside the organisation, focusing on personnel management before and after the organisational reforms. With regard to (2), using employees hired by the headquarters, who were at the core of the business organisation, as the main research objects,¹ I will analyse personnel transfers before and after the organisational reforms, focusing on (a) changes in the ranking system; (b) changes in trends of hiring and firing; and (c) methods of transfer and promotion, and consider the background and influence of the decentralised divisionalised structure in Nippon Railway Co.

The major data source used in this chapter is the Nippon Railway employee database, which is newly compiled and contains 28,067 sets of the panel data of employees hired by the headquarters for 1898, 1899, 1900, 1901, 1902, 1903, 1904 and 1906. It is based mainly on three sources: 'Shokuinroku (Staff list) 1898–1901'; 'Shahō (the company's in-house magazine) 1902–4'; and 'Kaisan irōkin haibun tenmatsu hōkokusho (A detailed report on bonuses distributed upon liquidation) 1906'. Advantages of this data set are that it includes data on individual names, division/section, work location, job, status and salary (except for 1906) at the end of each year, and that personnel changes such as hiring, resignation, salary increase/promotion and change of surname are recorded from 1902. On the other hand, the data is limited to employees who were hired by the headquarters. Nevertheless, employees hired by the headquarters were the core of railway business management during this period,² thus this data set is sufficient for examining the issues raised in this chapter.

Formation of the functional organisation

Managerial independence and business organisation in Nippon Railway Co.

In April 1892, the railways of Nippon Railway Co. reached Aomori (at the north tip of the Honshu, the main island of Japan), which meant that all of the lines which the company planned when it was established were completed. Then, Nippon Railway Co. cancelled the contract with the government to operate the railways and started controlling overall management by itself. With this change, the company, which had had only non-operational sections (General Affairs, Accounting and Purchasing), had to establish an organisation which included operational sections. Therefore, the company established three new sections – Construction, Engines and Traffic – and started managing work organisations.

In April 1892, Isaburo Kanbara,³ deputy director (*Kanji-ho*) of the Traffic Section, submitted a proposal to the Traffic Section Chief. In the proposal, he asserted that the company should set up a new organisation which would apply

the ‘benefit of division of labour’ in order to respond to the extension of railway lines. Moreover, he proposed to introduce a decentralised organisation by dividing the whole railway system into several geographic divisions and placing a superintendent in each division, who would have delegated authority from the Traffic Section Chief.⁴

Figure 4.1 shows Kanbara’s idea. We can see that Kanbara aimed to create a clearly stratified decentralised organisation. In response to this proposal, the Traffic Section decided to introduce a divisional structure based on Kanbara’s idea in July 1892. The position of the division superintendent was created in Sendai and Morioka, with the Sendai division superintendent covering traffic duties between Fukushima and Ichinoseki (108 miles) and the Morioka division superintendent covering traffic between Ichinoseki and Aomori (182 miles). The Traffic Section Chief announced that wide ranging authorities would be delegated to the division superintendents according to twenty-nine ‘*Jimu Itaku Jōken*’ (conditions of delegating clerical work), printed in the ‘*Un’yuka hō*’ (the Traffic Section’s in-house magazine, 22 August 1892). The delegated authorities included important ones such as (1) the authority to operate trains and issue orders regarding service; (2) authority over personnel management of employees who were hired by divisions or sections; (3) authority to issue and discount train tickets; and (4) authority to conduct external negotiations. Moreover, the division superintendents were only asked to produce a monthly report as an obligation to the Traffic Section Chief. From those facts, it can be said that in practice the division superintendents held absolute power over traffic duties, while the Traffic Section Chief collected information in the form of a monthly report. As a

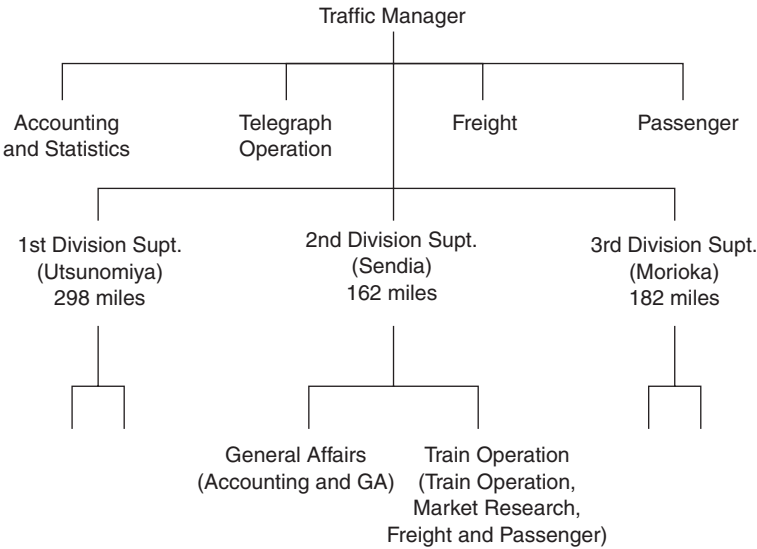


Figure 4.1 Isaburo Kanbara’s plan of organisation and duties of the traffic section (as of April 1892) (source: Kanbara (unknown)).

result, together with areas south of and including Fukushima district which were controlled directly by the Traffic Section Chief, decentralised organisations which controlled train operations were formed in each district.

Having been stimulated by this organisational reform in the Traffic Section, other functional sections undertook the establishment of decentralised organisations. First, in September 1892, the Construction Section was divided into four regional subsections – Ueno, Oyama, Fukushima and Morioka. In the case of the Construction Section, the extent of decentralisation was more thorough than that of the Traffic Section. Each subsection autonomously constructed and maintained railways under each subsection manager. In the Engine Driving Section, an organisational structure was created where each engine shed was separately managed by the headquarters and two branches in Fukushima and Morioka, by the end of the same year. As a result, at the end of 1892, the organisation of Nippon Railway Co. came to be a functional hierarchy. As many other railway companies at that time, including the Kyushu Railway Co., adopted a unitary form of functional organisation (Nakamura 1998: Chapter 8), the hierarchical organisation in Nippon Railway Co. was pioneering in Japan.

Expansion of transportation and managerial disorder

The Sino-Japanese war (1894–95) was one of the watersheds in the history of the Japanese railway industry. The Imperial Government Railway started rapid expansion of railway lines after 1896 through full-scale implementation of a railways construction plan, which had been formalised in the Railway Construction Law (1892). In the private railway sector, many companies were established in the second railway boom which occurred around the Sino-Japanese war. Meanwhile, existing railway companies, centring on the big five railway companies, also expanded rapidly through the extension of railway lines and mergers of other companies. In addition, the rapid industrial development after the war expanded the transportation market, and railway transportation finally began full-scale development (Nakamura 2002: 26).

Nippon Railway Co., which had already opened all planned railways by April 1892, further opened the Tsuchiura line (Tabata-Tomobe, later Joban line) and Sumida line in 1896, and bought out Ryomo Railway Company in January 1897. In this period, the company reinforced its transportation capacity by making the Omiya-Ueno line a double track (completed in April 1894). In December 1894, construction of the Omiya Workshop was completed, which enabled the company to prepare for the manufacturing and maintenance of its own railway rolling stock. While expanding those capital investments, as Figure 4.2 shows, traffic density started to increase in 1894.

The passenger traffic density (average numbers of passengers per day per mile) was 674 persons per day per mile in 1893. It increased to 1,096 persons per day per mile in 1897, a 60 per cent increase in only four years. The freight traffic density (average amount of freight per day per mile), on the other hand, increased by 80 per cent, from 244 tons per day per mile in 1893 to 453 tons per day per

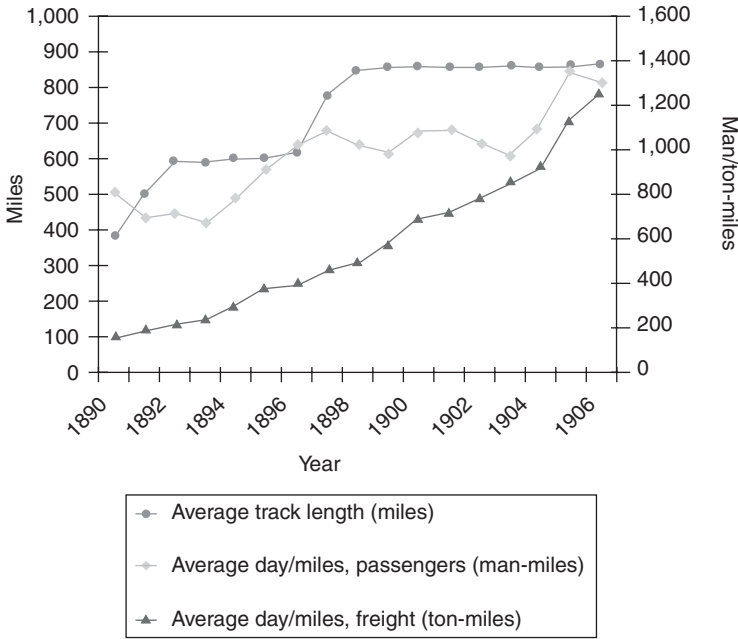


Figure 4.2 Track lengths and conveyance figures for Nippon Railway Co. (source: Nakamura 2003: 115).

mile in 1897. Despite the rapid increase in traffic density, the company successfully controlled the increase in operating costs at a reasonably low level, as Figure 4.3 shows. As a result, from the second half of 1894 to the first half of 1897, the company was financially successful – operational costs were around 40 per cent of all costs, and return on equity (ROE) was around 10 per cent (see Figure 4.4).

In 1898, however, the company's financial performance suddenly deteriorated. The current account balance consecutively declined in the second half of 1897 and in the first half of 1898. The ROE, which recorded 11 per cent in the first half of 1897, steeply decreased to 6.1 per cent in the first half of 1898. At the same time, the dividend rate which was 11 per cent in the first half of 1897, diminished by half, to 5.5 per cent. The main cause of this deteriorating financial performance was the steep increase in operating costs per mile, which had begun in the second half of 1897. In particular, as Figure 4.3 shows, the increase in the costs of engine driving, and repair and building of rolling stock were remarkable in the first half of 1898. Comparing the first half of 1897 and the first half of 1898, we find that these two costs increased by 612,192 yen, which was 53 per cent of the total increase (1,157,903 yen) in operating costs. The main causes of these increases were the increase in fuel expenses due to the steep rise in coal prices, and the increase in building and repair costs due to the opening of the Joban line which was used mainly for coal transportation.

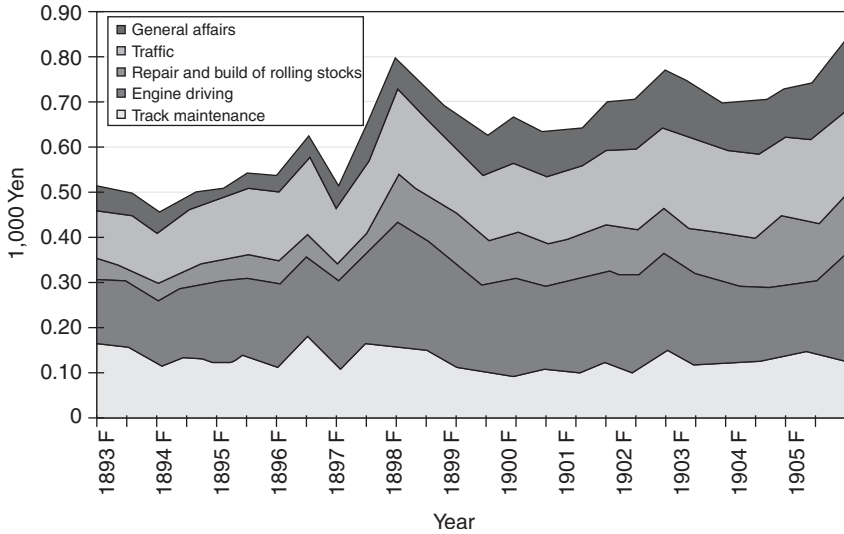


Figure 4.3 Details of operating costs per distances covered by trains for Nippon Railway Co. (source: Nippon Railway 'Hokoku' (1893–1905)).

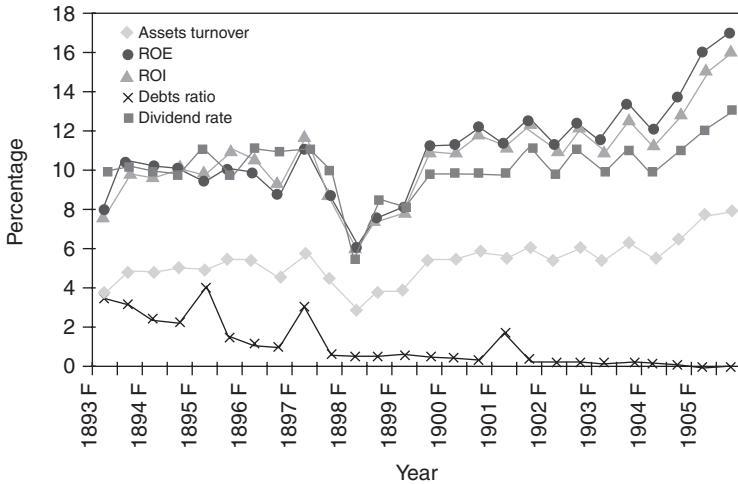


Figure 4.4 Business situations for Nippon Railway Co. (source: Nippon Railway 'Hokoku' (1893–1905)).

Furthermore, from 24 February to 6 March in 1898, a well-known, serious engine drivers' strike (Nittetsu Kikankata Sōgi) occurred, aggravating the confusion of the company. The engine drivers of the Nippon Railways Co. issued four requests in this dispute: (1) to raise wages; (2) to improve the status of engine drivers to be equal to that of the clerks; (3) to change the job title of engine

drivers; and (4) to rehire dismissed employees. They conducted the strike at all engine sheds except for Ueno, and all their requests were accepted by the company (Aoki 1979: 12). A pressing concern caused by this dispute for the management was that the increase in engine drivers' wages also led to increases in related personnel costs. Engine drivers' costs accounted for 10.2 per cent of all engine driving costs in the second half of 1897; this then steeply increased to 11.6 per cent in the second half of 1898 and 14.2 per cent in the second half of 1899. In addition, the request to raise the engine drivers' status made a substantial impact on the overall framework of the company's ranking system, which is discussed later. Moreover, with this dispute as a turning point, a trade union called *Kyōseikai* (Improve Group), which all the engine drivers had an obligation to join, was formed.

Masahisa Aoki proposes two reasons why the management lost in the dispute: the strong solidarity of the engine drivers and support by engine drivers of other companies, including the Imperial Government Railway. However, from the point of view of this chapter, it is also important that the organisation of the company at that time was a functional hierarchy, which caused the lack of communication between functional sections. As mentioned above, each function established geographical divisions from 1892; by around 1898, the geographical area covered by each administrative division had come to vary function by function, and hence the company's organisation had become one where orders from the headquarters only flowed down along vertical lines. This structure divided the employees by function, and it also made it difficult for the headquarters to coordinate the whole company. Moreover, the top executives were overwhelmed due to having to deal with other problems such as management scandals⁵ and the Government's rejection of a proposed revision of a by-law⁶ in the period from 1897 to 1898. In general, severe burdens are put on senior managers' management capacity in a functional organisation (Williamson 1975: 133–4), and in Nippon Railway Co. the senior managers' capacity reached the limits in this period.

The declining financial performance and chaotic managerial situation had a negative impact on the stock price of the company, which had been regarded as a blue-chip stock until then. In July 1897, the stock price of the paid-up shares of the Nippon Railway Co. with a 50 yen face value was above 100 yen. However, it declined to 76 yen at the end of the year, and further declined to 64 yen in March 1898 (Yamada Eitaro *Den Hensan-iinkai* (ed.) 1995: 97). As a result of the sudden decline of the stock price, together with a 50 per cent reduction of the dividend, a group of shareholders blamed the management. In particular, the 'reform group' pushed for replacement of the management and confronted Jūgo Bank, the largest shareholder, which supported the management. Eventually in August 1898, by a vote at the shareholders meeting, Yūjun Soga (a former lieutenant general), who was supported by the 'reform group' was appointed as the president. In this manner, Nippon Railway Co. set out toward reforms of its business organisation and systems through dramatic changes in the board members.

The first organisational reform and the ranking system

The new executives led by Soga implemented accounting reforms aimed at reduction of fixed costs and operating costs as well as purchasing reforms centring on selling off redundant stocks (Yamada Eitaro Den Hensan-iinkai (ed.) 1995: 108–9). After that they undertook organisational reform mainly in the Traffic Section.

For Nippon Railway Co., whose railway lines expanded due to the opening of the Tsuchiura (Joban) line, and whose train schedule and train operations became complex due to the increase in freight traffic, optimisation of the train operation was an urgent problem to be solved. Hence, in November 1898, the Train Operation Office, which was to be in charge of both train scheduling and train operation, was established in the Traffic Section (Nippon Railway 1903: 50). Isaburo Kanbara, who played the leading role in organisational reform in the Traffic Section in 1892, was assigned to be the first chief of the Train Operation Office (Nippon Railway's Staff List (1899)). Furthermore, in January 1899, the company introduced the Traffic Division in Ueno and Utsunomiya, in addition to the divisions already established in Sendai, Morioka and Mito (Nippon Railway (unknown): 235). The aim of this reform was to limit the span of control of the headquarters in Ueno, which had covered a vast area, to the Daiichi-ku Sen (the first district lines: Takasaki-line and Shinagawa line) and freight lines in Tokyo city in response to the increase in freight traffic.

The organisational reform centralising train operation and reorganising of the functional divisions brought immediate results. According to a study by Masaki Nakabayashi, Nippon Railway Co. and Imperial Government Railway achieved swift and smooth transportation of raw silk cocoons, transporting them from areas along the Nippon Railway lines to Suwa region by the discretionary distribution of specialised wagons to Akihabara station and stations along the first district lines of the Nippon Railway Co., and by transportation based on meticulous operation plans. It should be noted that the company did not distribute raw silk cocoon wagons to all stations, but concentrated on stations in the Ueno division. In 1900, raw cocoon wagons always stopped at Takasaki station (in the case of the Mito line and the Ryomo line) or Akihabara station (in the case of the Tsuchiura line and the Sumidagawa line) or Omiya station (in case of the second district lines: Omiya – Shirakawa), for transshipment or relaying of freight. By doing this, raw silk cocoon wagons were inevitably at least once under the supervision of the Ueno Traffic Division Superintendent, which enabled the company to avoid over-shipping or confusion of train operation due to mismanagement (Nakamura 2003: 126–8). This success in raw cocoon transportation was arguably achieved due to the organisational reforms, including the establishment of the Train Operation Office, which enabled harmonious operation of the specialised wagons, and subdivision which was achieved through traffic control.

Around the same time as the organisational reform in the Traffic Section, an organisational reform was also under way in other departments including the

Track Maintenance Section and Engine Driving Section. In October 1899, the company enacted the 'Shokumu Shōtei' (Organisational Chart) and the 'Jimu Bunshō Kitei' (Rules of the Office Duties), thus beginning reforms of the organisation and the ranking system (the first organisational reform). The main part of the reform was the establishment of seven functional sections, i.e. General Affairs, Accounting, Storage, Traffic, Engine Driving, Track Maintenance, and Workshop, each of which, in turn, was divided into two to six regional divisions (Figure 4.5). Whereas the modes of division of regions were different section by section before the reform, after that the modes were standardised for the three operational sections (Traffic, Engine Driving and Track Maintenance). Also, each functional section was delegated authority by the headquarters to control the relevant issues (Nakamura 2003: 123–6).

In many studies, this organisational reform was considered to be successful in rationalisation of administrative works by transferring accounting jobs from functional divisions to the Accounting Section, and in personnel reduction by rearrangement of the organisations (Yamada Eitaro Den Hensan-iinkai (ed.) 1995: 115). In fact, the company fired 33 stationmasters in the Traffic Section, 15 engineers and assistant engineers in the Track Maintenance Section, and 19 directors (*Shuji*) and clerks in the Storage Section and the Accounting Section, after the first organisational reform. In particular, as the Traffic Section implemented subdivision of divisions, senior stationmasters who had been assigned to main stations with high salaries became redundant. Meanwhile, in the Track Maintenance Section, as they finished construction of the new lines, expert engineers with high salaries were dismissed. In contrast, although eight engine drivers resigned in the Engine Driving Section, this was an average number of resignations at this period; therefore it could not be regarded as a special personnel reduction.⁷ In fact the emptied positions were filled afterwards with assistant engine drivers who were promoted from being engine cleaners.

In addition to the above organisational reform, *Shokumu Shōtei* (Organisational Chart) implemented an important change in the ranking system. Before 1898, there were four ranks in the company: senior managers (*Koto Yakuin*), middle managers (*Tsūjyo Yakuin*), employees hired by the headquarters (*Koin*), and employees hired by divisions or sections (*Bu-ka Yatoi*). The employees at and above the manager level were all white-collar. Therefore, blue-collar employees such as engine drivers and foremen could not become managers even if their salaries were high.⁸ Furthermore, the salaries for senior and middle managers were paid on an annual or monthly basis, and bonuses were paid once a year (one sixth of the salary).⁹ In contrast, most of the other employees were paid on a daily basis, and bonuses for engine drivers were set at half the amount of the bonus for managers (Aoki 1979: 10). In other words, the difference in rank corresponded to the way in which salaries were paid.

The new ranking system introduced by the first organisational reform is shown in Table 4.1. First, it is noted that the new system introduced functional classifications such as engine driving, mechanics, and civil engineering into the

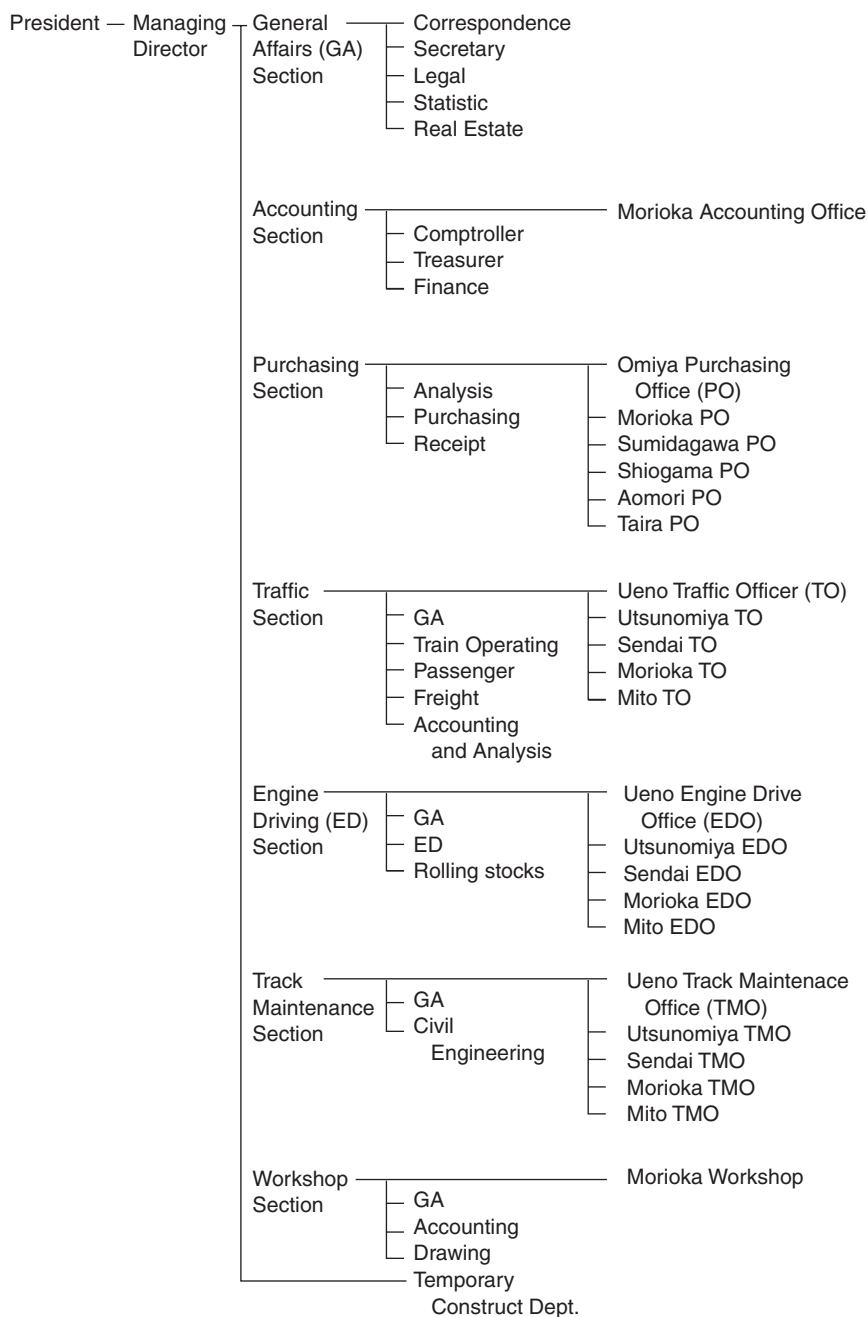


Figure 4.5 Organisation of Nippon Railway Co. (October 1899) (source: Kinoshita 1903: 68–92).

Table 4.1 The ranking system and personnel organisation (November 1899) (man)

	<i>Occupational category</i>	<i>Number of persons</i>			<i>Total</i>
		<i>Senior class</i>	<i>Middle class</i>	<i>Lower class</i>	
Section Chief Director Engineer Clerk	Section Chief	4	—	—	4
	Assistant Section Chief, Head of Offices, etc.	22	—	—	22
	Assistant Section Chief, Head of Offices, etc. Clerk, Assistant Section Chief, Head of Offices	22	—	—	22
	Station Master, Assistant Station Master	—	119	—	119
	Inspector of Conductor, Freight Manager, Telegraph Operation Manager	—	78	—	78
Assistant Clerk (AC)	Subtotal	—	11	—	11
	Assistant Clerk	—	208	—	208
	Station Master, Assistant Station Master	—	81	4	85
	Traffic staff, etc.	—	61	214	275
	Subtotal	—	17	77	94
Assistant Engineer (AE) AE in engine driving	Subtotal	—	159	295	454
	Engine Shed Manager, Engine Shed Assistant Manager, Driving Inspector	—	13	20	33
	Engine Driver	—	—	55	55
	Engine Shed Manager, etc.	—	33	—	33
	Roadmaster, Assistant of Roadmaster	—	59	—	59
Assistant Engineer Trainee (AET) AET in engine driving AET in mechanic AET in civil engineering	Subtotal	—	105	75	180
	Engine Driver Trainee	—	—	242	242
	Foreman, Assistant Foreman, etc.	—	—	19	19
	Assistant of Roadmaster, etc.	—	20	—	20
	Subtotal	—	20	261	281
Employee		—	117	1,472	1,589
Total		48	609	2,103	2,760

Source: Nippon Railway ‘Shokuin-roku’ (1899).

Note

Traffic staff = Conductor, Freight Clerk, Booking Clerk, Parcel Clerk, Telegraph Operator, Chief Yardmen, etc.

assistant engineer rank. As a result, the engine drivers were promoted to the rank of the assistant engineer in engine driving, which means that they were promoted to the manager level. This was in response to the request in the engine drivers' strike mentioned above. Another point to be noted is that new managerial positions such as assistant clerk and assistant engineer trainee were created. Employees such as engine driver trainee, foremen and deputy foremen, who had been excluded from the management ranks, were subsumed into the new positions. The framework of managerial positions of the company expanded from a white-collar-only structure to a structure which included the upper level blue-collar workers, in the process of the company's ranking system review which had been implemented with the engine drivers' strike. This was the beginning of the 'white-collarisation of blue-collar employees', a remarkable process which occurred after the Second World War. In addition, it was especially notable as the process was implemented as a result of management's concessions to the demands of the labourers.

However, it should be noted that the engine drivers were not directly promoted to the rank of assistant engineer, but that a new category of 'assistant engineer in engine driving' was created, and this position was paid wages on a daily basis. Therefore, what advantages did engine drivers really obtain when they were promoted, while still receiving pay on a daily-wage basis? There was no pecuniary improvement, apart from the improvement in bonus treatment which previously had been different for managers and standard employees. It may have been important for the employees that new career opportunities were opened to them. In fact, in the Engine Driving Section, positions such as engine shed managers, assistant managers and driving inspectors were created by the organisational reform and some engine drivers were assigned to the new positions.

Labour force structure after the organisational reform

How did organisational reform affect the labour force structure of the Nippon Railway Co.? The proportion of middle and senior managers increased from 6.7 per cent to 11.3 per cent, which went along with the trend from 1899. A breakdown of the data shows the number of middle managers increased, whereas senior managers decreased. The number of middle managers increased from 605 in 1898 to 1,042 in 1899. This increase of middle managers was due to the promotion of operating staff. In fact 430 operating staffs (297 engine drivers, 19 foremen and deputy foremen, 20 track maintenance assistants, 94 traffic related operating staff) were promoted to middle manager (Table 4.1).

However, after the increase of middle managers due to the ranking system reform, the increase continued and was accelerated from 1900 to 1902. The ratio of the managers to total employees went up to 14.1 per cent in 1902. Breaking down the managers by function, we find that the managers in the General Affairs Section were doubled from 32 in 1899 to 62 in 1902. In this period, the total number of employees in the General Affairs Section was also doubled. Oliver Williamson pointed out that the enlarged functional hierarchy entails huge costs

for coordination and communication among functions and strata (Williamson 1975: 133–4). Arguably the sharp increase in the number of employees in the General Affairs Section reflected the rise of coordination and communication costs.

We now analyse the characteristics of the labour force structure in this period focusing on employees' years of service (Table 4.2). It should be noted here that years of service of employees were relatively long in the Nippon Railway Co. According to Shinji Sugayama, the standard number of years of service of middle and lower level managers in Yawata Steel, the state owned iron works, was one to two years (Sugayama 1993: 25). In contrast, in the Nippon Railway Co., the proportion of employees serving for four years and more¹⁰ among clerks and assistant engineers was 60–80 per cent. The proportion of employees whose years of service were four or more among employees hired by the headquarters (*Koin*) was 35.1 per cent. With respect to the assistant engineers in engine driving (95.4 per cent served for four or more years) and clerks and deputy clerks in the Traffic Section (86.8 per cent), service years were especially long. For these functions, we can say that internal labour markets as described by Masahisa Aoki were formed (Aoki 1979: 29–31).

Next, we analyse the number of employees in and after 1899. In 1899, when the organisational reform and the personnel reductions were implemented, the number of employees was as small as 149. However, after 1900, the company hired more than 400 employees each year. The increase was particularly large for positions in the General Affairs Section, in the Traffic Section and in the Accounting Section. In the General Affairs Section, 62 per cent of employees (59 out of 95) were hired in and after 1901. This fact may reflect the above-mentioned high coordination and communication costs. At the same time, employees also increased rapidly in the Traffic Section. Regarding the 518 employees hired in 1900 and 1901, the following four points should be noted: (1) 465 employees worked at stations, whereas 53 employees worked in the head offices; (2) only three people were hired as managers (deputy stationmaster or freight manager); (3) the composition of employees working for stations by function was 207 telegraph operators, 137 conductors, 67 freight clerks, 27 booking clerks, and 24 yardmen; (4) the distribution of their daily wages was concentrated around 0.35 yen.¹¹ As has been mentioned, in 1899 the company implemented a reduction of blue-collar workers and fired veteran station officers with relatively high salaries. However, the number of stations was never reduced, with the gradual increase in freight traffic, duties related to transportation gradually increased. Hence it is considered that the company hired white-collar operational employees and blue-collar workers with low salaries in order to deal with the situation. However, the rate of increase in unskilled employees was faster than the rate of increase in traffic density; as a result a decrease in labour productivity came to the surface around 1902.¹²

Table 4.2 The length of continuous service in Nippon Railway Co. (December 1902)

Length of service	Less than 1 year		1 year or more		2 years or more		3 years or more		4 years or more		Total
	1902		1901		1900		1899		Before 1898		
	Man	%	Man	%	Man	%	Man	%	Man	%	
Year of entering a firm											
	Man	%	Man	%	Man	%	Man	%	Man	%	%
Section Chief	—	—	—	—	—	—	—	—	6	100.0	6
Director	1	3.4	5	17.2	3	10.3	—	—	20	69.0	29
Engineer	—	—	2	8.3	8	33.3	3	12.5	11	45.8	24
Clerk and Assistant Clerk											
traffic	18	2.4	25	3.4	32	4.3	22	3.0	640	86.8	737
accounting	1	2.7	3	8.1	4	10.8	3	8.1	26	70.3	37
general affairs	7	14.6	15	31.3	3	6.3	4	8.3	19	39.6	48
Subtotal	36	3.7	58	5.9	60	6.1	35	3.6	790	80.7	979
Assistant Engineer and AE Trainee											
in civil engineering											
general affairs	5	62.5	2	25.0	—	—	—	—	1	12.5	8
Subtotal	14	11.6	19	15.7	12	9.9	4	3.3	72	59.5	121
Assistant Engineer and AE Trainee	2	3.4	8	13.8	11	19.0	4	6.9	33	56.9	58
in mechanic											
Assistant Engineer and AE Trainee	—	—	5	1.2	11	2.6	3	0.7	398	95.4	417
in engine driving											
Employee											
traffic	239	18.9	291	23.0	227	18.0	60	4.8	446	35.3	1,263
accounting	6	16.7	7	19.4	9	25.0	4	11.1	10	27.8	36
general affairs	16	48.5	12	36.4	2	6.1	2	6.1	1	3.0	33
Subtotal	361	18.2	476	23.9	354	17.8	100	5.0	697	35.1	1,988
Total	414	11.4	573	15.8	459	12.7	149	4.1	2,027	56.0	3,622

Source: Nippon Railway 'Shokuin-roku' (1902) and 'Shahou' (1902).

Business performance of Nippon Railway Co. 1899–1902

The effect of the first organisational reform is reflected in Figure 4.4. In the first half of 1898, ROE decreased by 45 per cent compared with the first half of 1897 and stagnated until the first half of 1899. However, it recovered sharply in the second half of 1899. Then, after 1900, it stabilised around 12 per cent per year. During this period, the return on investment (ROI) also showed the same trend as the ROE, as the ratio of liabilities to net worth shifted to lower levels. The biggest factor which contributed to the recovery of profitability was the increase in the ordinary profit along with the decrease in the operating costs per mile.¹³ There were two factors which contributed to the decrease in the operating costs: (1) the decrease in engine driving costs caused by the decrease in the coal price¹⁴ and (2) the decrease in personnel costs in the Traffic Section and the Track Maintenance Section,¹⁵ which, in turn was mainly due to the personnel reductions mentioned above.

Meanwhile, labour productivity (value added per employee) decreased to 406 yen in 1898, and after that it gradually recovered to 647 yen in 1901. In contrast to this, labour share of costs decreased. In other words, the company enjoyed most of the gains in labour productivity. In this period, as previously mentioned, wages increased in the Engine Driving Section due to the labour movement. Therefore, the decline in the labour share was mainly due to the personnel reductions in the Traffic Section and the Track Maintenance Section. However, in 1902, labour productivity again decreased to the level of 500 yen. One of reasons for this may have been the gradual decrease in return on sales (ROS) from 1901 to 1902. An increase in operating costs (especially the general costs) may have accounted for this decrease in the ROS (Nakamura 2003: 118). This was arguably caused by the enlargement of the administrative divisions due to the expansion of the functional organisation. In addition, with respect to the Engine Driving Section the labour movement was another factor in labour cost increases.¹⁶

The Kyoseikai union, which was formed during the engine drivers' strike, strived to raise wages and maintain employment for the engine drivers and assistants. Following the Kyoseikai, other unions such as a platelayer union and a mechanics union, became active (Ikeda 1979: 60–8). In response to this, the company proceeded to offer conciliatory measures to the engine drivers and assistants, and then drove Kyoseikai into dissolution by making use of an accident involving the Emperor's Train¹⁷ as an opportunity to use police pressure against the union (Rodo undo shiryo kanko-iinkai (ed.) 1962: 620–30 and Nakanishi 2003: 883–4). The company succeeded in reorganising the Kyoseikai into a management-led employees' association as a form of research group (Kenkyukai). To accomplish this, the company implemented additional conciliatory measures, such as changing the method of salary payment for assistant engineers in engine driving from a daily wage to a monthly wage, and stopping personnel reductions in the Engine Driving Section over 1901 to 1902.¹⁸ While these measures calmed labour movements, it did not contribute to increasing

labour productivity. In fact, labour productivity decreased from 1902. The company started groping for ways to reduce redundant personnel while avoiding the re-emergence of functional labour movements.

Introduction of the multidivisional organisation and its consequence

Establishment of the Business Operations Division

The organisation which was introduced by the organisational reform in 1899 was efficient in implementing each function of the railway business, as it was formed based on the experiences which the company had accumulated for a long time. In fact, most railway companies including the Imperial Government Railway adopted the functional organisation.¹⁹ However, if the functional organisation becomes as large and complex as in the case of Nippon Railway Co., it is likely that such problems as lack of communication, loss of control between functions or strata, and overloading of administrative duties on senior managers, come to be serious (Williamson 1975: 134–6). In fact, by the 1900s, the Nippon Railway people recognised that there were difficulties in communicating between functions on the ground, as well as a lack of communication among section chiefs.²⁰

Moreover, administrative costs (total costs) as a proportion of operating costs increased from 9.7 per cent in the first half of 1899 to 16.8 per cent in the first half of 1903, due to expansion of investigative work for the purpose of divisional functions and controlling information (Figure 4.3). In addition, as Table 4.3 shows, the number of employees, which had been decreased by the organisational reform in 1899, again started increasing, and consequently operating income per head started declining.

In the face of the various problems mentioned above, the management of the Nippon Railway Co. started searching for a new organisational form at the beginning of 1903, and introduced a new organisation in April 1903 (Figure 4.6). The most notable characteristic of the new organisation was its clear demarcation between the line (Business Operations) employees, and the staff employees (Comptroller, Treasurer, General Affairs and Secretary).²¹

The Business Operations Division, in turn, was divided into five regional divisions. The General Superintendent of the Business Operations Division delegated the following powers to the superintendent of each regional division (Division Superintendent): (1) authority to supervise and direct employees who had been hired by the headquarters (below clerk and assistant engineer level); (2) authority over appointment or dismissal of employees who had been hired by the divisions (hired locally); (3) management of the operations and distribution of trains; (4) authority to make direct requests to the factories for the maintenance of rolling stock and for spare parts; (5) authority to make direct requests for construction expenses.²² The division superintendents were to have unitary control over operating functions in sites such as stations within the districts under jurisdiction, and

Table 4.3 The number of employees and labour productivity of the Nippon Railway Co.

	Year									
	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905
Number of all Employees (man)										
Total (a)	7,359	10,207	9,994	9,670	9,982	10,753	11,633	11,068	11,133	13,074
General Affairs	50	52	62	69	100	133	140	135	105	107
Track Maintenance	2,313	2,636	2,226	2,051	2,016	2,233	2,359	39	—	44
Engine Driving & Workshop	2,306	3,708	3,748	3,614	3,536	3,583	4,082	10,599	10,709	12,580
Traffic	2,481	3,575	3,747	3,723	4,108	4,575	4,821	—	—	—
Accounting	68	72	70	75	76	77	80	291	314	335
Purchasing	141	164	141	138	144	149	148	—	—	—
Secretary Staff	—	—	—	—	—	3	3	4	4	3
Chief Engineer's Staff	—	—	—	—	2	—	—	—	1	5
Number of Managers (man)										
Total (b)	565	699	667	1,090	1,377	1,508	1,640	1,543	1,467	1,507
Senior Managers	62	71	62	48	57	60	59	62	56	56
Middle Managers	503	628	605	1,042	1,320	1,448	1,581	1,481	1,411	1,451
Manager Ratio ... b/a	7.7%	6.8%	6.7%	11.3%	13.8%	14.0%	14.1%	13.9%	13.2%	11.5%
Average Number of Employees (man) (c)										
Operating Revenue (1,000 yen) (d)	—	8,783	10,101	9,832	9,826	10,368	11,193	11,351	11,101	12,104
Wages (1,000 yen) (e)	—	6,181	7,131	8,056	9,672	10,188	10,890	10,986	11,407	14,569
Operating Profit (1,000 yen) (f)	—	1,448	1,432	1,418	1,511	1,654	1,820	1,749	1,765	2,032
Tax (1,000 yen) (g)	—	3,474	2,875	4,229	5,233	5,460	5,530	5,806	6,115	8,175
Return on Sales (ROS) ... f/d	—	70	138	243	394	421	453	480	553	825
Monthly Wages per man (yen)	—	56.2%	40.3%	52.5%	54.1%	53.6%	50.8%	52.9%	53.6%	56.1%
Real Wages per man (yen)	—	13.7	11.8	12.0	12.8	13.3	13.5	12.8	13.2	14.0
Labour Productivity (yen) ... (e+f+g)/c	—	13.7	10.9	11.8	11.2	11.8	11.6	10.5	10.6	10.7
Real Labour Productivity (yen)	—	568.3	440.1	599.1	726.5	726.8	697.1	708.0	759.6	911.4
Retail Price Index (1896 = 100)	—	568.3	406.4	586.6	632.1	647.1	596.7	577.9	606.0	699.3
Labour Share ... e/(e+f+g)	—	100.0	108.3	102.1	114.9	112.3	116.8	122.5	125.4	130.3
	—	29.0%	32.2%	24.1%	21.2%	21.9%	23.3%	21.8%	20.9%	18.4%

Source: Nippon Railway 'Nenpou' (1901–05), 'Houkoku' (1896–1900), and Railway Bureau 'Annual Report' (1896–1905).

Note

Section chief, director and engineer is included in Senior Manager. Clerk, assistant engineer, assistant clerk and assistant engineer trainee is included in Middle Manager.

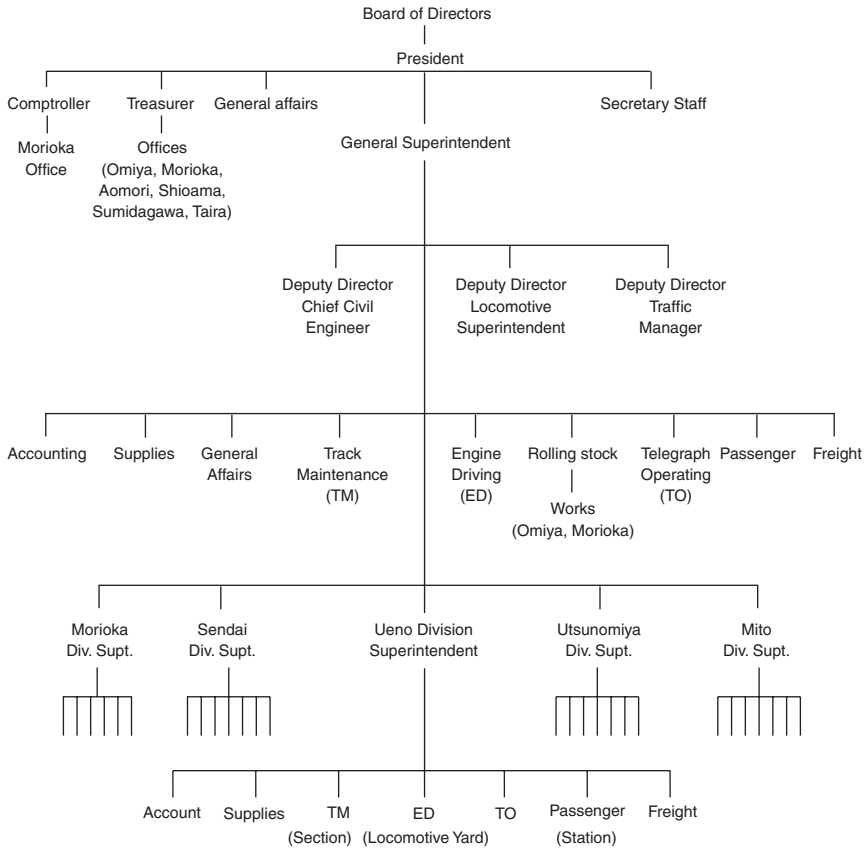


Figure 4.6 Organisation of Nippon Railway Co. (April 1903) (source: Nippon Railway 'Sha-ho' (4 April 1903)).

over track maintenance and engine sheds. In order to avoid confusion due to the organisational reform at this time, the Business Operations Division made detailed work manuals in June 1903 in order to systemise work patterns.

Meanwhile, employees at the headquarters were under the direct control of the president, in order for them to support strategic decision making by the top management. Notably, the Treasury Section was moved from the Accounting Section to the General Affairs Section, which was the core of the headquarters' employees, in order to keep it away from day-to-day accounting work. By doing this, it became possible to ensure quick fund raising activities to achieve long-term management strategies. In addition, in order to control the bloated organisation, the Comptroller Department, which had previously been inside the Accounting Section, became independent as the Comptroller Section. It was an attempt to enforce the control of the flow of information through statistics.

Background of introducing the decentralised divisional structure

The new organisation of the Nippon Railway Co. was similar to the decentralised divisional structure that the Pennsylvania Railroad had first adopted in 1857, and which had then gradually diffused in the major companies in the United States by the 1880s (Chandler 1977: 106–8, 120–1). Yūjun Soga, the president of the Nippon Railways Co. at that time stated as follows.

As a result of the research on organisations in railway companies in Great Britain and the U.S., we have built the organisation which we just announced, and this system conforms to the principles of organisation in American railway companies.

(*The Railway Times*, 2 May 1903)

As Soga wrote, comparing the merits and demerits of the Great British style (functional organisation) and the American style (divisional organisation), Nippon Railway Co. ventured to establish a decentralised divisional organisation modelled on ‘American railway companies’.

Soga also mentioned ‘... the fact is, there was a great distance between sections, and there was a lack of communication among them’ (*The Railway Times*, 2 May 1903) which implies that the first purpose of this organisational reform was to resolve the lack of communication and information flow between functions. This problem became apparent in the engine drivers’ strike in 1898. When the movement of engine drivers grew rapidly, the company’s response was forestalled. One of the reasons for the delayed response was that the company regarded the movement as a problem within the Engine Driving Section, and other functional sections including the Traffic Section, had nothing to do with it. This is evident from the fact that the Traffic Section Chief acted as a mediator in the settlement of the dispute between the Engine Driving Section Chief and the representatives of the engine drivers (Rodo undo shiryō kankō-iinkai (ed.) 1962: 22). It implies that the Traffic Section Chief was regarded as the ‘third party’. At that time, the Engine Driving Section and the Traffic Section were independent of each other like feudal lords in the pre-modern period.

Furthermore, lack of coordination and communication was also a problem on the shop floor level. For example, President Soga stated, ‘... if there is trouble with a train, engine drivers lay the blame on conductors’ error, and conductors, in turn, lay the blame on engine drivers’ error. Thus it always becomes an endless dispute’ (*The Railway Times*, 2 May 1903). Also, regarding the request of the mechanics for improvement of their working conditions, Kyoseikai, the union of the engine drivers not only ‘expressed no sympathy’, but also it displayed a ‘contemptuous’ attitude (Aoki 1977: 47). It is easy to imagine that because of this extremely vertically demarcated structure, communication between functions was impeded, which caused inefficiency. For example, one of the causes of the accident of the Emperor’s Train mentioned above was a lack of communication between the Engine Driving Section and the Traffic Section.

There was an urgent need for Nippon Railway Co., to recover its productivity by improving communication between the functions and work efficiency.

The second purpose of this organisational reform was the reduction of personnel costs. In the first organisational reform, Nippon Railways Co. could reduce some of the personnel costs by firing middle and upper class managers with high salaries in the Traffic Section and the Track Maintenance Section through restructuring of the organisation. However, due to the expansion of functional organisation, the number of employees in the administrative sections, especially in the General Affairs Section, substantially increased and the company could not undertake further personnel reductions in the Engine Driving Section for fear of labour disputes. Therefore, as mentioned above, labour productivity, which had increased once during 1900 to 1901, started decreasing again in 1902 (Table 4.3). Moreover, labour share which had continued to be at a low level since 1899 started increasing in 1902.

In order to recover profitability, it was necessary to deal with the labour movements. Given this situation, we can infer that the third purpose of the second organisational reform was to prevent labour movements. If one reason for introducing the decentralised divisional structure was to separate labour movements which had developed within vertically separated functions, this purpose would be reflected in personnel management policies put in place after the organisational reform. Hence, in the following section we attempt to check this hypothesis by analysing in detail personnel management practices before and after the introduction of the divisional structure.

Personnel management policy after the introduction of the divisional structure

Transfers and promotions

Personnel changes from 1902 to 1904 are summarised in Table 4.4. With regard to the changes in working locations which accompanied change in the geographical domain of the business, the proportion of personnel moved between locations, which had been 12.8 per cent in 1902, suddenly increased to 25.3 per cent in 1903, and stayed at 19.4 per cent in 1904. As for the personnel transfer between functions, the number of transfers was substantially higher in 1903 than the other years. This may be because the Comptroller Section was established as a part of the second organisational reform, and clerical employees were concentrated there. In addition, personnel transfers between on-site functions (stations, engine sheds and track maintenance positions) and off-site functions (divisions, operational and local offices) increased sharply, from 15 persons (0.4 per cent) in 1902 to 70 persons (1.8 per cent) in 1903. Unlike the personnel transfers between functions, which were centred on clerical workers, personnel changes between on-site and off-site functions occurred in every job and rank.

Next, we examine details of these personnel transfers, focusing on local offices which were the core of the decentralised divisional structure. Table 4.5

shows the previous jobs of 174 employees who worked in the five local offices – Ueno, Utsunomiya, Sendai, Morioka, and Mito – from 1903 to 1904. In this table we can observe that (1) the employees who were transferred from former functional offices of the same local offices were only 42.5 per cent of the total, which implies that there were many personnel transfers from other local offices and on-site positions; (2) the employees were transferred from various positions; and (3) personnel transfers of on-site employees were mainly between stations, although some people were also from engine sheds and the track maintenance. From these observations, we can infer that Nippon Railway Co. attempted to revitalise information flows between functions, between local offices and between on-site and off-site functions, by gathering people from various functions at local offices which administered local divisions, and by implementing personnel exchanges between distant local offices, and between on-site and off-site positions. In fact, each local office often held social gatherings in order to achieve harmony between functions or between on-site and off-site employees.

Table 4.6 shows the frequency of salary increases by rank (in part by function). The overall trend was that the frequency of the salary raise declined over 1903 to 1904. This trend is particularly notable among the senior managers such as section chiefs and directors (*Shuji*), and engine drivers. In particular, with regard to the engine drivers, until 1903, 80 per cent of them had salary raises once or more a year, however that ratio decreased to 50 per cent in 1904. This fact shows that engine drivers and assistants had been given favourable conditions before the organisational reform, but that their employment conditions declined after the organisational reform.

As for promotions, the framework which had been formed by the first organisational reform was not changed by the second organisational change. This framework consisted of three stages: (1) employees hired by the headquarters (*Koin*) \Rightarrow assistant clerk/assistant engineer trainee; (2) assistant clerk/assistant engineer trainee \Rightarrow clerk/assistant engineer; and (3) clerk/assistant engineer \Rightarrow director (*Shuji*)/engineer. The only change implemented by the second organisational reform was that the salary system for the engine drivers of assistant engineer rank changed from daily basis to monthly basis, thus ensuring that all assistant engineers were paid monthly.

Based on those observations, a model career path for engine drivers and assistants can be described as follows. A future engine driver was hired by the section as a cleaner. After working as a cleaner for at least six months, he was promoted to assistant engine driver, which was an employee (paid on a daily basis) hired directly by the headquarters. Afterwards, he acquired skill in engine driving for more than two years through on-the-job training (OJT) (Aoki 1977: 35). Once he established his skills, he was promoted to engine driver trainee as an assistant engineer trainee according to criteria such as 'seniority', skills and seriousness. His salary had been paid on a daily basis while he had been an assistant engineer trainee. His salary shifted to the monthly basis when he was promoted to assistant engineer. The highest hurdle for engine drivers and

Table 4.5 The source of supply of local office staff from April 1903 to December 1904 (man)

	<i>Former functional office</i>	<i>Head Office and the other division</i>	<i>On-site position</i>	<i>New hiring</i>	<i>Total</i>
Division Chief	1	5	—	—	6
Engineer	4	6	1	—	11
Clerk and Assistant Clerk	—	1	—	2	3
general affairs	15	12	16	—	43
traffic	7	5	2	—	14
engine driving	9	11	1	—	21
track maintenance	31	29	19	2	81
Subtotal					
Assistant Engineer and AE Trainee	2	—	—	—	2
engine driving	1	2	1	1	5
mechanic	15	6	3	—	24
track maintenance	18	8	4	1	31
Subtotal	54	48	24	3	129
Subtotal of manager rank	20	3	8	14	45
Employees	74	51	32	17	174
Total					

Source: Nippon Railway ‘Shahou’ (1903–04).

Table 4.6 The frequency of the salary increases by rank: 1902–04 (man)

	1902				1903				1904			
	All employees	Salary increase	%		All employees	Salary increase	%		All employees	Salary increase	%	
Section Chief	5	3	60.0		6	4	66.7		6	0	0.0	
Engineer	27	4	14.8		28	13	46.4		28	7	25.0	
Director	30	12	40.0		31	13	41.9		31	8	25.8	
Subtotal	62	19	30.6		65	30	46.2		65	15	23.1	
Clerk and Assistant Clerk	1,049	368	35.1		1,033	457	44.2		985	293	29.7	
Assistant Engineer and AE Trainee												
engine driving	415	334	80.5		398	315	79.1		365	182	49.9	
mechanic	57	29	50.9		60	11	18.3		57	19	33.3	
civil engineering	118	52	44.1		105	39	37.1		93	27	29.0	
Subtotal	1,639	783	47.8		1,596	822	51.5		1,500	521	34.7	
Employees	1,863	751	40.3		2,198	938	42.7		2,286	761	33.3	
Total	3,564	1,553	43.6		3,859	1,790	46.4		3,851	1,297	33.7	

Source: Nippon Railway 'Shahou' (1902–04).

assistants in developing their careers was the promotion from assistant engine driver to engine driver trainee. Originally under the OJT training system, there was a kind of apprentice relationship between engine drivers and assistant engine drivers. In addition, managers (for example engine shed managers and engine shed assistant managers) had great influence in employees' promotion (Aoki 1977: 36). Therefore the company could not control engine driver sections, which was a serious constraint in managing employee relations.

In order to resolve this problem, the company introduced examination systems for promoting assistant engine drivers to engine drivers trainees in June 1903.²³ At the first examination held on 20 June, 135 people took the examination for 50 positions, and 38 people passed. The examination revealed that assistant engine drivers who accumulated skills through the apprentice-like system lacked basic knowledge on the structure of locomotives and driving rules. The knowledge of driving techniques could be supplemented by attaining experience and proficiency. However, the lack of understanding of the rules of signals and driving, and the service regulations for engine drivers were serious concerns for train operation. Hence, the company introduced the examination systems not only to aid in promoting staff to engine driver rank, but also in recruiting and promoting staff from lower ranks such as assistant engine drivers and cleaners to the rank of engine driver and assistant engine driver. The Division Superintendents attempted to exercise control over those examinations. These changes meant that the company changed the old apprentice-like training system for engine drivers, and controlled the overall system of promotions by introducing the examination systems.²⁴

The engine drivers and assistants whose vested interests were threatened were against those changes. However, they did not undertake a dispute again as they had lost power due to the dissolution of Kyoseikai in November 1901, and due to the conciliatory labour management adopted by the company. It seems that during this period, personnel transfers were strategically used by the company to prevent labour movements, and the frequency of the personnel transfers increased due to the introduction of the decentralised divisional structure. The company personnel policies, such as reorganising work organisations through the introduction of the divisionalised structure, disrupting labour connections by instituting personnel changes through organisational reform, and breaking down labour relationships through the introduction of examination systems and the proactive hiring of graduates from vocational schools (covered later), were very effective.²⁵

Hiring and firing

The trend of hiring and firing from 1902 to 1904 is shown in Table 4.7. The number of resignations increased sharply from 1903, and at the same time, new employment decreased from 1902 to 1903. The resignation rate (number of resignation/average number of employees) also steeply increased from 8.2 per cent in 1902 to 16.4 per cent in 1904. It is notable that the firing of employees

Table 4.7 The number of hiring and firing: 1902–04

	1902		1903		(Jan.–Apr. 1903)		1904	
	Man	%	Man	%	Man	%	Man	%
At the end of previous year of employee (<i>t</i>)	3,431	—	3,597	—	—	—	3,443	—
Number of hired (<i>h</i>)	477	13.6	437	12.4	—	—	454	13.4
Number of resignation (<i>r</i>)	289	8.2	520	14.8	—	—	553	16.4
Number of layoff (<i>l</i>)	6	0.2	143	4.0	—	—	11	0.3
Hiring								
Promoted from employees hired by divisions	11	2.3	158	36.2	56	23.9	159	35.0
Employees hired after an internship	30	6.3	105	24.0	24	10.3	109	24.0
Firing within a year	28	5.9	31	7.1	—	—	50	11.0
Total	477	100.0	437	100.0	234	100.0	454	100.0
Resignation								
Voluntary resignation	278	96.2	477	91.7	51	83.6	531	96.0
Firing	2	0.7	32	6.2	7	11.5	12	2.2
Unknown	9	3.1	11	2.1	3	4.9	10	1.8
Fired after layoff	1	0.3	131	25.2	1	1.6	11	2.0
Total	289	100.0	520	100.0	61	100.0	553	100.0
Died	22	—	24	—	9	—	18	—

Source: Nippon Railway ‘Shokuin-roku’ (1892) and ‘Shahou’ (1902–04).

Note

The ratio of hired = $h \times 2/(t + (t + 1))$, the ratio of resignation = $r \times 2/(t + (t + 1))$, the ratio of layoff = $l \times 2/(t + (t + 1))$.

occurred mainly after the introduction of the divisional system in April 1903. Although most of these people left the company through a form of voluntary resignation, at least 131 people who resigned after being transferred to the 'reserve employees list' were in fact fired.

Observing the resignations by rank, we find that many managers resigned in 1903. This fact is reflected in that the average salary of the resigned employees increased greatly in 1903. This implies that the main targets of the personnel reductions were managers with high salaries. If this point is examined from the perspective of function, the following facts can be ascertained: (1) among the directors (*Shuji*) and engineers, the former chief of the Engine Driving Sections and the former heads of offices whose annual salaries were above 2000 yen were fired; (2) among the assistant engineers, many engine drivers (28 people) and assistant civil engineers (12 people) were fired; (3) among the clerks, the proportion of employees in the Business Operations Division, in which most employees were concerned with traffic related work, was overwhelmingly high. This trend was also observed in 1904. From these facts it can be said that the employment adjustment during this period targeted senior managers and engine drivers who had been left in place by the personnel reductions in the past, in addition to the increased number of redundant clerical workers in the Traffic Section.

On the other hand, Table 4.7 shows the breakdown of the employees who were newly hired by the headquarters. Thirty-five per cent of them were promoted from the employees who had been hired by divisions or sections. In other words, they were recruited in the internal labour market. In addition, 24 per cent were hired after an internship period, a group which included the graduates of the Iwakura Railway School. Whereas the graduates of the railway schools numbered less than 10 until 1903, the number suddenly increased to 29 in 1904. In response to the new practice of hiring from vocational schools, the company enacted internal rules for hiring employees, and introduced the entrance examination system. First, all of the new employees came to be recruited by the Business Operation Section, not by individual functional sections. To put it differently, the recruitment was centralised. Second, by expanding the range of qualified persons who were eligible to take the entrance examination to the graduates of secondary schools and vocational schools, the company aimed at hiring young and high quality employees for the lower ranks.

Business performance of the Nippon Railway Co. from 1903 to 1906

As a result of the new recruiting system in 1903, the proportion of low salaried persons among the newly hired employees increased, whereas the numbers of clerk rank and assistant engineer rank employees with relatively high salaries decreased. This fact, together with the reduction of the high salaried employees, may have reduced the personnel costs of the Nippon Railway Co. This point will now be examined with reference to Table 4.3.

First of all, the total number of the employees clearly decreased in 1903. This

was due to the personnel reduction through the organisational reform. Notably, the proportion of middle and senior managers decreased from 14.1 per cent in 1902 to 13.2 per cent in 1904, which implies that the personnel reduction targeted this group. With regard to the average salary, it decreased sharply from 11.6 yen in 1902 (in real terms, 1897 = 100) to 10.5 yen in 1903. As there is no evidence that the salary cut was implemented explicitly for each individual in this period, we can infer that the change in the composition of the employees by salary was the reason for this decline. Although real salaries gradually recovered from 1904, labour share continued decreasing from 23.3 per cent in 1902 to 21.8 per cent in 1903 and 20.9 per cent in 1904, reaching 18.4 per cent in 1905. This implies that the company was able to constantly receive a larger 'share of the pie' by obstructing labour movements with the introduction of the organisational reform, in addition to the personnel reduction in 1903.

As for the labour productivity, it rapidly increased from 1904. This phenomenon – labour share decreased while labour productivity increased – shows that the new organisation and the new systems which supported the new organisation enhanced efficiency, in addition to the rise of the capital share through decline of the labour movement. The factors which contributed to enhancing efficiency include (1) facilitated communication between functions; and (2) increased opportunities for promotions by the introduction of the examination system. It can be assumed that transaction costs were reduced due to the facilitated information flows within the organisation, and employees' 'career concern' raised their motivation to work. The 'career concern' effect was supposed to be large especially for the upper level of blue-collar workers. This point was shown by the fact that many examinees rushed to take the examination for the engine driver internship position.

The financial performance of the Nippon Railway Co., substantially improved due to the decrease in labour costs and increase in labour productivity (Figure 4.4). ROE went over 13 per cent for the first time in the second half of 1903, and continued to rise, reaching 16.9 per cent in 1906. ROI changed in the same manner as ROE.²⁶

It is true that this rapid financial recovery was partly due to the special procurement demand for wartime transportation during the Russo-Japanese War. As Figure 4.2 shows, the traffic density of both passengers and freight increased sharply from 1904 to 1905. Along with this, operating income which was 1,487 yen in the first half of 1904 increased to 1,857 yen in the second half of 1905. However, the total asset turnover rate (operating income/initial expense) also recovered from the second half of 1904 (Figure 4.4). This implies that the increase in revenue during this period was not brought about by additional investment. Also, the increase in traffic during this period was achieved without an increase in operating expenses. The operating costs as a share of operating income (operating costs/operating income) gradually decreased from 49.8 per cent in the first half of 1903 to 44.8 per cent in the second half of 1905. As a result, operating income per mile steadily increased from 762 yen to 1,026 yen in the same period, which enabled the company to have a high profit margin.

In other words, the cost reductions due to employment reduction as well as increase in labour productivity by the organisational reform contributed to the recovery of the financial performance of the Nippon Railway Co., notwithstanding the favourable conditions caused by the Russo-Japanese War.

Conclusion

This chapter examined how the modern business enterprise emerged in Japan focusing on the case of Nippon Railway Co., the largest railway company.

The Nippon Railway Co. implemented two major organisational reforms before it was nationalised in 1906. The outline of those organisational reforms is as follows. The company consistently expanded and refined its functional organisation until 1899. The direction it took was to transform the organisation from a simple (unitary) form to a form consisting of multiple hierarchies. First, in 1892, when all of the planned railways were opened and the contract with the Imperial Government Railway was cancelled, the company began to introduce regional divisions under the functional departments. As each functional section set regional divisions at its own discretion, geographical areas covered by each regional division varied by functional section, which made it difficult for the company to respond to labour movements and the outbreak of moral hazard²⁷ among employees by the beginning of 1898. Decline of the financial performance resulted in a drastic change in the governance structure and the management of the company in 1898. Subsequently, Yujun Soga, a newly appointed president, implemented an organisational reform. In 1899 he introduced a new organisational form, which was a carefully designed functional organisation. This organisation was more efficient, as it placed the head offices of each functional division in the same cities, which covered equal geographical areas. However as the scale of the company grew, this functional organisation was faced with increases in administrative costs.

Hence the company then implemented another organisational reform to introduce a decentralised divisional structure. This new organisation was designed through comparison of the organisations of railway companies in the US and Great Britain. The new organisation was an innovative one which had not existed in Japan previously. Although there were concerns about human resource requirements in operating the new organisation, the company efficiently used existing human resources and ran the organisation effectively. As a result, its business, which once sharply dropped off from 1898, started recovering in the second half of 1903, when the divisional organisation was introduced. Due to the reform, the controlling power of the division superintendents was reinforced and cooperation among functions was reinforced. Hence the company could deal with the sudden increase in traffic due to the outbreak of the Russo-Japanese War.

These organisational reforms corresponded to the reforms of the personnel management. With the first organisational reform in 1899, the upper ranks of the blue-collar workers were integrated into the manager ranks. The company

finally shifted wages for engine drivers from being paid on a daily basis to being paid on a monthly basis in 1902, and this was institutionalised in April 1903 with the second organisational reform. This was a consequence of the demands from engine drivers and assistants to improve their status, which had begun with the engine drivers' strike, and at the same time it was a symbol of the company's conciliatory attitudes toward labour issues. Moreover, these ranking system reforms gave incentives to the blue-collar workers by increasing the opportunities for promotions.

In parallel with the increase in status of the workers, the company took measures to deal with labour movements. In particular, the Kyoseikai was dissolved and was reorganised into a study group in 1901. The introduction of the divisional organisation in the second organisational reform was effective in suppressing labour movements. In fact, neither functional unions nor an enterprise union were formed in Nippon Railway Co. from then on. From the point of view of personnel management, the series of organisational reforms in Nippon Railway Co. was a great success.

Finally, in terms of the financial performance, it is noteworthy that labour productivity increased and both operating costs and profit improved from 1903, when the divisional organisation was introduced. The company earned a large amount of profit by responding to the sudden increase in traffic under the Russo-Japanese War through improvement of work efficiency due to the organisational and personnel reforms. This point is notable as contrasted with the first organisational reform, where the company suffered from a decrease in productivity due to the new costs incurred with the expansion of the organisation. Therefore, whereas one of the purposes of the second organisational reform was to impede the labour movement and for the company to gain a bigger 'share of pie' (Marglin 1974: 62), the second organisational reform greatly contributed to the improvement of the company's performance because the decentralised divisional organisation was well suited to the scale and the geographical sphere of the operations of the Nippon Railway Co.

Notes

- 1 In Nippon Railway Co. there was a clear demarcation between people hired by the headquarters who consisted of three ranks of employees: directors (*Shuji*) and engineers; clerks and assistant engineers; employees (*Koin*), and people hired by divisions or sections (*Bu-ka Yatoi*). In the employees rank, in addition to the low level clerical white-collar employees in shops such as telegraph operators and conductors, blue-collar employees such as yardmen, engine drivers and engine driver assistants were also included.
- 2 As of the end of 1899, the share of employees hired by the headquarters was more than 40 per cent even in the operational sections, except for factories and the Track Maintenance Section which used many workers and labourers (Nippon Railway '*Houkoku*' (second half of 1899)).
- 3 A graduate from the Department of the Civil Engineering, Engineering College (Kobu Daigakko, the forerunner of the Faculty of Engineering of the University of Tokyo). He was assigned to be deputy director of the Traffic Section in August 1889.

- It is highly suggestive that a civil engineer was responsible for train operation and led the organisational reform, in comparison to the importance of the role of civil engineers in the organisational development process in the US railway industry (Chandler 1977: 95).
- 4 'Ikensho' (Proposals) (April 1892) in Kanbara (unknown).
 - 5 An incident concerning misappropriation of transporting salaries for armies by a head of statistics in the Traffic Section. Detected in April 1897.
 - 6 An issue in which the government rejected the management's attempt to enforce a revision of a by-law, in defiance of the quorum of the general meeting (Yamada Eitaro Den Hensan-iinkai (ed.) 1995: 97–102). The revision had aimed to remove the restriction of large stockholders' rights to vote in general meetings.
 - 7 According to Aoki's study, the average number of engine driver resignations (including resignation due to death) during 1900–02 was 11.0 (Aoki 1977: 40).
 - 8 'Shoku Dai 40-gō Honsha Shintatsu 22' (August 1896) in Nippon Railway 1898.
 - 9 'Yakuin Shōyokin Shikyū ni Kansuru Reiki' (enacted in 1893) in Nippon Railway 1903: 254.
 - 10 In Japan Railway Co., the established standard of years of service in the company was regarded as being three years and more; if an employee resigned with less than three years' service, he was not paid retirement allowance ('Shokuin Taishoku Kyūyokin Kisoku' (enacted in July 1898) in Nippon Railway 1903: 260–1).
 - 11 The median and the mode was 0.35 yen, the mean 0.38 yen, and the standard deviation 0.06 yen. According to a salary table of the Nippon Railway Co., a daily wage of 0.35 yen corresponded to the eighth grade of daily-wage grades, and it was one rank higher than the minimum wage of the employees (ninth grade, at or less than 0.3 yen) (Nippon Railway 1903: 225).
 - 12 'Nittetsu Kubo Un'yu Kacho no Enzetsu' (A speech by Mr Kubo, a Traffic Section Chief) in *The Railway Times* (27 September 1902): 8.
 - 13 Operating costs per 1,000 miles was 625 yen in the second half of 1899, which was a 108 yen reduction from the second half of 1898 (733 yen) (Nakamura 2003: 117–18).
 - 14 The purchase unit price of coal for Nippon Railway Co. decreased from 8.4 yen per ton in the second half of 1898 to 5.4 yen in the second half of 1899 (Nakamura 2003: 119).
 - 15 Personnel costs in the Traffic Section decreased from 278,999 yen in the second half of 1898 to 271,649 yen in the second half of 1899. In the Track Maintenance Section, costs were also reduced from 55,265 yen to 46,233 yen. In total costs were reduced by 16,282 yen (Nippon Railway 'Houkoku' (1898 and 1899)).
 - 16 The cost of engine drivers increased from 8.8 per cent of the total costs in Engine Driving Section in the first half of 1898 to 13.5 per cent in the first half of 1900 (Nakamura 2003: 119).
 - 17 An incident whereby, on 10 November 1901, two trains nearly collided near Semine station as the Traffic Section Chief let the Imperial Train depart, despite the forerunning train having stopped with engine trouble (Rodo undo shiryo kanko-iinkai (ed.) 1962: 623–8).
 - 18 Only three had been paid monthly from among 123 engine drivers in 1901. In contrast, 136 out of 137 engine drivers were shifted to monthly basis wages in 1902. There were advantages included with monthly based salaries – full salary for up to 90 days sick leave and 30 days absence for personal matters was guaranteed (Woo 2003: 56).
 - 19 Thirty-eight from among 40 railway companies which had already been established in 1900 adopted functional organisation, whereas the remaining two companies adopted a simple hierarchy. In 38 companies which adopted functional organisation, five of them, Imperial Government Railway, Nippon Railway, Sanyo Railway, Kyushu Railway and Hoshu Railway, changed to multi-layer organisations. From calculations by Kinoshita 1900.

- 20 A talk by the president Soga in *The Railway Times* (2 May 1903).
- 21 'A talk by the president Soga' in Nippon Railway '*Sha-ho*' (14 April 1903).
- 22 '*Jimu-Shochō Kariinin Jikō*' (18 May 1903) in Nippon Railway 1903: 79–80.
- 23 Nippon Railway '*Kenkyukai Zasshi*' Number 18 (18 June 1903): 3 and Number 19 (28 July 1903): 7–9.
- 24 '*Ekifu/Hosen Kenchiku Kofu/Kurina Saiyo Shiken Kisoku*' (Regulations of entrance examinations for porters, platelayers and cleaners), '*Un'ten Joshu Minarai Saiyo Shiken Kisoku*' (Regulations of entrance examinations for engine driver assistant trainee) in Kanbara (unknown).
- 25 This point coincides with Margin's argument that '...these innovations in work organisation were introduced so that the capitalist got himself a larger share of the pie at the expense of the worker' (Marglin 1974: 62), rather than to improve efficiency of production.
- 26 This financial data is based on Table 4.1 in Nakamura 2003: 117.
- 27 A scandal involving the director in the Traffic Section. See note 5.

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5 Determinants and effects of employing professional corporate executives

A case of cotton-spinning companies in pre-war Japan

Tetsuji Okazaki

Introduction

One of the phenomena in modern business history which has been attracting the attention of economists, managerial scientists and lawyers, is the emergence and diffusion of corporate executives who are separated from ownership. The seminal work of Berle and Means (1932) stressed that ownership of large companies was substantially dispersed, and that as a result, a major part of corporate decision making was handled by professional executives separated from ownership.

On the other hand, Chandler (1962, 1977) gave a new interpretation of the role of professional executives from a historical perspective. From the late nineteenth century to the early twentieth century, large corporations combining multiple functions, typically production and distribution, emerged in the U.S. as a result of active horizontal and vertical consolidations aimed at economies of scale and scope. These large corporations integrated the function of resource allocation, which had been mainly handled by the market. To put it differently, Chandler proposed a view that the “visible hand” of corporate executives substituted for the “invisible hand” of the market. This view has had a deep impact not only on research in business and economic history, but also on economic theory (Williamson 1985; Milgrom and Roberts 1992; Lamoreaux, Raff and Temin 2003).

Chandler (1962) described the attributes of the executives of these large companies as follows: “These enterprises, far too large to be managed by small family groups, came quickly to be administered by full-time professional managers” (p. 24). Further, with respect to the shareholders of these corporations, “the stockholders, the legal owners, long ago abdicated this function. They had neither time, information, nor (as long as the enterprise was paying dividends) the interest to make the basic policy decisions. What little they did know about their company was told them by the manager, who spent all their working time administering its affairs” (pp. 312–13). In other words, according to Chandler, the basic attributes of the executives who emerged to manage these large companies are: (1) they worked full-time for the company, and (2) they were separated from ownership. In short, expansion of the role of corporate executives due

to the emergence of large integrated companies generated a new class of corporate executives, namely professional executives.

Chandler's view has also been influential in research on Japan's business and economic history, and literature exist on the development of large companies in Japan (Yui and Fruin 1983; Yui 1995; Takeda 1995), and on the emergence and diffusion of corporate executives (Morikawa 1981; Morikawa ed. 1991; Miyamoto and Abe 1999). In particular, Morikawa (1981), which investigated the diffusion of corporate managers using the data of "*Zenkoku Shogaisha Yakuinroku*" (*Handbook of Corporate Executives*), is both pioneering and still very important. Morikawa found that the proportion of professional executives in the total directors of large Japanese corporations increased from the 1900s to the 1930s, and that most of them had some form of higher education. He accounted for this phenomenon with the hypothesis that their higher capabilities were necessary to cope with an increasingly complex and difficult environment.

Based on these literature, in this chapter we aim to present a historical study that examines two aspects of the Japanese corporate system. First, we explore the determinants of employment of professional executives. In particular, the attributes of companies which employed professional executives are focused on. Through this, we intend to elucidate the roles which were expected of professional executives, and the relationship between the employment of professional executives and the ownership structure. Here, we operationally define a professional corporate executive as an executive who is not one of the ten largest shareholders of the company they work for and who is not an executive of any other corporation. As such, corporate executives comprise the positions of: chairman, president, vice-president, executive director and manager. In Japan, there were and are two types of executive director, the *senmu* director and the *jomu* director, with the former in the more senior position. In order to discriminate between these positions, the terms *senmu* director and *jomu* director are used in this chapter. Ordinary directors are excluded from the set of corporate executives because, in many cases, ordinary directors in pre-war Japan were engaged in governing top management, but were not in management itself (Okazaki 1999).

Second, we investigate how employment of professional executives affected corporate performance. It is important to analyze this issue quantitatively because the employment of professional executives could potentially have a negative effect on firm performance, as well as the positive effect of their professional capabilities. As is well-known, separation of ownership and control generates the agency problem between owners and management. Specifically, it is possible that moral hazard by professional executives would occur (Jensen and Meckling 1976; Milgrom and Roberts 1992). Given the potential for positive as well as negative effects, an empirical approach is required to see which of the two effects was dominant.

In addressing these two issues, we use data from the cotton-spinning industry. For our purpose, it is essential that data on the attributes of corporate executives as well as data on the attributes of companies are available. The cotton-spinning

industry satisfies this data availability condition, and also happens to have been one of the major industries in pre-war Japan. The rest of the chapter is organized as follows: the next section describes the data and samples; the following section overviews the distribution of the attributes of corporate executives and its change over time; the fourth section econometrically analyzes the determinants and effects of employing professional executives; and the final section concludes the chapter.

The data and the samples

Most of the cotton-spinning companies in Japan were organized into an industrial association called the “*Dainihon Menshi Boseki Rengokai*” (Japan Cotton Spinning Association). From 1903, the Association edited a semiannual handbook on the cotton-spinning industry, the “*Menshi Boseki Jijo Sankosho*” (*Handbook of the Cotton Spinning Industry*). The handbook contains firm-level data on the real side of corporate activities including production, input of raw materials, production capacity, and number of plants, as well as those on the financial side including capital, debt and profit. The founding year of each company is also available. We use all of the companies whose data are available in the second half-year issues of 1915, 1925 and 1935 as our primary samples. The data of 33, 51 and 59 companies are available for each year, respectively (Table 5.1). With respect to these primary samples, we collected data not covered in the Handbook from other sources.

First, the lists of corporate executives of each company are taken from the 1916, 1926 and 1936 issues of the “*Kabushiki Nenkan*” (*Yearbook of Corporate Stocks*) by Nomura Shoten,¹ a major securities company of the time. With respect to companies whose data on 1925 and 1935 are not available in the *Kabushiki Nenkan*, we complemented the data with the thirtieth and fortieth issues of the “*Ginko Kaisha Yoroku*” (*Directory of Banks and Companies*) by Tokyo Koshinjo, a major credit bureau of the time. With respect to companies whose data on 1915 are not available in the *Kabushiki Nenkan*, data were collected from their original business reports. The library of the Economics Department of University Tokyo has a collection of business reports from a wide range

Table 5.1 Description of the sample firms (number of firms)

	<i>Total number of cotton spinning companies</i>	<i>Data on the attributes of corporate executives are available</i>	<i>Data on the shareholding are available</i>
1915	33	23	22
1925	51	48	45
1935	59	52	50

Source: Dainihon Menshi Boseki Rengokai, *Menshi Boseki Jijo Sankosho*, the second half year issues of 1915, 1925 and 1935. Jinji Koshinjo. *Jinji Koshin Roku*, the 4th edition, Tokyo Koshinjo, *Ginko Kaisha Yoroku*, the 30th and 40th editions.

of companies, and the library at Osaka University has an almost complete collection of business reports from cotton-spinning companies. These reports were donated by the *Boseki Kyokai*, the association that succeeded the *Dainihon Menshi Boseki Rengokai*.

Second, information on the positions that executives of cotton-spinning companies held was collected from the fourth issue of the “*Jinji Koshinroku*” (*Directory of Personal Credit Research*), and the thirtieth and fortieth issues of the *Ginko Kaisha Yoroku*. As the *Ginko Kaisha Yoroku* has a personal index, the data for each person’s executive position was easily compiled (Okazaki, Sawada and Yokoyama 2005). There were many cases where executives of cotton-spinning companies held positions as ordinary directors or auditors in other companies, but as this chapter focuses on the executive positions defined above, in such cases, it was assumed involvement in those other positions was insignificant.

Third, we collected data for each executive’s shareholdings with respect to the company for which they worked. Specifically, we checked whether or not they were one of the ten largest shareholders. Shareholdings data were taken from the 1926 and 1936 issues of the “*Kabushiki Gaisha Nenkan*” (*Yearbook of Joint-stock Companies*) by Toyo Keizai Shinposha, a major publisher specializing in business and commerce, and from the original shareholder lists attached to the business reports discussed above. And finally, from the same data sources, we compiled data for each company’s ownership structure, specifically the ownership share of the ten largest shareholders.

Out of the primary sample companies, 33, 51 and 59 companies for 1915, 1925 and 1935, respectively, we have the lists of executives and information on their external executive positions for 23, 48 and 52 of these companies, respectively. They constitute the secondary sample of companies. The reason why the ratio of the secondary sample to the primary sample is low for 1915 is that the coverage ratio of the *Jinji Koshinroku* is low for that year. Finally, for the secondary sample, we have ownership data for 22, 45 and 50 companies for the same years (Table 5.2). This constitutes the final sample.

The ratios of the final samples to the primary samples are 66.7 percent, 88.2 percent, and 84.7 percent for 1915, 1925 and 1935, respectively. The ratios for 1925 and 1935 are reasonably high, but the ratio for 1915 is lower because of a potential selection bias. A major reason why some executives’ information is not available in the *Jinji Koshinroku* may be that they were not well established in business society, and these cases seem to be more frequent for professional executives who were not large investors. We should therefore be mindful of this potential bias in the following analysis.

Changes in the attributes of corporate executives

To begin, we examine the distribution of corporate executives’ positions (e.g. chairman, president, etc.). Table 5.2 shows the number of firms per executive position. The position of president existed in 70–80 percent of the sample companies for the period 1915 to 1935. The percentage of companies with the

Table 5.2 Distribution of executive positions

		<i>Chairman</i>	<i>President</i>	<i>Vice-president</i>	<i>Senmu director</i>	<i>Jomu director</i>	<i>Representative director</i>
Number of firms	1915	3	16	0	7	3	0
	1925	4	35	4	19	19	2
	1935	2	42	0	25	23	0
Percentage	1915	13.6	72.7	0.0	31.8	13.6	0.0
	1925	8.9	77.8	8.9	42.2	42.2	4.4
	1935	4.0	84.0	0.0	50.0	46.0	0.0

Source: See the text.

position of *senmu* director increased from 31.8 percent in 1915 to 50.0 percent in 1935. The diffusion of the *jomu* director position was more rapid. The positions of chairman, vice-president, representative director and manager were exceptional.

Table 5.3 shows the number of people in each position. There were 32, 96 and 110 corporate executives in the sample firms in 1915, 1925 and 1935, respectively. This implies that on average there were approximately 1.45, 2.13 and 2.20 executives per firm for these years. In 1915, half of the executives were presidents, with *senmu* directors being the next largest group. In 1925, the numbers of *senmu* and *jomu* directors increased significantly. In particular, the number of *jomu* directors increased sharply. From 1925 to 1935, the trend for an increasing number of *senmu* and *jomu* directors continued. Roughly speaking, top management of Japanese cotton-spinning firms in 1935 was composed of one president, one *senmu* director, and one *jomu* director.

Table 5.4 shows the attributes of these corporate executives. We identified corporate executives who did not hold an executive position in another company, who were not one of the ten largest shareholders of the company for which they worked, and who satisfied both these conditions, namely professional executives. First, it is notable that more than 80 percent of the companies did not have a professional executive in 1915. Even taking into account the possible sample bias mentioned in the previous section, this ratio is significantly high. Of the two conditions for professional executives, the ownership condition was the more restrictive. While approximately 70 percent of the firms had at least one executive who held no executive position in another firm, the percentage of firms which had at least one executive who was not one of the ten largest shareholders, was less than 30 percent.

In 1925, the percentage of firms which had no professional executives decreased to less than 60 percent. In other words, more firms came to have executives who did not hold an executive position in another firm and who were not one of the ten largest shareholders. In particular, the percentage of firms which did not have executives who were not one of the ten largest shareholders, decreased to 53.3 percent. This trend of separation of ownership and control continued, and consequently half the firms employed at least one professional executive by 1935.

Table 5.5 breaks down the data in Table 5.4 by firm scale in terms of paid-in capital. We divided the company samples into two groups: the companies whose capital was more than five million yen; and, those whose capital was less than or equal to five million yen. The data for 1915 is not reported because there were only two firms whose capital was more than five million yen. Looking at the data for 1925, we find that the distributions of the executives' attributes were substantially different between the two company groups. With respect to the smaller firm group, the percentage of companies which had no professional executive was as high as 69.7 percent. However, the same percentage was only 33.3 percent for the larger firm group. This suggests that the scale of companies was positively associated with the employment of professional executives.

Table 5.3 Executives of the sample firms

	<i>Number of firms</i>	<i>Total</i>	<i>Per firm</i>	<i>Chairman</i>	<i>President</i>	<i>Vice-president</i>	<i>Senmu director</i>	<i>Jomu director</i>	<i>Representative director</i>	<i>Manager</i>
1915	22	32	(1.45)	3	16	0	8	3	0	2
1925	45	96	(2.13)	4	35	4	19	31	3	0
1935	50	110	(2.20)	2	42	0	27	38	0	1

Source: See the text.

Table 5.4 Distribution of firms by number of executives of each attribute (%)

	Total	Number of sample firms	0	More than 0	1	2	3	4	5	6
1915										
Total Executives	100.0	(22)	0.0	100.0	59.1	36.4	4.5	0.0	0.0	0.0
No Executive Position in Another Firm	100.0	(22)	31.8	68.2	59.1	4.5	4.5	0.0	0.0	0.0
Separated from Ownership	100.0	(22)	72.7	27.3	22.7	4.5	0.0	0.0	0.0	0.0
Professional Executives	100.0	(22)	81.8	18.2	18.2	0.0	0.0	0.0	0.0	0.0
1925										
Total Executives	100.0	(45)	0.0	100.0	26.7	53.3	8.9	6.7	0.0	4.4
No Executive Position in Another Firm	100.0	(45)	15.6	84.4	46.7	22.2	6.7	4.4	2.2	2.2
Separated from Ownership	100.0	(45)	53.3	46.7	31.1	8.9	2.2	0.0	4.4	0.0
Professional Executives	100.0	(45)	60.0	40.0	24.4	8.9	2.2	0.0	4.4	0.0
1935										
Total Executives	100.0	(50)	0.0	100.0	26.0	46.0	16.0	6.0	6.0	0.0
No Executive Position in Another Firm	100.0	(50)	18.0	82.0	32.0	40.0	8.0	2.0	0.0	0.0
Separated from Ownership	100.0	(50)	40.0	58.0	30.0	10.0	14.0	4.0	0.0	0.0
Professional Executives	100.0	(50)	52.0	48.0	26.0	16.0	6.0	0.0	0.0	0.0

Source: See the text.

Table 5.5 Distribution of firms by number of executives of each attribute: by paid-in capital (%)

		Total	Number of sample firms	0	More than 0	1	2	3	4	5	6
1925	Not larger than 500 million yen	100.0	(33)	0.0	100.0	24.2	60.6	6.1	9.1	0.0	0.0
	Total Executives	100.0	(33)	18.2	81.8	45.5	24.2	6.1	6.1	0.0	0.0
	No Executive Position in Another Firm	100.0	(33)	63.6	36.4	27.3	6.1	3.0	0.0	0.0	0.0
	Separated from Ownership	100.0	(33)	69.7	30.3	21.2	6.1	3.0	0.0	0.0	0.0
	Professional Executives	100.0	(12)	0.0	100.0	33.3	33.3	16.7	0.0	0.0	16.7
	Larger than 500 million yen	100.0	(12)	8.3	91.7	50.0	16.7	8.3	0.0	8.3	8.3
	Total Executives	100.0	(12)	25.0	75.0	41.7	16.7	0.0	0.0	16.7	0.0
	No Executive Position in Another Firm	100.0	(12)	33.3	66.7	33.3	16.7	0.0	0.0	16.7	0.0
	Separated from Ownership	100.0	(12)								
	Professional Executives	100.0	(12)								
1935	Not larger than 500 million yen	100.0	(27)	0.0	100.0	44.4	44.4	11.1	0.0	0.0	0.0
	Total Executives	100.0	(27)	18.5	81.5	44.4	37.0	0.0	0.0	0.0	0.0
	No Executive Position in Another Firm	100.0	(27)	59.3	40.7	29.6	7.4	3.7	0.0	0.0	0.0
	Separated from Ownership	100.0	(27)	55.6	44.4	40.7	3.7	0.0	0.0	0.0	0.0
	Professional Executives	100.0	(23)	0.0	100.0	4.3	47.8	21.7	13.0	13.0	0.0
	Larger than 500 million yen	100.0	(23)	17.4	82.6	17.4	43.5	17.4	4.3	0.0	0.0
	Total Executives	100.0	(23)	21.7	78.3	30.4	13.0	26.1	8.7	0.0	0.0
	No Executive Position in Another Firm	100.0	(23)	39.1	60.9	17.4	30.4	13.0	0.0	0.0	0.0
	Separated from Ownership	100.0	(23)								
	Professional Executives	100.0	(23)								

Source: See the text.

After 1925, the diffusion of professional executives was saturated with respect to the larger group, but for the smaller firm group, the percentage of companies which did not have a professional manager declined to 55.6 percent in 1935. At the same time, the distribution of the companies' scales shifted to the right from 1925 to 1935. We consider that the diffusion of professional managers among the smaller companies and the shift of the company scale distribution brought about the change we observed in Table 5.4.

Next, we look at the diffusion of professional executives by position. Table 5.6 shows the average number of executives per firm by position and by attribute. Reading this table down the rows, we see the composition of executives for each attribute and by position, and reading the table down the columns, we see the composition of executives for each position and by attribute. In 1915, there were on average 0.182 professional executives per firm. It is notable that of these, 0.136 (74.7 percent) were *senmu* directors and 0.045 (25.3 percent) were *jomu* directors. In other words, the executive positions into which professional managers were recruited in 1915 were both *senmu* and *jomu* directors. Yui (1979, 1995) indicated that the position of *senmu* director was created in major companies, and competent people were recruited to the position from outside the largest shareholders since the end of the nineteenth century, and that the position of *jomu* director had started to diffuse since the First World War. The findings in Table 5.6 confirm the points of Yui (1979, 1995).

In 1925, the average number of professional executives increased, compared with the average in 1915. The position which contributed the most to this change was the *jomu* director. The share of *jomu* directors within the set of all professional executives was as high as 71.9 percent. At the same time, looking at the table down the columns, we find that 74.2 percent of *jomu* directors were professional executives. In other words, while a major share of professional managers were *jomu* directors, a significant fraction of these *jomu* directors were professional executives. In this sense, the position of *jomu* director was key for the diffusion of professional executives in cotton-spinning firms. Meanwhile, there emerged cases where professional executives were promoted to the position of president, but these cases were still the exception in 1925.

In 1935, the share of *jomu* directors within the set of all professional executives was still high, but a little lower than in 1925. This is basically due to the fact that there were cases where professional executives were promoted to *senmu* directors and presidents. This implies that the diffusion of professional executives spread from *jomu* directors to more senior executive positions.

Determinants and effects of employing professional executives

In this section, we first investigate what attributes of a company were associated with the employment of professional executives. We use the sample firms of 1925 and 1935 in the previous section, excluding three firms whose production was nil, for a total 92 firm-years worth of observations. Because of the possible sample bias we do not use data from 1915.

Table 5.6 Average number of executives by position and by attribute

		Total	Chairman	President	Vice-president	Senmu director	Jomu director	The others
1915	Total Executives	1.455	0.136	0.727	0.000	0.364	0.136	0.091
	No Executive Position in Another Firm	0.818	0.045	0.364	0.000	0.318	0.091	0.000
	Separated from Ownership	0.318	0.045	0.000	0.000	0.136	0.091	0.045
	Professional Executives	0.182	0.000	0.000	0.000	0.136	0.045	0.000
1925	Total Executives	2.133	0.089	0.778	0.089	0.422	0.689	0.067
	No Executive Position in Another Firm	1.533	0.044	0.311	0.089	0.378	0.644	0.067
	Separated from Ownership	0.778	0.022	0.067	0.044	0.089	0.511	0.044
	Professional Executives	0.711	0.000	0.022	0.044	0.089	0.511	0.044
1935	Total Executives	2.157	0.039	0.824	0.000	0.529	0.745	0.020
	No Executive Position in Another Firm	1.412	0.000	0.314	0.000	0.392	0.686	0.020
	Separated from Ownership	1.059	0.020	0.176	0.000	0.294	0.569	0.000
	Professional Executives	0.745	0.000	0.078	0.000	0.196	0.471	0.000

Source: See the text.

Employment of professional executives is measured by the number of professional executives divided by the total number of executives (PROFESSIONAL). As stated in the opening section, Chandler (1962) proposed a view that professional executives emerged in U.S. business society in the late nineteenth century because large companies which integrated the function of the market, needed their capabilities to manage internal resource allocation. In order to test this hypothesis we use the following four variables. The first variable is the logarithm of the paid-in capital of each firm (CAPITAL). This is a general proxy for the scale of firm activities, including production, marketing, finance, and labor management. The second variable is the logarithm of the production of cotton yarns, which measures the scale of production more directly (PRODUCTION). The third variable captures the effect that when a firm expanded to multiple plants, the workload of management increased to make professional executives necessary, so this variable uses data on the number of plants for each firm (PLANT). Finally, the integration of multiple functions would increase the demand for professional executives. In order to capture this effect, we use a dummy variable which equals 1, if a firm produced cotton cloth as well as cotton yarns, and 0, otherwise (INTEGRATE).

Chandler focused on factors which expanded the demand for managerial capabilities, which we intend to capture with the above variables. However, it is also desirable to take account of the availability of managerial capabilities among firm owners. Given the agency cost associated with employing professional executives, owner-executives would always be preferable, provided appropriate large shareholders with sufficient managerial capabilities were available. In order to capture this effect, we use the age of the firm (AGE), and the ratio of the shares of the ten largest shareholders to the total shares (SHARE10). As the firm ages, the founders of the firm retire and the firm looks for replacement executives. However, the larger shareholders, who are deeply committed to the firm through investment, would be disposed to provide their own managerial capabilities. Finally, we add another dummy variable which equals 1, if the observation is from 1935, and 0, otherwise, to control for macro-level shocks.

An important result to note from the econometric analysis is that the explanatory variables above are positively correlated with one another (Table 5.7). Further, the variables indicating firm scale in a broad sense, are correlated with one another and AGE, INTEGRATE and SHARE10 are also positively correlated with the scale variables. To avoid multicollinearity, we estimate the effect

Table 5.7 Correlation matrix of the explanatory variables

	CAPITAL	PLANT	PRODUCTION	AGE	SHARE10	INTEGRATION
CAPITAL	1.000	—	—	—	—	—
PLANT	0.653	1.000	—	—	—	—
PRODUCTION	0.826	0.710	1.000	—	—	—
AGE	0.496	0.541	0.562	1.000	—	—
SHARE10	−0.466	−0.433	−0.462	−0.443	1.000	—
INTEGRATION	0.295	0.236	0.223	0.275	−0.168	1.000

of CAPITAL, FACTORY, PRODUCTION, INTEGRATE and AGE separately. Another matter is that among the 51 observations there are many where PROFESSIONAL equals 0. Taking data censoring into account, we use a Tobit model for estimation. The equation to be estimated is as follows:

$$\text{PROFESSIONAL}_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 \text{SHARE10}_{it} + \beta_3 1935\text{DUMMY} + e_{it} \quad (1)$$

where X denotes the variables CAPITAL, PLANT, INTEGRATE or AGE, and e is the error term.

The estimation results are reported in Table 5.8. The coefficients of the variables indicating the scale of the firm (i.e. CAPITAL and PRODUCTION) are positive, but not statistically significant. However, the coefficients of the variables indicating the complexity of firm activities (i.e. PLANT and INTEGRATE) are positive and statistically significant. It was not, therefore, the scale of the firms' activities, but the complexity of the activities that brought about the employment of professional executives.

With respect to the variables indicating the availability of owner-executives, the coefficient of AGE is positive and statistically significant, and the coefficient of SHARE10 is negative and statistically significant. As expected, the availability of owner-executives was negatively associated with the employment of professional executives. Finally, the coefficient of the year dummy for 1935 is not statistically significant. This result is important because it implies that the "macro" interpretations of the diffusion of professional executives are inappropriate. For example, hypotheses such as the supply of professional executives increased overall, or that changes in social environment encouraged firms to promote professional executives, are not supported by the data.

Next, we explore how the employment of professional executives affected firm performance. For this, we use the ratio of professional executives to the total number of executives in 1925 as an explanatory variable, as well as other control variables. The dependent variable is each firm's return on equity (ROE) from 1925 to 1934. The equation to be estimated is as follows:

$$\text{ROE}_{it} = \gamma_0 + \gamma_1 \text{PROFESSIONAL}_{1925} + \gamma_2 X_{it} + \gamma_3 \text{ER}_{it} + \sum \gamma \text{YEAR}_t + e_{it} \quad (2)$$

where X is the same as in equation (1), ER refers to the ratio of equity to debt to control for the effect of capital structure on profitability, and YEAR is the year dummies to control for macro shocks. First, we estimate equation (2) by OLS. The results are reported in columns (a)–(c) of Table 5.9. In all cases, the coefficients of PROFESSIONAL are positive, and except for the case where we use PLANT for X , the coefficients are statistically significant. These results suggest that the employment of professional executives had a positive impact on the profitability of the firm.

However, we should be careful about the endogeneity of PROFESSIONAL. We actually treated this as an endogenous variable in equation (1), and hence, we choose an instrumental variable referring to the estimation results of equation (1).

Table 5.8 Determinants of employment of professional executives

<i>Dependent variable: Ratio of professional executives</i>					
<i>Estimation method: Tobit</i>					
	(a)	(b)	(c)	(d)	(e)
Constant	-0.802 (1.6141)	0.364 (0.3037)	-0.431 (1.0388)	0.2372 (0.3590)	0.217 (0.3574)
CAPITAL	0.089 (0.0967)				
PLANT		0.024 (0.0138)*			
PRODUCTION			0.102 (0.0940)		
INTEGRATION				0.4541 (0.2737)*	
AGE					0.016 (0.0090)*
SHARE10	-1.314 (0.5142)**	-1.174 (0.4825)**	-1.304 (0.5001) ***	-1.45 (0.4531)***	-1.179 (0.4834)**
1935 dummy	0.047 (0.2011)	0.061 (0.1978)	0.031 (0.0202)	0.0683 (0.2004)	-0.074 (0.2098)
Observations	92	92	92	92	92
Positive observations	41	41	41	41	41
Log likelihood	-81.826	-80.804	-81.653	-80.814	-80.726

Note

Standard errors are in parentheses.

*** significant at 1% level.

** significant at 5% level.

* significant at 10% level.

Table 5.9 Effect of professional executives on profitability

<i>A. Results by OLS</i>			
<i>Dependent variable: ROE</i>	<i>(a)</i>	<i>(b)</i>	<i>(c)</i>
Constant	−0.172 (0.0651)***	−0.031 (0.0274)	−0.042 (0.0228)
PROFESSIONAL	0.022 (0.0100)**	0.015 (0.0106)	0.031 (0.0090)***
CAPITAL	0.009 (0.0043)**		
PLANT		0.002 (0.0007)***	
INTEGRATE			−0.001 (0.0124)
ER	0.120 (0.0271)***	0.113 (0.0272)***	0.133 (0.0271)***
adR ²	0.282	0.290	0.272
Observations	361	361	361
<i>B. Results by IV</i>			
<i>Dependent variable: ROE</i>	<i>(d)</i>	<i>(e)</i>	<i>(f)</i>
Constant	−0.012 (0.1398)	−0.148 (0.2014)	−0.075 (0.0338)**
PROFESSIONAL	0.106 (0.0638)*	0.205 (0.3230)	0.090 (0.0300)***
CAPITAL	−0.005 (0.1192)		
PLANT		−0.004 (0.0112)	
INTEGRATE			−0.002 (0.0131)
ER	0.165 (0.0119)***	0.225 (0.1936)	0.155 (0.0305)***
adR ²	0.200	0.095	0.222
Observations	361	361	361

Notes

Independent variables include year dummies, although not reported.

Standard errors are in parentheses.

*** significant at 1% level.

** significant at 5% level.

* significant at 10% level.

Among the explanatory variables, the variable whose statistical significance is highest is SHARE10. So we estimate equation (2) using SHARE10 as an instrument. The results are reported in columns (d)–(f) of Table 5.9. The results are qualitatively the same as those by plain OLS. All of the coefficients of PROFESSIONAL are positive, and except for the case where we use PLANT for X, the coefficients are statistically significant. It is therefore confirmed that employment of professional executives improved firm profitability even after controlling for the endogeneity. One possible criticism to this statement is that PROFESSIONAL would not have a positive effect on firm profitability, if a firm optimized the composition of its management.² Our interpretation is that the positive coefficient of PROFESSIONAL is due to large shareholders' excess commitment to the management. Namely, in case a firm's ownership structure was concentrated, large shareholders tended to have more executive positions than the optimal level.

Concluding remarks

Professional corporate executives have been attracting the attention of economists and lawyers ever since the seminal work of Berle and Means in 1932. In this chapter, we explored the process of their diffusion in Japanese business society in detail, using data from cotton-spinning companies, and analyzed the determinants and effects of this phenomenon quantitatively.

Companies which had at least one executive without an executive position in another company were already numerous in 1915. However, companies which had at least one executive who was not one of the ten largest shareholders were few at the time. From 1915 to 1925, the number of companies which employed professional executives separated from ownership increased, and this trend continued until 1935. In 1935, half of the cotton-spinning companies had at least one professional executive. The employment of professional executives was positively associated with company scale. With respect to companies whose paid-in capital was larger than five million yen, the ratio of companies which had at least one professional executive had already reached two thirds in 1925. In many cases, professional executives were recruited for the position of *jomu* director.

The Japanese cotton-spinning companies of this period, when professional executives were diffusing throughout the industry, provide us with a good opportunity to see the determinants and effects of employing them. In this chapter, assuming a framework where the demand for professional executives of a company depends upon the scale and complexity of its activities, as well as upon the availability of managerial capabilities among owners, we conducted regression analyses on the determinants of employing professional executives. It was confirmed that it was not simply firm scale, but the complexity of their activities, captured by multiple plants and forward integration that drove firms to employ professional executives. Further, companies where the ownership shares of the ten largest shareholders were small, and established long beforehand, tended to employ professional executives. This is arguably because the availability of managerial capabilities is lower for these companies. Finally, we examined the effect of employing professional executives on profitability, and found that it had a positive effect on ROE after controlling for endogeneity of it.

Notes

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1 Nomura Shoten was renamed as Osakaya Shoten in 1923.

2 This issue was pointed out by Professor Hannah.

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6 Flexibility and diversity

The putting-out system in the silk fabric industry of Kiryu, Japan*

Masaki Nakabayashi

Introduction

The putting-out system and the factory system

How did the industrialization of the silk fabric industry begin? During the process of industrialization, how did the putting-out system function, and how was it replaced by the factory system? Japanese scholars of economic history seriously considered these questions in the 1950s. Many of their works during this time especially focused on the traditional silk fabric industry, where the putting-out system eventually prevailed. These works relied on Marxian economics,¹ an approach which did not allow analysis of the comparative efficiency among various institutions and organizations within the sector, thus precluding a full assessment of the putting-out system and the factory system, even though Marxian economists had strong interest in the comparative analysis of institutions. Further, these economic history works did not explicitly distinguish the technological choice between hand looms and power looms and the putting-out system and the factory system. As a result, although these works contributed to our understanding of the industry they did not provide a comparative institutional analysis of the putting-out system and the factory system.

Another approach used in understanding the industrialization of the silk fabric industry was the neoclassical economic one. This approach also relied on the idea of single-tracked economic growth based on technological progress. Moreover, the neoclassical approach attributes the economic development in a sector exclusively to the technological progress implying that, again, the production organization within the sector was not considered.

The radicals² challenged the assumption of both the traditional Marxist and neoclassical approaches that the factory system was technologically inevitable. Instead, they argued that the factory system was preferred because it was advantaged at controlling and monitoring workers and not necessarily associated with any technological improvement in productivity.

This challenge led to two strings of the literature. One of them explicitly analyzed the efficiency of capitalist organizations, a line of inquiry which eventually responded to the challenge of the radicals. These studies found that, as the

radicals asserted, the division of labor and the hierarchical organizations that compose the centralized production organization called the factory system were principally to control workers. However, as Alfred Chandler, Oliver Williamson, and David Landes have pointed out,³ the capitalist factory system is centered at the efficient control of workers, thus linking organizational form with technology and productivity.

The other line of research replaced the view of the radicals, by trying to reconstruct the history of multiple-tracked economic development. Michael Piore and Charles Sable argued that a decentralized production organization like the putting-out system which consists of accumulated small businesses highly specialized in each process could be more efficient than a large scale factory system in “flexibility of production.”⁴

Return to the regional and micro analysis

The traditional approach to industrialization mainly focused on changes in the micro-level of specific industries and emphasized the integral of those changes as the “industrial revolution.” This traditional approach was altered by revisionist views of the neoclassical approach to economic history, views which were based on the estimation of macroeconomic performance of nations supported by neoclassical economics. Nakamura (1983), for instance, pointed out that around 1900 the share of the traditional sector in the Japanese economy was much greater than that of the modern sector, the sector thought to be under a Japanese “industrial revolution.” This finding led him to assert that Japan’s industrialization was incremental rather than revolutionary. In another critique, Crafts (1985) emphasized that the increase in total factor productivity in the modern sector was not remarkable except for the cotton industry during the British industrial revolution.

The main implication of these works is that the modernization and growth of particular industries did not rapidly pervade the national economy, implying a relative slow macroeconomic growth rate at the beginning of modernization. However, as we know *ex post*, the early stages of industrialization of particular industries did herald important changes in some industries, and while the leading phenomenon cannot simultaneously be observed in the aggregate performance of the national economy, the micro-level analysis employed long ago still provides a good understanding of these early stage developments.

However, the industrialization of the silk textile sector extends beyond the use of large factories with a boiler – the change most focused on by the traditional approach. Hudson (1986) found the “genesis of industrial capital” in the financing of the wool fabric industry by the regional community, and Berg and Hudson (1992) called for reinterpreting “industrial revolution” to include changes of the traditional sector in regional economies. This point of view, in fact, has been shared by the literature on “proto-industrialization” since Mendels (1972), which paid attention to the relation between the changes in regional economies and the international market, rather than to the aggregate economic performance of the

nation state, in order to understand the beginning of the industrialization.⁵ The study by Tanimoto and Abe (1995) is one example of a Japanese study which associates a changing regional economy with industrialization.

It is therefore necessary to discuss the leading changes in regional economies in order to more fully understand the real process of industrialization. Moreover, it must be recognized that the changes in regional economies leading to the industrial revolution comprise a combination of possible choices of production organizations and technologies, rather than simply as a unique technology solution. Accordingly, the choice of production organization between the decentralized production organization (the putting-out system) and the centralized production (the factory system) must be distinguished from the choice of production technology between handloom and power loom, as was in Saito and Abe (1987). Related to this point, it is important to note that the choice of products strongly affects the chosen combination of technology and organization, as Minami, Ishii, and Makino (1982) clarified.

In conclusion, the constraints on production should be decomposed, separately identifying technological ones and institutional and organizational ones. The technological constraints define what production is technologically feasible, while institutions and organizations determine efficiency within this feasibility. Even where there exists a technology suitable for the putting-out system, the putting-out system could still be inefficient, for example if the manufacturer (putting-outer) and weavers (subcontractors) cheat each other. In order for trades between the manufacturer and the weavers – who are physically distant – to be realized, there needs to exist a mechanism that governs the trade relationship.⁶ Efficient institutions, given technological feasibility, can be explicitly analyzed by game-theoretic microeconomic theory. The descriptive insights of Chandler (1977), Williamson (1985), etc. have been re-interpreted, extended and formally analyzed by game theory and contract theory.⁷

Institutions and organizations in the silk fabric industry of Kiryu

This study takes the silk fabric industry of Kiryu, Gunma Prefecture (Figure 6.1) in the 1900s as an interesting case to understand the efficiency of the putting-out system in a changing traditional industry.

Following established definitions in game-theoretic institutional analysis, this study defines an “institution” as a Nash equilibrium strategy (plan of actions) where no player has an incentive to deviate. For instance, if any agent follows the Civil Law, then the Civil Law is an institution. It is also a Nash equilibrium strategy only if no individual deems it advantageous not to follow it in some circumstance. If a strategy is a Nash equilibrium only within a restricted group of agents, not in the whole society, then the strategy and relevant agents compose an organization. Therefore, a firm is an “organization” (since involved are not all people in the society to which the firm belong), and the putting-out system where the manufacturer effectively controls the subcontracting weavers is also an organization.



Figure 6.1 Isaburo Kanbara's plan of organization and duties of the Traffic Section (source: Isaburo Kanbara's proposal to the Traffic Section Chief of Nippon Railway Co. (April 1892). Unpublished original document).

Since the mid 1880s, the factory system rapidly diffused among the silk reeling, cotton spinning, cotton weaving, and, in some regions, the silk weaving industries. However, in Kiryu, the silk weaving industry did not adopt the factory system during this period, but rather kept the putting-out system. Interestingly, this maintenance of the traditional organization did not imply stagnancy in the silk fabric industry in Kiryu, in fact, the industry production grew with the domestic demand from Tokyo. Regional macro level data reveal that both the traditional weaving and traditional hand silk reeling grew. The putting-out system which organized hand loom weavers continued to dominate. The City of Fukui, Fukui Prefecture, is a contrast to Kiryu as silk weaving factories with power looms propagated using machine-reeled raw silk (Filature). Fukui mainly produced cheap *Habutae* (a silk fabric with plain weave) which was exported to the U.S.

The silk fabric industry emerged in the mid eighteenth century in the town of Kiryu, the State of Kozuke (renamed Gunma Prefecture after the Meiji Restoration) and neighboring area, and developed remarkably after the early nineteenth century, mainly stimulated by the demand from the Shogunate Capital Yedo (renamed Tokyo).⁸

Raw silk was Japan's most important export after Japan adopted international free trade in 1859. Prior to the early 1880s, most of the exported raw silk was hand-reeled raw silk produced by peasants in Northern Kanto, Chubu, and Southern Tohoku. Subsequent to the mid 1880s, exports to the U.S. increasingly constituted product from the modern silk reeling industry, which was centered in Nagano Prefecture. This trend expanded greatly after 1900 when railway trunk lines built in East Japan greatly facilitated the movement of raw silk, which was now increasingly brought to supply the modern silk reeling industry. After this period, the only areas in which traditional hand reeling dominated were Kiryu, Maebashi, Ashikaga, and Isezaki, the district where traditional silk fabric industry still grew (Figure 6.1).⁹

Economic historians have examined the traditional silk fabric industry in Kiryu, but did so in relation to a national transformation to a capitalist economy. The works published in this intellectual strain in the 1950s and 1960s presumed the putting-out system was a backward production organization that should have been replaced by the factory system because these works relied on Marxist single-track stage theory: the putting-out system → the manufactory system → the factory system.¹⁰

The single-track stage theory underpinning this Marxist view implies that the adoption of the factory system was irreversible. But in fact, at least before power looms were equipped, the putting-out system continued to be viable and adopted.

In each region, the putting-out system and the factory system were chosen given the conditions of the region – a choice not solely based on the newest technology.¹¹ In the weaving industry of Kiryu, the factory system equipped with hand looms had been chosen to weave the luxury fabrics,¹² while the putting-out system had been used for most other fabrics, until the factory system were equipped with power looms for most kinds of fabrics after the late 1910s.¹³ Instead of being supplanted, the putting-out system developed and dispersed within Kiryu,

especially from the 1860s to the 1900s, when the main products of Kiryu were yarn-dyed silk fabrics.¹⁴ With the spread of production of yarn-dyed silk fabrics, the throwing process, the finishing process, and the designing process, as well as the weaving process came to be put out. Manufacturers decreased the production inside of their workshops and established subcontracting relations with the independent artisans. This example suggests that the technological change induced by the change of products to the yarn-dyed fabrics affected the change in production organization, strong evidence against the single-track stage theory.

Formation of the industrial district

The silk fabric industry of Gunma Prefecture

The production of silk fabrics in Gunma Prefecture, including Kiryu, stagnated in the 1890s, decreased in the early 1900s, and then rapidly increased in the late 1900s. The production of fabrics woven with blends of silk and cotton also increased significantly after 1900.¹⁵

Growth of the hand silk reeling industry

The growth of the Kiryu weaving industry depended on the growth of the traditional silk reeling (hand reeling) in the region. Hand-reeled raw silk had been traded at Maebashi and Omama, but after free trade began in 1859 raw silk started to be exported reducing the supply available to Kiryu.

This reduction in supply was absorbed by increasing production of silk fabrics woven with imported cotton yarn in the short term, and by the increase of producing hand-reeled raw silk in the region in the long term.¹⁶ From the 1860s to the early 1870s, the supply of raw silk to Kiryu steadily decreased, so manufacturers in Kiryu adjusted by increasing production of fabrics woven with silk-cotton blends. Since the late 1870s, the production of hand-reeled raw silk increased in Yamada County and the raw silk was supplied to Kiryu through Omama market.¹⁷ Moreover, the Ryomo Railway connecting Kiryu with Maebashi, a big market for raw silk, was built in the late 1890s, increasing the supply of available raw silk. Even with these changes in supply, quality was maintained. In fact, the hand-reeled raw silk produced in the neighboring area after 1900 was said to be the best for hand-weaving in Kiryu,¹⁸ which meant the regional specialization had been robustly preserved.

Trades of material

Ro [fine gauze, leno], the representative luxury silk fabric of Kiryu, which was dyed after weaving, was produced by a special raw silk called “Omama Hiraito”¹⁹ produced only in the Town of Omama, Yamada County, and neighboring villages. Peasants produced this very high quality “Hiraito” to order; “Hiraito” was never traded in a market. The continuous relations between manu-

facturer and specialized producer were vital to a supply of the raw material for the luxury dyed-after-weaving.²⁰

Conversely, ordinary hand-reeled raw silk was traded in the Maebashi market and the Omama market. Weaving manufacturers purchased hand-reeled raw silk from peasants in Yamada County and silk merchants in Maebashi through these markets. However, this impersonal market for raw silk was faced with the difficulty in assessing the quality of raw silk. The quality of raw silk differed, with higher qualities garnering higher market prices, but quality could only be identified by the buyer after it was woven into a fabric. This represented a problem for the market as a seller had an incentive to cheat buyers by claiming that his product was of a higher quality than he knew it to be, a bad equilibrium. To prevent such cheating, the Sericultural Association of Omama was established in the Town of Omama in 1900, and the Sericultural Association of Maebashi was established for the City of Maebashi in 1903.²¹ In the Omama market, for instance, any raw silk supplied to the market had to include the stamp that specified the producer and was randomly inspected by agents of the Association. If inspection discovered an impropriety, the cheater faced punishment by the Association.²² Yarn-dyed fabrics were woven by ordinary hand-reeled raw silk, not by the special “Hiraito.” Hence the increased production of yarn-dyed fabrics in the 1900s under the putting-out system was also supported by this governance of trades in the regional market for raw silk.

The putting-out system in the development of the Kiryu silk fabric industry

Diversified demands in the market

A list of famous silk fabrics of Kiryu written by Yasuhei Sawa, a middleman in Kiryu, in 1873, gives an overview of the traditional products of Kiryu in the 1870s, right before synthetic dyes were introduced from Western countries (Table 6.1). The line of products varies from the traditional luxury dyed-after-weaving fabrics that includes *Ryumon* [patterned fine gauze], *Sa Aya* [gauze], and *Chirimen* [crepe], to the yarn-dyed [dyed-before-weaving] fabrics that had developed since the mid nineteenth century, and the fabrics mixedly woven of silk and cotton. The luxury dyed-after-weaving fabrics were woven of “Hiraito” produced in the Village of Omama, Yamada County, while the other yarn-dyed fabrics and the mixedly woven fabrics were woven of ordinary hand-reeled raw silk and cotton yarn. As well as the specialties of Kiryu, some weavers copied specialties that originated from other weaving districts such as Nishijin of Kyoto Prefecture, Yonezawa of Yamagata Prefecture, Chichibu of Saitama Prefecture, and Hachioji of Kanagawa Prefecture. This broad list of products suggests that Kiryu manufacturers had begun efforts to diversify their product.

Thirty years later, after 1900, the production of the yarn-dyed fabrics such as *Kaiki* [lustrine], *Shusu* [satin], and *Shuchin* [satin], and the *Habutae* [plainly woven] increased to a large portion, although the amount of each item greatly changed every year (Tables 6.2, 6.3, 6.4). The destination of the luxury

Table 6.1 Main fabrics produced in Kiryu, 1873

<i>Kind of fabric</i>	<i>Feature</i>	<i>Kind of material</i>	<i>Kind of material yarn</i>	<i>To be dyed before/after weaving</i>	<i>Production area</i>	<i>Origin area</i>
<i>Habutae</i>	Weave of the warp and weft of the first class raw silk, "for formal kimonos." A first class fabric.	Silk	Raw silk	After	Nishijin/Kiryu	Nishijin
<i>Ryumon</i>	A patterned fabric woven of the warp and weft of the first class <i>Hiraito</i> (flat-thrown silk thread) produced at Omama. First class fabric.	Silk	<i>Hiraito</i> of Omama	After	Kiryu	Kiryu
<i>Tango Chirimen</i>	Crepe woven of the silk warp and the silk or cotton weft.	Silk/Mixture of silk and cotton	Raw silk/Cotton yarn	After	Tango/Kiryu	Tango
<i>Joshu Chirimen</i>	Crepe.	Silk	Raw silk	After	Kiryu	
<i>Kabechiyoro Chirimen</i>	Crepe, good for kimonos for women.	Silk	Raw silk	After	Gifu/Kiryu	Gifu
<i>Ki Ro</i>	Fine gauze (leno) loosely woven of the <i>Hiraito</i> warp and the <i>Hiraito</i> weft. For luxury kimonos. Mon Ro. Kasumi Ro. The special fabric of Kiryu.	Silk	<i>Hiraito</i> of Omama	After	Kiryu/Nishijin	Kiryu
<i>Sa Aya</i>	Twilled gauze patterned with gammadion. Woven of <i>Hiraito</i> of Omama.	Silk	<i>Hiraito</i> of Omama	After	Kiryu	Kiryu
<i>Rinzu Sa Aya</i>	Twilled satin patterned with gammadion.	Silk	<i>Hiraito</i> of Omama	After	Kiryu	Kiryu
<i>Rinzu</i>	Satin woven of the warp and the weft of the first class raw silk.	Silk	Raw silk	After	Nishijin/Ueda/Kiryu	Nishijin
<i>Sha</i>	Gauze loosely woven of the first class <i>Hiraito</i> , used for summer coats.	Silk	<i>Hiraito</i> of Omama	After	Kiryu	Kiryu

<i>Kameyaya Ryumon</i>	Twilled gauze patterned with small gammadon.	Silk	<i>Hiraito</i> of Omama	After	Kiryu	Kiryu
<i>Rinzu</i>	Satin produced in Kiryu for a long time.	Silk	Raw silk	After	Nishijin/Kiryu	
<i>Aya Shibō</i>	Twilled and patterned satin.	Silk	Raw silk	After	Kiryu	Kiryu
<i>Higaki Sa Aya</i>	Twilled gauze patterned with parallelograms.	Silk	Raw silk	After	Kiryu	Kiryu
<i>Mon Sa Aya</i>	Twilled gauze patterned with small marks.	Silk	Raw silk	After	Kiryu	Kiryu
<i>Hiro Ryumon</i>	Gauze woven of 6 or 8 weft with one warp.	Silk	<i>Hiraito</i> of Omama	After	Kiryu	Kiryu
<i>Shioze Ryumon</i>	Woven of the first class <i>Hiraito</i> . ditto.	Silk	<i>Hiraito</i> of Omama	After	Kiryu	Kiryu
<i>Shike Ginu</i>	For hanging scrolls and screens.	Silk	Raw silk	After	Kiryu/Nishijin	
<i>Fusen Kinu Tsumugi</i>	Woven of spun silk yarn.	Silk	Raw silk	After	Nishijin/Kiryu	
<i>Hon-yori Shima Chirimen (Omeshi Chirimen)</i>	Crepe woven of raw silk warp and thrown silk weft.	Silk	Raw silk	After	Nishijin/Kiryu	Nishijin
<i>Higashi Shima Chirimen (Dasso Chirimen)</i>	Crepe woven of imported (machine thrown) cotton yarn warp and silk weft. Recently the fashion in West Japan, so that many weavers produce it.	Silk	Raw silk	After	Kiryu/Ashikaga	Kiryu
<i>Kabe Chiyo Ro Jima</i>	Gauze woven of four threads of warp with one tube-thrown thread of weft. There are many kinds of plan, patterned, etc. as well as striped ("Shima," "Jima").	Silk	Silk/Tube-thrown silk	Before	Kiryu	Kiryu
<i>Kabe Ro</i>	Gauze (leno) woven of tube-thrown and single-colored warp and weft. There are striped and plain-colored. For summer coats and other luxury cloths.	Silk	Tube-thrown silk	Before	Kiryu	Kiryu

continued

Table 6.1 Continued

<i>Kind of fabric</i>	<i>Feature</i>	<i>Kind of material</i>	<i>Kind of material yarn</i>	<i>To be dyed before/after weaving</i>	<i>Production area</i>	<i>Origin area</i>
<i>Men Ro</i>	Gauze (leno) woven of silk warp and cotton weft, or cotton warp and cotton weft.	Silk/Cotton	Raw silk/Cotton	Before	Kiryu/Ashikaga/Kawagoe	
<i>Hon Ito Ori</i>	Woven of silk organzine warp and <i>Hiraito</i> weft, unstarched. Luxury fabric with luster.	Silk	Raw silk/ <i>Hiraito</i>	After	Yonezawa/Kiryu	Yonezawa
<i>Fushi Ito Ori</i>	Woven of silk or dupion (spun) silk warp and dupion silk or noshi (spun) silk. A good fabric.	Silk	Raw silk/Dupion silk/Noshi silk	After	Yonezawa/Kiryu/Hachioji	Yonezawa
<i>Ryumon Hira</i>	Luxury fabric woven of cleaned silk warp and half-degummed silk weft.	Silk	Raw silk	After	Kiryu	Kiryu
<i>Shokan Hira</i>	Woven of cotton warp and linen weft.	Mixture of cotton and linen	Cotton/Linen	Before	Tokyo/Hachioji	
<i>Cha U (Ryu Jo)</i>	The most tightly woven of first-class fine silk warp and degummed silk weft.	Silk	Raw silk	After	Nishijin/Kiryu	
<i>Cha Maru</i>	Woven of a little thinner (than <i>Cha U</i>) warp and degummed and colored weft.	Silk	Raw silk	Before	Nishijin/Kiryu	
<i>Kara Kohaku Jima</i>	Striped taffeta woven of a little thick weft. Patterned.	Silk	Raw silk	Before	Nishijin/Kiryu	
<i>Tango Jima</i>	Woven of middle-class degummed silk.	Silk	Raw silk	Before	Nishijin/Kiryu	
<i>Kohaku Jima</i>	Striped taffeta woven of high-class silk threads. Woven of 8, 6, or 4 threads of warp per one thread of weft. A weft thread is composed of a few thin threads of raw silk. Plain, striped, or patterned.	Silk	Raw silk	Before	Nishijin/Kiryu	

<i>Kohaku Jima Obi Ji</i>	Striped taffeta for broad sashes, woven as Ryu Haku Jima, with organzine threads of warp. Patterned.	Silk	Raw silk	Before	Chikuzen/ Nishijin/Kiryu/ Hachioji/ Yonezawa
<i>Shusu</i>	Plain or patterned satin.	Silk	Raw silk	Before	Nishijin/Kiryu
<i>Ko Donsu</i>	Patterned satin damask woven of 5 threads of warp per one thread of weft.	Silk	Raw silk	Before/After	Nishijin/Kiryu
<i>Koyanagi Ji</i>	Patterned satin damask woven of 4 threads of warp per one thread of weft.	Silk	Raw silk	Before/After	Nishijin/Kiryu
<i>Futae Donsu</i>	Patterned satin damask.	Silk	Raw silk	Before/After	Nishijin/Kiryu
<i>Atsuta</i>	Amber-colored fabric woven of <i>Hiraito</i> .	Silk	Raw silk	Before	Nishijin/Kiryu
<i>Hongoku Ori</i> (<i>Yoritto Ori</i>)	Amber-colored.	Silk	Raw silk	Before	Nishijin/Kiryu
<i>Ito Nishiki</i>	Satin damask patterned by gold or other colored threads.	Silk	Silk/Gold	Before	Nishijin/Kiryu
<i>Yamato Nishiki</i>	Satin damask patterned by gold or other colored threads.	Silk	Silk/Gold yarn	Before	Nishijin/Kiryu
<i>Mon Ori Kyu sun Obi</i>	Low-class broad sash woven of silk warp and cotton weft.	Mixture of silk and cotton	Raw silk/ Machine thrown cotton		
<i>Kantan Ori</i>	Woven of low-class organzines. Patterned and colored.				Nishijin/Kiryu
<i>Shima Chirimen Usu</i> <i>Haori Ji</i> (Striped crepe for light coats)	Very light crepe woven of silk warp and silk or cotton weft.	Silk/Mixture of silk and cotton			
<i>Kinu Chirimen</i> (Crepe)	Patterned crepe woven of single-thread silk and thick trim.	Silk	Raw silk	After	Nagahama/ Tango/Kiryu

Source: Yasuhei Sawa, "Kokunai kaku san sho orimono ito gumi mei shou ryakki" (Concise note for names and organizations of fabrics in production areas of Japan), October 1873. Held by the Main Library, University of Tokyo.

Notes

Kiryu belongs to Gunma Prefecture, Nishijin and Tango to Kyoto, Hachioji to Kanagawa (to Tokyo later), Yonezawa to Yamagata, Nagahama to Shiga.

Table 6.2 Main fabrics produced in Kiryu, 1904-05

<i>Name of fabric</i>	<i>Kind of material</i>	<i>Material yarn</i>
<i>Habutae</i> (Plain weave)	Silk	Raw silk
<i>Mon Habutae</i> (Patterned)	Silk	Raw silk
<i>Aya Habutae</i> (Twilled)	Silk	Raw silk
<i>Shike Ori</i>	Silk	Raw silk/Dupion silk of Maebashi
<i>Mon Shike Ori</i>	Silk	Raw silk/Dupion silk of Maebashi
<i>Ro Ori</i> (Gauze (leno))	Silk	Raw silk/Dupion silk of Maebashi
<i>Nanako Ori</i>	Silk	<i>Hiraito</i> of Omama
<i>Chirimen Ori</i> (Crepe)	Silk	Raw silk
<i>Ro Chirimen</i> (Crepe gauze (leno))	Silk	Hand reeled raw silk of Omama
<i>Muffler</i>	Silk	<i>Hiraito</i> of Omama
<i>Mon Lace</i> (Patterned lace)	Silk	Raw silk
<i>Rinzu Ori</i> (Figured Satin)	Silk	Raw silk
<i>Sa Aya Ji Ori</i> (Twilled gauze)	Silk	Raw silk
<i>Kanko Chirimen Ori</i> (Crepe)	Mixture of silk and cotton	Raw silk/Cotton yarn
<i>Men Yoko Shusu</i> (Satin with cotton weft)	Mixture of silk and cotton	Raw silk/Cotton yarn
<i>Neri Oritomo</i> (Fabric woven degummed raw silk)	Silk	Raw silk
<i>Ito Ori</i>	Silk	Raw silk
<i>Ichu Raku Ito Ori</i>	Silk	Raw silk
<i>Futsu Ito Ori</i>	Silk	Raw silk
<i>Kohaku Ori</i> (Taffeta)	Silk	Raw silk
<i>Futsu Kohaku Ori</i> (Reversible loosely woven taffeta)	Silk	Raw silk

<i>Omeshi Chirimen</i> (Crepe)			
<i>Futsu Omeshi</i> (Reversible figured crepe)			
<i>Kanko Shusu</i> (Satin)	Silk	Raw silk	
<i>Atsuta Ori</i>	Silk	Raw silk	
<i>Shuchin Obi Ji</i> (Satin for broad sashes)	Mixture of silk and cotton	Raw silk/Cotton yarn	
<i>Shima Ro</i> (Striped gauze)	Silk	Raw silk	
<i>Fushi Ito Ori</i>	Silk	Raw silk	
<i>Kabe Ito Ori</i>	Silk	Dupion silk	
<i>Donsu Ura Ji</i> (Satin damask)	Silk	Dupion silk	
<i>Men Shuchin</i> (Satin woven of silk and cotton)	Mixture of silk and cotton	Raw silk/Cotton yarn	
<i>Yanabuki Ori</i>	Cotton	Raw silk/Cotton yarn	
<i>Men Men Shusu</i> (Cotton satin)	Cotton	Cotton yarn	
<i>Men Men Shuchin</i> (Cotton satin)	Cotton	Cotton yarn	
<i>Aya Ito Ori</i>	Silk	Raw silk	
<i>Usu Kohaku Ori</i> (Taffeta)	Silk	Raw silk	
<i>Taffeta</i>	Silk	Raw silk	
<i>Mon Taffeta</i> (Patterned taffeta)	Silk	Raw silk	
<i>Mon Donsu Ori</i> (Patterned damask)	Silk	Raw silk	
<i>Aya Ginu</i> (Twilled silk)	Silk	Raw silk	
<i>Kaiki</i> (Lustrine)	Silk	Raw silk	
<i>Shusu Sode Ura</i> (Satin)	Silk	Raw silk	
<i>Kobai Kaiki</i> (Lustrine)	Mixture of silk and cotton	Raw silk/Cotton yarn	
<i>Krami Ori Ire Kobai Kaiki</i> (Lustrine)	Mixture of silk and cotton	Raw silk/Cotton yarn	

Source: Gunmaken Naimubu (Department of the Interior, Gunma Prefecture), *Gunmaken orimonogyo genkyo chosasho* (Report on the current situation of the weaving industry in Gunma Prefecture), Gunmaken Naimubu, 1904, pp. 38–67.

Table 6.3 Production of fabrics in Town of Kiryu (Yamada County)

Year	Piece goods				Obi (Broad sashes tied over a kimono)			
	Silk		Mixture of silk and cotton		Silk		Mixture of silk and cotton	
	1,000 m ²	1,000 yards	1,000 kg	1,000 pieces	1,000 m ²	1,000 yards	1,000 pieces	1,000 pieces
1892	963	—	—	—	90	—	40	623
1893	2,223	—	7.61	—	119	—	52	742
1894	1,679	—	8.35	—	156	—	65	921
1895	991	—	—	—	208	—	56	1,787
1896	826	—	—	—	170	—	112	1,067
1897	848	—	—	—	174	—	113	1,578
1898	959	—	—	—	298	—	107	1,564
1899	566	5,166	—	—	109	9,257	87	1,515
1900	653	7,125	—	—	90	4,905	102	1,353
1901	1,479	—	—	—	1,775	—	59	686
1902	1,259	—	—	—	1,172	—	51	706
1903	604	—	—	—	479	—	26	732
1904	205	5,268	—	—	49	1,188	28	891
1905	988	—	—	—	745	—	28	353
1906	1,768	—	—	—	605	—	67	377
1907	1,756	—	—	—	1,248	618	96	988
1908	1,316	5,293	—	—	434	—	100	1,383
1909	2,332	313	—	—	414	—	63	1,153
1910	1,297	—	0.60	53	709	—	56	1,392
1911	1,242	2,721	0.50	0	1,004	—	142	1,429
1912	1,448	3,326	0.73	27	411	—	112	1,253

Source: *Gunma Ken tokeisho* (Statistics of Gunma Prefecture).

Notes

Quantity of fabric shown is by “tan” in the source. On this table, “tan” is converted into “m²” by 1 tan = 2.56 m². The numbers since 1901 show the production in Yamada County which includes the Town of Kiryu, whereas the most production of Yamada County was from Kiryu.

Table 6.4 Production of silk fabric in Town of Kiryu (Yamada County since 1901) (divided into kinds of fabrics)

Year	Woven of Omama Hiraito				Habutae (Plain)			Kaiki (Lustrine)			Chirimen (Crepé)		Hakama	Ito Ori	Fushi Ito Ori	Shike Gimu	Rinzu (Figured Satin)	Shusu Others		Total
	Ro (Gauze)	Others	Subtotal	m^2	a	b	$c = a + b$	m^2	1,000 yards	m^2	1,000 yards	m^2	m^2	m^2	m^2	m^2	m^2	m^2	1,000 yards	1,000 yards
1892	8,522	832	9,354	825,262	—	20,480	—	38,451	—	5,632	—	0	0	0	0	63,565	—	962,744	—	—
1893	60,178	5,133	65,311	2,059,648	—	24,550	—	23,045	—	11,159	476	8,207	0	0	0	28,751	—	2,223,345	—	—
1894	114,278	8,463	122,742	963,776	—	321,608	—	16,745	—	15,634	676	182,477	5,635	0	0	42,545	—	1,678,756	—	—
1895	336,586	15,250	351,836	223,598	—	244,283	—	49,421	—	22,467	1,533	46,886	5,412	0	0	35,607	—	990,979	—	—
1896	165,453	3,994	169,446	162,458	—	217,958	—	36,736	—	75,520	12,800	31,130	55,296	0	0	50,373	—	826,181	—	—
1897	133,862	3,968	137,830	178,790	—	233,728	—	40,858	—	72,960	16,640	29,440	59,392	0	0	70,272	—	848,102	—	—
1898	127,027	3,750	130,778	187,149	—	312,576	—	36,014	—	90,880	16,128	34,560	0	0	0	147,866	—	959,022	—	—
1899	122,138	0	122,138	—	1,395	—	3,532	36,014	—	132,454	15,040	143,759	28,288	0	0	82,644	240	566,354	5,166	—
1900	107,671	0	107,671	—	3,741	—	3,384	33,516	—	66,017	10,752	0	1,843	1,597	426,368	0	653,110	7,125	—	—
1901	238,520	0	238,520	808,115	—	83,389	—	31,526	—	72,371	13,312	0	2,125	6,400	209,818	—	1,478,505	—	—	—
1902	210,755	0	210,755	595,251	—	91,136	—	23,281	—	51,149	14,715	0	4,198	3,750	260,838	—	1,259,197	—	—	—

Source: *Gunma ken tokei sho* (Statistics of Gunma Prefecture), Gunma Prefecture.

Notes

Hiraito is a flat-thrown silk thread. “Others” of “Woven of Omama *Hiraito*” contain *Sha* (gauze), *Ryumon*, *Kame Aya Ori* (patterned with hexagons), and *Kame Mon Ori* (patterned with hexagons). Handkerchiefs are not included in this table.

dyed-after-weaving fabrics such as *Ro* [fine gauze, leno] was mainly Kyoto, while the yarn-dyed fabrics such as *Shusu* and *Shuchin* were destined for huge cities like Osaka and Tokyo. The yarn-dyed products contained fabrics that were lower quality compared with the dyed-after-weaving fabrics, but the “high-quality” *Shusu* was destined to Tokyo, which suggests that the yarn-dyed fabrics demanded in huge cities were not exclusively coarse products.²³

Generally in huge cities, especially in the Tokyo metropolitan region, mass consumers came to demand higher-quality fabrics after the 1890s, and, responding to this trend, the more diversified fashions composed of various materials, textures (combinations of warp and weft), and dyes came to be supplied by weaving districts.²⁴ Kiryu responded to this change in demand in Osaka and Tokyo by producing more yarn-dyed fabrics such as *Shusu*.

The technique of dyeing and the diversified products

The availability and use of power looms is also important to understand the diversification of products. Historians of the fabric industry have devoted most attention to this matter. Among them, Minami *et al.* (1982) looked at the hypothesis that power looms were hard to apply to weaving the yarn-dyed fabrics such as patterned cloths, striped cloths, and broad sashes, and documented that this accounted for a reason why power looms had not been introduced into Kiryu in the early period.²⁵ An implication of their impressive result is that technologies for variety of products other than mechanization must be considered since power looms were not suitable to the yarn-dyed fabrics common in Kiryu. Indeed Tamura (2004) pointed out that the synthetic dyeing, not the power loom, was critically important to realize the variety of fabrics in the traditional weaving industry.²⁶ If the technologies for variety of products gave more profits than those for cheaper products, it was just natural that they took the former.

Table 6.5 shows the number of articles related to technique and technology of the fabric industry on *Kiryu no Kogyo* [*The Fabric Industry of Kiryu*]²⁷ from 1900–03. The table makes apparent that the articles related to designs which include dyeing, designing, and texture dominated. Dyeing technique was for various colors, designing was for the variety of patterns and colors, and texture was for the diversified and complicated combination of warp and weft that resulted in different looking of the surface of cloths. This fact mentions that manufacturers in Kiryu were greatly interested in techniques and technology for the variety of fabrics among the modern techniques and technologies in the early 1900s. Exactly at that time, dyeing in Japanese fabric industry had almost finished transition from natural dyes to synthetic dyes such as alizarin and aniline,²⁸ and various techniques of dyeing were tried for the variety of designs using these synthetic dyes.

Moreover, the Commercial and Industrial Association of Kiryu [Kiryu Sho Ko Dogyo Kumiai] wanted to have an institute of research and education especially for dyeing, and in response established the Textile School of the Town of Kiryu [Kiryu cho ritsu Kiryu Orimono Gakko], a school for apprentices. This

Table 6.5 Articles on *Kiryu no kogyo* (The industry of Kiryu) about technologies and techniques for fabric production, 1900–03 (number of articles)

Year	Samples	Dyeing	Design	Preparing and finishing	Texture and weaving	Throwing	Loom	Others
1900	Dyeing and Texture	17	4	1	2	1	0	1
1901	Dyeing and Texture	17	4	4	1	0	0	7
1902	Dyeing and Texture	33	5	3	3	1	0	1
1903	Dyeing and Texture	19	0	3	0	0	0	0
Total		86	13	11	6	2	0	9

Source: *Kiryu no kogyo* (The manufacturing of Kiryu), no. 16–19, 22, 29–58, 61–2, Jan.–Apr., July, 1900, Feb.–Dec., 1901, Jan.–Dec., 1902, Jan.–Jul., Oct.–Nov., 1903. *Orimono kogyo* (The fabric industry) (succeeding *Kiryu no kogyo*), no. 63, Dec., 1903.

Notes

“Samples” are a few samples of dyed threads and scraps to show the effects of new synthetic dyes and new patterns of “texture” on the top page of every issue. “Texture” mentions a combination of the warp and the weft to make a specific pattern on the surface of the fabric. “Others” include articles about other techniques and reports about foreign fabric industry.

school was modified to a school classified as a secondary school, was renamed the Kiryu Textile School of Gunma [Gunma ken Kiryu Orimono Gakko] in 1900, and was reorganized the Kiryu Textile School of Gunma Prefecture [Gunma ken ritsu Kiryu Orimono Gakko], funded by Gunma Prefecture. The school was integrated with the Isezaki Dyeing and Weaving School of Gunma Prefecture [Gunma ken ritsstu Isezaki Sen Shoku Gakko] and to the Textile School of Gunma Prefecture [Gunma ken ritsu Orimono Gakko] in 1905.²⁹ The Textile School surveyed design samples and dyeing methods in Western countries and systematically taught them. It also affiliated a Special Program [Bekka] for craftsmen for dyeing and weaving that supported their study.³⁰ In addition, the top pages of each issue of *Kiryu no Kogyo* were occupied by a few samples of synthetic dyeing tried by instructors and students of the school, with explanations on how to emulate the dye procedure.

The samples on the top pages had a model. The Industrial Association of Kiryu, [Kiryu Bussan Dogyo Kumiai] succeeded by the Textile Association of Kiryu [Kiryu Orimono Dogyo Kumiai] subscribed to American and English textile journals since 1898,³¹ and *Kiryu no Kogyo* had contents similar to those of *Textile Colorist*, Philadelphia, a center of the modern textile industry that pursued the variety of products, targeting the mass consumption in the industrial society.³² Diversified designs in the 1900s were not accidents in the traditional industry, but the results of concerted efforts to introduce modern synthetic dyeing from the Western world.

The diversity of yarn-dyed fabrics produced by the new technologies and techniques of dyeing and designing also led to rapid changes in production organizations. While most weaving manufacturers dyed their product within their workshops in 1900, it was found that in 1904 that subcontracting independent dyers dominated.³³ Instead of replacing the putting-out system, manufacturers consistently expanded this system in Kiryu – subcontracting both for dyers and weavers.

Development of the putting-out system

In Yamada County, of which a large portion is the Town of Kiryu, the number of power looms actually decreased in the early 1910s (Table 6.6b), a stark contrast to the trend of the whole Gunma Prefecture.³⁴ Another impressive feature of Yamada County is that the number of putting-out manufacturers dropped a half from 1905 to 1912 while the number of subcontracting weavers increased during the same time, so that the number of subcontracting weavers per putting-out manufacturer tripled (Tables 6.6a, 6.6b). This expansion of the putting-out sector was accompanied by increased production of diversified yarn-dyed fabrics for the mass consumption in huge cities. The expanding putting-out was thus neither a relic of the Tokugawa period nor associated with the growth from the Tokugawa period. It was instead a new phenomenon in the early twentieth century stimulated by mass consumption, and realized with the progress of synthetic dyeing to diversify the product, not with the use of power looms.³⁵

Table 6.6a Production organization of the silk fabric industry in Yamada County, Gunma Prefecture

Year	Number of independent weaving houses	Number of weaving houses subcontracting	Total	Number of looms		Number of operatives			
				Power	Hand	Weaving operatives		Supporting operatives	
Male	Female	Male	Female						
1901	724	3,796	455	6,558	1,050	7,258	—	—	
1902	714	3,691	168	6,307	1,026	7,132	—	—	
1903	704	4,331	181	6,429	2,070	10,984	810	1,227	
1904	468	2,751	167	5,629	903	1,946	1,884	7,928	

Source: Gunma Ken tokeisho (Statistics of Gunma Prefecture).

Table 6.6b Production organization of the silk fabric industry in Yamada County, Gunma Prefecture

Year	Factory industry			Cottage industry			Manufacturers farming out weaving			Weavers subcontracting										
	Number of factories	Number of looms	Number of operatives	Number of cottages	Number of looms	Number of operatives	Number of manufacturers	Number of looms	Number of operatives	Number of weavers	Number of looms	Number of operatives	Number of Male	Number of Female						
1905	39	152	438	58	648	302	0	898	37	1,078	199	0	417	13	529	3,540	0	4,202	65	4,630
1906	35	152	388	70	897	394	0	1,245	91	1,297	109	0	293	26	382	3,663	0	4,161	217	5,002
1907	33	173	418	59	876	418	0	1,367	95	1,447	139	0	388	37	468	4,034	0	5,650	263	5,562
1908	32	330	432	60	872	390	0	1,298	81	1,382	124	0	343	40	418	4,070	0	5,594	301	5,473
1909	41	356	503	54	1,005	423	5	1,369	64	1,463	97	0	280	24	446	4,155	0	5,439	293	5,433
1910	73	420	625	63	1,195	385	0	1,291	60	1,384	104	0	322	32	405	4,560	0	5,950	324	5,892
1911	66	163	569	46	754	375	12	1,399	51	1,377	70	0	0	0	0	4,713	0	6,176	279	6,029
1912	59	204	555	33	816	377	12	1,357	35	1,341	99	0	76	21	76	5,337	0	7,347	287	7,144

Source: Gunma Ken tokeisho (Statistics of Gunma Prefecture).

Efficiency of the putting-out system and benefit of agglomeration

The putting-out system in the Kiryu silk fabric industry

The weaving manufacturer [*Motobataya*] bought material yarn, and either contracted with independent producers to weave the yarn or weaved it in its workshop. There were two kinds of subcontractors: those who just subcontracted weaving [*Chinbataya*], and those who also shared in the profit from the sales of the clothes which they wove [*Shitabataya*]. Subcontracting was not restricted to only weavers – there were also craftsmen/women who subcontracted designing (making patterns), preparing looms, throwing, cleaning, and dyeing. Spatially, manufacturers concentrated in the Town of Kiryu, while craftsmen/women were both in Kiryu and the neighborhood.³⁶ Clearly, weaving remained the main subcontracted task.

In 1900, the subcontracting weavers who did not receive a share of the profits [*Chinbataya*] as well as weavers who shared the profits [*Chinbataya*] usually wove on looms that they owned, using reeds and heddles they leased from their contracted manufacturer. These subcontracting weavers mainly worked on yarn-dyed fabrics such as *Shusu* (satin) and *Kaiki* (Lustrine).³⁷

The putting-out system began to disperse in the mid nineteenth century, when yarn-dyed fabrics came to be produced, and after the 1880s, manufacturers rapidly extended the putting-out system in substitution of in-house production (the factory system). As seen above, this shift was especially rapid in the late 1900s, because synthetic dyeing broadened the variety of yarn-dyed fabrics, and their production could therefore be contracted out efficiently. The putting-out system of Kiryu in the 1900s consisted of small workshops where one of the following tasks was performed: weaving, designing of patterns, throwing, preparing, dyeing, and cleaning, which were networked by subcontracting.

Relationship between manufacturers and subcontracting weavers

Two benefits of the putting-out system for the manufacturer have been identified previously: namely that the manufacturer can shift the risk of fluctuating market demand to the subcontractor, and that the manufacturer can utilize cheap slack labors in a peasant family by subcontracting. However, although these sound reasonable, if they are true they should hold regardless of the specific historical conditions of a region. These benefits therefore can not explain why the putting-out system of Kiryu rapidly expanded in the 1900s, nor why expensive yarn-dyed fabrics as well as cheap ones were subcontracted after 1900. Contrastingly, there were also costs of the putting-out system. Opportunistic behaviors of subcontractors – such as embezzlement of material yarn or production of lower than contracted quality – were costs to the manufacturers and discouraged the use of subcontracting by them.³⁸ Indeed some manufacturers in Kiryu complained about

subcontractors' opportunistic behaviors as "dishonest" trades. Against those "dishonest" trades, the Textile Association of Kiryu [Kiryu Orimono Dogyo Kumiai] reached an agreement to collectively punish "dishonest" subcontractors, although the cooperation among the manufacturers did not really work.³⁹

Given that manufacturers expanded the putting-out system rather than the factory system in Kiryu, these manufacturers must have somehow mitigated the problem of "dishonest" trades, allowing them to profitably take advantage of the putting-out system. It is important for our inquiry to understand the real relationship between manufacturers and subcontractors, going beyond the comments of some manufacturers in the media and official reports.

To tackle the "dishonest" trades problem, *Kiryu no Kogyo* [The Industry of Kiryu] had kept the "column of subcontractors" that described the name of each subcontractor, the name of the manufacturer with whom the subcontractor traded, and the evaluation of the subcontractor by the manufacturer, on every issue since 1903 (Appendix). As shown from those descriptions, a considerable share of manufacturers had a few subcontractors with whom they had conducted business for more than ten, or even 30 years. Moreover, some manufacturers had special subcontracting weavers who specialized in *Shusu* (satin), *Kaiki* (Lustrine), *Moroito Ori*, or other kinds of fabrics for a long time, and these manufacturers asked their special subcontractors to weave product when they needed special products for the "exhibitions" and "fairs," or when they wanted to have the "best quality" silk woven. In addition, some subcontractors kept long histories of transactions, passing them on to their children, who also were weavers. An important point to observe is that manufacturers who had kept a long history of good relations with special subcontractors also had good relations with new subcontractors.

A continuous relationship between the manufacturer and the subcontractor can be sufficient to avoid "dishonest" trades even when monitoring is imperfect. For this to occur, their relationship must be repeated and long lasting, both parties must want to maximize profits and must care about receiving these profits for the long-term. If these conditions hold, it is possible that the loss of the gains from the relationship deters the subcontractor from "dishonest" trade.⁴⁰ If the manufacturer pursues the one-shot profit by opportunistically exploiting the subcontractor, or if the subcontractor pursues the one-shot profit by opportunistically cheating the manufacturer, each would lose the long-term larger benefit that would obtain if trade were honest. This fact gives both sides a strong incentive to keep mutual prosperity.⁴¹ Therefore, there did not exist any problem between the competitive manufacturers who produced high-quality yarn-dyed fabrics and their core subcontractors, as their relationship was long lived. The "dishonest" trades seem to have happened to the manufacturers who avoided long-term trades with subcontractors and did not or could not pay sufficient weaving fees to subcontractors.⁴² Complaints about "dishonest" trades from some manufacturers were actually death cries of losing manufacturers.

Related to this point, Matsumura (2002) clarified that the manufacturers failed to collectively act to deter "dishonest" trades by subcontractors. As

Matsumura (2002) mentions, the deterrence of “dishonest” trades was possible only by the continuous relation between the competitive manufacturers who successfully developed new products and their subcontractors. In other words, the collective governance of trades among the manufacturers was not effective, while the individualist governance of trades was dominant, which explains the exit of less efficient manufacturers in the early 1900s.

Another point is that many of the core subcontractors of large manufacturers were male, or couples, suggesting that they were specialized full-time weavers, not part-time weavers. Some of them were sufficiently specialized as to own three or four looms. The shift from the part-time weaving to the full-time weaving continued into the 1910s.⁴³

Therefore, core subcontractors were not “dishonest” or part-time subcontractors, as has been assumed in the literature. The competitive manufacturers had long-term relations that were more than ten years with many full-time subcontractors, each of whom specialized in weaving a few kinds of fabrics. The number of subcontractors per manufacturers was about 20 (Tables 6.6a, 6.6b), and generally each subcontractor had transactions with only a few manufacturers – hence an average manufacturer is thought to have organized a few dozen subcontracting weavers. The putting-out system in Kiryu was thus based on a long-term relationship between a core of full-time specialized weavers and a few manufacturers.

Flexibility of production and efficiency of agglomeration

Then what were the benefits of the putting-out system for competitive manufacturers? A benefit of the putting-out system was in that “it is not necessary to newly train weavers when the kinds of fabrics are changed,” – a flexibility in the kinds of fabrics, as well as a flexibility in the scale of business.⁴⁴ Flexibility seems to have been important to competitive manufacturers.

As shown on Table 6.4, the fluctuations in production of each fabric were considerably large, and the designs of each fabric changed often due to changing fashions. Under such a situation, it was not economical for a manufacturer to train and maintain all skilled weavers within his factory. On the other hand, each weaver specialized in some kinds of fabrics (Appendix).⁴⁵ Thus, a manufacturer could realize a varied lineup of fabrics at lower cost by organizing several subcontracting weavers skilled in a few specialties and maintaining them by means of a long-term relationship. Also, subcontracting weavers can reduce the risk associated with fluctuating demand by planning production with each manufacturer and keeping relations with a few manufacturers, not with only one manufacturer. Indeed in Kiryu, subcontracting was generally not exclusive so that each subcontractor was allowed to enter in contracts with other manufacturers. This type of contract was preferred also by manufacturers because “changes” in the fashion were considerable in the industry.⁴⁶

The designs of fabrics are determined by the combination of dyeing material yarn, throwing, designing, texture, finishing, and so on. If the extension of the

putting-out in the 1900s meant the development of the production organization that realized flexible diversification of fabrics, the putting-out system should be seen in each of throwing, designing, and finishing. Kameda (2000) and Hashino's Chapter 2 of this book find facts consistent with this inference. Sada-kichi Goto, the manufacturer they studied, had produced *Obi* (broad sashes) until the end of the 1890s. In the 1900s, however, this manufacturer diminished the production of *Obi*, and increased the production of cloths for kimonos, for which the weaving was put in the charge of subcontractors. Moreover, he extended subcontracting transactions with throwsters, cleaners, and dyers. He also conducted many trades with them in a year, each of them on a small scale. These transactions suggest that he chose the putting-out system for a flexibility and variety of fabrics, instead of the factory system.⁴⁷ After World War I, when the product market, the labor market and the production technology all had drastically changed, Goto went back to the factory system, and introduced power looms into his factory.⁴⁸

From 1880 to the 1900s, when production of the yarn-dyed fabrics developed, manufacturers catered to new demands by offering new designs, and flexibly responded to the fashion in the market. A flexible production organization is desirable under these market conditions. The putting-out system at that time was such an organization: it provided geographically concentrated specialized subcontractors with long-term relations with manufacturers who could be contracted based on changing market demands. Skilled full-time craftsmen/women were preferred as core subcontractors to cheap part-time workers by competitive manufacturers there. Further, as manufacturers had to adjust to fluctuations in fashion, the benefit of in-house specialized workers and production became smaller, regardless whether their products were high or low-quality. Thus, manufacturers who were competitive diminished the production in their factories, and organized weavers skilled in specific fabrics as subcontractors. Under competitive pressures (mainly for variety), the manufacturers who could not offer novelties exited, and skilled weavers concentrated with the competitive manufacturers. Therefore, the putting-out system worked to exploit the benefits of agglomeration from flexibly organizing each process of the silk fabric industry.

Until the 1910s, power looms could not be used in the weaving of yarn-dyed fabrics with varied designs due to their technological limitations. Given this technological constraint, the putting-out system was chosen as it was the least expensive production organization given the combination of weaving by hand looms and dyeing using synthetic dyes. The putting-out system was advantageous in Kiryu because of the concentration of skilled workers and the "flexibility of production" by the "flexible specialization."⁴⁹

During the Tokugawa Period, consumers of *Ro* [fine gauze, leno] – the representative luxury fabric of Kiryu – were not the general public. Not until the late nineteenth century when yarn-synthetically-dyed fabrics with varied designs were offered at reasonable prices did the mass consumption of silk fabrics occur. While the rich bought the luxury *Ro* from long-established boutiques, the new consumers bought articles which matched the fashion and their taste in general

department stores. In this transition and expansion, the putting-out system is thought to have efficiently adjusted to the style of consumption.

Keeping this point in mind, we should mention the implication of the “flexibility” of Kiryu in the early twentieth century was a little different from that of Lyons in the mid-nineteenth century.⁵⁰ The efficiency realized in Lyons was that for haute couture that was consumed by the very rich sensitive to the mode in Paris. The consumers of Kiryu fabrics in the 1890s to the 1900s were the upper part of the mass in huge cities.⁵¹ The modernization of dyeing and designing with the putting-out system allowed lower prices of the yarn-dyed fabrics, which created the mass consumption.

Concluding remarks

The technological progress in Kiryu existed in synthetic dyeing and systematic designing from the 1890s to the 1900s. Neither the large factory system nor the putting-out system consisting of organized unskilled part-time weavers was desirable there. Manufacturers organized weavers skilled in some specialties as core subcontractors, and traded with skilled dyers and skilled throwsters who were desirable for the designs targeted. The putting-out system that flexibly organized skilled craftsmen/women in long-term relationships was chosen for the yarn-dyed fabrics given the technology of synthetic dyeing. In addition, the regional market around Kiryu of material yarn was well-organized, which supported the weaving and dyeing processes. The production system optimally organized from the upstream to the downstream, enabling the industry to grow with the new demand from the emerging masses in big cities such as Tokyo.

However, the mass consumption of fabrics that producers in Kiryu responded to was not a specific phenomenon of Japan, nor was the benefit of agglomeration in Japan and Europe. For instance, in the 1900s, the fabric industry in New York and New Jersey created the demand of mass consumption by offering varied goods. A considerable part of the production was conducted by the putting-out system that organized women and children of families in the City – called tenement homework.⁵² The manufacturing industries in the twentieth century industrial societies pursued the same goal, namely, the flexible supply of varied products for mass consumption. The paths to the goal, however, were varied among industries in respective societies. The comparative analysis of them in the micro-level is left as an exciting research agenda.

Appendix Weavers under putting-out contract, shown on the issues in 1903 of Kiryu no kogyo (manufacturing of Kiryu)

<i>Manufacturers farming out weaving</i>			<i>Subcontractors</i>		<i>Kind of fabric</i>	<i>Description and evaluation of the subcontractor told by the manufacturer</i>
<i>Name</i>	<i>Location</i>	<i>Name</i>	<i>(Female/Male)</i>	<i>Location</i>		
Yosokichi Aida	Minato	Kichigoro Ohsawa (M), and another		Hishi 1, Umeda 1	<i>Katki</i>	“Weaving excellently, they have been dedicated to his job for several years.”
Shojiro Asakura	Kiryu	Shinkichi Takei (M), and 9 others		Kiryu 2, Hososawa 4, Kasagake 4		“They have steadily worked for a few years, with good skill.”
Zensuke Iwasawa	Kiryu	Naka Suto (F)		Godo	<i>Chirimen</i> (Crepe)	“She has dedicatedly worked for as long as 20 years.”
		Nui Ozaki (F)		Sakaino		“I’ve had her weave fabrics for exhibitions.”
		Tsune Hirata (F)		Kiryu		“She worked as an apprentice twenty years ago, and since then until now, she’s been sincerely working, with excellent weaving.”
		Iku Yamada (F), and another		Morita 1, Yamamae 1		“She has applied herself to weaving good fabrics.”
Kakutaro Ueno	Kiryu	Giichiro Ohkawa (M), and 3 others		Kiryu 1, Hishi 3	<i>Shusu</i> (Satin)	“With very good skill, they have been steadily dedicated to weaving for 5–6 years.”
Teisuke Ebara	Kiryu	Torajiro Arai (M), and another		Sakaino	<i>Kohaku</i> (Taffeta)	“They have steadily worked as subcontractors of the manufacturer for more than 20 years with excellent skill.”
		Sadakichi Moriguchi (M)		Kiryu		“He has steadily worked as a subcontractor of the manufacturer for more than 20 years with his excellent skill.”
		Den Arai (F)		Kiryu		“She has steadily worked as a subcontractor of the manufacturer for more than 10 years.”

continued

Continued

<i>Manufacturers farming out weaving</i>			<i>Subcontractors</i>		<i>Kind of fabric</i>	<i>Description and evaluation of the subcontractor told by the manufacturer</i>
<i>Name</i>	<i>Location</i>		<i>Name (Female/Male)</i>	<i>Location</i>		
Eihachi Osawa	Kiryu		Kikujiro Higashi (M, throwster), and 5 others	Kiryu (throwsters) 3, Sakaino 3		"They have worked for 5-6 years with fairly good skill."
			Kijuro Shinobe (M), and 2 others	Kiryu 1, Yamamae 2	Shusu (Satin)/ other fabrics for <i>Kimono</i>	"They have steadily and devotedly subcontracted weaving from the manufacturer for more than 30 years."
			Kinjiro Shimada (M)	Yamamae		"They have also been dedicated . . . with good skill for 20 years."
			Ainosuke Yanagisawa (M)	Omama		"They have also been dedicated with good skill."
			Kumekichi Kobayashi (M), and another	Kiryu 1, Kasagake 1		"They have steadily subcontracted weaving from the manufacturer."
Buhei Oshima	Kiryu		Koresichi Suwa (M), and 2 others	Kiryu 3		"They have subcontracted weaving from the manufacturer for about 1 year." "They are promising subcontractors."
			Sakujiro Unno (M), and another	Kiryu 2	Cho Shusu (Satin)	"They have subcontracted for as long as 14-15 years with sincerity." "The manufacturer ask them when he needs silk fabrics with the best quality."
			Tsune Unno (F)	Kiryu		"She has subcontracted weaving from the manufacturer, and her products are fairly good."
Yoshihei Oshima	Ashikaga		Nami Inoue (F), and 2 others	Kiryu 3	Shusu (Satin)	"They are dedicated to their job."
			Kazusaburo Yoshida	Kiryu		"Ordinary attitude and ordinary skill."
			Shikasaburo Yanagita	Morita 2,		"They have been devoted to weaving <i>Chichibu</i> ."

Gennojo Okada	Yabakawa	(M), and 6 others Shinichiro Totsuka (M)	Nirakawa 5 Nirakawa	<i>Chichibu</i>	“He is promising whereas he has worked only 1 year.”
		Maki Okawa (F), and another	Yabakawa 2	Cotton <i>Hakata</i>	“They have sincerely subcontracted weaving for 14–15 years with good skill.”
		Kumajuro Nishida (M)	Yabakawa		“He has sincerely subcontracted weaving from the manufacturer for more than 10 years.”
		Kane Sugiyama (F), and another	Yabakawa 2		“They have sincerely worked on weaving for more than 5 years.”
		“A” and 2 others (anonymous)	Yabakawa 3		“They take the lead in dishonest trades where they often embezzle the weft.” “The manufacturer has paid in advance, but they don’t really finish.”
Kiikuro Kato	Kiryu	Jihei Maehara (M), and 2 others	Kiryu 2, Umeda 1	<i>Shusu</i> (Satin)	“They have dedicatedly worked for more than 20 years to satisfy the manufacturer.”
Shoichi Kato	Kiryu	Kinzo Nagahashi (M), and 2 others	Kiryu 2, Umeda 1	<i>Shusu</i> (Satin)	“They have worked on weaving <i>Shusu</i> . . . for more than 30 years, having steadily been devoted to producing excellent fabrics.”
		Jihei Maehara (M), and another	Umeda 2		“Having sincerely been devoted to their jobs for more than 25 years.”
		Togoro Kojima (M)	Kiryu		“He has weaved very good fabrics for more than 20 years.”
		Kensaburo Kanai (M) Sentaro Otsuka (M)	Kiryu Umeda		“Having steadily worked for more than 15 years.” “He has sincerely worked on weaving good fabrics.”
Eiichiro Kitagawa	Kiryu	Risaburo Noda (M), and 4 others	Aioi 3, Kasagake 1, Hirosawa 1	<i>Moroitoori/ Yoshinoori/ Ayaitoori/ Shimaroori</i> (Striped fine gauze)	“They have devoted to weaving Moroitoori, Yoshinoori, Ayaitoori, Shimaroori for 5–6 years with excellent skill.”

continued

Continued

Manufacturers farming out weaving			Subcontractors		Kind of fabric	Description and evaluation of the subcontractor told by the manufacturer
Name	Location		Name (Female/Male)	Location		
Matagoro Kurihara	Kiryu		Tsunee Hiruma (M), and 2 others	Aioi 3	<i>Moroitoori/ Yoshinoori/ Ayaitoori/ Shimaroori</i>	"They have woven out several kinds of fabrics for 3-4 years sincerely and with good skill."
			Keitaro Fujieda (M)	Kiryu	<i>Kankoshusu</i> (Satin)	"The steadiest."
			Yoshitaro Deguchi (M)	Kiryu	<i>Kankosyusu</i>	"His attitude and skill are good."
			B (anonymous) C (anonymous)	Kiryu Kiryu	<i>Kankosyusu</i>	"He consumes [embezzles] the weft very much." "He sometimes pawns the [manufacturer's] weft."
Banshichi Saito	Yabakawa		Yoshihei Nishida (M), and another	Yabakawa 2	Cotton <i>Hakata</i>	"They have steadily and devotedly subcontracted weaving from the manufacturer with good skill."
Tokuhei Suzuki	Kiryu		Seijuro Nakamura (M), and 2 others	Kiryu 3	<i>Shusu</i> (Satin)	"One of the best technicians." "The manufacturers order products for exhibitions and fairs from them."
			Masao Hirota (M)	Hirosawa	<i>Shusu</i>	"He has very steadily devoted to weaving <i>Shusu</i> for 20 years."
			Shinzaburo Suzuki (M)	Kiryu		"Just excellent, whereas he has subcontracted from the manufacturer only for one year and little longer."
Zenzo Sumiyoshi	Kiryu		Shinichiro Horie (M), and another	Nirakawa 2	<i>Shusu</i> (Satin)	"Steadily."
Chukichi Tajima	Kiryu		Nuijiro Kojima (M)	Umeda		"He has dedicatedly and steadily subcontracted weaving from the manufacturer for 12 years since 1892, with 3-4 looms he owns."
			Yoshizo Inagawa (M), and another	Kiryu 2		"He has dedicatedly subcontracted weaving from the manufacturer, also with 3-4 looms he owns, and his weaving is good."

Yuzaburo Tamura	Kiryu	Chokichi Shimizu (M), Kiryu 1, Sakaino 1 and another	Kiryu 1, Sakaino 1	"They have sincerely worked for 7–8 years."
		Matakichi Okawa (M), Teijiro Hagiwara (M), and 2 others	Umeda 3 Umeda 3	"Very steadily." "Their attitude and skill are fair."
Itaro Tosaka	Kiryu	Ryokichi Sakurai (M), and 2 others	Hirosawa	"They have all steadily worked for more than 10 years and their products are especially excellent."
		Otokichi Morita (M), and 6 others	Kasagake 3, Hirotsawa 4	"They have sincerely worked for more than 10 years and their products are good."
Nobejuro Tomioka	Kiryu	Rintaro Shimoyama (M), and 3 others	Kiryu 2, Kasagake 2	"They have dedicatedly subcontracted weaving from the manufacturer for 10 years with excellent skill, and especially sincere, so that they are the best among his subcontractors."
		Sotaro Suto (M), and another	Kiryu 1, Sakaino 1	ditto.
Mojuro Hashimoto	Kiryu	D (anonymous)	Kawachi	"A so-called boom weaver." "During the boom, weight of fabric is often surprisingly small [he often embezzles threads], while fairly honest during the depression like these days."
		Toyo Akagawa (F), and another	Kiryu 2	"They have subcontracted weaving from the manufacturer for about 4 years." "They are honest and their products are excellent."
Kyusuke Harase	Kiryu	Shohachi Yoshida (M)	Kiryu	"Whereas he has worked as a subcontractor of the manufacturer for just 1 year, he is honest and his skill is good."
		Unokichi Takahashi (M)	Umeda	"He has sincerely worked for as long as 8 years so that the manufacturer has been satisfied."

continued

Continued

<i>Manufacturers farming out weaving</i>			<i>Subcontractors</i>		<i>Kind of fabric</i>	<i>Description and evaluation of the subcontractor told by the manufacturer</i>
<i>Name</i>	<i>Location</i>		<i>Name (Female/Male)</i>	<i>Location</i>		
Takejiro Hoshino	Kiryu		Rin Kurihara (F), and 2 others	Kiryu 3	<i>Mon Kaiki/ Kobai Kaiki</i>	“They have steadily and dedicatedly worked for 7–8 years with very good skill, and fabrics for exhibitions and fairs are woven by them.” “They came to work for the manufacturer recently, and their products are very good.”
Yasuzo Hosoya	Kiryu		Tatsukichi Hoshino (M), and another Saijiro Ishikawa (M)	Kiryu 1, Kawachi 1 Kiryu		“He has constantly and sincerely worked on weaving good products so that he is the best subcontractor.” “They are very honest and their skill is excellent, having worked for more than 8 years.”
Denjiro Maehara	Kiryu		Otokichi Okawa (M), and another Heikichi Kogure (M)	Kiryu 2 Morita	<i>Shusu (Satin)</i>	“He has consistently worked on weaving for as long as 20 years.” “They work well and satisfy the manufacturer.”
Genichiro Masao	Kiryu		Fumiya Nabeshima (M), and 2 others Kiyusaku Mukouda (M) Isonojo Okawa (M) Asajiro Umesawa (M)	Kiryu 3 Umeda Kiryu Morita		“He has worked well.” “Not so bad.” “He has sincerely worked on weaving for more than 20 years, and his output is large and its quality is good.” “He has steadily worked on weaving for more than 20 years and his products are excellent.”
			Kumagoro Sonoda (M)	Morita	<i>Shusu (Satin)</i>	

Teikichi Masuda	Kiryu	Seijuro Suwa (M), and 3 others	Kiryu 1, Shimanogo 2, Higashi 1	<i>Shusu</i> (Satin)	“They have subcontracted weaving from the manufacturer with excellent skill, and fabrics for exhibitions and fairs have been woven by them.” “They are honest and have woven excellent fabrics for 8–9 years.” “He and all his family have subcontracted weaving from the manufacturer with 3 looms.”
Fusataro Matsumoto	Kiryu	Miki Futawatari (F)	Kiryu		“She has the most steadily subcontracted weaving from the manufacturer with good skill.” “They have sincerely subcontracted weaving from the manufacturer for as long as more than 8 years with good skill.” “They have very honestly and devotedly worked on weaving <i>Shusu</i> , so that the manufacturer places his hopes on them.” “They are relatively devoted.”
		Fusa Tadokoro (F), and another	Kiryu 1, Omata 1		
		Katsujiro Suda (M), and another	Omata 2		
		Iwakichi Tamura (M), and 2 others	Kiryu 1, Umeda 1, Omata 1	<i>Shusu</i> (Satin)	
Masakichi Maruki	Kiryu	Tsunetaro Mukouda (M)	Umeda	<i>Kaiki</i>	“He has applied himself to subcontract from the manufacturer for more than 10 years.” “They have been honest for 5 years since they came to subcontract and their skill is excellent.” “He has honestly applied himself to weaving <i>Kaiki</i> for 4 years.” “They have steadily worked for about 3 years.”
		Tadashi Osawa (M), and 2 others	Umeda 2, Kasagake 1		
		Yonekichi Morishita (M)	Umeda	<i>Kaiki</i>	
		Shichihei Ishijima (M), and 3 others	Umeda 4		

continued

Continued

<i>Manufacturers farming out weaving</i>			<i>Subcontractors</i>		<i>Kind of fabric</i>	<i>Description and evaluation of the subcontractor told by the manufacturer</i>
<i>Name</i>	<i>Location</i>		<i>Name (Female/Male)</i>	<i>Location</i>		
Yonekichi Mogi	Kiryu		Sai Kanenko (F)	Umeda	Shusu (Satin)	<p>"She has sincerely applied herself to weaving for more than 30 years, and all fabrics for exhibitions and fairs so far have been woven by her."</p> <p>"They have steadily applied themselves for 16-17 years with weaving excellent products."</p> <p>"He has steadily worked for more than 16 years with good skill."</p> <p>"She has consistently and sincerely applied herself, and her products so well that all fabrics for exhibitions are woven by her these days."</p> <p>"He has worked for more than 13 years with weaving good fabrics."</p> <p>"They have honestly worked on weaving . . . for 6 years." "They are very honest if their skill cannot be said to be excellent."</p> <p>"His skill is very good and he is steady, with having woven very good fabrics for 10 years."</p> <p>"They have devotedly and consistently applied themselves to weaving, and it should be appreciated that they still sincerely work although they are as old as 80."</p> <p>"His skill is very good, he is honest, and he has applied himself to weaving for 2 years."</p>
			Kichigoro Kaneko (M), and 2 others	Umeda 3		
			Soshichi Maehara (M)	Umeda		
			Dai Morishita (F)	Kiryu		
			Denzo Kakinuma (M)	Kiryu		
			Kichijiro Shimizu (M), and 2 others	Umeda 3	Shusu	
			Sakichi Takakusagi (M)	Umeda	Shusu	
			Genjiro Maehara (M), and his wife (F)	Umeda		
			Fusataro Osawa (M)	Kiryu		

Matsutaro Motojima	Kiryu	Mitsusaburo Aramaki (M), and another	Kiryu 1, Hishi 1	<i>Shusu</i> (Satin)	“Their skill is good and they are sincere, with having subcontracted weaving from the manufacturer for 3–4 years.”
		Keijiro Osawa (M), and 3 others	Kiryu 1, Umeda 3		“He is very sincere whereas he has worked for less than 2 years.” “Also his skill is good.”
Shohei Wada	Kiryu	Fusa Miyamura (F), and 4 others	Kiryu 5		“They have devotedly subcontracted weaving from the manufacturer for 6 years since he started his business.”
		E (anonymous)	Kiryu		“Not so good, as he/she sometimes pawns the weft and fabrics woven sometimes disappear [are stolen].”
Anonymous	Kiryu	F (anonymous)	Umeda		“He/she conducts various kinds of dishonest transactions.”

Source: Kiryu no kogyo (Manufacturing of Kiryu), no. 53–8, 61–3, 1903.

Notes

All manufacturers are male. “Description” is about one (of subcontractors) whose name is shown. Subcontractors are weavers if without a special mention. Yamada County, Gunma Prefecture: Town of Kiryu, Town of Omama, Village of Umeda, Hirosawa, Nirakawa, Yabakawa, Aioi, Kawauchi. Nitta County, Gunma Prefecture: Village of Kasagake, Godo, Sakano, Shimanogo. Sawa County, Gunma Prefecture: Village of Higashi. Ashikaga County, Tochigi Prefecture: Village of Hishi, Morita, Yamamae, Omata.

Notes

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- 1 Marx (1988).
 - 2 Marglin (1974).
 - 3 Chandler (1977); Williamson (1985); Landes (1969, 1986). Saito and Abe (1987) studied Japanese cotton weaving industry based on the research by Landes (1969).
 - 4 Sable and Zeitlin (1985, 1997). Motivated by Sable and Zeitlin, Tanimoto (1998) studied the putting-out system of Japanese cotton industry, focusing on the labor supply of peasants. See note 13 of Chapter 1 of this book.
 - 5 Ogilvie and Cerman (1996).
 - 6 Governance of trade means designing an incentive mechanism such that a good Nash equilibrium is reached, where honest trades are the best response to both of the buyer and the seller. Lack of governance of trade could lead to a bad Nash equilibrium where cheating each other is the best response to both players such that trades are actually not conducted. Aoki (2001), pp. 60–1.
 - 7 Milgrom and Roberts (1992).
 - 8 Kiryu Orimonoshi Hensankai [Editorial Committee for the History of Kiryu weaving], ed., *Kiryu orimonoshi, jokan* [*The history of Kiryu weaving, vol. 1*], Kiryu, 1935. Ishihara (1993). The Tokugawa Shogunate (Samurais' government) had historically kept its stronghold in the loyalty of the lords in the East of Japan, and Yedo in the East had been the Tokugawa Shogunate Capital (Samurais' capital), while Kyoto in the West of Japan has been the imperial capital. In 1868, during the Meiji Restoration, the imperial government supported by the lords in the West defeated the Tokugawa Shogunate, occupied Yedo, and renamed it Tokyo (that literally means the "eastern capital").
 - 9 Nakabayashi (2003b), p. 134.
 - 10 Representative works by the traditional approach are Ichikawa (1959, 1996). A slightly modified perspective was presented by Kimura 1959a, 1959b, 1960, 1963, 1988, which recognized the putting-out system in Kiryu as a "decentralized manufactory." All of these studies, however, considered the putting-out system to be "backward" organization that should have been replaced by the "manufactory" system and the factory system. About Ashikaga, see Kudo (1962), pp. 90–1.
 - 11 Saito (1984) and see Chapter 1 of this book.
 - 12 Kimura (1959a), pp. 385–99; Kimura (1960), p. 137; Hashino (1997), pp. 15–16. Also in Ashikaga, the luxury fabrics and the export *Habutae* [plain fabric] were woven in the factory system equipped with hand looms (Wasedaigaku Keizaishigakkai [Society for economic history, Waseda University], ed., *Ashikaga orimonoshi jokan* [*History of the Kiryu weaving, vol. 1*], Ashikaga, Ashikaga Sen-i Dogyokai [The Textile Association of Ashikaga], pp. 208–300; Kosho 1963, 1972; Kawamura 1987, 1995.
 - 13 Tsujimoto (1978), p. 48; Kameda (1989), pp. 561–5; Hashino (1997).
 - 14 "Yarn dyeing" means material yarn is dyed before weaving. For the luxury fabrics that were dyed after weaving, the cleaning and finishing processes undertaken after weaving were important, and those processes were conducted inside the manufacturers' workshops. In contrast, in the production of the yarn-dyed fabrics, dyeing, arranging warps, cleaning yarn, throwing, re-reeling, and other preparation processes were important. Because those processes needed special skills, the craftsmen who specialized in each process were relatively important and were organized as subcontractors by manufacturers. Kimura (1959a, 1959b, 1961); Kawamura (1983, 1991).
 - 15 Nakabayashi (2003a), pp. 27–8, Tables 1.1, 1.2.

- 16 Kawamura (1988), p. 74; Kawamura (1983), pp. 171–8; Kawamura (1991), p. 49; Ichikawa (1996), p. 115, Kimura (1989), Kameda (1994), Nakabayashi (2003a), p. 29, Table 1.3.
- 17 Yamada County, Gunma Prefecture, “Yamada Gun rinji noji shocasho” [Special report on agriculture of Yamada County] (compiled in Gunma Kenshi Hensan Iinkai [Editorial committee of the history of Gunma Prefecture]), *Gunma kenshi, Shiryohen 18* [History of Gunma Prefecture, Historical Documents 18], Maebashi, Gunma Prefecture, 1978, p. 853.
- 18 Yasuzo Kawamoto, Shinshichi Miura, and Kenzaburo Ando, *Meiji 33 nen kaki shugaku ryoko Ryomo chiho hataorigyo chosa hokokusho* [Research report of the 1900 summer field work on the Weaving industry of Gunma Prefecture and Tochigi Prefecture], Tokyo, Koto Shogyo Gakko [Commercial College], 1901 (compiled in Masato Fujiwara, ed., *Meiji zenki sangyo hattatsu shi shiryō bessatsu, 50-IV*, [Historical documents of industrial development in the early Meiji, special volume, 50-IV], 1969), p. 223.
- 19 “Hiraito” is silk yarn flatly thrown from hand-reeled raw silk threads.
- 20 Kawamura (1988), p. 61. *Ryomo chiho hataorigyo chosa hokokusho*, p. 224. Gunma ken sanshogyo chosakai [Research committee for sericultural industry, Gunma Prefecture], *Gunma ken orimono genkyo chosasho* [Report on the current situation of the weaving industry of Gunma Prefecture], Maebashi, the third department of Gunma Prefecture, 1906 (compiled in *Meiji zenki sangyo hattatsushi shiryō, bessatsu, 49-II, III*, 1969), pp. 218–19. Omama Sanshi Dogyo Kumiai [The Sericultural of Omama], *Meiji 34 nendo Omama Sanshi Dogyo Kumiai hokokusho* [Annual report of the Sericultural Association of Omama, 1901], Omama, Omama Dogyo Kumiai (1902), p. 4.
- 21 Maebashi Kenshi Dogyo Kumiai [The Sericultural Association of Maebashi], Maebashi Nenshi Dogyo Kumiai [The Throwing Association of Maebashi], eds., *Maebashi kenshi dogyo kumiai, Maebashi nenshi dogyo kumiai, enkakushi* [History of the Sericultural Association of Maebashi and the Throwing Association of Maebashi], 1915 (compiled in *Meiji zenki sangyo hattatsushi shiryō, bessatsu, 52-IV*, 1969), p. 32. Omama Sanshi Dogyo Kumiai, *Omama Sanshi Dogyo Kumiai teikan* [The articles of the Sericultural Association of Omama], Omama Sanshi Dogyo Kumiai, 1900.
- 22 *Meiji 34 nendo Omama Sanshi Dogyo Kumiai hokokusho*, p. 3.
- 23 Out of the total sales of Kiryu in 1886, 55 percent was destined to Tokyo, 17 percent to Osaka, 12 percent to Kyoto, and 4 percent to Nagoya of Aichi Prefecture. *Kiryu orimonoshi, chukan* [History of the Kiryu weaving, vol. 2], 1938, pp. 553–4. But in 1900, “The biggest one of domestic destinations . . . is Kyoto-Osaka area, followed by Tokyo. Out of the total domestic sales, 70 percent is to Kyoto-Osaka area and Nagoya, and 30 percent was to Tokyo, . . . , the many *Obi Ji* [fabrics for broad sashes for kimonos], *Han Eri Ji* [for decorative collars], *Shusu* were destined to Osaka, mainly *Ro* and *Chirimen* to Kyoto, and *Shusu*, *Shchin* and other high-quality fabrics were to Tokyo,” *Ryomo chiho kigho chosa hokokusho*, p. 222.
- 24 Tamura (2004), pp. 177–210.
- 25 Minami *et al.* (1982), pp. 338–45. Makino (1984), pp. 41–3.
- 26 Tamura (2004), pp. 133–75.
- 27 Issued by Kiryusha, an industrial body established by weaving and dyeing manufacturers in 1898.
- 28 *Gunma ken orimono genkyo chosasho*, p. 130.
- 29 Gunma ken ritsu Orimono Gakko, *Gunma kenritsu Orimonog Gakko ichiran* [Guidebook of the Textile School of Gunma Prefecture], Kiryu, Gunma Kenritsu Orimono Gakko, 1910, pp. 2–3. *Kiryu orimono shi, gekan* [History of the Kiryu weaving, vol. 3], 1940, pp. 135–57.
- 30 *Gunma ken orimono genkyo chosasho*, p. 130.

- 31 They are now held by the department of engineering library, Gunma University, which succeeded the Textile School.
- 32 Scranton (1983, 1989).
- 33 In 1900: "Dyeing is conducted by the special method of each weaving manufacturer so that there is not an independent dyer." *Ryomo chiho hataorigyo chosa hokokusho*, p. 228. In 1904: "Putting-out [of dyeing] was not conducted in Kiryu before, but these days the weaving industry has become much more complicated compared with that in old days, hence each weaving manufacturer cannot afford to worry about dyeing, and improvement in dyeing has become necessary, therefore independent specialized dyers have emerged." *Gunma ken orimono genkyo chosasho*, p. 88. There were seven independent dyers, four of whom owned boilers for heating (*Gunma ken orimono genkyo chosasho*, pp. 88–9).
- 34 In whole Gunma Prefecture, the number of factories equipped with power looms steadily increased through the 1900s to the early 1910s. Nakabayashi (2003a), pp. 39–41, Tables 1.9 (a), 1.10 (a).
- 35 "In the Tenpo period [1833–43],... the production of luxury patterned fabrics prospered, thus any weaving manufacturer took the factory system for weaving and put out just a little production to subcontractors,..., however, as ordinary cloths such as *Chirimen* [crepe] mixedly woven silk and cotton and *Men Nanbu* became more and more popular since then, the products by the factory system became those of the ruralized industry, and the number of subcontracting weavers increased, and moreover, in the early 1880s, exactly when common cloths for *Obi* [broad sashes] such as *Men Shusu* (cotton satin) came in, the regional textile industry experienced a big change; the demand for the traditional luxury fabrics decreased and the supply of common products got more and more pleased in the market from day to day, therefore the manufacturers even more and more subcontracting weavers." *Gunma ken Naimu bu* [Department of Interior, Gunma Prefecture], *Gunma ken orimonogyo enkaku chosasho* [History and overview of the weaving industry in Gunma Prefecture], Maebashi, Gunma ken Naimu bu, 1904 (compiled in *Meiji zenki sangyo hattat-sushi shiryō bessatsu 48-III*, 1969), p. 60.
- 36 "Subcontractors includes those of designing (also conducting making patterns), of preparing looms, of weaving, of throwing, and so on. Among them, contracting weavers and throwsters prosper very well, so any small street in Kiryu, you hear the sounds of shuttles. Also, in Nanbu Shinjuku of Kiryu, there are uncountable throwing houses equipped with water wheels along a ditch. As well as them, seen is that every house with a thatched roof in the neighboring villages has a loom so that weaving is conducted." *Ryomo chiho hataorigyo chosa hokokusho*, p. 225. In Kiryu, there were 4,977 subcontractors in 1904, which included 13 designers, 65 loom preparers, 218 throwsters, 17 dyers, 4,560 weavers, 14 cleaners. *Gunma ken orimono genkyo chosasho*, p. 218.
- 37 Large portion of subcontracted weaving is that of Shusu, and that of Kobai Kaiki and Mon Habutae (Plainly patterned) is also subcontracted.... Generally, weaving of fabrics that do not need power looms is subcontracted, and only reeds and heddles are leased to subcontractors, to make them weave by their own looms.... Some time looms are leased. As usually seen in other textile regions, prepared warp with weft is handed." *Ryomo chiho hataorigyo chosa hokokusho*, p. 225.
- 38 Landes (1986); Saito and Abe (1987).
- 39 *Gunma ken orimonogyo enkaku chosasho*, p. 61. *Kiryu orimonoshi*, vol. 3, 477.
- 40 Fringe benefits in kind are sometimes called "embezzlement" trades, but this naming is misleading. As long as the manufacturer observes the benefit, it is neither opportunistic nor a "dishonest" trade. In many situations, the manufacturers seem to be able to infer if the manufacturers are "honest" or "dishonest." In those situations, "embezzlement" actually does not happen. Although many works such as Landes (1986) have pointed out "embezzlement" in the putting-out system, it is not clear if this was a serious issue.

- 41 Under these conditions, conducting “honest” trades could be a subgame perfect equilibrium (a stronger concept of Nash equilibrium).
- 42 *Gunma ken orimonogyo enkaku chosasho*, p. 64. *Ryomo chiho hataorigyo chosa hokokusho*, pp. 226–7.
- 43 In Kiryu, the subcontracting weavers who have been part-time weavers are changing to full-time weavers because the income from weaving is increasing by the prosperity of the weaving industry, so that the area where subcontracting weavers live is expanding to whole Yamada County, Nitta County, . . . Sawa County, . . . Tochigi Prefecture, and to Saitama Prefecture.” Tokyo Zeimu Kantokukyoku [The Tax Office of Tokyo], *Orimono seisan oyobi torihiki chosa* [Survey of the production and transaction of fabrics], 1920 (compiled in *Meiji zenki sangyo hattatsushi shiryō bessatsu* 53-IV, p. 134.
- 44 *Gunma ken orimonogyo enkaku chosasho*, p. 61. *Kiryu orimonoshi*, vol. 3, p. 477.
- 45 “Each weaver is specialized in a specific kind of fabric by special skill,” *Ryomo chiho hataorigyo chosa hokokusho*, p. 228.
- 46 *Gunma ken orimono enkaku chosasho*, pp. 64–72.
- 47 Kameda (2000), pp. 44–5; Nakabayashi (2003a), pp. 48–9, Tables 1.11, 1.12.
- 48 See Chapter 2.
- 49 Piore and Sable (1984).
- 50 Cottareau (1997).
- 51 Tamura (2004).
- 52 Hindman (2002), pp. 187–212.

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7 The development of dispersed production organization in the interwar period

The case of the Japanese toy industry

Masayuki Tanimoto

Introduction

The purpose of this chapter is to show how the dispersed production organization, as distinct from the centralized modern factory system, functioned to promote industrialization in interwar Japan, through an exploration of the development process of the toy industry in Tokyo.

Recent studies on the history of indigenous industries have revealed that Japan's modern economic growth included the development of forms of industrial organization other than the factory system.¹ The putting-out system, which prevailed among the rural weaving industries in the last quarter of the nineteenth century and the first quarter of the twentieth century, was the typical production form of this kind. The putting-out system was adopted by factors, who had previously been simply buying and selling fabrics, as a means to respond to the new business environment that had emerged after the Opening of the Ports and the Meiji Restoration, bringing together the potentially increased demand for clothes and the strategic behaviour of the rural peasant households. The system functioned rather efficiently, successfully evading the 'internal contradiction of the putting-out system',² and promoted the development of the rural weaving industry in competition with the large mechanized weaving factories.³

Even within the rural weaving districts, however, centralized workshops, equipped with power looms, emerged during the interwar period and although weaving by peasant households persisted, its decline became clear. On the other hand, a new type of dispersed production system based on small workshops was emerging in large cities such as Tokyo or Osaka. The toy industry, which we will examine in this chapter, was a typical urban small-scale industry of this kind.

The output of the toy industry in Tokyo, which accounted for more than 50 per cent of the total output of toys in Japan in most years during the period, rose rapidly during World War I from 0.3 million yen in 1914 to 1.92 million yen in 1918.⁴ Production stagnated during the first half of the 1920s, as Figure 7.1 shows,⁵ but recovered in the latter half of the 1920s and increased conspicuously immediately after the Showa Depression around 1930. This trajectory paralleled that of the total output of manufacturing industry in Tokyo and the growth rate exceeded that of Japan as a whole in the 1930s.⁶ According to the statistics for

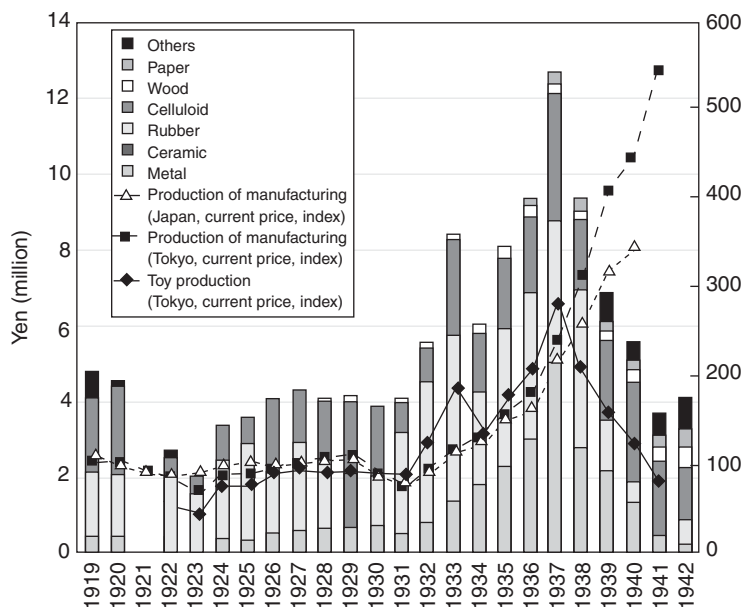


Figure 7.1 Total value of toy production in Tokyo (source: *Kōjō (Kōgyō) Tōkeihyō, Tokyo-fu Tōkeisho and Shinohara (1972)*).

1939, however, ‘factories’ employing fewer than five people accounted for 40 per cent of the total number of employees, and they produced 30 per cent of total output in ‘metal toys’. The comparable numbers for ‘toys other than metal’ were 71 per cent and 55 per cent, respectively.⁷ In fact, a municipal survey of manufacturing industry in Tokyo, executed in 1936, regarded toy manufacturing as one of the typical industries in which the putting-out system widely prevailed.⁸ It is obvious that production forms other than the factory played a significant role in this industrial growth. It is also worth noticing that the most toy products in those periods were not made from paper or wood like traditional Japanese toys, but from ‘new’ materials, such as metal from the 1900s, and rubber and celluloid from the 1910s. Thus, toy manufacturing in Tokyo was a newly-emerging small-scale industry in the interwar period, and its trajectory of production embodied that of industrial growth in interwar Japan.

The driving force behind this growth was the expansion of the export market. As is shown in Figure 7.2, the total value of Japanese toy exports increased rapidly during World War I, then stagnated and recovered through the 1920s, declined around 1930 and conspicuously increased in the 1930s. This trajectory was almost parallel with that of production shown in Figure 7.1. Though we are unable to calculate accurately the proportion of exports to output due to the limitations of the available statistics,⁹ we could hardly deny the significant role of exports in the growth of toy manufacturing.

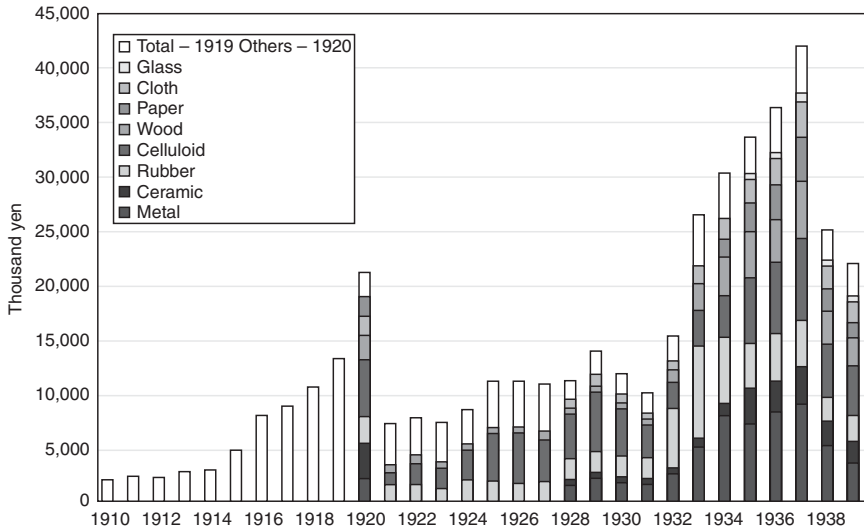


Figure 7.2 Total value of toy export (Japan, current price) (source: *Dainippon Gaikoku Bōeki Nenpyō*).

Table 7.1 demonstrates the composition of the overseas market. The main market was consistently North America and Western Europe, accounting for more than half of the total. As for Asia, British India was the largest market; followed by Dutch East India in the 1930s. On the other hand, the volume of exports to China was rather small. Thus, in general, Japanese toy exports were targeted at the markets of high income areas, including the wealthy layers in the colonies, competing with manufacturers from western countries, especially the German toy industry. This form of industrial rivalry, competing for the affluent market in industrial finished goods, appears to have pioneered an important type of world trade which was to expand after World War II.

These particularities of toy manufacturing mean that it is suited to the purpose of this chapter, which considers the ‘new’ development of the dispersed production form in modern Japan. This ‘newness’ implies not only the time when it occurred, but also the changing factors related to the competitive basis of the production form. As mentioned above, the labour force of the rural weaving industry was composed of members of peasant households. However, it is obvious that the primary competitive basis of the weaving industry – the low opportunity cost of off-season agricultural labour¹⁰ – cannot be simply applied to industries located in non-agricultural, urban areas. What, then, can account for the competitiveness of urban small-scale industries?

The studies of urban history might have answered this question with the concept of the ‘sweat shop’ or ‘sweating system’. These concepts were widely discussed in the context of social reform in the latter half of the nineteenth

Table 7.1 Overseas markets of toy export trade (%)

	<i>North America</i>	<i>Europe</i>	<i>Asia</i>					<i>Latin America</i>	<i>Others</i>
		<i>UK</i>		<i>China/ Hong Kong</i>	<i>British India</i>	<i>Dutch India</i>			
1930	33.5	23.1	14.2	29.6	8.5	9.0	5.7	6.6	5.9
1937	43.0	22.1	16.6	15.0	3.3	3.0	2.7	6.4	13.4

Source: *Dainihon Bōeki Nenpyō*.

century and in the early twentieth century in western countries, and have been revived in the discussion of the ‘urban informal sector’ in contemporary developing countries.¹¹ The concept of ‘Toshi Zatsugyō-sō (urban miscellaneous occupations stratum)’, which was proposed in the 1960s to cover the lower stratum in the cities of modern Japan, also recognized such concepts.¹² Based on these studies, the major source of the competitiveness of urban small-scale industries lay in cheap labour and miserable labour conditions. However, in the light of the adoption of labour-saving power looms and the factory system in the rural weaving industry during the interwar period¹³ and the emergence of the superior economic situation of urban areas compared to rural ones at that time,¹⁴ it is not sufficient to attribute the competitiveness of urban small-scale industry to cheap labour. Although these approaches rightly describe the working conditions of the time, the key factors that promoted the adoption of dispersed production organization in competition with the centralized factory need to be explored.

The concept of ‘flexible specialization’, derived from the seminal paper by C. Sabel and J. Zeitlin, comes to mind in this context.¹⁵ The experience of the Japanese toy industry might be seen as a case demonstrating their claims of the historical existence of various production styles other than mass production. Considering the features of toy manufacturing in Japan, however, divergences from the ‘flexible specialization’ argument are also apparent. The skill level of most of the small workshops in the toy industry can hardly be equated with that of the ‘crafts’, on which some of the ‘flexible specialization’ historiography places a special emphasis as a source of competitiveness. In fact, as will be shown later, the value-added labour productivity of small-scale workshops was far below that of large factories. The workers’ skill could not fully compensate for the difference in the physical productivity of the toy industry. An explanation in terms of the nature of the toy market, in which demand for diverse and fashionable goods prevails, also appears to be insufficient, given the existence of toy factories employing hundreds of employees in the US and the UK.¹⁶ Even in Japan, several celluloid toy factories employed hundreds of workers in the interwar period.¹⁷ Actually, these factories prided themselves on the high quality and popularity of their products. These facts indicate the necessity for further exploration of the development process of the industry, keeping the context of Japanese economic development in mind.¹⁸

We will investigate the structure of the industry and the features of individual actors such as merchants, manufacturers and domestic workers in the next section. The third section is devoted to examination of the relations between the actors. The fourth section discusses the geographical concentration and institutional assistances as foundations of the dispersed production form. The fifth section describes the creation and reproduction of the actors. The last section is a conclusion.

The traders in the toy manufacturing industry

Table 7.2 demonstrates the geographical distribution of the traders listed in the directory of the toy traders in 1933. The traders were divided into two categories, ‘merchants’ and ‘manufacturers’. The merchants, especially the ‘ton’ya’ (a kind of wholesalers, being mentioned below) were concentrated in Asakusa in the northeast part of Tokyo. Manufacturers inhabited the areas adjacent to Asakusa, though their areas of concentration differed according to the materials they used. Generally speaking, toy manufacturers utilizing relatively newly introduced materials such as rubber and celluloid gathered in the suburban areas that were incorporated into the city of Tokyo as new wards in 1932. In short, the ‘ton’ya’ in the commercial centre of Asakusa, which was also relatively new compared to the traditional centre of Nihonbashi, bounded the several types of manufactures. This view of the industry can be seen in the figure provided by a municipal survey,¹⁹ a sketch of which is shown as Figure 7.3, centring on a ‘ton’ya’ as a controller of three different types of manufacturing processes. The role of domestic work is also noticeable in this figure. We will investigate the feature of the individual actors in the following parts of this section.

‘Ton’ya’: merchants organizing manufacturing and wholesaling

In terms of the merchants in Table 7.2, there were three different types of traders engaged in the toy business. The function of the ‘material merchants’ is obvious, but the distinction between ‘Oroshi-shō’ and ‘Ton’ya’, both of them literally meaning ‘wholesaler’, needs to be scrutinized. About half of the ‘ton’ya’ were members of the Tokyo Toy Wholesalers Trade Association (Tokyo Gangu Oroshishō Dōgyō Kumiai), which included prominent merchants such as Toyoda-ya and Masuda-ya.²⁰ On the other hand, only six names of ‘oroshi-shō’ appear as members of the association.²¹ Their names are not to be found in the directory of prominent traders in Tokyo, either.²² According to the municipal survey of ‘ton’ya’, 80 out of 106 toy ‘ton’ya’ admitted that they were concerned with manufacturing or processing as well as wholesaling.²³ Generally speaking, the superior status of ‘ton’ya’ over ‘oroshi-shō’ derived from the diversity of their business, while ‘oroshi-shō’ remained purely as distributors operating between the ‘ton’ya’ and retailer.

With regard to the manufacturing process, activities involving the creation of original designs and devices can be analysed. We can use the number of applications and registrations of designs and New Utility Models (Jitsuyō-shin’an) as an index of this kind of activity.²⁴ According to Table 7.3, 35 ‘ton’ya’ registered or

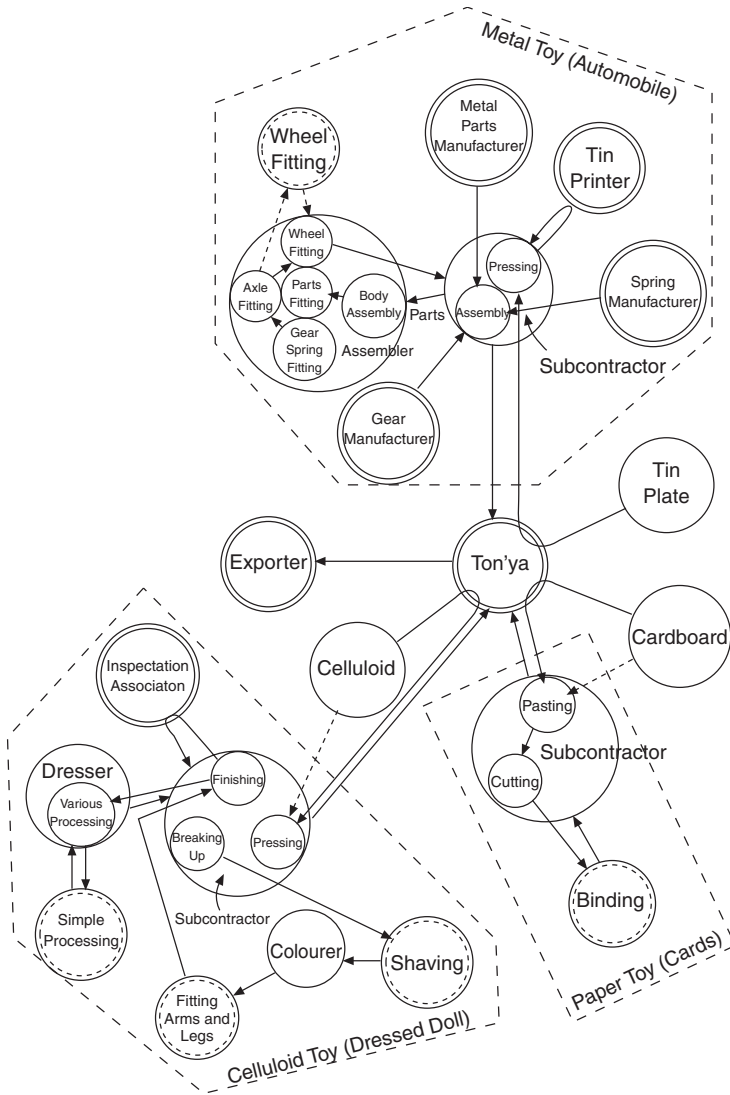


Figure 7.3 Production form of toy manufacturing (e.g. automobile, dressed doll and cards) (source: *Tonyasei Shōkōgyō Chōsa*).

Note

○ indicates domestic works

tried to register original ideas for designs or devices with the Patent Office of the central government. Though their total number was not as large as that of other actors, their per capita number was the largest recorded in Table 7.3. 'Ton'ya' thus maintained the relatively high ability to create and develop original products, which was crucial in the toy business.

Table 7.2 Distribution of toy traders in 1933

Ward	Commerce		Manufacturing								
	Wholesaler	Material	Ton'ya	Celluloid	Rubber	Metal	Paper	Wood	Glass etc.	Traditional dolls etc.	Gift with food
Nihonbashi	1	—	15	—	—	—	—	—	2	—	—
Kanda	—	—	15	—	—	2	1	—	3	—	1
Asakusa	51	10	121	10	10	42	21	12	19	28	10
Fukagawa	11	—	1	—	—	6	—	—	2	2	—
Honjo	4	—	12	8	5	113	9	12	9	4	16
Shitaya	12	4	11	2	9	19	25	1	15	9	11
Adachi	12	—	—	14	4	10	17	1	10	8	1
Joutou	4	5	—	40	11	2	4	2	1	2	—
Mukoujima	8	1	1	55	45	11	5	6	4	4	1
Arakawa	15	4	2	54	30	20	45	13	24	15	16
Katsushika	7	1	—	59	9	2	4	2	—	4	1
Edogawa	—	—	—	8	1	1	1	—	—	—	—
Ōji	6	—	—	2	1	—	3	1	—	1	—
Takinogawa	9	—	—	—	4	—	2	—	—	—	—
Others in Tokyo City	39	1	7	6	10	5	5	1	15	5	2
Total	179	26	185	258	139	233	142	51	104	82	59

Source: *Dai-Tokyo Gangu Shōkōgyōsha Meibo*.

Note

Bold numbers indicate the largest and the second largest number within the same business categories.

Table 7.3 Number of application and registration of New Utility Model and design (Sum of 1928, 29, 33, 35, 38)

	Total	New Utility Model		Design registration	Total (%)	New Utility Model		Design registration (%)
		Application	Registration			Application	Registration	
<i>Number of persons</i>								
Commerce and manufacturing	3	1	3	3	0.4	0.2	1.0	1.5
Commerce (Member of the association)	35	27	18	13	4.4	5.3	6.1	6.6
Commerce (Non-member of the association)	21	9	6	8	2.6	1.8	2.0	4.1
Manufacturing ('Factory')	80	41	29	43	10.1	8.1	9.9	21.9
Manufacturing (non-'Factory')	88	44	34	40	11.1	8.6	11.6	20.4
Others	569	387	204	89	71.5	76.0	69.4	45.4
Total	796	509	294	196	100.0	100.0	100.0	100.0
<i>Number of applications or registrations</i>								
Commerce and manufacturing	14	3	6	5	0.7	0.4	1.3	0.8
Commerce (Member of the association)	242	129	70	48	12.9	15.8	15.6	8.0
Commerce (Non-member of the association)	32	9	6	17	1.7	1.1	1.3	2.8
Manufacturing ('Factory')	412	116	66	230	22.0	14.2	14.7	38.3
Manufacturing (non-'Factory')	269	76	44	149	14.4	9.3	9.8	24.8
Others	900	485	258	152	48.2	59.3	57.3	25.3
Total	1,869	818	450	601	100.0	100.0	100.0	100.0
<i>Number of applications or registrations per person</i>								
Commerce and manufacturing	4.7	3.0	2.0	1.7	—	—	—	—
Commerce (Member of the association)	6.9	4.8	3.9	3.7	—	—	—	—
Commerce (Non-member of the association)	1.5	1.0	1.0	2.1	—	—	—	—
Manufacturing ('Factory')	5.2	2.8	2.3	5.3	—	—	—	—
Manufacturing (non-'Factory')	3.1	1.7	1.3	3.7	—	—	—	—
Others	1.6	1.3	1.3	1.7	—	—	—	—
Total	2.3	1.6	1.5	3.1	—	—	—	—

Sources: *Jitsuyō Shin'an Kōhō, Ishō Kōhō, Tokyo Gangu Shōhō, Nihon Seruroido Shōkō Taikan, Dai-Tokyo Gangu Shōkōgyōsha Meibo, Gangu Saiseikamroku, Tokyo Seruroido Shōkōgyōsha Jinmeiroku, Zentoku Kōjō Tsūran.*

Embarking on export business was also the new wave for wholesalers in those days. The foreign traders in Yokohama conventionally executed the export trade. However in the 1920s, prominent 'ton'ya' started to engage in the export trade by sending samples or taking part in overseas trade fairs.²⁵ As the directory of export traders in Tokyo in 1936 listed 14 'ton'ya's,²⁶ we can confirm that a significant number of 'ton'ya' engaged in direct export business in the 1930s.

These activities affected the success of individual 'ton'ya'. The most prominent 'ton'ya' in the 1930s, Toyoda-ya and Masada-ya,²⁷ registered or tried to register the largest number of designs and New Utility Models.²⁸ They were also the leading merchants in the export trade. That is, the ability to develop and export was the key factor in the business success of 'ton'ya' in the interwar period. The pivotal role of 'ton'ya' in the Japanese toy business is thus clear.

Manufacturers

It is not easy to obtain an accurate figure for workshops other than 'factories'. Here, we try to get a rough image of the existence of small workshops by comparing two different types of directory. According to the directory of toy traders, the figures from which are shown in Table 7.2, the numbers of toy manufacturers in Tokyo in 1933 were 233 for metal, 258 for celluloid and 139 for rubber. Among these manufacturers, 36, 32 and 47 respectively were listed in the directory of 'factories' (Kōjō Tsūran, which was a kind of census of 'factories'), the definition of which was workshops employing five or more workers (the word 'factory' is defined in this way from now onward). Since the numbers of 'factories' that were not listed in the directory of toy traders were not more than 65, 47 and 77 respectively, at least half of the workshops were smaller than a 'factory' in terms of the number of employed workers. In particular, the dominance of small workshops in metal and celluloid toy manufacturing was conspicuous.

The municipal survey provides data on the composition of the labour force in small workshops. As Table 7.4 indicates, the average number of workers was less than four. A third of them were the male employer himself and members of his family. It is also noticeable that the number of 'apprentices' was almost equal to that of 'workers'. The combination of family labour, including the employer, and 'apprentices' seems to have formed the core labour force of the workshops. These workshops were also characterized by their lack of power machineries in comparison with 'factories'. In fact, 90 per cent of the toy workshops in the municipal survey were not equipped with prime movers. For example, it was treadle machines that enabled small workshops to engage in one of the core processes of toy manufacturing, moulding, without motor power.

On the other hand, it is noticeable that the operations of these workshops required a certain level of skill. According to Table 7.5, more than half of the small-scale toy manufacturers replied that they needed training lasting at least a year and 45 per cent claimed more than two years was necessary. This is in sharp contrast to the case of domestic workers shown in the same table. Nearly 60 per cent of domestic workers could engage in their work without any training and another

Table 7.4 Composition of workforce of toy manufacturers

Source	Number of sample		Workers per workshop (person)						(Breakdown of non-family)			
	Ton 'ya	Small workshops	Total	Family		Non-family		Adult	Apprentice	Others		
				Male	Female	Male	Female					
Shōkōgyō Chōsa (1935)	–	370	3.64	1.07	0.25	1.97	0.34	1.06	1.00	0.25		
Ton 'ya-sei Shōkōgyō Chōsa (1936)	106	320	3.13	0.85	0.58	1.25	0.45	–	–	–		

Notes

The year in parenthesis indicates the investigation year.

'Family' includes an employer.

Table 7.5 Term required to form the skill for toy manufacturing (%)

	<i>Unnecessary</i>	<i>Less than (months)</i>		<i>Six months</i>	<i>One year to</i>	<i>More than</i>
		<i>One</i>	<i>Six</i>	<i>to one year</i>	<i>two years</i>	<i>two years</i>
Small Workshops	0.9	23.4	15.0	6.6	8.8	45.3
Domestic Works	58.2	28.7	11.7	0.8	0.3	0.3

Source: *Ton'ya-sei Shōkōgyō Chōsa* (1936), *Naishoku Chōsa* (1936).

30 per cent with training for less than one month. Thus, the small workshops were composed of workers with a certain level of skill, including the employers, the adult employees and the 'apprentices', together with family workers who might also have received a period of training. Moreover, some of the skilled workers in these workshops had the ability to create original models of new products.

As was seen in Table 7.3, the manufacturer was the primary source of new designs and New Utility Models in terms of the total number. It is notable that the number of workshops other than 'factories' producing original designs exceeded that of 'factories'. Of course the turn out rate of small workshops should be lower because the number of workshops far exceeded that of factories. Considering the cost of application and registration, however, the workshops appearing in Table 7.3 were likely to have been only a minority of those having the ability to develop new products. In fact, a wider range of manufacturers registered their newly created designs with the trade association named Tokyo Yushutsu Seruroido Gangu Kōgyō Kumiai (The Association of Tokyo Manufacturers' of Export Celluloid Toys). Table 7.6, which lists the names of workshops that registered their designs with the manufacturers' association, indicates that only six workshops out of 25 applied to or registered with the Patent Office. Though the table includes the owners of large factories such as Nagamine or Tokyo Celluloid, a workshop that does not appear in the directory of 'factories', Shimizu Unokichi, recorded the largest number of registrations. The number of non-'factory' workshops listed, 15, also exceeds the number of 'factories', ten. A significant number of small workshops had the ability to create original products and merchandise their ideas in practice.

As for the celluloid workshops, we can trace the chronological changes by matching the directories for different years. According to Table 7.7, 221 workshops out of the 254 in the directory for 1928 could not be found in the 'factory' directory for 1929. Since nineteen of them emerged in the 'factory' directory for 1933, the rate that the workshops grew into the factories was calculated to be 8.6 per cent (19/221) during four years and 2.1 per cent annually. The result of the same calculation during 1933 to 1937 was 1.8 per cent annually. In addition, Table 7.7 also gives the figures for the 'exit' rate of the workshops, regarding the disappearance of the name from the directory as an exit from the business. The 'exit' rate during 1928 to 1933 was 45.7 per cent, 9.1 per cent annually.²⁹ The annual 'exit' rate fell to 5.3 per cent in the following years, 1933 to 1939, and 5.5 per cent during the latter half of the 1930s, 1936 to 1939.

Table 7.6 Design registration with manufacturers' association (celluloid toy, cases in 1928 and 1929)

Name of traders (Family name followed by first name)	Number of registration	Registration to the Patent Office New Utility Models and Designs				Appearance in Directory of toy traders				Appearance in Census of Factory			
		1928–29	1933	1935		1928	1933	1936	1939	1929	1931	1933	1937
Shimizu Unokichi	108	—	—	—		—	○	○	○	—	—	—	—
Nagamine Seruoido*	83	2	—	—		○	○	○	○	○	○	○	○
Tokyo Seruoido (Izumi Torazō)*	65	28	2	—		○	○	○	○	○	○	○	○
Horikoshi Yasuo	38	—	—	—		○	○	○	○	—	—	—	—
Akio Shūzō	23	1	—	—		○	—	○	○	—	—	—	—
Nomura Yasunosuke	23	—	—	—		—	—	○	○	—	—	—	—
Akagi Seiji	22	—	—	—		○	○	○	○	—	—	—	—
Ishizaki Matasirō	14	—	—	—		○	○	○	○	—	—	—	—
Mano Yoshi	11	—	—	—		—	—	○	○	—	—	—	—
Sakai Shirō	11	—	—	—		—	—	○	○	—	—	—	○
Masuda Katsugorō	10	—	—	—		○	—	○	○	—	—	○	○
Takeuchi Seikichi	9	—	—	—		—	○	○	○	—	—	—	—
Oginura Kametarō*	8	—	—	—		—	○	○	○	—	○	○	○
Asaka Daigorō	6	—	—	—		○	○	○	○	—	—	—	—
Okuda Minoru	6	—	—	—		○	○	○	○	—	—	—	—
Gotō Tomokichi	6	—	—	—		—	—	○	○	—	—	—	—
Hirukawa Teijirō	6	1	—	—		○	—	○	○	—	—	—	—
Aoki Kenji	5	—	—	—		○	—	○	○	—	—	—	○
Ôtsuka Eitaro	5	—	1	1		—	○	○	○	—	—	—	○
Ôshima Yoshishige	5	—	—	—		—	—	○	○	—	—	—	—
Akimoto Suekichi	4	—	—	1		○	○	○	○	○	○	○	○
Udagawa Ichizō	3	—	—	—		○	○	○	○	—	—	—	—
Hoshi Chiyokichi (Tōshirō)	1	—	—	—		○	○	○	○	○	○	○	○
Ishibashi Kyūzō	1	—	—	—		○	○	○	○	—	—	—	—
Hamaguchi Seikou (Hamaguchi Nankaen)	1	—	—	—		○	○	○	—	—	—	—	○

Source: Documents of the Tokyo Celluloid Toy Export Manufacturers' Association and the bulletins and the directories used in Table 7.3.

Note

*Indicates the trader engaged in both commerce and manufacturing.

Table 7.7 Number of manufacturers of celluloid goods

	1929	1933	1936	1939
<i>Census of Factory</i>				
Celluloid goods	61	78	135	116
Celluloid toys	40	47	68	8
<i>Directory of Traders</i>				
Celluloid goods	873	—	865	1,374
Celluloid toys	254*	259	351	502
Toy traders in <i>Census of Factory</i>	33	31	—	—
Other than above	221	228	—	—
<i>Newly listed workshops in the Census of Factory from non-factory workshops</i>				
1931	9	—		
1933	19	—		
1937	28	16		
Total	34	16		
	1928	1933	1936	1939
<i>Exits of traders</i>				
Traders in the 1928 Directory	254	138	—	—
Traders in the 1933 Directory	—	259	157	177**
	Exit rate	Annual exit rate	(%)	
1928–33	45.7	9.1		
1933–39	31.7	5.3		
1936–39	16.6	5.5		

Source: Directories and Census of Factory.

Notes

* Data in 1928.

** Increased number can be explained by the difference of coverage in each directory.

To generalize these figures, we can point out the influence of the changing business climate. Since a large number of the manufacturers in existence in 1928 were compelled to exit the toy business during the Showa Depression around 1930, only a little over half were able to continue their businesses until 1933. These figures vividly illustrate the instability of the small workshops. On the other hand, though, 70 per cent of the manufacturers in 1933 continued in business at least until 1939. In the light of the 'exit' rate of 'private firms' as a whole in Japan from 1975 to 1986, 4.1 per cent to 4.6 per cent annually,³⁰ the 'exit' rate of small workshops in celluloid toy manufacturing in the 1930s does not appear so high.³¹ Though they lacked the ability to resist the depression, we cannot assume that instability was a particular characteristic of this trade. Moreover, as the rate of growing into factory suggests, there was a slight but noticeable possibility for small-scale manufacturers to enlarge their workshops. In spite of the scale of their business, small workshops did include promising manufacturers. Therefore, it is not sufficient to regard small workshops simply as a pool of unskilled labourers.

Domestic workers

Though domestic workers engaged in manufacturing processes, they should be distinguished from the small workshops in the toy business. As was mentioned above, they typically carried out unskilled work such as fitting or assembling parts. According to the municipal survey on domestic work,³² almost all domestic workers were female (674 out of 717), making a sharp contrast with the composition of workers in small workshops shown in Table 7.4. Eighty-three per cent of them were over the age of 30, not household heads and without a main occupation. The occupations of the household heads show particular characteristics as well. The municipal survey revealed that 1,524 of the 5,633 household heads, which were total samples of this survey were unemployed. As for the 4,109 gainful workers, the number of workers in typical unskilled occupations such as day labourers and porters reached 1,006. Gainful workers also included 356 of peddlers and street stall operators. Thus, a large number of the domestic workers belonged to households located in the lower income layer, complementing the income of the household or even earning the core income for the household. These unstable households created by the concentration of the population to the urban area worked as sources of unskilled labourers in low wages that were indispensable for the urban industries. In fact, not only 'ton'ya' or 'factories', but also small workshops placed orders with domestic workers.³³

The division of labour between domestic workers and manufacturers suggests the logic of the formation of the factories in the toy industry. For example, the factory built by Tomiyama, a leading metal toy manufacturer in the 1930s, was equipped with an assembly line on which hundreds of female workers worked. Recalling the gender bias of the domestic workforce, we can assume that Tomiyama's factory internalized the processes that had formerly been carried out by domestic workers. The fact that female workers accounted for 49.3 per cent of all workers in celluloid toy workshops and 64.3 per cent in rubber toy workshops that employed more than ten workers in 1933 might support this assumption.³⁴ The high percentages of females are in stark contrast to the composition of workers shown in Table 7.4, where the proportion of female workers in small workshops is 33 per cent at most. Thus, the main purpose of factory formation in toy manufacturing in the 1930s appears to have been the internalizing of the fitting or assembly processes, and it actually implied the internalizing of the out-work formerly executed by domestic workers. In other words, small workshops maintained their position as the manufacturers taking charge of the basic processes of toy manufacturing such as pressing, moulding or parts making even in the 1930s.

Organization of the industry: transactions between actors

Transactions in finished goods

In this section, we will examine the transaction processes among actors, beginning with consideration of transactions in finished goods. To investigate this aspect of the transaction process, emphasis needs to be placed on the transactions between manufacturers and 'ton'ya', as the latter represented the pivot of the distribution system. We will utilize the advertisements in the monthly trade journal, published by Tokyo Gangu Oroshishō Dōgyō Kumiai (the Tokyo 'tonya' trade association) to provide information to retailers, to observe the relationship between them.³⁵

Table 7.8 arranges the information given in the individual advertisements. The total number of advertisers appearing in six issues of the journal was 87, including 62 that could be found in the members list of the 'ton'ya' trade association. There were also ten manufacturers in the remaining 25 advertisers. As for

Table 7.8 Information from advertisements in *Tokyo Gangu Shoho* (*Journal of Toy Trade*) (1933/April, July, August, October–December)

<i>Total of advertisers (Breakdown of advertisers)</i>	87
Member of Trade Association of Wholesalers	62
With special mention in advertisement	25
(Overlapping included)	
Directly run workshop*	4
Corroborated workshop	2
Goods with trademark of ton'ya	23
(Registration of trademark)	4
New Utility Model or Patent	7
No special mention in advertisement	37
Non member of association	25
Manufacturers	10
Table games etc.	4
Harmonica	1
Tin toy	1
Rubber toy	1
Saving box	1
Telescope	1
Others	1
(Overlapping included)	
Trademark	10
(Registration of trademark)	2
New Utility Model or Patent	2
Others	15

Notes

* Celluloid toy 1, Rubber toy 2, Paper toy 1.

Advertisers taken up in this table are limited to the inhabitants in Tokyo.

the advertisements by 'ton'ya', four of them demonstrated directly-run factories, two mentioned collaboration with specific workshops and 23 exhibited their trademarks. The registration of New Utility Models or patents with the Patent Office was also mentioned by seven 'ton'ya' and two manufacturers.

These observations give us the clues as to the relation between 'ton'ya' and manufacturer. As Table 7.8 shows, the integration of production and sales was rather rare, though some 'ton'ya' ran workshops directly.³⁶ Production and sales were mainly carried out by independent parties, and there were various patterns of transaction among the parties. We can analyse the features of transactions by means of the trademarks affixed to the products. In fact, a large number of traders in the toy business had their own trademarks. In addition to those shown in Table 7.8, the number of trademarks listed in the contemporaneous comprehensive guidebook of the celluloid industry (*Nihon Seruroido Shōkō Taikan*, published in 1928) reached 46 for 'ton'ya' and 208 for manufacturers. The latter number indicates that even small workshops maintained the potential ability to provide finished goods on their own account, affixing their trademarks. However, it was another matter whether their trademarks were actually affixed to the products.

As for the cases in Table 7.8, most of the advertisements by manufacturers exhibited their products with their own trademarks. In this situation, the manufacturers might have maintained a relatively strong position in negotiation with the 'ton'ya', since the retailers and consumers, the demand side of the market for product, would recognize the products by the sign of the manufacturer. In fact, the September 1935 advertisement for Kosuge Matsuzō, a leading metal toy manufacturer in the 1930s, showed a large print of trademarks and allocated 16 kinds of original product to the five prominent 'ton'ya' designated as exclusive sales agencies for the respective products. Undoubtedly, the manufacturer had taken the initiative in transactions in the Kosuge's case.

However, these cases were not the majority in Table 7.8. The number of 'ton'ya' trademarks shown in the advertisements much exceeded that of manufacturers. The prominent 'ton'ya', such as Toyoda-ya or Masuda-ya, often showed illustrations or photographs of commodities with their trademarks guaranteeing their quality. Although most 'ton'ya' did not run manufacturing workshops, they often sold products with their trademarks. It seems that a kind of relational transaction, not only simple spot transactions, took place between 'ton'ya' and manufacturers.

The formation of the group of workshops that belonged exclusively to a specific 'ton'ya' was clear evidence of relational transactions. In addition to the case of Kasama Shingo which formed the group of workshops named 'kenkyū-kai (study circle)' in Table 7.8, several other 'ton'ya' formed informal groups named 'shinboku-kai (brotherhoods)'.³⁷ The comprehensive guidebook of the celluloid industry also mentions the number of workshops and subcontracted workers (*shitashoku*) specifically related to individual 'ton'ya' as follows: Miura Tokuji: thirty-five, Kuramochi Chōkichi (Toyoda-ya): hundreds, Kazama Kurō: hundreds, Aiba Kintarō: many, Ishibashi Sentarō: many processors.³⁸ Recalling

that 'ton'ya' maintained the ability to create original designs and devices, these relations might have involved more than the transaction of finished goods and included manufacturing processes as well. How, then were 'ton'ya' involved in the manufacturing process?

Transactions within manufacturing

It is not an easy task to observe the real commitment of 'ton'ya' to the manufacturing process, given the unavailability of primary documents relating to them.³⁹ The following description of conflicts in the business is based on rare materials which make it possible to speculate about these relations.

These materials are the advertisements in the trade journal. The advertisement by Masuda-ya in the issue of November 1930 describes a conflict with another 'ton'ya' from the viewpoint of Masuda-ya. Masuda-ya insisted that the reason why it had to stop the sales of its brand new product was because 'a certain longstanding "ton'ya"' groundlessly claimed the invasion of its intellectual property right to the product, and forcibly took the mould away from the workshop that had been manufacturing these products for Masuda-ya.

We can derive several interesting points from this description. As Masuda-ya emphasized the newness of the product, and the workshops seemed to be passive as regards the 'ton'ya's claim, the idea of the new product must have been provided by a 'ton'ya', probably by Masuda-ya. In fact, this conflict was finally settled when the New Utility Model registration with the Patent Office was completed in the name of Masuda-ya. On the other hand, assuming that the claim of 'certain longstanding "Ton'ya"' included some truth, the risk of the idea being leaked or stolen by the other parties, probably through the subcontractors, must have existed.

It is also interesting that 'certain longstanding "Ton'ya"' seized the mould directly. The mould was a lump of design information and the most costly device in manufacturing.⁴⁰ In fact, Nihon Seruroido Shōkō Taikan gives information on moulds owned by individual manufacturers. Providing or financing the mould seems to be an important method by which 'ton'ya' controlled workshops.

However, the advertisement in the journal of April 1930, in which a subcontracted workshop apologizes to a contractor, shows a case in which the provision of the mould could not fully prevent the design information from leaking out, or even might tempt workshops into being subject to morale hazard. The accused workshop, provided with the mould and materials by Kaneko Shinzaburō, a manufacturer, had produced imitation products using the mould and scrap material and sold them secretly through a 'ton'ya' that had no contact with Kaneko Shinzaburō. This incident came to light when the low quality of the imitation led to consumers' complaints to the original producer. In other words, however, a cleverer manufacturer could have managed to provide the market with better imitations, by making the product more carefully.

The efforts of 'ton'ya' to tie workshops into specific relations with them, which we mentioned above, might have been motivated by this problem. They

tried to avoid leaks of information by secluding their workshops from other 'ton'ya' or manufacturers. Moreover, to prevent the workshops from being subject to morale hazard, 'ton'ya' might have developed long-term transaction relationships with their subcontractors.

The two articles taken up so far took the viewpoint of the 'ton'ya'. On the other hand, Table 7.9 presents data on transactions from the subcontractors' side. Though the data aren't specified for the toy manufacturing, they can be accepted as approximations for it. According to the proportion of business types, workshops which only engaged in consigned work accounted for around 40 per cent in 'metal products other than those made of cast-iron' and 'rubber', and 80 per cent in 'celluloid'. Since these figures seem to be too high for celluloid toys and too low in metal and rubber toys, considering the composition of output, it can nonetheless be assumed that at least around half of the workshops engaged only in consigned work.⁴¹ This consigned work seemed not simply to mean getting the order in advance but getting the order with materials, the transaction form that characterized production under the putting-out system. This assumption is confirmed by the fact that the proportion of workshops not engaged in material purchasing or product sales was close to the estimated proportion carrying out consigned work. As for the consignor, it is noticeable that the number of 'factories' (the word used in this survey) ranked with that of 'ton'ya'. It suggests the development of the division of labour within the production sector. The number of consignors per workshop is also interesting. The lowest average number was 2.5 for celluloid, and the number for other sectors exceeded 5. If the small workshops tended to transact with several 'ton'ya' or manufacturers, the specific or exclusive relation between them might not have been the natural result of the transaction, but the result of the strategic behaviour of the consignor.

The financial relations within the system can also be seen in Table 7.9. More than half of the consignees received payment 'a month after' the transaction. Payment in advance, which seemed to be included in 'others', occurred in less than 10 per cent of all transactions. The proportion of 'payment after a month' by the purchasers reached 75 per cent in cases of producers selling products on their own accounts, while 'payment after a month' for materials accounted for 60 to 80 per cent of their transactions. In these cases, most of the financial support was provided by the materials merchants through purchase on credit. Therefore, it was not the normal situation for workshops to be financially supported by 'ton'ya' or manufacturers other than being provided with the materials (or moulds).

The structure of dispersed production organization

The multilayered structure and the diverse relationship within the toy manufacturing industry are now clear. On the one hand, there were the manufacturers that organized small workshops and domestic workers. Some of them held the initiative in their transactions with 'ton'ya', while the 'ton'ya' tried to control

Table 7.9 Transactions from the viewpoint of small workshops* (1935)

	Number of workshops by types of transaction workshops					Proportion of workshops that engaged in the concerned business			
	Own account (%)		Own account +consignment +consignee (%)		Own account +consignment +consignee (%)	Consignee (%)	Material purchasing goods (%)	Sales of consignee (%)	
	Own account (%)	Own account +consignment (%)	Own account +consignee (%)	Consignee (%)					
Metal products other than made from cast iron	606	40.9	0.7	14.5	1.2	42.7	60.6	56.8	57.3
Rubber	114	50.9	0.9	9.6	0.9	37.7	71.1	61.4	47.4
Celluloid	163	13.5	1.8	4.9	0.0	79.8	20.9	20.2	84.7
(Number per workshop)									
Purchasing materials from					Selling products to				
Total	Manufacturers	Wholesalers	Total	Manufacturers	Wholesalers	Retailers	Government	General	
Metal products other than made from cast iron	3.7	1.6	2.1	10.9	3.4	3.8	1.3	0.2	2.3
Rubber	3.7	1.4	2.3	11.6	2.9	5.5	2.9	0.0	0.3
Celluloid	3.6	1.1	2.4	5.9	0.1	5.8	0.0	0.0	0.0
(Number per workshop)									
Being consigned from									
Total	Manufacturers	Wholesalers	Retailers	Government	General				
Metal products other than made from cast iron	6.3	4.1	0.8	0.0	0.1	1.3			
Rubber	5.3	1.4	1.2	0.0	0.0	2.7			
Celluloid	2.5	1.0	1.5	0.0	0.0	0.0			

Source: *Shōkōgyō Chōsasho*.

Note

*Workshops that employed less than ten workers.

their production processes by providing ideas for new products, moulds and materials and establishing specific relations with manufacturers. On the other hand, the majority of small workshops were consignees producing parts and tending to transact with several consignors. Thus, toy manufacturing involved multilayered transactions between 'ton'ya' and the manufacturers of finished or semi-finished products, as well as between the manufacturers of finished products and parts, and even between 'ton'ya' and the manufacturers of parts, with a diversity of relations in each respective layer of transactions.

It is certain that 'ton'ya' played pivotal roles in this organization. To the extent that it was 'ton'ya' that acquired market information, manufacturers had to depend on them for many reasons. Information of market trends could decide the fate of manufacturers producing fashionable toys. Long-term transactions between 'ton'ya' and wholesalers or retailers possibly limited the sales routes. In fact, an attempt at joint sales by the association, planned by leading metal toy manufacturers such as Tomiyama or Kosuge, could not be satisfactorily put into practice due to the pressure from prominent 'ton'ya'.⁴² In order to secure saleable products, however, 'ton'ya' had to organize manufacturers in some ways. This was the motivation behind the attempts by 'ton'ya' to create specific relations with manufacturers, or even commit themselves to the production processes by providing ideas, moulds and materials. Here, we can observe the potential similarities between the business activities of 'ton'ya' and manufacturers. Indeed, both of them possessed development capacity to some extent and made attempts to diversify into the other's business, as in, for example, 'ton'ya's commitment to production or manufacturers' entry into sales activities, thus competing with and complementing each other. Therefore, it should be pointed out that the model of a hierarchical structure of production, in which a few prominent traders vertically organize the other actors, does not completely apply to the structure of the toy manufacturing industry. The competing as well as complementary nature of the actors which characterized the structure of the division of labour in this industry worked as the source of the dynamic behaviour of traders. It was precisely this dynamism that constituted the foundation of the industrial development of the dispersed production organization in the inter-war period.

The basis of dispersed production organization

Location: the advantage of the concentration of traders

The geographical concentration of traders was another particular feature of the toy industry. Table 7.10 shows that traders in toy production using 'new' materials, such as metal, celluloid and rubber, were concentrated in Tokyo. It is noticeable that this concentration was not paralleled in the concentration of the celluloid or rubber industries as a whole. The development production of celluloid material, substituting for imports after the 1910s, took place in Osaka and in Hyōgo prefecture. Osaka showed the largest share of celluloid goods other than

Table 7.10 The prefectural concentration of production

	1935		
	<i>Tokyo</i>	<i>Osaka</i>	<i>Hyōgo</i>
Metal products	14.9	21.8	10.9
Metal other than made from cast iron	31.7	30.1	6.8
Metal toy	75.3	15.0	0.0
Material celluloid	16.9	36.2	45.6
Celluloid toy	93.9	4.6	0.0
Celluloid comb	7.6	92.4	0.0
Celluloid goods others	18.2	75.7	1.0
Soft rubber goods	19.1	13.1	36.1
Rubber toy	78.3	12.3	3.6
Hard rubber goods	74.6	15.6	7.9

Source: *Kōjō Tōkei Hyō*.

toys as well, and the production of soft rubber goods, except toys, was concentrated in Hyōgo Prefecture. All these facts indicate that the determinant factor in the location for toy manufacturing was not the proximity to material provision, but the common characteristics of finished goods. Assuming ‘economies of scale’ in material provision, it was ‘economies of scope’ that drove the toy industry to concentrate in Tokyo.

The geographical distribution of toy traders within Tokyo has already been shown in Table 7.2. Table 7.11 uses data for the blocks within wards to demonstrate the high level of concentration of traders. As is shown in the table, the location of ‘ton’ya’ in Asakusa-ku was almost entirely limited to only two blocks. Metal toy manufacturers were concentrated in three blocks in Honjo-ku, especially 39 in Umayabashi, and the number of celluloid toy manufacturers was recorded as 36 in Kameido in Joutou-ku, followed by 22 in Terashima in Mukoujima-ku and Oku in Arakawa-ku. The number in Oku reached 89 in the 1939 directory with its broader coverage, as shown in the right part of the table.⁴³ There are five blocks recording more than ten traders in rubber toys in this table as well.

The highly concentrated location of traders suggests the positive effects of concentration, reminding us of Alfred Marshall’s argument for the effects of external economies in industrial clusters.⁴⁴ With regard to ‘ton’ya’ for instance, proximity to other traders engaged in the same industry might have increased the opportunities to acquire market information, which was indispensable for the sales of fashionable goods. The concentration also facilitated the development of the division of labour among traders that might have increased the productivity of the industry.

Moreover, it was noticeable that the traders located within each cluster were not limited to toy traders. In fact, as the data for 1939 indicate in Table 7.11, it is better to say that the celluloid toy workshops were located within the

Table 7.11 Geographical concentration of toy traders by block

Ward	Block	1933 Directory of toy traders							1939 Directory of celluloid traders						
		Commerce			Manufacturing				Total			Manufacturing Processing			
		Wholesale	Material	Ton'ya	Metal	Celluloid	Rubber	Others	Toy	Others	Colouring	Lathing	Grinding	Carving mould	
Asakusa	Mukouyanagihara	4	1	3	3	-	2	6	27	1	6	1	-	-	
	Kotobuki	-	-	-	1	-	1	3	10	2	3	1	-	-	
	Kojima	3	3	2	2	1	-	5	16	3	4	-	2	1	
	Kuramaekatamachi/ Kuramae	-	-	22	-	-	-	-	63	-	2	-	1	-	
	Minami-motomachi	6	-	21	2	1	-	5	3	-	-	-	-	-	
	Asakusabashi	-	-	-	-	-	-	-	59	-	2	1	1	-	
	Yanagibashi	-	-	-	-	-	-	-	21	-	1	-	-	-	
	Torigoe	-	-	-	-	-	-	-	34	1	7	1	3	1	
	Higashi misuji	1	-	4	-	-	-	2	11	-	2	-	1	-	
	Nishi misuji	-	-	-	-	-	-	-	10	-	4	1	-	-	
Honjo	Umayabashi	-	-	-	39	2	1	5	9	1	4	-	-	1	
	Ishihara	-	-	1	27	1	-	9	8	1	4	-	-	-	
	Higashi komagata	-	-	-	17	-	-	1	5	1	1	-	1	1	
	Mukoujima	-	-	-	2	-	1	-	10	2	1	-	-	-	
	Kinshicho	-	-	9	-	-	-	15	2	-	1	-	1	-	

Shitaya	Iriya	2	3	1	3	—	1	10	28	3	14	—	4	1	—
	Ryosenji	—	—	2	4	—	1	19	18	2	8	—	4	—	—
Joutou	Kameido	3	5	—	2	36	11	6	81	34	20	10	—	2	3
Mukoujima	Terashima	2	1	—	6	22	16	14	131	19	62	11	5	7	3
	Azumamachi higashi	—	—	—	—	5	15	2	35	18	10	2	—	1	—
	Azumamachi nishi	4	—	1	4	13	14	4	101	31	38	5	5	6	5
	Sumida	1	—	—	1	3	—	—	26	2	19	—	—	2	—
Arakawa	Oku	4	2	1	1	22	4	32	247	83	125	7	4	14	5
	Nippori	2	1	1	4	11	14	23	90	39	22	10	1	3	3
	Mikawajima	6	—	—	6	18	9	33	94	14	51	5	3	12	2
	Machiya	2	—	—	2	3	1	10	92	22	53	3	4	5	2
	Minamisenju	1	1	—	7	—	2	15	19	—	12	3	—	1	—
Katsushika	Hondashibue	3	—	—	—	17	1	1	58	25	9	12	1	3	6
	Hondayotsugi	—	—	—	—	12	—	1	29	13	3	7	—	1	4

Source: Directories and Census of Factory.

concentration of traders in various celluloid goods. This appears to have been true also of traders in metal or rubber toys, judging from the distribution of 'factories' shown in Table 7.12. These facts suggest that the traders might have moved in among the industries using the same material. For example, 19 celluloid toy manufacturers out of 351 in the 1936 directory were classified as manufacturers of other celluloid goods in the 1939 directory. There were also 26 contrary cases, and 23 toy manufacturers in the 1939 directory appear to have been engaged in the production of other celluloid goods. This flexibility among traders seems to have relieved the blows of market fluctuations on them. Though this buffer function was probably limited, as market trends of the industries would not have been conversely correlated as to compensate the slump of the other industry, it might have provided more opportunities to survive, at least for traders with a relatively high ability to respond to the unstable economic environment.

Meanwhile, the co-existence of related types of industry within an area was important for toy traders as well. The mould producer was a typical example. As mentioned previously, it was vital for traders to possess the mould if they were to acquire the fruits of product innovation. Therefore, the mould producer was indispensable for 'ton'ya' which lacked a production section, and for the workshops that were unable to prepare the moulds by themselves because of lack of the skills required to make them. It might also be pointed out that the mould producer would typically not be a toy manufacturer for fear of leaking design information. In this situation, the mould 'factories' generated in the concentration of the metal processing manufacturers in Honjo-ku, or the mould processing workshops whose location overlapped with that of the celluloid toy manufacturers, played important roles in actualizing originally generated ideas as real products. Similar roles were played in the areas of business that required relatively high skills, such as manufacturing springs and gears and printing tin plates. The concentration of the related industries provided complementary factors indispensable to the development of the dispersed production organization based on small workshops.

The role of institutional assistance

On the other hand, the concentration of potentially competing traders also raised the problems that retarded the development of the industry. The main problem of this kind was the imitation of products. Numerous examples of the imitation problem in the toy business can be seen in the advertisements in the trade journals. For example, advertisements often cautioned retailers or consumers not to buy imitation goods. Warnings to the imitator or apologies by the imitator were expressed in the advertisements as well. The conflict between two 'ton'ya' described in the previous section also arose over complaints about the imitation, or counterfeiting, of saleable products. The cribbing of ideas or the imitation of products greatly affected the sales of the developers. In particular, they suffered heavy losses in cases where information about an idea or know-how was

Table 7.12 Concentration of the industries related to or using the same materials in toy manufacturing

Ward	Census of Factory 1931				1939 Directory						
	Industries using the same materials				Toy related industries						
	Rubber goods		Celluloid goods		Metal processing		Mould processing for celluloid goods				
	Total	Toy	Total	Toy	Total	Toy	Tin printing	Springs	Gears*	Mould for pressing	Rubber mould
Nihonbashi	—	—	—	5	—	—	—	—	1	—	—
Kanda	—	—	—	25	—	—	—	—	—	—	—
Asakusa	5	6	—	65	10	—	—	—	—	3	3
Shitaya	3	4	—	61	2	—	—	—	—	—	—
Fukagawa	1	—	—	72	2	—	—	—	1	2	—
Honjo	14	7	4	434	32	5	—	—	1	11	1
Mukoujima	46	17	9	51	2	—	—	—	—	—	1
Joutou	8	8	5	118	—	—	—	—	—	—	3
Katsushika	6	3	1	16	—	—	—	—	—	—	14
Edogawa	5	2	—	19	—	—	—	—	—	—	—
Arakawa	38	9	6	84	—	—	1	—	2	—	12
Adachi	6	1	—	4	2	—	—	—	—	—	—
Itabashi	6	2	—	23	—	—	—	—	—	—	—
Ōji	—	3	3	19	—	—	—	—	—	—	3
Takinogawa	10	2	1	33	—	—	—	1	—	—	—
Toshima	15	1	—	50	—	—	—	—	1	—	—
Hongō	—	—	—	14	1	—	—	—	—	1	—
Koishikawa	1	—	—	18	—	—	—	—	—	—	—
Others	31	3	—	360	—	—	—	1	—	2	1

Source: *Nagasawa (1934), p. 99.

delivered swiftly to the imitators, as the period of profitable sales tended to be short for fashionable kinds of good. Concentration caused thick information flows among traders and facilitated the acquisition by imitators of crucial information. It was the sort of problem that could not be fully solved by the parties themselves. How did they cope with it?

Utilizing the patent system institutionalized by the central government was one method of coping with this problem. Acquiring the authorized 'patent' or 'registration' probably brought various benefits to toy traders. They could be used to demonstrate the high quality or originality of their products to consumers, since the advertisements often boasted of products with registration as New Utility Models or designs. At the same time, they provided the basis for victory in the battle over imitation. Indeed, in the cases we observed in the previous section, the completion of the design registration settled the conflict, and the advertisement was used to express apology for the invasion of the rights protected by the official registration system. Apparently, the patent system worked to restrict imitation to some extent.

However, it should be noted that the patent system was often criticized by the traders because the time required for completion of the registration was so long, usually over half a year.⁴⁵ Even though a trader might acquire legal measures to protect their property rights over a certain design six months later, the commercial life of this design might by then have ended, particularly in the case of fashionable products. If so, the imitator might already have captured the profits by the time of registration.

The registration of designs with the association mentioned in the previous section was an attempt to cope with the flaws in the official patent system. The system founded by Tokyo Seruroido Gangu Kōgyō Kumiai (the Tokyo celluloid toy products manufacturers' association) started in 1928 and recorded numerous registrations by traders. The data in Table 7.6 showed just a part of these registrations. While the swiftness of the registration described below might have attracted traders, the combination of the registration system with the inspection of export goods worked effectively to maintain the system. Since the entire inspection of export goods was legally compulsory in the manufacturers' association from 1925 onwards, the association's policy of registration of all designs could be executed at least for export goods. If the design or device of products was not registered, they could not pass the inspection and lost the export market. The designs were proposed to the jury on a weekly basis, examined for their uniqueness, and finally judged as to their validity for registration. The printed sketches of the registered designs were distributed to the inspectors, and the samples of the registered goods were reserved for reference for five years before they became common knowledge.⁴⁶ In the light of these ingeniously designed procedures, together with the legal force applied, the high evaluation of this system given in the official history of the association, which describes it as having worked rather effectively to restrict the practice of imitation among traders, seems to be justified.⁴⁷

The association also executed various policies to promote the toy business other than the design registration system. Quality control by inspection, as men-

tioned above, was one of such policies. The officers of the manufacturers' association authorized by the Tokyo prefectural government executed the actual inspection. Though the effects of the inspection are difficult to measure at present, the frequently reported conflicts with traders assure us, that, nonetheless, the inspection was not a mere formality.⁴⁸

The celluloid toy manufacturers' association also engaged in joint sales activities, consigning the members' products with low commission to export merchants. In the area of materials purchase, it carried out business ranging from joint purchasing of materials to managing a joint production facility for celluloid material. However, all these businesses eventually collapsed. In the case of the metal toy manufacturers, even the formation of a manufacturers' association had not been accomplished by the beginning of the regulated economy of World War II. Only informal organizations worked to improve transactions between 'ton'ya' and metal toy traders.

These observations lead to a composite evaluation of the role of the associations in the toy business. The association appears to have played an important role in regulating transactions among traders through its inspection and registration system, and by improving 'irrational' commercial customs. However, neither the selling, nor the purchasing or producing policies pursued by the association resulted in success. This latter evaluation differs from the claim of recent historiography which emphasizes the significant role of joint businesses executed by or related to trade associations.⁴⁹ As these claims were derived from case studies of the weaving industry in the countryside, we may assume that differences in the composition of traders or in the environments of the areas concerned caused the distinction. In other words, the competing nature of the 'independent' traders and the mobile characteristics of the community in urban areas might have made joint businesses difficult. Yet, the association's measures to set the transactions in order were particularly significant for an industrial organization composed of numerous 'independent' traders.

The creation and reproduction of traders

Lastly, we will examine the creation and reproduction of the actors in the industry. Table 7.13 compiles information related to the establishment of individual 'ton'ya' drawn from a series of interviews.⁵⁰ We can derive some information about 67 'ton'ya', all of them continuing their businesses into the 1930s. With regard to the time of establishment, 41 out of 63 (4 out of 67 lack this kind of information) established their businesses after World War I. It is noticeable that the number of businesses established during the period of stagnation in the 1920s almost equalled the number established during the boom period of World War I. The transition from traditional toys to new toys can be assumed to have mobilized the toy business and brought about the inflow of newly established 'ton'ya'.

Who, then, were the people who established their own businesses as 'ton'ya'? Twenty-nine out of 43 'ton'ya' whose occupational careers are revealed in the

Table 7.13 Reference information of the founders of Ton'ya (67 people)

1 Year and the age of establishment							
Year	Age		Succession				Total
	-19	20-24	25-29	30-34	35-39	40-	
1830s	-	-	-	-	-	-	2
1870s	-	-	-	-	-	-	2
1880s	-	-	1	-	-	-	5
1890s	1	2	-	-	-	-	6
1901-05	-	-	2	1	-	-	4
1906-10	-	-	1	2	-	-	3
1911-15	1	1	2	1	-	-	8
1916-20	-	4	2	3	-	-	12
1921-25	-	4	5	2	-	1	12
1926-30	-	1	1	2	1	-	5
1931-	-	-	1	1	-	1	4
Total	2	12	15	12	1	2	63

2 Name of employer	Number of sample		3 Term of being employed	Number of sample		4 Birth place (region)	Number of sample
	43	24		24	34		
Toyoda-ya	4	Toy 'Ton'ya'	5 years	2	Tokyo	6	
Yamahatsu	3	Toy 'Ton'ya'	6 years	-	Kanto	11	
Iwakane	2	Toy 'Ton'ya'	7 years	1	Shin'etsu/Hokuriku	8	
Ohnishiya Honten	2	Toy 'Ton'ya'	8 years	2	Tohoku	1	
Inoue	2	Toy 'Ton'ya'	9 years	1	Others	8	
Nagamine	2	Toy 'Ton'ya'	10 years	6			
Other toy 'Ton'ya'	14	One each	11-15 years	6			
Other commerce	12		16-20 years	6			
Rubber trader	1						
Son-in-law	1						

Source: Tokyo Gangu Shōhō.

interviews had experience of working at a toy 'ton'ya' affiliated to the association. Five of the remaining 14 had possibly managed toy-related commercial businesses and eight of the other nine had once worked as clerks. Thus, the largest number of 'ton'ya' founders came from among the experienced clerks, and many of them had been trained in toy 'ton'ya' themselves. Their years of experience were five at the shortest, 20 at the longest, and most frequently ten (24 cases). Fifteen out of 44 established their businesses in their late twenties, 12 in their early twenties and thirties, altogether accounting for nearly 90 per cent of the total number. As regards their birthplaces, it is notable that only 20 per cent of them were born in Tokyo. To sum up, the typical life course of a 'ton'ya' might have been as follows: going to Tokyo to be a clerk, most likely in the toy business, in his teens, gaining experience as a clerk for about ten years, and eventually establishing his own business around the age of 30.

What about the manufacturers? Information about manufacturers was available for 89 celluloid toy workshops existing in 1928.⁵¹ Forty-two out of 79 founded their own workshops during World War I (ten manufacturers lack the information of their periods of establishment). If we include the 23 founded in the 1920s, this accounts for more than 80 per cent of the total, demonstrating the recent rise of the celluloid toy industry. According to Table 7.14, 48 out of 54 manufacturers had previously worked in the celluloid industry. We were able to obtain the names of 30 manufacturers and five commercial businesses at which 37 of them had previously worked, with some having worked at more than one enterprise. On the other hand, several future manufactures had previously worked in the same factories, such as Nagamine, Chigusa and Royal which were commonly characterized as the large scale of employment. The highest number were the six who had had experience working at Nagamine Celluloid factory. These were the pioneering celluloid manufacturers in Japan, having started their operations during World War I or even prior to it. Typically the worker acquired skills in the broad sense at the pioneering factory and established his workshop in the boom period during World War I. This pattern of skill formation and workshop establishment seems to have been common in newly transplanted industries of some kinds.⁵² On the other hand, 30 manufacturers had gained their experience in small 'factories' or even small workshops. In the light of the composition of the small-factory workforce shown in Table 7.4, it seems probable that the future manufacturers had been employed as 'live-in apprentices'. Thus, the life course described as 'from apprentice to owner of independent workshop', even though the scale of workshops where they experienced the period of 'apprentice' could vary, prevailed in toy manufacturing businesses in interwar Japan.

The number of years of experience before establishing a workshop was five years in six cases and two years and seven years in five cases each. The average number of years was apparently smaller than in the case of 'ton'ya', and reflecting this, the age at the time of establishing a workshop was younger than for 'ton'ya', the later twenties being the most common age by the first half of the 1920s. On the other hand, as with 'ton'ya', the proportion born in Tokyo was

Table 7.14 Reference information of the founders of celluloid toy workshops (89 people)

1 Year and age of establishment (person)						
Year	Age				Unknown	Total
	20-24	25-29	30-34	35-39		
-1900	1	-	-	-	-	1
1901-05	-	-	-	-	1	1
1906-10	-	1	-	-	2	3
1911-15	3	2	-	-	3	9
1916-20	6	15	4	8	5	42
1921-25	5	5	2	1	2	18
1926-27	1	1	1	1	-	5
Total	16	24	7	10	13	79

<i>2 Name of employer</i>	<i>Number of sample</i> 37	<i>4 Birth place (region)</i>	<i>Number of sample</i> 54
Nagamine seruroid	6	Tokyo	12
Chigusa seruroido	4	Kanto	15
Royal Shōkai	2	Shinetsu/Hokuriku	14
Ichijo seruroido	2	Tohoku	3
Aoki Hiromi Seruroido	2	Others	10
Teikoku seruroido	2		
Jūzen seruroido	2		
Other celluloid manufacturers	23		
Commerce related to celluloid	5		
	One each		
	One each		
<i>3 Term of being employed</i>	<i>Number of sample</i> 54		
Experienced in celluloid business	47		
Years of experience revealed	39		
1 year	3		
2 years	5		
3 years	—		
4 years	3		
5 years	6		
6 years	3		
7 years	5		
8 years	3		
9 years	2		
10 years	1		
11–15 years	7		
More than 10 years	1		

Source: *Nihon Seruroido Shōkō Taikan*.

around 20 per cent. Therefore, as with the life course of the 'ton'ya', coming to Tokyo in their teens, training at a manufacturer's, then trying to become independent was the typical pattern for the manufacturer establishing one's own workshop.

However, it is noticeable that there were no cases of cross-over between the life courses of the two different kinds of trader described in Tables 7.13 and 7.14. Once engaged in the toy industry, the type of business that a trader might establish was fixed, depending on the kind of occupation they had engaged in during their teenage years. Starting a 'ton'ya' business seemed to require more funds or skills, as the 'candidates' for 'ton'ya' needed to spend longer gaining experience in previous employment than manufacturers. However, their expected profit should have been relatively large and most of them were located in the upper income layer compared to manufacturers. What, then, was the income level of the manufacturers?

Referring to Table 7.15, since the employer himself (almost all employers being male) was the chief worker in the small workshops, the earnings (income minus expenditure) of the small workshops in the table was the sum of the business profit and the payments to the employer and his family workers. Regarding this as the core earnings of the employers' household, per household core earnings of the workshops that utilized capital from 500 yen to 1,000 yen were 52 yen per month in the celluloid industry and 40 yen in 'metal products other than made from cast iron'; for capital from 1,000 yen to 2,000 yen, that were between 52 yen and 132 yen in celluloid (the data of celluloid for capital from 1,000 yen to 2,000 yen seems to be inadequate), and 53 yen in 'metal products other than made from cast iron'. The comparison between these earnings and the wages of employees is as follows; in the celluloid industry the wage of employees in factories with capital of 100 to 500 thousand yen (average number of employees a little below 30) was equivalent to the per capita earnings of workshops using 500 to 1,000 yen as capital (average number of employees a little below 4.6); in 'metal products other than made from cast iron', the wage of employees in factories with capital of 100 to 500,000 yen (average number of employees a little less than 50) was equivalent to per capita earnings in workshops with capital of 1,000 to 2,000 yen (average number of employees a little less than 3.4).⁵³

In addition, Table 7.16 shows the increase of 16 per cent in celluloid and 30 per cent to 50 per cent in 'metal product other than made from cast iron', in earnings in workshops from 1932 to 1935. On the other hand, the average daily male wage slightly decreased from 2.29 yen in factories employing 30 workers or more in 1932 to 2.21 yen in factories employing 50 workers or more in 1936. Since the wages in 1935 and 1936 differed only slightly,⁵⁴ the wages in the large-scale factories appear hardly to have increased at all between 1932 and 1935. Therefore, the earnings of small workshops in 1935, which were 15 to 50 per cent higher than those of 1932, might have equalled the wages of workers employed in factories producing 'metal products other than made from cast iron' with capital of 500,000 yen or more, the largest category in Table 7.15. Given that 1932 was almost the bottom of the Showa Depression, the data for 1935

Table 7.15 Feature of workshops by scale (total value of using capital, industries including toy manufacturing) (yen)

Total value of using capital	Value-added products per worker (per month)	Earnings (Income minus expenditure)		Wage or salary per employee (per month)
		Per workshop (per month)	Per family worker (per month)	
All Celluloid				
Less than 100 yen	12.7	13.0	8.1	9.3
100 yen and more	22.6	37.4	20.0	16.6
500 yen and more	24.7	52.3	28.3	17.1
1,000 yen and more	16.9	2.0	1.0	21.3
2,000 yen and more	39.5	132.6	65.4	24.4
5,000 yen and more	88.0	242.7	124.3	20.5
10,000 yen and more	77.8	309.5	222.9	54.7
50,000 yen and more	241.7	5,414.3	10,828.6	53.4
100,000 yen and more	127.5	3,099.0	—	63.3
500,000 yen and more	197.6	21,566.0	—	37.2
Metal products other than made from cast iron				
Less than 100 yen	26.0	18.1	16.1	11.6
100 yen and more	31.4	29.9	24.3	17.4
500 yen and more	32.7	40.2	31.3	18.8
1,000 yen and more	34.7	53.7	40.4	21.5
2,000 yen and more	42.9	95.2	71.4	26.6
5,000 yen and more	49.1	143.5	110.4	32.7
10,000 yen and more	70.4	389.1	320.3	41.1
50,000 yen and more	126.5	2,565.8	1,876.5	44.8
100,000 yen and more	338.5	12,820.6	70,513.1	62.9
500,000 yen and more	47.3	—6,607.4	—	76.9

Source: *Kōgyō Chōsasho*.

Notes

Value-added = Income-expenditure (cost of materials, fuel, depreciation, rental price of capital).

Rental price of capital = Fixed capital \times *0.08 (= Interest rate shown in *Kōgyō Chōsasho*).

show the earnings of workshops more in usual economic environment. Thus, it was not rare for manufacturers at the non-‘factory’ level to obtain incomes matching those of workers in large-scale factories. If they reached the ‘factory’ level, they could in fact expect incomes superior to those of skilled workers in large-scale factories.⁵⁵ This was a necessary condition for the achievement of the manufacturer’s life course from skill formation to establishment of an independent workshop, along the divided career track.

On the other hand, wage differentials among employees were quite large, as the lowest wage in small workshops was recorded as less than half of that of the large-scale factories. This cannot be attributed solely to the difference in labour-force composition – the high proportion of the ‘apprentices’ in small workshops – as the wage of workers in small workshops was also relatively low. It is apparent that one of the indispensable conditions for the relatively high average of earnings in small workshops was this wage differentiation by scale of workshop. At the same time, it meant that employees with the lower wages could not possibly increase their income as long as they were in employee status, assuming the low labour mobility from small workshops to large ones. In this situation, establishment of one’s own workshop must have appeared a promising option, though it involved considerable risks. It was the real prospect of this life course that drove the creation and reproduction of workshops, forming the social foundation of the dispersed production organization in modern Japan.

Concluding remarks

The toy industry in Tokyo emerged during World War I and developed conspicuously in the 1930s after a stagnant period in the 1920s. Given the importance of the overseas market, especially those of western countries, for this industry, this trajectory meant that toy manufacturing in Tokyo had acquired sufficient competitiveness over its counterparts in western countries. This chapter has as its starting point the fact that dispersed production organization based on small workshops actually worked to activate this competitive industry.

The ‘ton’ya’, defined as a merchant in a broad sense, was the key actor along one axis in this production form. They transacted business with wholesalers, including export traders, and manufacturers, and even committed themselves to production processes in some ways. Along the other axis, the manufacturers consisted of ‘factories’ and small workshops, the number of the latter being larger than that of the former. In each small workshop, the employer often acted as a core worker supported by ‘apprentices’ and family workers, as well as adult workers. Though the small workshops tended to engage in the processing of parts as consignees, they were required to form a certain level of skills, based on a couple of years’ training, which distinguished them from unskilled domestic workers.

It is also significant that the ‘ton’ya’, ‘factories’ and small workshops all included traders capable of creating original models of products. While the prominent ‘ton’ya’ merchandised their originally-developed products with their

Table 7.16 Fluctuations of earnings of workshops (1932–35)

	Year	Number of workshops	Earnings of workshop	
			(Per month: yen)	1935/32 (Index)
<i>Capital 500 yen and more</i>				
Metal products other than made from cast iron	1932	1,603	40.16	100.0
	1935	93	62.13	154.7
Celluloid	1932	30	56.33	100.0
	1935	33	65.50	116.3
<i>Capital 1,000 yen and more</i>				
Metal products other than made from cast iron	1932	1,256	53.71	100.0
	1935	123	70.42	131.1
Celluloid	1932	75	1.96	100.0
	1935	21	135.17	6,900.2

Source: *Kōgyō Chōsasho and Shōkōgyō Chōsasho*.

Notes

Survey in 1932 covered whole of Tokyo City.

The coverage of the investigation in 1935 was limited to four Wards (Shinagawa, Toshima, Arakawa, Joutou).

own trademarks, utilizing the organization of the manufacturers under their control, some manufacturers themselves produced originally-designed products on their own account, strengthening their positions relative to the 'ton'ya'. In fact, it was not rare even for small workshops to possess these potential capabilities. In other words, workshops situated within the structure of production organization controlled by the 'ton'ya' were also the actors capable of producing finished goods on their own account.

Thus, the relationship between 'ton'ya' and manufacturer, or consigner and consignee among manufacturers was not only one of complementarity or exploitation within the division of labour, but also one of the competitive struggles in the same field. It was the latter feature of the relationship that generated the industrial dynamism of the dispersed production organization. 'Ton'ya' competed with manufacturers for saleable products, and some small workshops succeeded in becoming 'factories' through their potential capacity to produce original finished products. This production organization was by no means static for the traders, and their continuous activity and vigorous new entry were the necessary conditions for generating the dynamism of the industry.

The geographical concentration of the traders supported this dynamism as it generated positive effects on the ability of traders to survive. The possibility of dealing in a variety of toy products – metal, celluloid and rubber toys as well as traditional ones – provided the 'ton'ya' with the opportunity to enjoy 'economies of scope'. Indeed, the most prominent 'ton'ya' were general toy wholesalers dealing in all kinds of toy products.⁵⁶ The concentration of toy manufacturers facilitated the division of labour in the production process, providing business opportunities for the small-scale new entries. Moreover, the existence of manufacturing trades using the same materials eased the instability of workshops suffering from market fluctuations, as it supplied opportunities to change to products based on similar skills or techniques. The various types of businesses also played important roles in complementing the small workshops, by providing specialized parts and devices such as springs, gears and moulds. The national centre for second-hand bookshops in Kanda-ku can also be mentioned as an abundant source of design information.⁵⁷ Since the existence of traders outside the toy industry reflected the concentration of various industries in adjacent areas, and this plurality seemed to be characteristic of the metropolis, it might have been the environment of the metropolis that provided the basis of the dynamism of dispersed production organization.

On the other hand, however, disorder in the transaction process, such as imitation, tended to be greater in the metropolis where social relation among the inhabitants were relatively weak. It was unlikely that social pressure, that could have worked to restrict the subjection to morale hazard among the fluid population, would form. Though the high density of traders in the concentrated areas produced some kinds of social relations, they could not have reached the intimacy of those in rural communities. In these circumstances, the measures to protect intellectual property rights institutionalized by the central government and the manufacturers' association represented an effective attempt to compen-

sate for the lack of the intimate community that could otherwise have worked to maintain order in the transaction process. The mandatory quality inspection by the association, supported by the manufacturers' association act, was another institutional reaction designed to cope with transaction disorder. The existence of geographical concentration, together with the institutional response, thus worked for the traders in enhancing the possibility of their survival in the unstable economic environment.

The creation and reproduction of traders were actualized on this industrial basis. The life course pattern of entry into the industry – being employed as a juvenile worker in the teenage years and establishing an independent business after the twenties – was common to both 'ton'ya' and manufacturers, making other patterns rare. This pattern suggested that the establishment of one's own business required a certain level of skill formation in a broad sense. The life course was actualized in the expectation of an income as an employer approximating to the wage of an employee in a large-scale factory, and their relatively low wages encouraged apprentices and workers to alter their employment situation. It was the prospect of this life course that promoted the creation and the reproduction of traders, functioning as the social foundation of the dispersed production organization.

The competitiveness of the dispersed production organization arose from this prospect. As Table 7.15 demonstrates, value-added productivity differed significantly between the workshops of different scales. Despite its relatively low productivity, however, the small workshop reproduced if the prospective life course, described above, actually existed. Assuming a significant number of them had the capability to develop new designs or devices, and had more opportunities to exercise their abilities because of their autonomous position, this production organization was able to compete with the factories that achieved higher productivity. The existing traditional distribution system, composed of 'ton'ya' and other wholesalers, functioned to connect these numerous workshops to the market. It was also a response to the emergence of newly-developed toys that enabled them to enjoy the 'economies of scope'. Therefore, the creation and reproduction of the workshops were actualized in combination with the traditional distribution system, motivated by their own interests. In other words, the path dependence of the distribution system caused the dispersed production organization to work as a competitive production organization. In this sense, thus, the trajectory of the toy industry in Tokyo could also be characterized as the 'new' development of the dispersed production organization in the interwar period.

Notes

1 Concerning the historiography of this field, see Tanimoto (2006).

2 Landes (1969/2003) p. 58.

3 Tanimoto (1998) Part 2.

4 The production data up to 1918 are extracted from *Nōshōmu Tōkeihyō*.

5 The main statistical source for Figure 7.1, *Kōjōtōkeihyō*, limited its investigation to

- 'factories' employing five workers or more. This limitation is problematic in the case of the toy industry, as will be discussed below. However, since we could not obtain consistent data for total production before 1938, and we may also predict that these data reflect the movement of total production, we used this statistics as index of the total amount of toy production.
- 6 The decline of production after 1937 was typical of the destinies of manufacturing industries unrelated to the war.
 - 7 *Kōgyō Tōkeihyō*, 1939.
 - 8 *Tonyasei Shōkōgyō Chōsai*.
 - 9 If we calculate the export dependency rate as the value of exports divided by the value of production, using *Dai-Nihon Bōeki Nenpyō* (Annual Overseas Trade Statistics of Japan) and *Kōjō Tōkeihyō* (Statistical Charts of Factory), we find it to be far larger than 100 per cent in most years in the 1920s and 1930s. This reveals the coverage problem in the production statistics – not including small workshops – as well as the difference in prices between the production stage and the export stage.
 - 10 Tanimoto (1998) gives micro-level evidence on this point for the rural weaving industry in Japan. Sokoloff and Dollar (1997) bases their case on comparison of macro-data for England and United States of America.
 - 11 Todaro (1997).
 - 12 Sumiya (1964).
 - 13 Saitō (1984).
 - 14 Nakamura (1971/1983).
 - 15 Sabel and Zeitlin (1985) (1997). There have also appeared works that treat urban small-scale industries from the viewpoint of 'flexible specialization'. See Johnson (1996) and Scranton (1997).
 - 16 Nagasawa (1934), pp. 139, 142; Brown (1996), pp. 98–9.
 - 17 *Kōjō Tsūran* and *Rōdōtōkei Jisshi Chōsa*.
 - 18 Johzen Takeuchi's work reveals the fact that the newly-founded modern factories in Meiji Japan based on the transplanted machines and technologies tended to collapse in the early twentieth century and thereafter the export-oriented development of these industries was promoted by the putting-out system (Takeuchi (1991)). Though the industries covered in his argument, the brush, hosiery and button industries, do not include toy production, his work provides the starting point of our argument.
 - 19 *Tonyasei Shōkōgyō Chōsa*.
 - 20 The 'trade association' was a legal body in Japan after the enactment of the Jūyō Bussan Dōgyō Kumiai Hō (The Trade Association Act for Strategic Commodities) in 1900, the revised version of a law enacted in 1897. The legal bases for 'manufacturers' association', to be discussed later in this chapter were the Jūyō Yushutsuhin Kōgyō Kumiai Hō (The Manufacturers' Associations Act for Strategic Export Commodities) enacted in 1925 and its revised version, the Kōgyō Kumiai Hō (The Manufacturers' Associations Act) of 1931. For discussion of the function of these associations, see Tanimoto ed. (2006), Chapters 1 and 7.
 - 21 The membership is confirmed in the directories included in the Tokyo Gangu Shōhō (*Journal of Tokyo Toy Trade*).
 - 22 *Tokyo-shi Shōkō Meikan*.
 - 23 *Tonyasei Shōkōgyō Chōsa*.
 - 24 The New Utility Model Law was enacted in 1905, 20 years after the enactment of the Patent Monopoly Act in 1885. The aim of the New Utility Model Act was to enhance the coverage of ideas and devices to be officially protected. In fact, most of the applications by toy traders to the Patent Office were for New Utility Models and designs. As for design registration, The Design Bylaws enacted in 1888 were the legal foundation.
 - 25 *Nendo Hōkoku, Jigyō Hōkoku* (Annual Reports by Furitsu Tokyo Shōkō Shōreikan).
 - 26 Trade Directory of Tokyo 1936.

- 27 The annual value of toy sales by Toyoda-ya, estimated by the mercantile agency in Tokyo (Tokyo Kōshinjo), reached three million yen in 1937, the highest among toy traders. Masuda-ya ranked within the next group with one million yen of value of annual sales.
- 28 The number of them was 90 for Toyoda-ya and 50 for Masuda-ya, according to the data source used for Table 7.3.
- 29 'Number of workshops exiting during 1928–33'/5 (years during 1928–33)/'Number of workshops in 1928 (bench mark year)'.
- 30 *Chūshō Kigyō Hakusho*, 2003, p. 295.
- 31 The average exit rate of Japanese retailers in post World War II, that was around 4 per cent, was evaluated to be relatively low in contrast with that of USA (Ishii(1996), pp. 169–81).
- 32 *Naishoku Chōsa* 1935.
- 33 According to Tonyasei Shōkōgyō Chōsa, 26 manufacturers ordered the works to domestic workers in 1935, and just seven of them were listed in Kojo Tsūran (Census of Factory).
- 34 *Tokyo-shi Kōjyō Yōran*.
- 35 *Tokyo Gangu Shōhō* (*Journal of Tokyo Toy Trade*).
- 36 A celluloid toy factory with a sales section is included in this number.
- 37 *Nihon Seruroido Shōkō Taikan*, p.124.
- 38 *Ibid*, pp. 214–23.
- 39 Most of the primary documents concerning traders in interwar period are said to have been lost during World War II. Indeed, the northeast part of Tokyo, in which toy business located, was the most severely damaged area in World War II.
- 40 The annual report in 1928 indicates that the largest part of the assets of Tokyo Celluloid Manufacturer (Tokyo Seruroido Kakōsho), employing hundreds of workers in the 1920s, was the 'moulds' (24,000 yen), exceeding 'machines and tools' (100,000 yen) and 'land and buildings' (180,000 yen).
- 41 Celluloid goods other than toys, such as combs, were generally simple commodities. Metal and rubber products included more complicated products.
- 42 *Nihon Kinzoku Gangu-shi*, pp. 304–13.
- 43 These three wards containing celluloid toy traders bordered on each other.
- 44 Marshall (1920).
- 45 Article in *Tokyo Gangu Shōhō* (August 1932).
- 46 *Tokyo Seruroido Gyōkai-shi*, pp. 58–9.
- 47 *Ibid*, pp. 57–9.
- 48 *Ibid*, pp. 53–5, 69–70.
- 49 Yamazaki (1969), Abe (1989).
- 50 The series of article in *Tokyo Gangu Shōhō* called 'Hanjō shōten hōmon ki (Reports on the prosperous merchants)' and its successor. We could only utilize half of them due to the incomplete set of back numbers.
- 51 *Nihon Seruroido Shōkō Taikan*.
- 52 Takeuchi (1991) conceptualized these factories as 'early factory'.
- 53 Since rent was included in the payments of workshops, estimated rent of ten yen has been subtracted from the wages of employees in Table 7.15. For the estimation of rent, see Tanimoto (2003).
- 54 Ohkawa *et al.* (1967), p. 243.
- 55 The core income of the households in workshops included the contribution by family workers. For an in-depth comparison, including this issue, see Tanimoto (2003).
- 56 Some of the middle scale 'ton'ya' concentrated on a certain kind of toy, such as Ogimura on celluloid or Nishimura on rubber.
- 57 A future prominent tin toy producer, Tomiyama, used to go to Kanda and collect ideas for new toys, such as cars and aircraft, from imported foreign magazines (*Omocha Ichidai*, pp. 44, 45).

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8 The evolution of organizational structure of the modern machinery industry in Japan

Kazuaki Kagami

Introduction

This chapter discusses the evolution of production organizations of the machinery industry in modern Japan. A type of production organization of the Japanese machinery industry, called '*shitauke-keiretsu*', has attracted attentions of many researchers and practitioners because of its high performance since the 1970s.¹ Some literature argues economic-theoretically that it could allow the related firms to take cooperative behaviors based on long-term relationships and reciprocity, and thereby resulted in efficient outcomes.² However, the observation that many companies in Japanese machinery industry stalled in the 1990s implies that the system could not always work well. Even if an organization would perform highly efficiently in the short term, it might fail to develop in the long run.

To understand the production organizations, it is important to examine not only from the static, but also the dynamic point of view. The static performance refers to the quality, quantity and costs of production under a set of fixed technologies, whereas the dynamic performance refers to the capability to adopt new technologies relevantly and promote innovations quickly.³ It is noteworthy that, in actual fact, the dynamic performance has been more significant than the static in modern machinery industry in general. Needless to say, the static performance is also crucial, because no one can realize dynamic development before achieving static efficiency. However, it is difficult to harmonize trade-offs between static and dynamic purposes: the static-oriented structure of organization is often contradictory to dynamic performance. Moreover, when a set of static-oriented behaviors are derived as a Nash equilibrium, the whole industry might be stagnant to perform dynamic development. The main subject is to sketch and analyze what and how static-oriented equilibria were established and how they were changed dynamically in the Japanese machinery industry.

The major method of economics used to research industries is to focus on the final market structure-conducts-performance,⁴ but this chapter stresses the organizational or intermediate market structure-conducts-performance. As the modern machinery industry is composed of numerous processes of production, industrial performance depends on the relationship between the upstream unit of

supplying intermediate goods and services and the downstream unit of providing final products to end users, rather than the structure of the final market. Consequently, the structure of organization determines the industrial performance to a considerable extent.

Each entity makes decisions about the organizational structure to achieve desirable performance under a specific circumstance, which includes the preceded history, exogenous shocks, government policies, and organizational structure that the other entities choose. It is notable that each entity's performance might depend on other entity's decision about organizational structure. In interactive situations multiple equilibria might exist, and thus serious coordination failures might happen. Many industries and countries have suffered from such phenomena.⁵ The machinery industry in Japan has experienced various types of organizational structures. Meanwhile, the machinery industry encountered successive huge exogenous shocks, and as a result, the prevailing pattern of organizational structure was destroyed. The standing feature of the development of the Japanese machinery industry is that while it achieved long-term growth with innovations, it experienced several changes of dominant organizational structure, which provided opportunities to utilize a new set of technologies and organizations.

The machinery industry in Japan has often been attended with rapid growth and development in the postwar period. However, it should be noted that there was an opportunity that the former dominant structure of organization was destroyed, maintaining most of the resources, at the end of World War II, and that the industry took advantage of this opportunity.⁶ Similar processes have repeatedly occurred in the history of the machinery industry in Japan: for example, the restoration at the beginning of the Meiji Era, the reform under the war regime, and the recovery in the postwar period. This chapter describes the process of organizational change in the history of the Japanese machinery industry since the late nineteenth century.

Production organizations of the machinery industry in Japan

An overview of the machinery industry in Japan⁷

The beginning and the early stage of development

At the beginning of the Meiji Era, in the middle of the nineteenth century, Japan lacked the technologies and knowledge that had developed in the Western countries, because the border had been closed since the early seventeenth century. The Japanese political leaders, who keenly realized the necessity to catch up with advanced countries, thought that the development of the modern machinery industry was significant in achieving that. Then, they attempted to import and borrow from overseas a whole set of technologies, knowledge, and equipment to produce important machines, such as guns, ships, and machinery for telecommunication.

There was another channel through which the modern machinery industry entered Japan. That is, domestic, small and scattered craftsmen learned technologies and skills through engaging in repairing and supplying parts for imported machines.⁸ In particular, they acquired skills to repair simple machines for consumers, such as bicycles and sewing machines.⁹

In short, to take advantage of the opportunity by the sudden opening of the border, the modern machinery industry in Japan started to catch up with the Western industry with two types of organizational structure: one is a large and self-sufficient structure often assisted by the government, and the other is a small and scattered structure.

The rapid growth in the prewar period

By the late 1920s, the machinery industry began to form a kind of inter-organizational structure. The public as well as private machinery corporations emerged. Meanwhile, they provided a lot of engineers and entrepreneurs onto the market, and converted some divisions into separate companies. For example, most of the warplane manufacturers were separate from shipbuilding companies.¹⁰ Also, small businesses engaging in repair and parts supply increased and developed. As a result, there came to be enough enterprises and workers to create external networks (see Table 8.1). As a result, the machinery industry was faced with a new challenge: whether and how the entities could form organizations between various producers.

Despite steady development, most of the small enterprises kept to a low productivity in the early 1930s. Table 8.2 shows the number and the percentage of factories by size in the machinery industry. There were a lot of small-sized enterprises, as has been stressed by many researchers and policy makers. They were faced with harsh price competition and were motivated to take short-term actions. Consequently, they did not provide standardized products update technologies and equipment.¹¹

Table 8.1 Number of establishments and workers in the machinery industry

<i>Year</i>	<i>Number of establishments</i>	<i>Workers</i>	<i>Value of gross output (million yen)</i>
1904	1,526	—	—
1914	1,812	—	—
1920	3,640	237,229	689.0
1925	4,043	254,206	457.6
1930	5,540	199,117	628.8
1935	10,250	415,347	1,359.3
1940	24,804	1,520,290	6,443.1
1941	25,412	1,681,276	8,793.6
1942	24,910	2,066,136	10,332.4

Source: Tsusyo-sangyo-daijin-kanbo-chyosa-toukei-bu (1961: 196–7).

Table 8.2 Number and percentage of establishments by factory size in the machinery industry

Year	Total number of establishments	5-9 persons		5-29 persons		500 and more persons	
		Number of establishments	Percentage	Number of establishments	Percentage	Number of establishments	Percentage
1909	1,526	848	55.6	1,316	86.2	11	0.7
1914	1,812	970	53.5	1,551	85.6	20	1.1
1920	3,640	2,449	67.3	2,994	82.3	53	1.5
1925	4,043	1,989	49.2	3,307	81.8	65	1.6
1930	5,540	3,404	61.4	4,842	87.4	45	0.8
1935	10,250	5,178	50.5	8,626	84.2	93	0.9
1940	24,804	11,342	45.7	20,009	80.7	302	1.2
1941	25,412	11,833	46.6	20,565	80.9	327	1.3
1942	24,910	11,002	44.2	19,621	78.8	423	1.7

Source: Tsusyo-sangyo-daijin-kanbo-kyosa-toukei-bu (1961: 196-7).

The rapid increase of similar enterprises limited further development of the machinery industry in Japan, through harsh homogeneous competition. To cope with this situation, they gradually devised various types of organizational structures. There were three major types: some big companies organized small manufacturers to form company groups; some small firms organized voluntary partnerships or cooperatives among similar businesses; and other small manufacturers were organized by middlemen or brokers. The 1930s was characterized by a period of external organization.

Figure 8.1 denotes the ratio of value added to gross output of the machinery industry, which can be interpreted as a proportion of internal production. One can find a declining trend from 67.2 percent to 44.4 percent in the 1930s. It suggests that division of works through outsourcing proceeded in the machinery industry during this period.

Rise and fall of the war regime

If this process had continued to proceed, the nature of the organizational structure of the Japanese machinery industry would be different from how it is today. However, the war regime during World War II radically changed the institutions and organizations of the Japanese economy.¹² In particular, because the government regarded the machinery industry as a key to win the war, it attempted to reform its market and organizational structure. First, many firms were forced to convert their products from consumer goods to armaments and munitions. Second, almost all the imports of technologies and resources from hostile

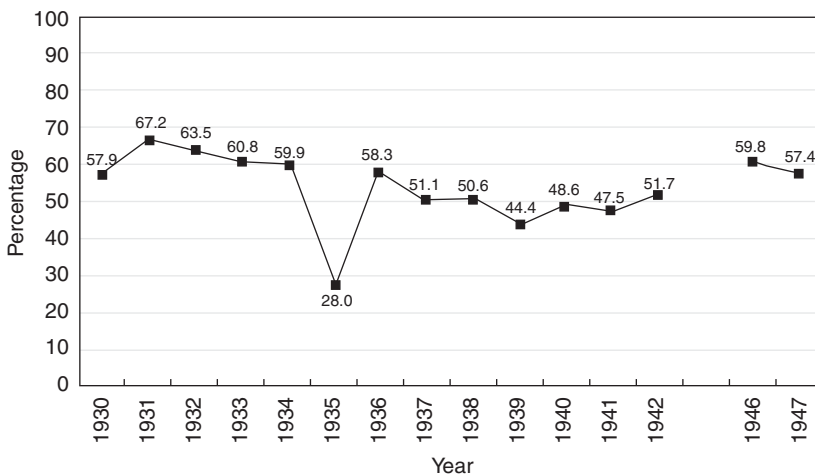


Figure 8.1 Sequence of the rate of added value per gross output value in the 1930s and the 1940s (source: Tsusyo-sangyo-daijin-kanbo-chyosa-toukei-bu (1961: 196–7)).

Note

I suspect that the value in 1935 might be erratum, but I leave it original.

countries were restricted. Third, the government took a policy to prohibit the trading of parts by way of brokers, and to construct a hierarchical organization of sub-contractors under each large assembler.

Another observation in Figure 8.1 is that there was an up-sloping trend in the 1940s, contrary to that in the 1930s. It implies that the production organizations substantially changed under the war regime.

The war regime was a grand experiment which was carried out by a set of invigorating government policies, and brought about a lot of difficulties as well as abundant rewards: rapid growth of production, increase of equipment and engineers, improvement of technologies, production management and coordination of production units, etc.

The rapid growth in the postwar period

When the war ended, the machinery industry had a lot of serious problems. Almost everyone pointed out that the machinery industry lacked sufficient demand, because munitions were no longer needed and the colonies were reduced in scale. Furthermore, they understood that the technology level had decreased relatively during the war. On the other hand, there were a lot of equipment as well as engineers and workers who experienced mass-production of machines under the war regime. There were two alternative ways for the machinery industry to develop in the new postwar environment. One was to form a horizontal organization and utilize abundant labor, a route which was taken, for example, by the sewing machinery industry. The other was to form a vertical organization, a route which was taken, for example, by the automobile industry.

Since the former could raise production and export quickly, most people and even the government admired this type of production organization in those days. However, later it was found that it deterred dynamic-oriented behaviors, and as a result, it could not become the dominant structure in the machinery industry. Also, the structure organized by brokers similar to that before the war, initially grew in the early postwar period, but then declined at the end of the 1950s. On the other hand, vertical production organizations, called '*shitauxe system*' or '*shitauxe-keiretsu*', emerged in the middle of the 1950s. They prevailed rapidly in the high-growth era and came to be considered as the typical production organizations in the Japanese machinery industry in the 1960s.

Types of production organizations

The definition of production organization

In this chapter, by 'production organization' I mean a specified connection between plural business units engaging in similar production activities. Also, I will not focus on the stable patterns and functions of production organizations, but on their evolution. In particular, attention will be put on how certain

methods of organizing businesses were instigated by a certain historical set of conditions.

Vertical structure

The flow of business in the modern machinery industry ordinarily consists of procuring various materials and parts, processing and assembling them to final products, and selling them to the end users. Thus it is essential for the industry to coordinate those business units vertically related to each other.

We can discriminate three generic types of vertical structure: integrated, quasi-integrated, and free market (see Table 8.3). Every type can be characterized by the level of unity of decision-making and the way of internalizing externalities between business units. Under the integrated structure, a single decision-maker controls every activity of production from the upstream to the downstream by orders. On the other hand, in the free market, suppliers and buyers are independent entities, and carry out anonymous exchange of non-differentiated intermediate goods guided by price. And under the quasi-integrated structure, the participants negotiate with each other to adjust their behaviors about price, quantity, quality, timing, and so on.

Both integration and quasi-integration structures differ from the free market structure by whether participants use the voice strategy or the entry-exit strategy within them as the means of internalizing externalities.¹³ On the other hand, the organization with integrated structure plays as a single decision-maker, or establishes the perfect incentive mechanism to control its participants. In contrast, both quasi-integration and free market play as a group of independent players, or prepare a limited incentive mechanism to govern transactions between participants.

Horizontal structure

In the Japanese machinery industry, the size of a single market for each sub-industry had not been great enough for most enterprises to enjoy scale economy over a period of time. Instead, scope economies often existed among these sub-industries, so that one could mutually enter into another sub-industry at a small cost. Thus large firms with high set-up costs attempted to expand the line of products to compensate for the lack of scale of a single class of products.¹⁴ In particular, at the early stage of development, they formed comprehensively integrated

Table 8.3 The typology of vertical structures of production organization

<i>Type</i>	<i>Means of internalizing vertical externalities</i>	<i>Pattern of decision making</i>
Vertical integration	order	unified
Quasi-integration	negotiation	related
Free market	price	dissociated

Source: Author.

structures to internalize all externalities between related industries so that they could avoid ‘the non-industrialization trap’.¹⁵ On the other hand, small firms with low set-up costs tended not to confine themselves to a specific sub-industry but kept flexibility to adjust to any trade conditions and uncertain circumstances. They provided a variety of machinery parts and products by tuning non-specialized equipment to produce orders by hand, even in the postwar period.

To summarize, the horizontal structure of production organization has two dimensions within a single market and a greater range over a multiple market. The former is divided into three types of structure: horizontal merged, quasi-merged, and competition within a market. The latter has also three types: conglomerate, quasi-conglomerate, and competition over multi-markets (see Table 8.4).

The features of a vertical organizational structure are clear, but the nature of quasi-merger or conglomerate types are more complex. A typical structure of quasi-merger is cartel. All participants in a cartel negotiate on price or quantities; with each pursuing their own interests. Their behaviors are harmonized with each other, but they are still independent players. Another quasi-merger is a kind of partnership or cooperative association, which is generally motivated to utilize common utilities, to induce common R&D, and to guarantee quality of products and establish common brand names.¹⁶ This type of structure has been seen frequently in multi-markets too. Typical quasi-conglomerates are multi-divisional organizations and network organizations. The former has been studied intensively by Williamson (1975) and Chandler (1977), while the latter became more common after Piore and Sable (1984).

Perspectives on hybrid structures of production organization

The structures of production organization are understood as a mixture of vertical and horizontal elements.¹⁷ The picture can be simplified as in Table 8.5. I plan to sketch the feature of each cell in this table, and then to correspond with observations of the history of the machinery industry in Japan.

Performance of production organization

The structure of a production organization determines its performance. The performance of a production organization depends on the costs and the benefits

Table 8.4 The typology of horizontal structures of production organization

	<i>Merger or conglomerate</i>	<i>Quasi-merger or quasi-conglomerate</i>	<i>Competition within or over market(s)</i>
Means of internalizing horizontal externalities	order	negotiation	price
Pattern of decision making	unified	related	dissociated

Source: Author.

Table 8.5 Hybrid structures of production organization

<i>Horizontal structure in upstream sectors</i>			
	<i>Merger or conglomerate</i>	<i>Quasi-merger or quasi-conglomerate</i>	<i>Competition within or over market(s)</i>
<i>Vertical structure</i>			
Integration	Complete concentration	Multi-division	Integrated production
Quasi-integration		Tonya-sei, Shitauke-sei	
Free market	Double monopoly	Partnership, cooperatives	Pure market

Source: Author.

associated with coordinating vertical and horizontal relations. It is notable that there are two dimensions of performance: static and dynamic. Not only could organizations with poor static performance hardly survive, but also organizations that do not generate innovations, will never survive in the long term. Some organizations are effective in sharing a certain technology or knowledge horizontally, but they are not able to stimulate innovations with the vertical integrity, and thus they disappear. It is essential to understand how organizational structure can be effective at coping with the trade-offs between the static and the dynamic performance.

The beginning of the modern machinery industry in Japan

The comprehensively integrated structure

The forms of production organization found at the beginning of the modern machinery industry in Japan were vertically integrated, horizontally merged and conglomerate. To establish the modern machinery industry, it was necessary to understand all the related works comprehensively. Thus they selected a kind of complete concentration structure, which internalized almost every externality.

The government played a leading role in setting up the modern machinery industry. In particular, they bore a large amount of the initial costs and gave continuous support to those industries, including guns and ships, and telecommunication machinery.¹⁸ The direct role of the government policy was limited, but the indirect effects were substantial. Moreover, the governmental lead to introduce the industry had affected the characteristics of those machinery manufacturers with large initial costs in a path-dependent manner.¹⁹ For example, they had traditionally ignored outsourcing and tended to internalize every work without regard to cost.²⁰

As sub-categories of the machinery industry have large externalities with each other, it is difficult for a single branch of the industry to stand

independently. In other words, it cannot exist without various related industries, such as materials, parts, and other machines. Therefore, it was natural that they imported and borrowed a whole set of technologies, engineers, equipment and plants, and adopted the comprehensive structure of organization to found the modern machinery industry.

Scattering manufacturing

Another type of production organization adopted at the beginning of industrial development was individual and scattering works. Hoshino and Sakisaka (1960: 19) wrote, 'It is a natural way for machinery industry in any underdeveloped country to progress in starting with repairing imported machinery products, then learning works and designs with accumulating capitals, after those, trying to provide small and simple machinery, and at last producing big and complex machinery.' It was true that repairing and copying imported products contributed to establishment of some machinery industries, such as the sewing machinery and the bicycle industry in Japan.²¹

Inter-firm relations

As addressed above, two types of production organization developed in parallel during this period. One was when modern entrepreneurs or the government adopted deliberately large-sized, comprehensive, and integrated structures, and imported the whole system of production. This was seen as a rational way to set up the modern machinery industry in the absence of other related industries. By contrast, the other way was through traditional craftsmen who created a small-sized and scattered structure, and learned skills and knowledge of production through copying and repairing imported machineries. That was a natural way for underdeveloped countries to catch up with advanced countries.

Although they were highly diverse from each other, there was one common feature between them. Large-sized firms survived and grew without any dependence on other firms. Small and scattered businesses planned to rely on casual and partial jobs. That is, both types existed and ran independently, and few inter-firm relations were formed.

Emergence and changes of inter-firm organizations during the prewar and the war regime period

Growth of the machinery industry and emergence of inter-firm organization

Up until the end of the 1920s, several machinery industries had grown to the certain extent that it became possible to form inter-firm organizations (see Table 8.1). In other words, the growth of the machinery market enabled the industry to advance the division of labor and specialization of works. Some large companies

created a separate branch of machinery products. Thus, the population and variety of small and medium-sized businesses grew remarkably.

As a result, designing connections between various firms gradually became significant. In particular, many researchers have paid attention to organizational relationships among small and medium-sized enterprises (SMEs) of the machinery industry. Since the share of SMEs was large in the machinery industry, it could determine the performance of the whole industry, whether they worked effectively or not. There were three major classes of organizational structures with regard to SMEs: '*kogyo-* *kumiai*', '*tonya-sei*' and '*shitauke-sei*'.

Horizontal organization: 'kumiai'

General features

The term '*kumiai*' refers generically to a class of organizations formed among homogeneous parties, like cooperatives and associations.²² Economists usually criticize such organizations, because they would restrict price competitions and cause social losses. In the prewar period, however, it was widely accepted that the *kumiai* could work effectively to enhance static and dynamic performance. So, the government has supported a certain class of *kumiai* organization among SMEs by creating special acts: they legislated for the export industries as '*Jyuyo-yushutsuhin-kogyo-kumiai-hou* (Law on the industrial cooperative associations for important exports)' in 1925, and then amended it in 1931 as '*Kogyo-kumiai-hou* (Law on the industrial cooperative associations)'. The kind of production organizations, established under this law, were called the '*kogyo-kumiai* (industrial cooperative association)'.²³

The *kumiai* organization was expected to play two substantive roles: acquiring rents through cooperative works and raising negotiation power against opponents in trade. Later, under the war regime, another role was added, namely a control channel for the government. The number of *kogyo-kumiai* increased gradually, and then under the war regime it increased sharply after late 1930s (see Table 8.6).

The functions of the kogyo-kumiai

The primary function of a *kumiai* organization was to guarantee the quality of products in order to resolve the adverse selection problem. Although machinery parts or goods require high and uniformed quality in general, the competition among too many too small entities drove them to lower the quality of products. As a result, the reputation of the industry, based on the expected quality of products, were devalued. This is an 'adverse selection problem' under imperfect information situation.²⁴ This economic theory explains why it is rational for every party to select low quality privately at the equilibrium, even though the outcome would not be desirable. To avoid suffering from adverse selection, they required an institution, which would establish a standard for goods among

Table 8.6 Number of the *Kogyo-kumiais* in all manufacturing industries

<i>Year</i>	<i>Number</i>
1925	2
1926	23
1927	57
1928	76
1929	90
1930	111
1931	152
1932	212
1933	344
1934	513
1935	662
1936	850
1937	1,173
1938	2,836
1939	4,417
1940	6,580
1941	8,590
1942	8,250

Source: Kogyo Kumiai Chuo-kai (1943: Table III).

businesses engaging in providing similar products, and then inspect and control these businesses in order to maintain the standard. That was the primary purpose of the government in promoting *kogyo-kumiai* in 1932 (Ministry of Commerce and Industry, Department of Industry 1936: 1–2; *Industrial Bank of Japan, Research Division* 1932: 2; Kawabata 1937: 97–107; and *Kogyo-kumiai-chyuo-kai* 1940: 1).

In order to maintain the uniformity of the quality of products, the *kogyo-kumiai* employed specialized staff engaged in inspection not only into products, but also into materials and equipments. In addition, the law permitted them to force the members of the *kumiai* to obey the agreements on price, quality and quantity of products. The *kogyo-kumiai-hou* specified further activities, such as possessing common utilities, cooperative businesses in manufacture, storage, deliveries and sales, and financing. All of them would be deemed static oriented policies.

Although the *kogyo-kumiai-hou* intended to pursue static purposes, the *kogyo-kumiai* had in fact contributed to the achievement of dynamic performances. The *kogyo-kumiai* was set up to be a channel through which to acquire new technologies, skills and information of production or products, and to spread them among its members. In other words, it was an institution for research and education.

In addition, it organized quality contests and exhibitions of products and techniques of production. These could be regarded as rank order systems, to promote members to be more innovative, and to spread these innovations among other members.²⁵

In short, the *kumiai* structure of production organization was suitable to conditions in those days, and helped to accomplish static and dynamic performance.

Changes in nature under the war regime

The government started a big challenge to reform various dimensions of the state and the economy to provide for the coming war in the middle of the 1930s. One of the major targets was the structure of the machinery industry, and for this purpose the government made the best use of the *kogyo-kumiai*.²⁶ First, it functioned as a channel of information flow between the government and numerous small enterprises. Second, it enabled a lot of small factories to change products from private consumer goods to munitions and armaments. Third, it was planned to work as a unified production unit to supply parts to the central large factory. Although the *kogyo-kumiai* did not always control these functions completely, the government worked hard to promote it to small enterprises. Consequently, the number of the *kogyo-kumiai* increased rapidly during the war regime period (see Table 8.6).

In those days, Japanese economy was seriously in short supply of various resources and materials, such as iron, metals, rubbers and so on, since the supply of exports from abroad were restricted by the hostilities and the demand from the military increased substantially. Thus, the government allocated scarce resources to public use, especially to armaments. As a result, most enterprises, which provided goods for the private sector, were unable to run their own businesses well, since there were no resources available. For instance, there were 7,545 associate members belonging to 51 *kogyo-kumiais* in Osaka city at the end of 1940. Thirty-nine percent of members' business took a downturn and all of them, excepting one *kogyo-kumiai*,²⁷ commented that the most crucial reason was 'lack of resources' (Osaka City Office: 1941).

The government realized that the increase of poor business and bankruptcy might cause confusion in society. Thus they prompted SMEs to convert their businesses, and most of the SMEs were willing to do so in order to be allocated the resources. However, since they had never experienced sophisticated mass production, it was not easy for them to adjust to produce armaments. Thus, the central assemblers and army arsenals complained that the procurements from the converted SMEs would cause confusion and then lower the productivity (Nomura 1939: 241; Tokyo Chamber of Commerce and Industry 1937: 51–2).²⁸

Historical path-dependence might be another reason why these central assemblers were reluctant to procure externally. According to Komiyama (1941: 40), 'the machinery industry in Japan has been taking a policy of comprehensive integration, which manufactures any parts internally at high costs beyond rationality, since they have been supported by the government'. For this reason, large factories were generally unwilling to use external outsourcing (Kawabata 1939: 16).

To cope with these circumstances, the government altered the role of the *kogyo-kumiai*, namely they wanted it to provide technical assistance to SMEs

Table 8.7 Functions of the Kogyo-Kumiai practiced under the war regime (number/percentage)

Number of Kogyo-Kumiai	Number of replies	Inspection and execution				
		Inspection on products	Inspection on materials	Inspection on equipments	Execution	
Total	7,820	3,198	302	411	657	
Machinery Industry	694	243	17	15	22	
	—	—	7.0	6.2	9.1	

Control							
Quantity	Allocation of resources	Sales	Price	Cooperative procurement	Cooperative working	Specifying materials	Restriction on transaction
Total	492	2,539	743	844	299	122	212
	15.4	79.4	23.2	26.4	9.3	3.8	6.6
Machinery Industry	25	184	85	41	23	8	14
	10.3	75.7	35.0	16.9	9.5	3.3	5.8

Common facilities			Sales (autonomous)	Providing other requirements	Finance		Subcontracting works	Conducts
Works	Storage	Delivery	Others		Fund loan	Deposit	Guarantee	
Total	285	138	92	112	846	170	281	1,203
	8.9	4.3	2.9	3.5	26.5	5.3	8.8	37.6
Machinery Industry	50	8	3	14	33	26	12	96
	20.6	3.3	1.2	5.8	13.6	10.7	4.9	39.5

Source: Kogyo Kumiai Chuo-kai (1943: Table (B)).

and to mediate subcontract dealings. Table 8.7 shows the functions of the *kogyo-kumiai* in 1941. It is obvious that the functions to control were given more stress than the function to accomplish organizational rents. The governmental policy distorted the original purpose of the *kogyo-kumiai*. Therefore, under the war regime, the *kogyo-kumiai* was not thought as a cooperative or association, but as a means of control by the government.

Evaluating the kogyo-kumiai

In the process of the development of the machinery industry before the war, the *kogyo-kumiai* functioned effectively as one of the production organizations for resolving the problem of adverse selection and scale and scope of economy. However, the number of *kogyo-kumiai* was less than 1,000 even in the middle of the 1930s (Table 8.6). This observation means that we should not overestimate the quantitative magnitude of the *kogyo-kumiai*, put to cooperative purposes.

When the number of the *kogyo-kumiai* increased to 8,000 in the early 1940s, its nature had already been changed under the war regime by the government. So, one might hesitate in evaluating it as a kind of production organization, at least, with regard to static performance.

Moreover, there is another reason why *kogyo-kumiai* could not work effectively to achieve static performance. Some research reported that it already faced some troubles in 1935 (Nagoya Koto Shogyo Gakko Sangyo Chosa Shitsu 1936: 46). Table 8.8 shows how many *kogyo-kumiais* had resolved or dealt with which

Table 8.8 The number of Kogyo-Kumiai by resolved or bothered with problems

	<i>Resolved issue</i>	<i>Bothering issue</i>
Cooperative Purchases	16	2
Cooperative Sales	23	11
Finance	9	10
Agreements on Exclusive Trade	5	—
Agreements on Price	4	13
Agreements on Quantity	24	13
Common Utilities	14	5
Inspection	19	8
Improving Quality and Specifying Standard	8	6
Outsider Problem	1	19
Competition against Other Districts	—	5
Opposition against Dealer Groups	—	6
Diffusion of Company Size	—	4
Misunderstanding by the Government	—	3
Cooperative Spirits	2	5
Further Development of Business	1	5

Source: Nagoya Koto Shogyo Gakko Sangyo Chosa Shitsu (1936: 46).

Notes

The total number of answers is 167.

The research was carried out in 1935 by sending questionnaire letters to 513 *kogyo-kumiais*.

type of subject. It suggests that the *kogyo-kumiai* failed to provide the incentive mechanism to deal with conflicts of interests among its members, though it succeeded in coping with issues which were relatively conflict free, such as cooperative purchases and sales, possessions of common utilities, and inspection.²⁹ The *kogyo-kumiai* was based on egalitarianism; therefore, it tended to lapse into malfunction when dealing with complicated issues. It could be established easily, but its function was limited by nature.

It is ironic that, under the war regime, the governmental force changed the original nature of the *kogyo-kumiai* to settle the incentive problems, and then enabled it to induce the dynamic development.

Vertical organization in the prewar period: 'tonya-sei'

On the contrary to the *kumiai* structure, there were some production organizations formulated vertically by a kind of middleman, generically called *tonya*. This type of organization was referred to as the '*tonya-sei*'. It was not clear when and how '*tonya-sei*' appeared, but it had been prevailing at the beginning of the 1930s (Fujita 1965: 78).

The early *tonya-sei* organization was pretty loose. The *tonya* organized small and medium-sized manufacturers, providing demand information, delivering materials, financing, and managing sales. Although the *tonya* was regarded as the leader of the *tonya-sei* organization, most of *tonyas* possessed little ability to control its members. Their main, and often only, function was to connect small manufacturers to the end market, and they usually kept themselves apart from manufacturing. The conflicts within the *tonya-sei* organization were settled not only through negotiations, but also by entry-exit behaviors. Small manufacturers participated in several *tonya-sei* organizations, and floated between them depending on trade conditions offered by *tonyas*.

At least 40 percent of transactions were started through the *tonya-sei*³⁰ (Komiyama 1941: 70, Table (12)).³¹ Approximately half of small manufacturers got materials through *tonyas* (Tokyo City Office 1937: 26). A lot of SMEs in the machinery industry belonged to the *tonya-sei* organization, and were supported through it. However, the *tonya-sei* organization was not exclusive. Just over thirty-seven percent of manufactures with less than ten workers traded with more than five *tonyas*, and 64.3 percent of those dealt with more than three *tonyas* (Komiyama 1941: 71, Table (13)). It means that even the smallest class of manufacturers did not always form the exclusive organization with a specific *tonya*, but made open relationships at a considerably high rate.

The *tonya* specialized in connecting SMEs to markets, while the SMEs in the machinery industry concentrated on manufacturing in the *tonya-sei* organization. The distinct specialization brought about rapid growth for members and then the machinery market at the early stage of development. Many small factories accumulated experiences of division of labors, continuous works, and the first step of mass production. However, as a result of the specialization, the *tonya* generally lacked knowledge in manufacturing technologies and skills. That fact prevented

the *tonya-sei* organization from achieving more profound coordination and dynamic development.

***Vertical organization under the war regime: 'shitaue-sei'*³²**

The concept of shitaue-sei organization

Further development of the machinery industry gradually revealed the faults of the *kogyo-kumiai* or the *tonya-sei* organization. The growth and sophistication of the industry made external trade more attractive by raising opportunity costs of internal production. However, without the coordination between vertically related activities in production process, external trade was left barren because of the substantive nature of the modern machinery industry. There appeared the *shitaue-sei*, which connected closely the parts production in the upstream and finished-machinery manufacture in the downstream in several industries in the early 1930s.

There is a lot of literature on the *shitaue-sei* in the machinery industry during the prewar and the war regime period (Kawabata 1939; Tasugi 1941; Komiyama 1941; Fujita (ed.) 1943; Kobayashi (ed.) 1958; and Fujita 1965). The term 'shitaue' is referred to as a kind of transaction or production organization with subcontracting. It is noteworthy that there is some conceptual confusion among these studies. First, some researchers identify the *tonya-sei* and the *shitaue-sei* in the same category. One of the dominant views regards both as a system of exploitation through external transactions. Second, some arguments are confused between voluntary formed *shitaue-sei* and that formed by the government under the war regime, which is referred to as the '*kyoryoku-kojyotaisei* (cooperative manufacturing system)'. This view emphasizes that both have the organizational structure, where they coordinate vertically a large factory and a group of satellite manufacturers. Third, several advocated that a class of production organization which displays a long-term and cooperative relationship, much admired in the 1970s and analyzed in the 1980s, was typical of inter-firm organizations in Japan.

The difficulty lies in the fact that the character of the *shitaue-sei* organization is actually manifold. I define the *shitaue-sei* as a class of production organization that is a vertically quasi-integrated inter-firm relationship between the upstream and downstream units in a certain production process.³³ The most typical example of the *shitaue-sei* was the organization which formed between a central large factory and some satellite small suppliers.³⁴

The emergence of shitaue-sei organization

The *shitaue-sei* was invented to overcome the faults of the former production organizations, the *kogyo-kumiai* and the *tonya-sei*. The *kogyo-kumiai* had been effective, to some extent, to raise the level of primitive technologies and skills of small enterprises simultaneously, and to teach members horizontal coordination.

The *tonya-sei* had enabled small businesses to exist without direct connections to the final customers, and also had created the conditions needed to trade between vertically related units. However, neither the ability to harmonize vertically related production process more sophisticatedly, and to promote radical innovations.

Then, around the middle of the 1930s, some large-sized firms began to select outsourcing partners, entrusted partial works temporarily, and formed more harmonized relationships, i.e., the *shitauxe-sei* organization.³⁵ Seemingly, most of these relationships started through a brokers' introduction, and then gradually changed to more fixed and continuous ties. Thus, the early form of the *shitauxe-sei* was similar to the *tonya-sei*. According to the '*Sho Kogyo Chosa*' (Tokyo City Office 1937: 26), most small manufacturers sold their outputs to factories, while most deals started through brokers. Komiyama (1941: 57–8) illustrates a prominent view, 'the observation should be made that the absence of close connections between central factories and satellite enterprises did invite the appearance of entities like broker'. The fact should be regarded as evidence that large firms, which had always adopted the comprehensively integrated conglomerate type of production organization and thus avoided outsourcing, began external trading. Needless to say, the broker intervention type of production organization should not be overestimated. However, it opened the way to the direct cooperation between isolated large firms and scattered small businesses.

Expansion and limit of the early shitauxe-sei structure

The reason why the large machinery companies began external transactions was that, due to the preparation for the coming war, demand for the machinery industry increased so rapidly that it became beyond the capacity of large companies. In the 1930s, the nominal value of gross output of the machinery industry expanded more than ten times (see Table 8.1). Thus, the large factories came to rely for some processes on external manufacturers, so that the rate of added value per output value fell about 10 points (see Figure 8.1). However, the large factories still preferred to keep manufacturing internal as much as possible (Ueda 2004: 25–6).

In short, under the early *shitauxe-sei*, most small manufacturers engaged in temporary and floating transactions through brokers. Therefore, since they practiced little vertical harmonization, any organizational performance achieved was not very satisfactory. As a result, the government thought that the unstable relationship would not correspond with their plan to expand production capability under the war regime.³⁶

Adjustment of the shitauxe-sei organization by the government: kyoryoku-kojyo-taisei

The government started to reform the production organization in the machinery industry in the 1940s. Two policy guidelines were decided by the Cabinet:

'*kikai-tekko-seihin-kogyo-seibi-yoko* (the guideline on the reformation of machine and iron industries)' in 1940 and '*kyoryoku-kojyo-jisshi-yoko* (the guideline on construct cooperative factory organization)' in 1941. The government intended to construct the production organization, which connects, fixedly and exclusively, a group of small satellite suppliers to a central factory, and thus creates vertical harmonization in the production process.³⁷

Another important factor of this policy was the requirement of private enterprises to pursue the state objective, instead of private interests. The government planned to control production, such as quantity and timing, not by profit motivation, but by its own authority. And thus, they forbade the activities of brokers.

However, this policy did not meet the government's intention. Ueda (2004: 151–8) explains the two reasons for the failure: first, there existed institutional inertia, especially in large factories, who were reluctant to practice outsourcing; and second, small enterprises intended to avoid the fixed and exclusive transactions because of the risks of being locked in. Ueda's view is supported by Figure 8.1, in which the rate of added value per value of output increased from 1940 to 1942, in contrast to that in the 1930s. Despite the government policy, outsourcing had shrunk during this time.

The essential mistake of the Japanese government was to neglect the incentive problem when they tried to design production organization (Okazaki and Okuno-Fujiwara 1999). The enterprises behaved on the basis of private interests, even in wartime. In addition, the government figured out that the broker intervention organization, which had been thought of as anarchy and disorderly, would work the rational part of functions of production organization. Therefore, the government amended the policy to permit brokers and floating relationship (Ueda 2004: 153). Although the government made considerable efforts to reform production organizations between manufacturers related vertically, it resulted in failure. Even in the warplane industry, which was regarded as strategically the most important, some bottlenecks on the production process had not been resolved well into the war (Nainenkikan Hensyu-bu 1944: 2–3).³⁸ Ueda (2004: 174) concludes that the challenge of reforming production organization in the machinery industry under the war regime ended in failure.

Evaluation of the shitaue-sei organization

The *shitaue-sei* organization, which forms quasi-integration between upstream and downstream units in the production process, was a production organization set up to cope with the problems that the *kogyo-kumiai* and the *tonya-sei* organizations could not resolve. Although the ideal style of the *shitaue-sei* was the highly harmonized vertically connected organization, most of the *shitaue-sei* organizations constructed privately in reality looked like loose and unstable ties interconnected by brokers. As the government was not satisfied with the performance achieved through *shitaue-sei*, they endeavored to create the ideal form of the *shitaue-sei* organization by public authority. However, many

commentators thought that the *shitauxe-sei* conducted by the government did not work effectively.

It is also true that the *shitauxe-sei* prevailed on the basis of government power under the war regime, and that the volume and the quality of machinery outputs had rapidly increased with this type of production organization. The most important role of the *shitauxe-sei* during the war was to accumulate various experiences in and around the machinery industry. Many workers, engineers and enterprises learned about mass production based on external transactions through participating in the *shitauxe-sei* organization.

Restructuring of production organization in the early postwar period

Overview on the circumstances in the period of recovery

The initial conditions just after the war

Due to the end of the war, the machinery industry lost huge military demand. However, there remained a large but not so sophisticated production capability. The Japanese machinery industry acquired various foundations for development because of the war, while it also lost many things.

The Ministry of International Trade and Industry (1960: 59) points out four factors that the war regime brought to the machinery industry: abundant equipments, settlement of disciplined workers in certain factories, establishment of precision machine industry, and spread of mass production to a considerable extent. Hoshino and Sakisaka (1960: 64) say, 'Even though failed, wasted much money, and executed as the forms of armament industry, the Japanese machinery industry experienced all-out mass production for the first time in its history.' And the survey on the electric machinery industry by Takeuchi (1966: 207–11) addresses the conditions changed under the war regime as: explosion of the output, expansion of production lines and accumulation of new technologies, construction of inter-firm relationships, and continuing existence of abundant volume of plants and equipments even though heavily depreciated during the wartime.

In short, the war left three inheritances to the supply side of the machinery industry: the increase of production capacity and the rise of technological level, the experience of mass production and external transactions, and the abundant but exhausted equipments.³⁹

*General conditions of the machinery industry in the recovery period*⁴⁰

The machinery industry recovered more rapidly than other industries. In particular, SMEs led the growth of the industry. Then, there was a great demand due to the Korean War in 1950, which rapidly expanded the industry (see Table 8.9). It is notable that the orientation of the parties in the machinery industry shifted from volume expansion to technological improvement around 1950. In other

Table 8.9 Industrial activity indexes in the recovery period (1934–36 = 100)

Year	Total	Manufacturing	Metal	Machinery
1945	63.2	59.1	55.1	147.3
1946	19.2	28.9	15.6	51.4
1947	46.2	35.1	23.2	59.8
1948	61.8	52.5	40.0	107.4
1949	76.7	68.9	70.4	131.6
1950	88.0	82.0	96.6	125.6
1951	119.4	115.1	144.0	197.1

Source: Kikai Kogyo Kenkyu-kai (1969: 30 Table 1-1).

words, their goal was altered from the static performance to the dynamic performance (Hoshino and Sakisaka 1960: 76).

The division of labor in the recovery period

The division of labor in the machinery industry in the postwar period is examined in Figure 8.2, which draws the rate of value added by firm size in terms of workers.⁴¹ The rate of the whole machinery industry (thick line in Figure 8.2) fell clearly from 1955 to 1965, in contrast to the increase trend in 1950 to 1955. It implies that the division of labor in the machinery industry progressed from 1955. Also, Figure 8.2 tells us that in the first half of the decade, middle-sized factories (30–199 workers) rapidly expanded outsourcing, and that in the second half of the high growth era, large-scale firms (200 or more workers) organized external transactions, and at the same time small enterprises (4–29 workers) expanded their own production capabilities.

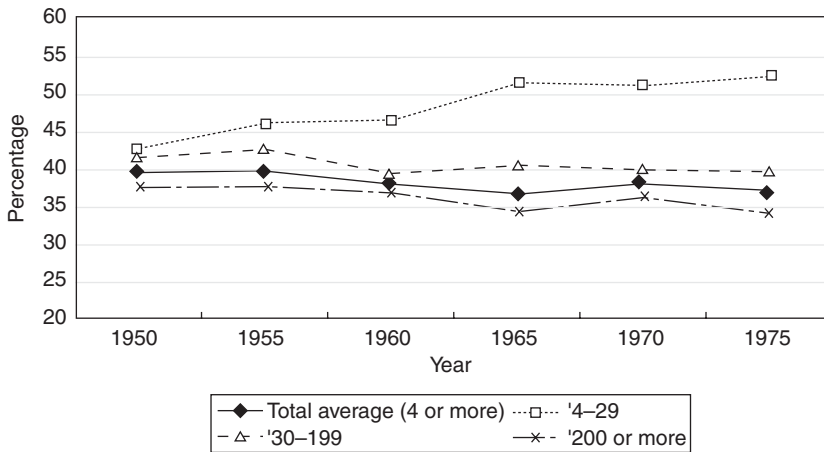


Figure 8.2 The rate of added per net-output value in the postwar period by firm size of workers (source: Ministry of International Trade and Industry (annual), *Census of Manufacturers*).

*Floating production organization in the postwar period**Revitalization of the tonya-sei organization*

Small and Medium Enterprise Agency (1949b: 77) reports 'external transaction relationships collapsed when the war ended'. This suggestion is supported by 'Tokyo-to Chusho Kogyo Jitsujyo-Chosa' (Tokyo Shisei Chosa-kai and Tokyo Metropolitan Government Office 1947) in 1946. As shown in Table 8.10, most factories engaged in works which were planned voluntarily, and those engaging in ordered work in a subcontracting relationship were few. The *shitaue-sei* organization disappeared almost completely.⁴²

Meanwhile, middlemen and brokers played important roles during this time. That is, the production organization, like the *tonya-sei*, reverted, in contrast to the decline of the *shitaue-sei*. In the confused situation caused by the end of the war, middlemen and brokers took the advantage in acquiring materials and connecting between demand and supply. According to Tokyo Shisei Chosa-kai and Tokyo Metropolitan Government Office (1947), small factories relied on approximately 40 percent of materials coming from middlemen (Tokyo Shisei Chosa-kai and Tokyo Metropolitan Government Office 1947: 58), and small manufacturers sold more products through middlemen than through *kumiais* (Tokyo Shisei Chosa-kai and Tokyo Metropolitan Government Office 1947: Table (54)).

The production organization, similar to the *tonya-sei*, turned into the dominant structure in the machinery industry. However, its functions were limited compared with the original *tonya-sei* in the prewar period, and moreover, the middlemen had little motivation to behave as organizers of production (Small and Medium Enterprise Agency 1950: 93–5).

For these reasons, there was a very unstable structure and functions were limited to connecting between supply and demand of resources or products. This

Table 8.10 Distribution of the types of work, which factories engaged in

<i>Firm size by workers</i>	<i>Voluntary work</i>		<i>Ordered work</i>		<i>Mixture</i>	
	<i>Number</i>	<i>Percentage</i>	<i>Number</i>	<i>Percentage</i>	<i>Number</i>	<i>Percentage</i>
1–4	79	79.8	16	16.2	4	4.0
5–9	63	77.8	15	18.5	3	3.7
10–29	114	84.4	7	5.2	14	10.4
30–49	56	83.3	10	14.5	3	4.3
50–99	46	95.8	2	4.2	–	–
100–199	20	87.0	1	4.3	2	8.7
200 or more	4	100.0	–	–	–	0.0
Not obvious	1	33.3	1	33.3	1	33.3
Total	392	83.2	52	11.0	27	5.7

Source: Tokyo Shisei Chosa-kai and Tokyo Metropolitan Government Office (1947: Table (33)).

Note

Italic number shows error or misprint in the original.

fashion of production organization remained until the first half of the high-growth era (Small and Medium Enterprise Agency 1953: 233).

Shortfalls of floating production organization

The type of production organization with unstable connections through middlemen between upstream and downstream units had little capability of achieving organizational performance. Around 1950, external transactions were carried out by an assembler beating down the price, a sub-contractor cutting the time for delivery resulting in negligent work. This system prevailed in the machinery industry; it implies that the static performance remained low.

Moreover, the short-sighted behavior of both principal- and sub-contractors prevented themselves from investing in new technologies and specialized equipments and dynamic progress was restrained. Consequently, reformation of production organization, involving SMEs, was requested.

Cooperative associations in the postwar period

*Outline of the kumiai organization in the postwar period*⁴³

In those days, it was widely recognized that the floating relationship between assemblers and suppliers should be reformed so that SMEs could work more efficiently. Many researchers and policy makers insisted on forming a cooperative association (*kumiai*).⁴⁴

The postwar cooperative associations were started by the ‘Syoko-kyodo-kumiai-hou (Law on commercial and industrial cooperative associations)’ enacted in 1946. However, this system contained the major attributes of the *kogyo-kumiai* begun under the war regime, and therefore did not fit the circumstances of the postwar period. The government brought in ‘Chyusho-kigyo-tou-kyodo-kumiai-hou (Law on the Cooperative Association of Small and Medium Enterprises)’ in 1949, through which postwar cooperative associations were launched. This law lent itself to several organizational forms corresponding to the required goals. In particular, two types were important: the ‘*jigyo-kyodo-kumiai* (Business cooperative associations)’ and the ‘*kigyo-kumiai* (Company associations)’. Small and Medium Enterprise Agency (1949a: 98) explains that the *jigyo-kyodo-kumiai* is ‘a cooperative association centering on common production facilities’, and that the *kigyo-kumiai* ‘behaves as a joint enterprise, into which every members completely sinks’.

The *kumiai* organization spread widely and rapidly as a result of several revisions of the law, which made the system more easy to use. There existed about 25,000 *jigyo-kyodo-kumiai* and about 10,000 *kigyo-kumiai* in the late 1950s (see Table 8.11).

Table 8.11 Sequence of the number of cooperative associations by type

Year	<i>Jigo-kyodo-kumiai</i>	<i>Jigo-kyodo-sho-kumiai</i>	<i>Kaisi-kyosai-kyodo-kumiai</i>	<i>Kigo-kumiai</i>	<i>Shinyo-kyodo-kumiai</i>	Total
	<i>Business cooperative associations</i>	<i>Business cooperative small associations</i>	<i>Cooperative associations for fires mutual relief</i>	<i>Company associations</i>	<i>Credit cooperative associations</i>	
1950	13,482	—	—	5,103	626	19,211
1951	15,746	—	—	9,216	640	25,602
1952	17,683	—	—	10,205	326	28,214
1953	20,350	—	—	10,885	366	31,601
1954	22,297	—	—	11,142	381	33,820
1955	23,330	—	—	10,936	390	34,656
1956	23,439	—	—	10,680	405	34,524
1957	23,944	—	—	10,482	456	34,882
1958	24,612	5	9	10,558	460	35,644
1959	25,015	10	28	10,526	461	36,040
1960	20,095	19	34	5,117	468	25,733
1961	21,309	23	33	5,127	480	26,972
1962	22,907	27	36	5,148	500	28,618
1963	24,319	28	36	5,096	510	29,989
1964	25,721	27	37	5,089	526	31,400
1965	27,283	27	37	5,075	531	32,953
1966	28,598	27	37	5,058	538	34,258
1967	29,585	27	38	5,064	542	35,256
1968	32,737	28	38	4,961	544	38,308
1969	34,203	32	39	4,900	541	39,715

Source: Syoko Chukin Bank Chosa-bu (1987).

Note

Sharp contraction in 1960 was due to elimination of sleeping associations.

The functions of the kumiai organization

The early style of the *jigyo-kyodo-kumiai* functioned mainly for cooperative business, such as purchases and sales, for providing information, and for fund raising, which the middlemen carried out under the floating production organization (see Table 8.12). The *kumiai* was a substitute for the role of the middlemen.

However, considerable numbers of the *kumiai* organizations were established not for the functions intended by the government, but just for privileged conditions for loans and the taxes.⁴⁵ Toyama (1954: 9) wrote, 'Unfortunately, few *kumiais* sufficiently take advantage of genuine functions, *i.e.*, economy of cooperative organization.' In reality, according to Small and Medium Enterprise Agency (1950: Table 22), about 30 percent of the members regarded the *kumiai* organization as expedient. Furthermore, similar problems occurred even in the *kigyo-kumiai*, which was more solid than the *jigyo-kyodo-kumiai*. About 20 percent of the *jigyo-kyodo-kumiai* and about half of the *kigyo-kumiai* did not work substantially in 1960 (see Table 8.12).

Shortfalls of the kumiai organization

The most critical defect of the cooperative organization is that it spent too much time amongst themselves determining the organizational behavior. For example, Hirose (1956: 6) pointed out 'the associate members checked each other because their interests were multifold, thus it was difficult to promote the business on the basis of unanimous agreement'. Moreover, as the industry developed, and each enterprise had to choose between risky actions more quickly and with more drastic effect, it gradually became clear that the nature of the *kumiai* organizations impeded their own development.

Shoko Kumiai Chuo Kinko (1973) shows the results of investigating the environment around the *kumiai* organization as of March 1972. It points out that there were three major problems when carrying out cooperative business: disagreement, unequal use, and scale gaps between members. All of them related to the negotiation costs and distribution of benefits within the *kumiai* organization.

When internal negotiation costs are large enough within an organization, it is difficult for the organization to make a decision. As a result, the *kumiai* organization remains malfunctioning and in the end collapses. Therefore, although the *kumiai* organization had the potential to work more effectively than the floating production organization, it did not work well in the highly complicated and sophisticated circumstances.

The shitauke-sei and the shitauke-keiretsu in the postwar period

An overview of vertically quasi-integrated production organizations in the postwar period

The floating production organization similar to the *shitauke-sei* of the prewar days appeared and turned into the dominant form temporarily in the early days

Table 8.12 Main functions of the Jigyo-kyodo-kumiai organization

	Purchase	Sale	Receiving orders	Processing work	Storage	Delivery	Inspection	Test and research	Common facilities	Fund loan	Guaranty of liabilities	Price control
Machinery Industry	208 17.9%	103 8.8%	122 10.5%	71 6.1%	20 1.7%	20 1.7%	33 2.8%	27 2.3%	25 2.1%	127 10.9%	20 1.7%	38 3.3%
	Management of intellectual property	Quantity control	Marketing	Clerical work	Welfare program	Education and providing information	Agreement conclusion	Others	Nothing	Not obvious	Total	
Machinery Industry	6 0.5%	6 0.5%	57 4.9%	74 6.4%	41 3.5%	87 7.5%	26 2.2%	14 1.2%	23 2.0%	15 1.3%	1,164 100.0%	

Source: Small and Medium Enterprise Agency (1952; Table 11).

of postwar. However, this type of organization was not suitable for achieving dynamic performance, and as a result soon declined. Instead, another type, often referred to as the '*shitaue-keiretsu*' emerged, in which the upstream and the downstream units in the production process were vertically interconnected. In other words, it was interpreted as the stable and cooperative *shitaue-sei*, which Komiyama (1941) rated as the ideal production organization. It is not true that the *shitaue-keiretsu* has existed continuously since prewar or wartime.

Some major machinery makers were undertaking mass-production of more sophisticated machinery goods around 1950. They focused on the procurement system involving small and medium-sized manufacturers, and started an overall reformation of it. They selected relatively well-skilled parts suppliers, continuously sent orders to them, and provided technological assistance and equipments. Simultaneously, the assemblers requested suppliers to cap the price.⁴⁶

The condition of continuous rapid growth of the machinery industry allowed the *shitaue-keiretsu* to develop, and at the same time, the improvement of production organization through the advance of the *shitaue-keiretsu* enabled the machinery industry to develop further.

The mechanism of emergence of the shitaue-keiretsu

The *shitaue-keiretsu* is regarded as a kind of institution, where a set of the central factory's and the satellite businesses' actions constitute a Nash equilibrium.⁴⁷ A set of actions associated with a Nash equilibrium is stable, once the equilibrium has established. How was the *shitaue-keiretsu* as an institution established during the high-growth era?

When the floating *shitaue-sei* is the dominant production organization, a central factory expects any satellite enterprises to have free access to other factories, and therefore its best response is to force the price to be capped; on the other hand, a satellite enterprise foresees the action chosen by the central factory, and in reply never commits to the specific central factory. Consequently, even if all parties recognized that their payoffs under the floating *shitaue-sei* are poor, they would choose the set of actions to maintain the situation. This set of actions is also a Nash equilibrium. Such behaviors and outcomes were actually observed around 1950.⁴⁸

In order to explain the shift from one equilibrium to another, I introduce a framework of the game-theoretic evolutionary economics, which examines a set of situations where deviations from the Nash equilibrium can happen by external shocks or mutations of parties, and analyzes the set of equilibria determined stochastically as a result of repeated external shocks.

I suggest that the *shitaue-keiretsu* might be an evolutionarily robust institution against external shocks in two senses: it would be very stable, once achieved, although it is not easily achieved. This is because with the nature of the machinery industry, each party has to bear considerable expenditure to institution-specific assets, and the institutional complementarity works effectively since the related parties are many and various.

Because of these features, the *shitaue-keiretsu* raises risks of failure in establishment despite large costs and efforts, as under the war regime. However, once it is founded as an institution, participants can enjoy great organizational performance under certain circumstances.

*Alternative choice of production organization: the case in the sewing machine industry*⁴⁹

Meanwhile the sewing machine industry adopted another type of production organization at the beginning of the postwar period, which it was easy for anyone both to enter and to exit. They established common standards for parts and finished-products in 1947, and then promoted specialization and division of labor through the process of manufacturing and selling parts, assembling, and sales. Many small enterprises entered into every stage of the production process, and the prominent growth of outputs was achieved through severe competition.

This production organization in the sewing machine industry achieved static performance, corresponding to the environment of that period; it absorbed many small enterprises that had been hampered by the collapse of the war regime, and went on to achieve mass-production and reduced costs.⁵⁰ As a result, from 1950, it was highly regarded as the main force of export.

However, the production organization lacked the dynamic capability. So, the sewing machine industry did not develop further, and had lost global competitiveness by the end of the 1950s. A few companies, which survived and continued developing, adopted a production organization like the *shitaue-keiretsu*.⁵¹

Comparison and relation between the kumiai and the shitaue-keiretsu organization

Comparison between the kumiai and the shitaue-keiretsu organization

Although both the *kumiai* and the *shitaue-keiretsu* organization were introduced to prevail against the floating production organization, which was dominant during the early postwar period, the *shitaue-keiretsu* became more familiar than the *kumiai* organization, and most small factories were incorporated in the *shitaue-keiretsu* in the 1960s.⁵² Because the *kumiai* was organized between homogeneous enterprises, it cost a lot to create consent within it and between other types of businesses, and such features did not correspond to the circumstances of that period. Thus, the *kumiai* was inferior to the *shitaue-keiretsu*.

Finally, it should be noted that it took a long time for the *shitaue-keiretsu* to be established. As Hayashi (1961) points out, the *kumiai* achieved better performance than the *shitaue-keiretsu* in the short term. If the growth of the machinery industry had not continued long enough to establish the *shitaue-keiretsu*, it might not have prevailed.

Fusion between the kumiai and the shitaue-keiretsu

Although the original structure of the *kumiai* was substantially different from that of the *shitaue-keiretsu*, there appeared some challenges which brought them together in the middle of the 1950s. This resulting type of production organization is referred to as the '*shitaue-kumiai*' or the '*shitaue-kyodo-kumiai*', defined in Shoko Kumiai Chuo Kinko (1973: 71) as 'the cooperative association, whose most or all of members have subcontracting relationship with a certain central enterprise'. The *shitaue-kumiai* increased rapidly in the 1960s.

This type of production organization worked as the *jigyo-kyodo-kumiai* accompanied by an organization leader and vertical harmonization, or the *shitaue-keiretsu* with parts supplier and horizontal coordination. However, seemingly, most *shitaue-kumiais*, established during the 1950s and the 1960s, were converted from the *shitaue-keiretsu*, in order to obtain the preferential treatment given by government to the *kumiai* organization.⁵³

This form was consistent with the environment of the 1960s and the 1970s, and then became the dominant production organization in the machinery industry. A lot of Japanese machinery companies have gone through various problems, but have taken the world's machinery market by storm with this type of production organization.

Conclusion

This chapter has discussed the history of the production organization in the modern machinery industry in Japan from the evolutionary viewpoint. It started with extremely diversified forms: the comprehensively integrated and the independently scattered production organizations in the late nineteenth century. And, finally, in the postwar period, the stable and well-harmonized vertical inter-firm organization developed. The process has not been deterministic, but rather casual.

This picture is different from one suggested in Chandler (1977), where he says the organization structure should lead to the uniquely and universally desirable form in a straightforward manner. What actually happened was that every entity in the industry repeatedly took turns to alter production organization and adjust themselves to the situation they faced. Such challenges to match production organizations to the circumstances have continued in the machinery industry. The hybrid form which prevailed in the 1960s was tuned sophisticatedly and developed further in the 1980s. A lot of Japanese machinery companies have achieved a worldwide reputation by it. In the 1990s, however, they encountered serious problems and have had to try new production organizations.

Since incorporation of theoretical analyses and historical views are essential when studying production organizations, I have not been able to address those after the 1970s through a lack of sufficient information about them. I hope that additional knowledge of production organization in the machinery industry after the 1970s might continue to improve our cognition and understanding of the production organization.

Notes

- 1 See Asanuma (1985, 1989, 1997) and Nishiguchi (1994).
- 2 For example, Aoki (1988) and Ito (1989).
- 3 The pioneering work which emphasizes dynamic performance is Schumpeter (1934), who insists that 'competition through innovation is more important than competition through price' (Kamien and Schwartz 1982).
- 4 This is the traditional research method in industrial organizations. See Sherer and Ross (1990).
- 5 See David (1985) for an introduction to the 'coordination failure'. Murphy, Shleifer, and Vishny (1989) analyze this in the context of development.
- 6 See Miwa (1996) and Ito *et al.* (1988). Miwa (1996) emphasizes that the private sector did take the opportunity. In contrast, Ito *et al.* (1988) analyze the role of the government in executing the 'big push' from an economic theoretic viewpoint.
- 7 See Nagao (1995), Suzuki (1996) and Ueda (2004) for a history of the modern machinery industry in Japan. And see Whittaker (1997) for a historical survey of small enterprises in Japan.
- 8 Odagiri and Goto (1997) show that there was the capability to repair and reproduce simple parts in Japan even in those days.
- 9 Some of them grew and later became big companies and survive today: for example Miyata bicycles and Brother Co. sewing machines.
- 10 See Odagiri and Goto (1997: Chapter 10).
- 11 Also see Qwan (2003: Chapter 2) implies that the small traditional industry was less innovative than the large modern industry during the prewar period.
- 12 See Nagao (1995: Part I) and Ueda (2004: Chapters 3–8).
- 13 The concepts of the voice strategy and the entry-exit strategy follow Hirshman (1970).
- 14 For example, many shipbuilding companies expanded their business to aircrafts, industrial machines, electric apparatus and then automobiles. (Hoshino and Sakisaka 1960: 35–6; and Odagiri and Goto 1997: Chapter 10)
- 15 The term of the 'non-industrialization trap' means the situation where any party is reluctant to make industrialized investments on a Nash equilibrium, when the Marshallian externality occurs through such investments. See Ito *et al.* (1988: Chapters 4 and 5), and Murphy, Shleifer, and Vishny (1989) for a more detailed explanation.
- 16 Whittaker (1997: 111–17) and Miyashita (1999).
- 17 I will not deal with the structure in the downstream sector so much, because there are already a lot of theoretical and empirical studies on relationship between market structure and performance in the end market, but little literature on the choice of vertical organization exist. For related issues, see Mathewson and Winter (1986) and Kranton and Minehart (2000).
- 18 See Suzuki (1996); Sawai (1990); Teikoku Tsushin-sha (1928).
- 19 Iida *et al.* (1960: 51) states that: 'The machinery industry in Japan was launched for public demands, mainly including armaments. As a result, the fact has determined the nature of development.'
- 20 Kojima (1938: 218); Komiyama (1941: 39–40); Nagao (1995: 25–6).
- 21 See Department of International Trade and Industry of Osaka (1951: 3) and Japanese Association of Sewing Machines (1961) for the sewing machine industry, and Qwan (2003: Chapter 8) for the bicycle industry.
- 22 See Whittaker (1997: Chapter 6).
- 23 See Koike (1938) and Kawabata (1937).
- 24 See basic textbooks of microeconomics.
- 25 See Matsumoto (1993).
- 26 Kawabata (1939: 97–103) investigates the circumstances in those days.
- 27 This one was 'Osaka Chikuoinki Kogyo Kumiai (Osaka Gramophone Industrial

- Association)'. The reason why he couldn't run his business was 'prohibition to production by the government'.
- 28 See also Kojima (1938: 215–16 and 223–37), Komiyama (1941: 41–2), and Okumura (1960: 278–81).
 - 29 This problem is referred to as 'team moral hazard' in modern economics. See Alchian and Demsetz (1972).
 - 30 The share of market-like trade, order and *shitauxe-sei* are about 13 percent, 12 percent and 9 percent respectively. The 18.8 percent who trade through 'friendship' is not clearly classified as either '*tonya-sei*' or '*shitauxe-sei*'.
 - 31 Komiyama (1941) describes and analyzes based on the original datum of '*Sho Kogyo Chosa*' (Tokyo City Office, Department of Social Affairs 1936).
 - 32 See Ueda (2004) for detailed information related to this section.
 - 33 This notion is equivalent to the one referred at Komiyama (1941: 11).
 - 34 On the classification of outsourcing organizations of that period, see Komiyama (1941: 33–5) and Mori (1940: 119–21), for example.
 - 35 Fujita (ed.) (1943) says, 'as everyone knows, the term of the *shitauxe-sei* industry became to be seen as an ordinal economic phenomena around the time of Japan-China disturbance'. See also Komiyama (1941: 47) and Fujita (1965: 78).
 - 36 See Yano (1939: 34), Kawabata (1939: 17), and Ueda (2004: 138).
 - 37 Ministry of International Trade and Industry (1960: 57) explains these policies comprehensively. Also see Ueda (2004: 138).
 - 38 See also Oshiro (1970: 153 and 178), and Nishiguchi (1994: 53).
 - 39 See also Arisawa (ed.) (1994).
 - 40 See Ministry of International Trade and Industry (1960: 59–61) and Hoshino and Sakisaka (1960: Chapter 2).
 - 41 The values of the group with four to nine workers are calculated as *gross* output value.
 - 42 See Tokyo Shisei Chosa-kai and Tokyo-to (1947: 47).
 - 43 See Small and Medium Enterprise Agency (1949a), Inagawa (1977), Kimoto (1993) and Miyashita (1999).
 - 44 See Small and Medium Enterprise Agency (1953: 301–11).
 - 45 See Hirose (1956: 6).
 - 46 There is a lot of literature on the *shitauxe-keiretsu*. For example, see Economic Planning Agency (1959: 42), Tokyo Metropolitan Government Office (1964), and Kikai Shinko Kyokai Keizai Kenkyu-jo (1965).
 - 47 Nash equilibrium is referred to as the situation in which any parties remain unchanged in themselves, so long as the other parties follow the set of actions specified by the equilibrium. See Aoki (1996/2000, 2001), for the study of institutions by the game-theoretic approach.
 - 48 See Kagami (2001).
 - 49 See Osaka Department of International Trade and Industry (1951), Japanese Association of Sewing Machines (1961) and Brother Corporation Ltd. (1971).
 - 50 For example, a certain special occupation part maker manufactured many parts several times rather than the Singer Company, which was the greatest sewing machine maker of those days.
 - 51 For example, Brother Corporation, today's leading company in Japan, adopted a fixed and highly coordinated style of production organization, contrary to the prevailing fashion in the sewing industry.
 - 52 Small and Medium Sized Enterprises Agency (1964: 178).
 - 53 See Kikai Shinko Kyokai Keizai Kenkyu-jo (1965: 7), Kawashima (1954), and Small and Medium Enterprise Agency (1956).

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