

The Labor Force in Meiji Economic Growth: A Quantitative Study of Yamanashi Prefecture

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# *The Labor Force in Meiji Economic Growth: A Quantitative Study of Yamanashi Prefecture\**

## I

ECONOMIC development and “modernization” have certain universal consequences for the structure and organization of the labor force. The history of each advanced country shows a shift of population out of agriculture and the replacement of family enterprise and particularistic employment relationships by large enterprise and wage labor. But the pace and completeness of these inevitable changes have varied widely among different countries.

To take one example, Mataji Umemura has pointed out that in each of the classic Western instances of industrialization, the first phase of modern economic growth was accompanied by an absolute increase in the agricultural population and labor force, and that absolute declines in most cases came relatively late in the process of modernization. In the United Kingdom, the decline probably set in very early in the nineteenth century, but in the United States, France, Germany, and Italy, the agricultural population continued to increase well into the twentieth. Japan is the apparent major exception, and despite substantial differences among the estimates of the agricultural labor force by various scholars, there is a consensus that it exhibited no sustained rise.<sup>1</sup> In another direction, Rosovsky and Ohkawa have emphasized the important role played very late in Japanese economic development by “indigenous” manufactures and productive organization.<sup>2</sup> Abegglen and others have described

\* The author is indebted to the Ford Foundation Foreign Area Fellowship Program for a grant under which part of the research reported in this paper was conducted in 1960-62, and to Mataji Umemura for calling his attention to the 1879 census of Yamanashi Prefecture.

Throughout this article, the names of Japanese authors are listed in the following way: where the citation is to an English-language work, the name is printed in the Western fashion, with the given name followed by the family name; where the citation is to a Japanese-language work, the family name precedes the given name and is separated from it by a comma in parentheses.

<sup>1</sup> Umemura (,) Mataji, *Ching'in, Koyō, Nōgyō* (“Wages, Employment, Agriculture”; Tokyo: Taimeido, 1961).

<sup>2</sup> Henry Rosovsky and Kazushi Ohkawa, “The Indigenous Components of the Modern Japanese Economy,” *Economic Development and Cultural Change*, IX (Apr. 1961), 476-501.

the precapitalist aspects of the employment relationship which persist even (especially?) in large-scale enterprise in modern Japan.<sup>3</sup>

Quantitative measures of changes of these kinds during the Meiji era would be very useful in understanding the peculiarities of Japanese economic growth. Unfortunately, the most important record of the shifts in the composition of the labor force—the occupational tables of a modern population census—begins for Japan only in 1920, after the foundations of a modern industrial society had been completed.

This paper summarizes some of the results of a study of the labor force in one prefecture for which a comprehensive population census exists for the early Meiji era.<sup>4</sup> Yamanashi Prefecture, extending north from Mount Fuji, was chosen for a pilot census conducted as of the end of 1879. The prefecture is even today almost totally rural, but economically it was one of the most developed areas in Meiji Japan, including some of the most important centers of sericulture, silk reeling, and silk textiles. In addition to the early population census, we have virtually complete factory statistics for the prefecture in the *Yamanashi Ken Tōkeisho*, beginning in 1883.

## II

The pattern of economic activity in Yamanashi Prefecture was highly specialized, but such specialization was not atypical even in preindustrial Japan. In almost every region the vast majority of the labor force seems to have been engaged in agriculture, specifically in cereal cultivation, as a primary occupation. A large number of manufactures and trades were ubiquitous, either because they could be carried on practically only at the site of consumption or because the raw materials were ubiquitous and the work could be carried on anywhere. Examples of the first kind of “residential” activities are construction and retail trade; examples of the latter are *sake* brewing and the fabrication of straw products. These activities were carried on in Yamanashi in proportions similar to those of Japan as a whole.

Another category of products, of both agricultural and manu-

<sup>3</sup> James C. Abegglen, *The Japanese Factory: Aspects of Its Social Organization* (New York: Free Press [Macmillan], 1958).

<sup>4</sup> Tōkeiin, *Kai (no) Kuni Meiji 12-nen Jimbetsu (no) Shirabe* (“Census of Individuals in the Province of Kai”; Tokyo, 1882).

facturing origin, was produced for a national or overseas market and was more or less concentrated in certain regions and prefectures. This regional specialization had its origin in part in comparative advantages of climate, soil, or proximity to the sea or to urban markets and in part in the monopoly system of the feudal era. Yamana-shi Prefecture had its silkworm products and, to a lesser extent, Japanese-style paper and crystal ware. Similarly, indigo production was concentrated in Tokushima Prefecture, edible seaweed in Tokyo and Hiroshima, tea in Kyoto and Shizuoka, ceramics in Gifu, and so forth. Specialization had proceeded far even in the earliest years of the Meiji era. In the *Meiji 7-nen Bussanhyō* in 1874 (the first comprehensive survey of commodity output) for 24 of the 52 products listed, 30 per cent or more of the output was accounted for by only 2 of the 64 prefectures.<sup>5</sup>

In Tokugawa times there were some occupations which were particularly urban, either as part of the *bakufu* and *han* administrations or the court or as catering to their personnel. After the opening of the ports, we might add activities catering to foreigners. Apart from these urban specialties, concentrated in the three great cities and a few of the larger castle towns, almost all manufacturing and service activity was carried on in farm households,<sup>6</sup> and almost all agricultural specialties were produced by households which also engaged in cereal cultivation. Since the labor demand in agriculture is highly seasonal, this arrangement was an economical allocation of activity in a population which had to devote a great proportion of its total input to feeding itself. Viewed in terms of cereal production, the marginal cost of labor in these side occupations was almost nil up to the point at which the entire population could be occupied around the year. The existence of underemployment of the available labor time can be seen in the literature of late Tokugawa, in which the traveler was always besieged by *kumosuke*, peddlers, and would-be entrepreneurs of all kinds. The clear impression is that there was a great excess in the supply of their services.

The activities in which the greater part of Meiji economic growth took place were largely rural occupations, depending for their labor

<sup>5</sup> Yamaguchi (,) Kazuo, *Meiji Zenki Keizai no Bunseki* ("An Analysis of Early Meiji Economy"; Tokyo: Tokyo Daigaku Shuppankai, 1956).

<sup>6</sup> "Farm household" (*nōka* or *nōgyō setai*) is used here as it is in the Japanese data, as a household in which at least one member is engaged in agriculture.

supply on the slack time of the farm population, at least in the earlier years.<sup>7</sup> Scholars of the period have devoted great attention to the handful of establishments using imported techniques—in ship-building, mining, engineering, etc.—but “modern” industries and modern techniques were almost irrelevant to the main thread of economic growth until about the Sino-Japanese war, except as they consumed tax revenues and foreign exchange. The major export items were tea and silkworm products (eggs, cocoons, raw silk, and silk textiles) in varying proportions; and the growth of consumption was overwhelmingly in “indigenous” products, made by traditional techniques. In each case the main reservoir of labor supply was the excess (off-peak) labor time of the farm household.

Rapidly increasing production of agricultural specialties, such as cocoons and tea, fruits and vegetables, each having its peak labor demand at a different time of the year, absorbed much of the slack time of the farm population. In addition, as the demand for non-agricultural goods and services increased, former side occupations became primary occupations, first of individual members of farm households. Later, individuals might become entirely committed to nonagriculture, “going out” (*dekasegi*) to work for long periods of time, and farming might fall from the primary occupation of the household as a whole to the status of a side occupation. None of these patterns was uncommon even in pre-Meiji society; what was rare, however, was the abrupt transition of an entire household out of agriculture. The number of persons whose primary, even exclusive, occupation was in nonagriculture did increase, as did at least the proportion of totally nonagricultural households. But time series which purport to show the occupational or sectoral composition of the labor force in these terms are necessarily very inadequate as indicators of the changing composition of economic activity.

The most significant qualitative studies of Japanese economic development<sup>8</sup> utilize the labor force estimates of Hijikata<sup>9</sup> and

<sup>7</sup> This point is emphasized by Ranis: “Reserves of productivity usually do exist somewhere in the underdeveloped economy . . . . *Taking up the slack* in any economy means making potential increments of productivity socially available . . . . In the case of Japan, *slack* was in evidence mainly in the form of excess labor on the land and in reserves of productivity in the land.” Gustav Ranis, “The Financing of Japanese Economic Development,” *Economic History Review*, XI (Apr. 1959).

<sup>8</sup> Among these would be included Umemura (,) Mataji (cited in n. 1) and the following works: Kazushi Ohkawa, *Growth Rate of the Japanese Economy* (Tokyo: Kinokuniya, 1957); Shinohara (,) Miyohai, *Nihon Keizai no Seichō to Junkan*

Hemmi,<sup>10</sup> both of whom trace their estimates back from the 1920 census. Hijikata used a variety of measures of economic activity, while Hemmi estimated the agricultural labor force as a function of the so-called farm household in the population registers. In the absence of a previous census to use as a benchmark, their estimates are extremely speculative.

The "farm households" of the household registers are especially dangerous to use as an index of the labor input in agriculture, because the Japanese family system, plus the definition of a farm household to include any household in which even one person engaged in farming even part time, almost guarantees the stability of the number of farm households over a long period of time. But the changes in the structure of labor inputs in the economy depend more upon the number of gainfully employed persons per household and the allocation of the labor of each household and each individual among various primary occupations and side occupations.

### III

For Yamanashi Prefecture, where we have the two censuses, 1879<sup>11</sup> and 1920,<sup>12</sup> to use as benchmarks, we used a different technique to estimate labor inputs by sector. We calculated an annual series for the native-born and resident population of the prefecture by using various series from the population registers to link figures from the two censuses. The total labor force was estimated by applying to each year's population figures, subdivided by sex and into urban and rural, participation rates derived by interpolating between the two census years. The resulting population and labor-force estimates for 1879-1911 are shown in Appendix Table 1.

("Growth and Cycles in the Japanese Economy"; Tokyo: Kinokuniya, 1961); Yamada (,) Yūzō, *Nihon Kokumin Shotoku Suikei Shiryō* ("Comprehensive Survey of National Income Data for Japan"; Tokyo: Tōyō Keizai Shimpōsha, 1957).

<sup>9</sup> Hijikata (,) Shige-yoshi, "Shokugyōbetsu Jinkō no Hensen o Tsūjite Mituru Shitsugyō Mondai" ("The Unemployment Problem Seen Through Changes in the Employed Population by Industry"), *Shakai Seisaku Jihō* (Sept. 1929).

<sup>10</sup> Hemmi (,) Kenzō, "Nōgyō Jinkō no Kōteisei" ("The Constancy of the Agricultural Population") and "Nōgyō Yūgyō Jinkō no Suikei" ("Estimates of the Employed Population in Agriculture"), both in Tōbata (,) Seiichi, and Ohkawa (,) Kazushi, *Nihon no Keizai to Nōgyō* ("Japan's Economy and Agriculture"; Vol. I, Tokyo: Iwanami, 1956).

<sup>11</sup> Tōkeiin (cited in n. 4).

<sup>12</sup> Naikaku Tōkeikyoku, *Taishō 9-nen Kokusei Chōsa Hōkoku: Zenkoku no Bu dai 8—Shokugyō* ("Report of the 1920 Population Census: Nationwide, Part 8—Occupations"; Tokyo, 1934).

These population series were used as the basis of estimates of net out-migration. Yamanashi Prefecture had a higher rate of natural population increase than the national average during the early Meiji period, but there was no great net outward movement of population until about the time of the Sino-Japanese war. Some out-migration

TABLE 1  
NET OUT-MIGRATION, YAMANASHI PREFECTURE, 1879-1912

| <i>Years</i> | <i>Net Annual Out-migration</i> |
|--------------|---------------------------------|
| 1879-83      | 340                             |
| 1884-88      | 60                              |
| 1889-93      | 380                             |
| 1894-98      | 2,520                           |
| 1899-03      | 1,680                           |
| 1904-08      | 1,520                           |
| 1909-12      | 1,880                           |

Source: Difference between change of native-born population and change of resident population, Appendix Table 1.

on the part of males was offset by in-migration of females recruited to the silk filatures. About 1894, however, the rapid conversion of silk reeling to steam power reduced labor requirements within the prefecture just as the rapid growth of modern manufactures was beginning elsewhere in the country. From 1894 forward, Yamanashi has been a net exporter of population.

Economic activity in the prefecture, except for agriculture, revolved almost completely around silk products. In 1879 over 95 per cent of the labor force was engaged as a primary occupation or a side occupation either in agriculture or in one or another branch of the silk-products industries; the proportion in 1920 was around 90 per cent. The commencement of massive movement out of this highly specialized area suggests that, despite continued growth of the silk-products industries, they ceased to be the "leading sector" of the Japanese economy about the time of the Sino-Japanese war.

The concept used here to measure labor input, which takes into account both primary and side occupations, is the man year, full-time equivalent (FTE). Both the 1879 Yamanashi Prefecture census and the 1920 population census show the number of persons engaged in each activity either as a primary occupation or as a secondary occupation. The number of FTE in each year was taken to equal the total labor force, but weights were chosen so that each primary "job" would contribute as much to labor input as two side "jobs."

TABLE 2  
 MAN YEARS OF LABOR INPUT (FULL-TIME EQUIVALENT) BY SECTOR, AND BY PERCENTAGE OF TOTAL LABOR FORCE, YAMANASHI PREFECTURE, 1879-1911

| Years                | Number of Full-Time Equivalents<br>(Five-Year Averages) |                               |          | Percentage of Labor Input                 |                                     |          |
|----------------------|---|-------------------------------|----------|---|-------------------------------------|----------|
|                      | Agriculture,<br>Forestry,<br>Fishery                    | Mining,<br>Manufac-<br>turing | Services | Agricul-<br>ture,<br>Forestry,<br>Fishery | Mining<br>and<br>Manufac-<br>turing | Services |
| 1879-82 <sup>a</sup> | 186,585   | 31,973                        | 18,798   | 78.6                                      | 13.5                                | 7.9      |
| 1883-87              | 193,674   | 31,820                        | 20,715   | 78.7                                      | 12.9                                | 8.4      |
| 1888-92              | 196,028   | 38,369                        | 25,105   | 75.5                                      | 14.8                                | 9.7      |
| 1893-97              | 198,593   | 41,376                        | 28,178   | 74.1                                      | 15.4                                | 10.5     |
| 1898-02              | 204,125   | 43,409                        | 30,132   | 73.5                                      | 15.6                                | 10.8     |
| 1903-07              | 220,625   | 42,765                        | 31,894   | 74.7                                      | 14.5                                | 10.8     |
| 1908-11 <sup>a</sup> | 218,318   | 50,147                        | 35,614   | 71.8                                      | 16.5                                | 11.7     |
|                      |   |                               | Total    |   |                                     |          |
|                      |   |                               | 237,358  |   |                                     |          |
|                      |   |                               | 246,208  |   |                                     |          |
|                      |   |                               | 259,502  |   |                                     |          |
|                      |   |                               | 268,146  |   |                                     |          |
|                      |   |                               | 277,666  |   |                                     |          |
|                      |   |                               | 295,284  |   |                                     |          |
|                      |   |                               | 304,080  |   |                                     |          |

<sup>a</sup> Less than five years.

Source: Appendix Table 2.



In the case of factory workers, however, where we have the average number of days of employment per year, 300 days were reckoned as one FTE. The occupational categories of the two censuses were adjusted to make them comparable, and full-time equivalents were calculated for 81 individual classifications.

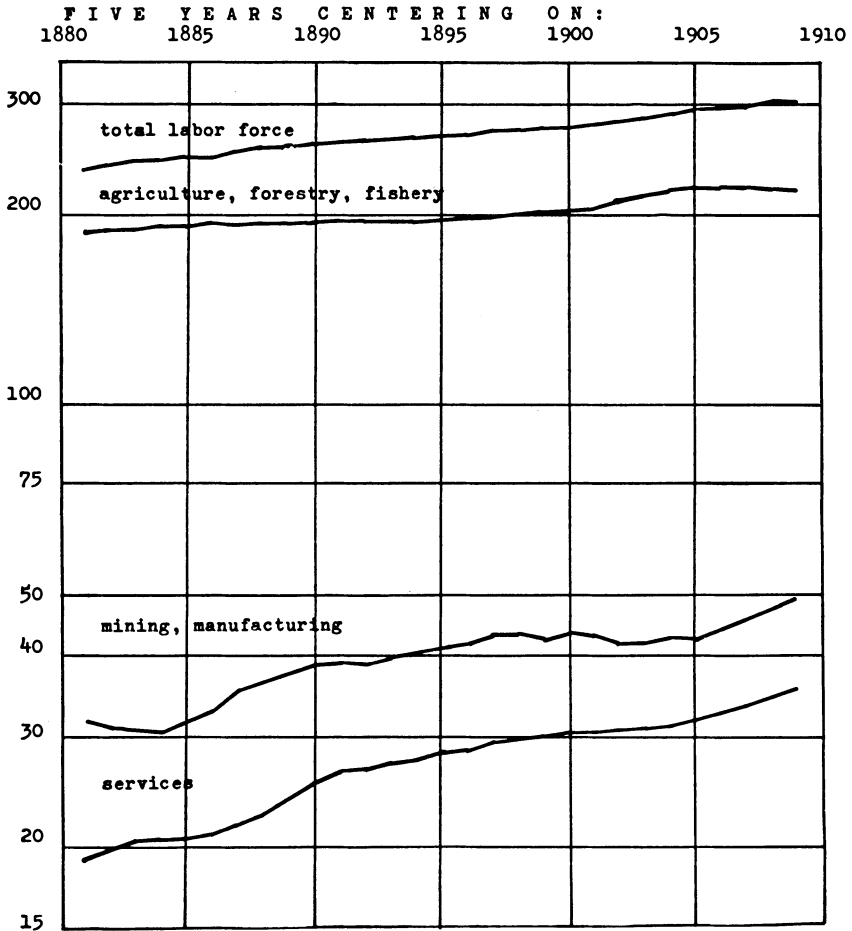


FIGURE 1.—Labor input by sector, full-time equivalents, Yamanashi Prefecture, 1879-1911 (five-year moving averages; thousands of man-years, full-time equivalent).

For each of these classifications, labor-input series were estimated for the years between the censuses with the aid of various indicators of activity from the factory data and other information in the *Yamanashi ken Tōkeisho*, the *Nōshōmu Tōkeihyō*, the *Nihon Teikoku Tō-*

*kei Nenkan*, and elsewhere. Labor input to agriculture was treated as a residual. The series were aggregated sectorally, and are shown by five-year averages in Table 2, and in five-year moving averages in figures 1 and 2.<sup>13</sup>

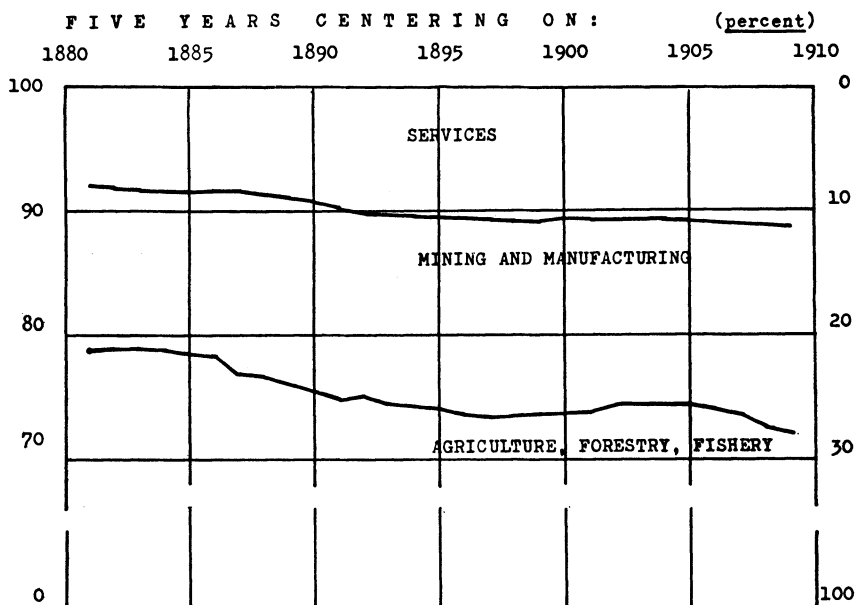


FIGURE 2.—Proportion of labor input by sector, full-time equivalents, Yamanashi Prefecture, 1879-1911 (five-year moving averages).

As we would expect, labor input in manufacturing and in services increased both relatively and absolutely, but there was also a steady increase in the labor input to agriculture until the last few years of Meiji; and the change in the relative proportion of labor input to the different sectors is remarkably gentle. If we had paid attention only to the number of persons engaged in agriculture as a primary occupation, however, we would have had a very different result. The census figures for the number of persons engaged in cultivation, animal husbandry, and sericulture in 1879 was 193,872 as against 193,714 in 1920—a comparison quite congruent with the alleged

<sup>13</sup> A complete description of the techniques used to estimate population, labor force, and FTE by sector can be seen in ch. iii and in the appendix of my unpublished doctoral dissertation, "Employment and Wages in Japanese Economic Development: A Quantitative Study of Yamanashi Prefecture in the Meiji Era" (University of Washington, 1965).

“constancy” of the agricultural population. The reasons for the difference can be seen in the shifting composition of side occupations. The comparison in Table 3 shows that nonagricultural activities were carried on largely as side occupations to farming in early Meiji, whereas by Taishō times, specialization and “commitment” were the

TABLE 3  
SECTORAL DISTRIBUTION OF LABOR FORCE, PRIMARY AND SIDE  
OCCUPATIONS, YAMANASHI PREFECTURE, 1879 AND 1920

|  | 1879 <sup>a</sup> |        |      | 1920 <sup>a</sup> |         |      |
|--|-------------------|--------|------|-------------------|---------|------|
|  | (1)               | (2)    | (3)  | (1)               | (2)     | (3)  |
| Agriculture,<br>forestry, and<br>fishery | 194,164           | 29,238 | 13.1 | 196,259           | 127,511 | 39.4 |
| Mining and<br>manufacturing              | 26,418            | 21,375 | 44.7 | 64,059            | 14,245  | 18.2 |
| Services                                 | 14,498            | 15,035 | 50.9 | 46,991            | 11,786  | 20.1 |

<sup>a</sup> The columns are:

- (1) number of persons engaged as primary occupation;
- (2) number of persons engaged as side occupation;
- (3) side occupations as percentage of total.

Note: Column (2) is the total *number* of side “jobs” in each sector, and includes the side occupations of persons whose primary occupation is in the same sector (e.g., persons who engage in silkworm breeding as a side-occupation to agriculture), so that the sum of (1) and (2) in each sector is greater than the number of *persons* engaged in that sector.

rule in manufacturing and services, while a great number of persons engaged in agriculture as a side occupation. Consideration of primary occupations alone would have resulted in a serious underestimation of manufacturing and service activity in the early period, and an underestimation of farming activity later.

#### IV

In our study we also attempted to compare the role of “indigenous” and modern industries in the two census years.<sup>14</sup> Here, how-

<sup>14</sup> Following Rosovsky and Ohkawa (cited in n. 2) we have considered both the nature of the product or service and the productive organization in classifying activities into traditional (indigenous) or modern components. Our definition of a traditional product is slightly different from theirs; here a traditional item is one which was regularly available before 1859. Some products must be regarded as “hybrids” of traditional and modern—for instance, machine-reeled silk, a “traditional” product manufactured at least partially by modern techniques. Some products, like beef and clocks, were certainly produced in Japan in Tokugawa times but only in minute quantities, and the increase in their production and consumption can hardly be distinguished from that of completely new or foreign products. These cases have been

ever, we have confined our attention to primary employment. In 1879, only 445 persons were engaged as a primary occupation in activities which could be regarded as "modern," and another 749 in occupations whose place in a traditional-modern classification is ambiguous. Of the persons employed in economic activities of a modern type in 1879, only 23 were engaged in manufacturing. Employment in the "modern sector" grew 20.8 times, from 445 to about 9,260, in the 41 years between the censuses; or six times, from 5,810 to about 35,000,<sup>15</sup> if the "hybrid" case of silk reeling and the ambiguous categories are included. Even in 1920, the bulk was not in manufacturing, but in banking, communications, transport, and such services; only 3,069 persons were engaged primarily in the manufacturing activities we have classified as modern; the ambiguous occupations other than silk reeling accounted for another 753 persons engaged in manufacturing.

Traditional employments outside of agriculture did not fail to flourish. Excluding all ambiguous categories, the increase in non-agricultural traditional employments was almost threefold, from 22,221 to about 65,000. Absolutely, this is more than seven times the increase in the entire modern sector, and more than twice the increase in the modern, "hybrid," and ambiguous categories together. To the extent that this pattern was that of all Japan, it testifies to the enormous vitality of the indigenous sector of the Japanese economy, particularly to the remarkable elasticity of both supply and demand with respect to income of the traditional (pre-Meiji) Japanese manufactures and of traditional productive organization.

## V

Silk reeling illustrates the process, described above, of gradual and partial specialization and commitment of the labor force. The in-

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classified here as "ambiguous," along with those services which combine both modern and traditional elements—for instance, the retail sale, in traditional family enterprises, of modern or imported goods. Moreover, there were "teachers" and "soldiers" in pre-Meiji Japan, but whether this fact justifies regarding a primary school teacher or an army officer as pursuing an "indigenous" calling is a purely arbitrary matter; such occupations too have been classified as "ambiguous" cases. All occupations listed specifically as occurring in *kaisha* (companies) were classified as modern.

<sup>15</sup> The rounded figures for 1920 here and following are a result of the rough division of some of the 244 occupational categories in the 1920 census which clearly lumped together indigenous and modern-type activities. The 774 categories in the 1879 census could be grouped according to the preceding definitions with considerable confidence.

TABLE 4  
 LABOR INPUT, FULL-TIME EQUIVALENTS, SILK-REELING INDUSTRY: YAMANASHI PREFECTURE, 1873-1911  
 (FIVE-YEAR AVERAGE)

| Year                 | Silk-Reeling Factories |        |        | Households |        |       | Total |        |        |
|----------------------|------------------------|--------|--------|------------|--------|-------|-------|--------|--------|
|                      | Male                   | Female | Total  | Male       | Female | Total | Male  | Female | Total  |
| 1873-77              | 157                    | 970    | 1,127  | 32         | 1,957  | 1,989 | 189   | 2,927  | 3,116  |
| 1878-82              | 286                    | 1,905  | 2,191  | 78         | 4,298  | 4,376 | 364   | 6,203  | 6,567  |
| 1883-87              | 510                    | 3,457  | 3,967  | 63         | 2,429  | 2,492 | 573   | 5,886  | 6,459  |
| 1888-92              | 661                    | 5,375  | 6,036  | 129        | 3,631  | 3,760 | 790   | 9,006  | 9,796  |
| 1893-97              | 734                    | 6,768  | 7,502  | 227        | 4,739  | 4,966 | 961   | 11,507 | 12,468 |
| 1898-02              | 603                    | 5,540  | 6,143  | 505        | 7,544  | 8,049 | 1,108 | 13,084 | 14,192 |
| 1903-07              | 921                    | 8,157  | 9,078  | 527        | 5,393  | 5,920 | 1,448 | 13,550 | 14,998 |
| 1908-11 <sup>a</sup> | 1,595                  | 12,490 | 14,085 | 384        | 4,816  | 5,200 | 1,979 | 17,306 | 19,285 |

<sup>a</sup> Less than five years.

Source: Appendix Table 3.

dustry was the biggest manufacturing activity in Japan from the beginning of the Meiji era to its end in terms of the number of establishments, the number of persons engaged, and the value of output. At first, almost all silk was reeled on primitive, hand-operated *zaguri* apparatus in rural households. By 1911, the industry was dominated by steam-powered factories employing several hundred girls apiece, yet several hundreds of thousands of households in Japan still produced raw silk by the old method. Machine-reeled silk and *zaguri* silk were of different quality, suitable for weaving in different kinds of looms, but there was a close economic connection between the two. The continued existence of the *zaguri* reeling in the face of competition from modern factories indicates that the marginal opportunity cost of domestic female labor was still extremely low; in addition, the household industry was a major element in the labor supply for the factories.

Silk filature was a skilled occupation, requiring dexterity of hand and eye to find the filament ends and feed them into the spinning yarn at the proper time to maintain uniformity. But the basic skill was essentially the same in both the household and the factory operation. Wages remained low in the face of increased labor demand in the factories because there was a virtually unlimited supply of girls who had learned silk reeling literally at their mothers' knees.

Our series for the Meiji era from Yamanashi Prefecture illustrate some of these trends. Table 4 presents our estimates of the relative labor input to household and to factory silk reeling between 1873 and 1911. The increase in labor time used by the silk-reeling factories expanded rather steadily, with one rather severe recession between 1897 and 1901; but the labor input in household production reached a peak only in those years. The fluctuations of the latter were much greater, as we might expect, but household reeling remained an important part of the silk industry throughout the Meiji era.

The course of real wages in silk-reeling factories is further evidence of the elasticity of supply of this kind of labor. Daily wage rates, deflated by a local cost of living index, appear to have risen irregularly between the first years for which we have wage data and the end of the Meiji era, but the hours of labor also increased almost exactly enough to offset this increase.

TABLE 5  
DAILY AND HOURLY WAGES OF FEMALE OPERATIVES IN SILK-  
REELING FACTORIES, CONSTANT (1885-87) PRICES:  
YAMANASHI PREFECTURE, 1885-1911  
(FIVE-YEAR AVERAGES)

| Years                | Real<br>Daily<br>Wage<br>(Sen) | Working<br>Day<br>(Hrs.) | Real<br>Hourly<br>Wage<br>(Sen) | Index (1885-7 = 100)  |                |                        |
|----------------------|--------------------------------|--------------------------|---------------------------------|-----------------------|----------------|------------------------|
|                      |                                |                          |                                 | Real<br>Daily<br>Wage | Working<br>Day | Real<br>Hourly<br>Wage |
| 1885-87 <sup>a</sup> | 11.6                           | 11.5                     | 1.01                            | 100                   | 100            | 100                    |
| 1888-92              | 11.9                           | 11.7                     | 1.01                            | 102                   | 102            | 100                    |
| 1893-97              | 14.1                           | 11.9                     | 1.19                            | 122                   | 103            | 118                    |
| 1898-02              | 12.5                           | 12.0                     | 1.04                            | 108                   | 104            | 103                    |
| 1903-07 <sup>b</sup> | 12.6                           | 12.5                     | 1.01                            | 109                   | 109            | 100                    |
| 1908-11 <sup>a</sup> | 13.0                           | 13.1                     | 1.02                            | 113                   | 114            | 100                    |

<sup>a</sup> Less than five years.

<sup>b</sup> 1905 data missing.

Source: Wages, Appendix Table 6; working day, Appendix Table 4.

## VI

Our data for Yamanashi Prefecture do not yield usable series on the working day for other industries, but the highly elastic labor supply, expressed in the stability of real wages, was apparently not confined to silk reeling. The next biggest single nonagricultural consumer of labor power in the prefecture was silk-textile weaving. The structure of the industry was similar to that of silk reeling, in that domestic handloom weaving continued to exist side by side with powered factory enterprise. Table 6 presents the movement of real daily wages in Kōfu and in Yamura (today's Tsuru City), which was the center of the handloom weaving district.

The one "modern" manufacture which was relatively important in the Japanese economy in terms of labor demand and in contribution to total output in the late Meiji period was cotton spinning. The industry was almost unrepresented in Yamanashi, and we will not presume to generalize from the statistics of the two factories which existed in the prefecture during the Meiji era. Yet the conditions of labor supply to the spinning industry were not substantially different from those for the silk-reeling factories, and recruiters for each competed for the same workers. The mass of cotton-spinning employees comprised young girls recruited from farm families for periods of one to three years, and their low wages reflected the

TABLE 6  
DAILY WAGES OF WEAVERS, CONSTANT (1885-87) PRICES: KÔFU AND YAMURA, 1883-1911

| Years     | Kôfu              |          |                   |                        | Yamura              |                     |
|-----------|-------------------|----------|-------------------|------------------------|---------------------|---------------------|
|           | Real Wages (Yen)  |          | Index             |                        | Real Wages (Female) | Index 1885-87 = 100 |
|           | (Male)            | (Female) | (Male) 1885 = 100 | (Female) 1885-87 = 100 |                     |                     |
| 1883-1887 | .178 <sup>a</sup> | .188     | 100               | 106                    | .105 <sup>c</sup>   | 110                 |
| 1888-1892 | n.a.              | n.a.     |                   |                        | n.a.                |                     |
| 1894-1897 | n.a.              | .152     |                   | 86                     | .098                | 103                 |
| 1898-1902 | .170 <sup>b</sup> | .136     | 95                | 77                     | .079 <sup>d</sup>   | 83                  |
| 1903-1907 | .183              | .171     | 103               | 97                     | .099 <sup>e</sup>   | 104                 |
| 1908-1911 | .170              | .158     | 95                | 89                     | .087                | 91                  |

<sup>a</sup> 1885 only.

<sup>b</sup> 1899-1902.

<sup>c</sup> 1883, 1885-87. (Data for 1888-1893 not used because cited as monthly rates. )

<sup>d</sup> 1898-1901.

<sup>e</sup> 1904-7.

Source: Wages, Yamanashi Ken, *Yamanashi Ken Tokaisho* ("Yamanashi Prefecture Statistical Yearbook"; annual, 1883-responding years. Deflators, Kôfu and Yamura consumer price indexes, Appendix Table 5.



low marginal product of (extra) daughters in agriculture.<sup>16</sup> Ōkōchi<sup>17</sup> and Sumiya<sup>18</sup> have found the supply of female labor to the cotton-spinning industry highly elastic in the late-Meiji-early-Taishō period, despite the often violent competition for trained operatives, and they explain recurring complaints of labor shortages by temporary regional disequilibria caused by lack of information. Umemura<sup>19</sup> has provided support for this thesis by showing that it was recruiting expenditures, rather than wage rates, which responded most conspicuously to cyclical upswings in labor demand.

TABLE 7  
DAILY WAGES OF CONSTRUCTION WORKERS, CONSTANT (1885-87)  
PRICES: YAMANASHI PREFECTURE, 1883-1911\*

| Year      | Real Daily Wage (Yen) | Index (1885-7 = 100) |
|-----------|-----------------------|----------------------|
| 1883-1887 | .299                  | 116                  |
| 1888-1892 | .276                  | 106                  |
| 1893-1897 | .277                  | 107                  |
| 1898-1902 | .218                  | 84                   |
| 1903-1907 | .233                  | 90                   |
| 1908-1911 | .318                  | 124                  |

\* Daily wages in seven construction trades, Kōfu. Weights by straight-line interpolation between number of persons engaged, 1879 and 1920 censuses.

Source: Wage rates, *Yamanashi Ken Tōkeisho*; deflator, Kōfu consumer price index, Appendix Table 5.

TABLE 8  
DAILY WAGES OF WORKERS IN MANUFACTURING, CONSTANT  
(1885-87) PRICES: YAMANASHI PREFECTURE, 1883-1911\*

| Year      | Real Daily Wage (Yen) | Index (1885-7 = 100) |
|-----------|-----------------------|----------------------|
| 1883-1887 | .189                  | 114                  |
| 1888-1892 | .172                  | 104                  |
| 1893-1897 | .180                  | 108                  |
| 1898-1902 | .160                  | 96                   |
| 1903-1907 | .173                  | 104                  |
| 1908-1911 | .180                  | 108                  |

\* Daily wages in 47 manufacturing occupations—Kōfu quotations except for factory employment, where prefecture averages were used. Weights by straight-line interpolation between number of persons engaged, 1879 and 1920 census.

Source: Daily wage rates, *Yamanashi Ken Tōkeisho*, corresponding years; deflator, Kōfu consumer price index, Appendix Table 5.

<sup>16</sup> For a classic first-hand account of the labor market in the cotton-spinning industry in the first decades of this century, see Hosoi (,) Wakizō, *Jokō Aishi* ("The Sorry History of the Factory Girls"; Tokyo: Iwanami, 1925).

<sup>17</sup> Kazuo Ōkōchi, *Labor in Modern Japan* (Tokyo: Science Council of Japan, 1958).

<sup>18</sup> Sumiya (,) Mikio, *Nihon Chin Rōdō Shiron* ("Dissertation on the History of Wage Labor in Japan"; Tokyo: Tōdai Gakujutsu Sōsho, 1955).

<sup>19</sup> Cited in n. 1.

Silk reeling, textile weaving, and cotton spinning all had predominantly female work forces, and our wage figures for the first two industries are for female operatives. But daily wages in the construction trades, which were almost completely male, show a declining tendency until the last years of Meiji, and a similar index of real daily wages for forty-seven manufacturing occupations shows no clear trend. All of these occupations were of a "traditional" character, and their existence as rural side occupations is again probably a key to their wage behavior.

The failure of manufacturing real wages to rise in the face of rapidly increasing manufacturing employment indicates that the "slack" in the rural labor supply had not yet been taken up. Indeed, the behavior of the purchasing power of yearly contract wages in agriculture suggests that the surplus labor time on the land was increasing.<sup>20</sup>

TABLE 9  
WAGES OF ANNUAL CONTRACT LABORERS IN AGRICULTURE,  
CONSTANT (1885-87) PRICES: KÖFU, 1885, 1894-1911

| Years   | Real Annual Wage (Yen) |        | Index (1885 = 100) |        |
|---------|------------------------|--------|--------------------|--------|
|         | Male                   | Female | Male               | Female |
| 1885    | 22.3                   | 11.6   | 100                | 100    |
| 1894-97 | 16.6                   | 10.9   | 74                 | 94     |
| 1898-02 | 13.6                   | 8.7    | 61                 | 75     |
| 1903-07 | 14.0                   | 9.0    | 63                 | 78     |
| 1908-11 | 12.9                   | 8.6    | 58                 | 74     |

Source: Wage rates, *Yamanashi Ken Tōkeisho*, corresponding years; deflator, Appendix Table 5.

In spite of this evidence that the *marginal* product of labor in agriculture was falling, output per capita and output per worker—that is, the *average* product of labor—rose substantially during the Meiji era, as Ohkawa has shown for Japan as a whole. Expansion of the market and improved techniques brought greater economic opportunity, even on the land; but the result was not an increase in the unit price of labor in real terms, because the growth of opportunity was outstripped by the growth of available labor time. Agricultural wage rates, and the wage rates in occupations which drew their

<sup>20</sup> Real *daily* wage rates for agricultural labor did not fall but moved roughly in the same fashion as daily wage rates in manufacturing. These rates, however, reflect supply and demand conditions at the seasonal peaks and are not an indicator of the year-round marginal productivity of agricultural labor but rather of wages in occupations alternative to agriculture at those times of year in which the labor market was tightest.

workers from the labor reservoir in the countryside, remained extremely low.

While wage *rates* in manufacturing remained stable, wage *earnings* increased prodigiously, both in the aggregate, and per worker. Not only were there more persons engaged in manufacturing occu-

TABLE 10  
DAYS OF OPERATION PER YEAR AND ANNUAL EARNINGS, CURRENT  
AND CONSTANT (1885-87) PRICES: SILK-REELING FACTORIES,  
YAMANASHI PREFECTURE, 1883-1911  
(FIVE-YEAR AVERAGES)

| Years                  | Days of<br>Factory<br>Operation<br>Per Year | Annual Earnings            |                            | Index (1885-7 = 100)                        |                  |
|------------------------|---|----------------------------|----------------------------|---|------------------|
|                        |   | Current<br>Prices<br>(Yen) | 1885-87<br>Prices<br>(Yen) | Days of<br>Factory<br>Operation<br>per Year | Real<br>Earnings |
| 1883-1887              | 142.9                                       | 16.7 <sup>a</sup>          | 16.9 <sup>a</sup>          | 99  | 100              |
| 1888-1893              | 157.6                                       | 20.7                       | 19.6                       | 109   | 116              |
| 1893-1897              | 174.8                                       | 35.1                       | 24.5                       | 121   | 145              |
| 1897-1902              | 190.2                                       | 48.2                       | 23.8                       | 131   | 141              |
| 1903-1907              | 214.7                                       | 56.4                       | 27.1                       | 148   | 161              |
| 1908-1911 <sup>b</sup> | 251.2                                       | 76.4                       | 33.3                       | 174   | 198              |

<sup>a</sup> 1885-87.

<sup>b</sup> Less than five years.

Source: Days of operation, Appendix Table 4; annual earnings, *Yamanashi Ken Tôkeisho*—see footnote, Appendix Table 6; deflator, Appendix Table 5.

pations, but these occupations took an increasing portion of each worker's potential labor time. In silk reeling, for instance, the average number of days of factory operation approximately doubled between 1883 and 1911, and as a consequence real annual earnings per worker also doubled.

Japanese wage rates in the Meiji era were a pittance either by Western or by contemporary standards; and the wage rates for female silk-reeling operatives were among the lowest in Japan. In our Yamanashi Prefecture data, we have silk-reeling wage rates both from individual factories and in the form of annual or quarterly wage quotations for predominantly nonfactory occupations. Daily wages of female silk-reeling employees were twenty-second out of 30 categories of factory workers in the prefecture in 1906-1911, and their hourly wages were seventeenth out of 20 categories for which the latter measure can be calculated. In the lists of predominantly nonfactory occupations in the yearbooks, over the entire period 1883-1911, daily wages of female silk-reeling operatives were fifty-

first out of 53 occupational categories in Kōfu, below even agricultural day laborers and exceeding only male and female domestic servants.<sup>21</sup> But by the criteria of Meiji Japan, such wages might provide a handsome income, especially for farm girls whose productivity was close to zero at home, except perhaps on the days of peak

TABLE 11  
AVERAGE WAGE EARNINGS OF ADULT FEMALE WORKERS IN SILK-  
REELING FACTORIES, YAMANASHI PREFECTURE; AND INCOME  
PRODUCED PER GAINFULLY EMPLOYED IN PRIMARY  
INDUSTRY, JAPAN (OHKAWA'S ESTIMATES)  
1885-1911

| Years                | Annual<br>Earnings (Yen)<br>Female<br>Silk-reeling<br>Operatives<br>Yamanashi | Annual<br>Income (Yen)<br>Produced<br>per Worker<br>Primary<br>Industry,<br>Japan | Ratio |
|----------------------|---|---|-------|
| 1885-87 <sup>a</sup> | 16.7  | 21.3  | .78   |
| 1888-92              | 20.7  | 27.6  | .75   |
| 1893-97              | 35.1  | 35.2  | 1.00  |
| 1898-02              | 48.2  | 53.8  | .90   |
| 1903-07 <sup>b</sup> | 56.4  | 70.0  | .81   |
| 1908-11 <sup>a</sup> | 76.4  | 79.5  | .96   |

<sup>a</sup> Less than five years.

<sup>b</sup> 1905 missing.

Source: Annual earnings, *Yamanashi Ken Tōkeisho*; see footnote, Appendix Table 6. Income produced, Ohkawa (cited in n. 8), p. 249.

farm activity. Despite the severe sex differential in wages which was ubiquitous in Japan, female wage earnings in Yamanashi's silk-reeling industry more than kept pace with the average product for all gainfully employed in Japanese agriculture at a time when the latter was rising rapidly. Authorities may not agree whether or not the cultivator reaped much of the benefit of the growth of agricultural output in the Meiji era, but it is clear that a daughter or two in the filatures, or even more, a son in one of the better-paying construction trades, was a tremendous boost to the income of a farm household, and to a poorer tenant family was a fortune. The comparison in Table 11 is especially striking when one reflects that the values in

<sup>21</sup> The values ranked in this case were the arithmetic means of the ratios between five-year arithmetic means of daily wages for each occupational category and those of female silk-reeling workers. Not all of the six five-year periods were available for every occupational category, and where values were missing within any one five-year period, the ratio was calculated for the remaining years.

the second column include the share of primary product taken by landlords and the government, as well as by the cultivators.

Another "indigenous" measure of the level of factory earnings is its rice equivalent. In Tokugawa Japan, one *koku* (180.5 liters) of rice was reckoned as the income necessary adequately to sustain one person for a year. On this basis, toward the end of the Meiji era the earnings of one girl in the silk filatures could have supported a whole family at pre-Meiji standards.

TABLE 12  
ANNUAL WAGE EARNINGS OF ADULT FEMALE WORKERS IN SILK-  
REELING FACTORIES, YAMANASHI PREFECTURE, AND PRICE OF  
RICE, KÖFU, 1885-1911

| Years                | Annual<br>Earnings<br>Female<br>Silk-reeling<br>Operatives<br>(Yen) | Price of<br>Rice, Yen,<br>per Kōku | Ratio |
|----------------------|---|------------------------------------|-------|
| 1885-87              | 16.7  | 6.59                               | 2.54  |
| 1888-92              | 20.7  | 7.44                               | 2.79  |
| 1893-97              | 35.1  | 10.60                              | 3.31  |
| 1898-02              | 48.2  | 14.87                              | 3.24  |
| 1903-07 <sup>a</sup> | 56.4  | 16.68                              | 3.38  |
| 1908-11 <sup>b</sup> | 76.4  | 17.10                              | 4.46  |

<sup>a</sup> 1905 missing.

<sup>b</sup> Less than five years.

Source: Annual earnings, *Yamanashi Ken Tōkeisho*; see footnote to Appendix Table 6. Rice prices, *Yamanashi Ken Tōkeisho*, corresponding years, commodity price tables.

A third view of the magnitude of silk-reeling wages in the perspective of Meiji living standards can be seen in the wage deductions and company expenditures for workers' board. For 1907, the *Tōkeisho* shows for each factory, by age and sex, the number of workers who receive *makanai* (meals, and possibly other necessities) at work; the wage rate for those workers who do and who do not take *makanai*; and the total expenditure of the factory in providing for them. From these an average deduction for board and its average cost can be imputed. Apparently, meals were not subsidized, as deductions from wages averaged 8.7 sen per day, and the factory expenditure averaged 8.0 sen per worker per day.<sup>22</sup> In the same year, the

<sup>22</sup> The mean deduction for adult female workers alone was 9.2 sen, but we could not calculate mean expenditures separately by age and sex.

mean daily wage for adult female silk-reeling operatives was 27.2 sen. Even if the expenditure for *makanai* were entirely for food, and that of the most meager sort and quantity, a wage which left the worker 70 per cent after her keep could hardly be called one of grinding penury.

## VII

It is hazardous to generalize from a few characteristics of one prefecture, but these findings in part have suggested to the author an hypothesis about the character of Meiji economic growth.

The increase in labor productivity in agriculture was apparently adequate to counter diminishing returns and to sustain some increase in the proportion of labor power which could be devoted to nonagricultural pursuits, but this increase was not nearly as remarkable as some authorities have suggested. The intersectoral movement of the labor force was not primarily a shift of population totally out of agriculture, but occurred first as the absorption of the slack time in farm households, especially that of the women, into various side occupations.

The availability of this previously unutilized labor time, plus the rapid increase in population, was sufficient to assure a virtually "unlimited supply of labor" over the whole period, even in the highly skilled indigenous occupations. The unit price of labor in real terms, whether measured explicitly in wage rates or implicitly in the incomes of family enterprise, remained low despite unprecedented increases in total income per household, per capita, or per worker. Outside of a few industries, these increases were not realized primarily by improvements in techniques but by the more complete utilization of existing labor time and by its reallocation among primary and side occupations. This reallocation was, of course, facilitated by the growth of population and by the freedom of movement consequent on the Meiji revolution.

In this context, the output of products like raw silk and silk textiles could respond readily to the pull of outside demand, and the income generated by their export had a multiplier impact on the indigenous consumer economy. These latter industries generally had low capital requirements, and the skills required were plentiful because they had been practiced in the premodern economy as side occupations.

The dynamic of Meiji economic growth had already been de-

scribed with remarkable insight in 1863 or 1864 by Fukuzawa Yuki-chi in a pamphlet polemicizing against the partisans of *jōi*,<sup>23</sup> who asserted that foreign trade was impoverishing the country by driving up the cost of necessities.

Now, it is commonly said that the people are suffering on account of the rise in commodity prices, but in truth, there has not been an increase in the value of goods, but only a fall in the value of money. The goods which cost 1 *ryō* in the past now cost 3 or 4, but daily wages have risen even more, and the value of the rice allotments of the *bushi* has risen in a similar proportion, so that it can hardly be said that everybody is in distress.

Since the beginning of foreign trade, the circulation of money has quickened, and there are fewer people in distress than before. There are all kinds of evidence, but we will give one or two examples. When times are bad it is difficult to make a living, and we expect to see many people offering themselves out for work at very low pay, only to get something to eat. But recently the number of laborers has diminished, even to the palanquin carriers on the highways. Doesn't this mean that there are better ways of making a living than going out into service?

In Oshu, a certain *daimyō* with a rice income of only 100,000 *koku* has been selling silk from his fief and has brought its value up to over 900,000 *ryō* in a year. Estimating 100,000 *koku* to correspond to a population of 100,000, this means about 9 *ryō* per person. One must say that this is really a huge profit! In this fief, people are outdoing one another in working at silk, and do not hire themselves out at all. Family incomes are good enough that everybody is building houses and buying *kimono*. People who in earlier years wanted for salt to put on their adulterated rice (*bakumeshi*), now eat fish with pure rice, so that the prices of both rice and fish have risen. The farmer who grows the rice and the fisherman who takes the fish, plus the carpenter and the plasterer, become prosperous, and conditions improve throughout the province.

This situation is not limited to this one fief in Oshu, but is the same throughout Japan. A province which does not produce silk grows cotton, and if an area is not suitable for cotton, it grows oil seeds. Even in the case of rice and barley, which are not produced for foreign demand, domestic demand is fluid throughout the country. All manner of trade is being augmented, so that farmers and merchants both are now extremely busy at their respective callings.<sup>24</sup>

Generally, outside of specific modern facilities such as the railroads and perhaps the technical aspects of cotton spinning, the main threads of Meiji economic growth seem not to have constituted an Industrial Revolution, if the latter means mainly urbanization, mechanization, and the appearance of new industries. Rather, there was a vast increase in the scale of an already functioning economic order

<sup>23</sup> The slogan of the militant nationalists, "Expel the barbarians."

<sup>24</sup> Fukuzawa (,) Yukichi, "Tōjin Ōrai" ("Coming and Going of the Foreigners") in *Fukuzawa Yukichi Zenshū* ("Complete Works of Fukuzawa Yukichi"; Tokyo: Iwanami, 1951), Vol. I.

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in response to population increase, the widening of the market, and a permissive political arrangement. The incomes of the common people rose substantially, largely as a result of increased participation by the existing labor force. In plain English, the Japanese did it mostly by working longer and working harder.

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APPENDIX TABLE 1  
POPULATION AND LABOR FORCE: YAMANASHI PREFECTURE, 1878-1911

| Year | Native-born<br>Population <sup>a</sup> | Resident Population |         |         | Labor Force |         |         |
|------|--|---------------------|---------|---------|-------------|---------|---------|
|      |  | Male                | Female  | Total   | Male        | Female  | Total   |
| 1878 | 391,300                                | 195,000             | 196,100 | 391,100 | 129,170     | 103,380 | 232,550 |
| 1879 | 396,200                                | 196,500             | 199,800 | 396,300 | 129,060     | 104,100 | 233,160 |
| 1880 | 404,700                                | 200,500             | 203,900 | 404,400 | 131,390     | 106,110 | 237,500 |
| 1881 | 409,900                                | 202,900             | 206,300 | 409,200 | 132,640     | 107,110 | 239,750 |
| 1882 | 409,800                                | 202,600             | 206,100 | 408,700 | 132,150     | 106,870 | 239,020 |
| 1883 | 416,000                                | 205,500             | 208,900 | 414,400 | 132,860     | 108,090 | 240,950 |
| 1884 | 420,500                                | 207,500             | 211,100 | 418,600 | 134,740     | 109,050 | 243,790 |
| 1885 | 426,200                                | 210,200             | 213,800 | 424,000 | 136,160     | 110,200 | 246,360 |
| 1886 | 431,200                                | 212,500             | 216,100 | 428,600 | 137,340     | 111,230 | 248,570 |
| 1887 | 436,500                                | 215,300             | 219,000 | 434,300 | 138,840     | 112,530 | 251,370 |
| 1888 | 443,300                                | 218,700             | 222,600 | 441,200 | 140,680     | 113,190 | 253,870 |
| 1889 | 450,600                                | 222,100             | 225,900 | 448,000 | 141,570     | 115,790 | 257,360 |
| 1890 | 456,400                                | 224,500             | 228,400 | 452,900 | 143,750     | 116,640 | 260,390 |
| 1891 | 460,600                                | 226,500             | 230,400 | 456,900 | 144,660     | 117,590 | 262,250 |
| 1892 | 464,200                                | 228,100             | 232,000 | 460,100 | 145,360     | 118,280 | 262,640 |
| 1893 | 468,000                                | 229,800             | 233,700 | 463,500 | 146,080     | 119,070 | 265,150 |
| 1894 | 472,500                                | 229,800             | 233,700 | 463,500 | 145,740     | 118,910 | 264,650 |
| 1895 | 478,100                                | 230,200             | 234,200 | 464,400 | 145,660     | 119,090 | 264,750 |
| 1896 | 485,300                                | 237,500             | 241,500 | 479,000 | 149,910     | 122,750 | 272,660 |
| 1897 | 489,200                                | 238,700             | 242,800 | 481,500 | 150,280     | 123,240 | 273,520 |
| 1898 | 491,900                                | 239,900             | 243,900 | 483,800 | 150,680     | 123,470 | 274,150 |
| 1899 | 499,400                                | 241,800             | 246,100 | 487,900 | 151,530     | 124,600 | 276,130 |
| 1900 | 506,900                                | 243,900             | 248,300 | 492,200 | 152,480     | 125,520 | 278,000 |
| 1901 | 514,700                                | 245,800             | 250,400 | 496,200 | 153,310     | 126,350 | 279,660 |
| 1902 | 525,500                                | 247,800             | 252,700 | 500,500 | 154,180     | 126,210 | 280,390 |

APPENDIX TABLE 1 (Continued)

| Year | Native-born Population <sup>a</sup> | Resident Population |         |         | Labor Force |         |         |
|------|-------------------------------------|---------------------|---------|---------|-------------|---------|---------|
|      |                                     | Male                | Female  | Total   | Male        | Female  | Total   |
| 1903 | 530,400                             | 254,400             | 259,500 | 513,900 | 158,590     | 130,530 | 289,120 |
| 1904 | 536,900                             | 258,500             | 263,600 | 522,100 | 162,430     | 132,510 | 294,940 |
| 1905 | 543,500                             | 260,800             | 265,700 | 526,500 | 161,110     | 133,340 | 294,450 |
| 1906 | 550,200                             | 264,100             | 268,800 | 532,900 | 162,760     | 134,740 | 297,500 |
| 1907 | 557,000                             | 267,400             | 272,000 | 539,400 | 164,380     | 136,030 | 300,410 |
| 1908 | 563,800                             | 265,600             | 274,100 | 539,700 | 162,870     | 138,510 | 301,380 |
| 1909 | 572,600                             | 267,900             | 277,000 | 544,900 | 163,870     | 138,420 | 302,290 |
| 1910 | 581,500                             | 270,200             | 280,200 | 550,400 | 164,850     | 139,920 | 304,770 |
| 1911 | 590,600                             | 273,000             | 283,900 | 556,900 | 166,180     | 141,700 | 307,880 |

<sup>a</sup> Native-born population: persons resident in Japan who were either resident in Yamanashi Prefecture in 1879 or born in Yamanashi Prefecture.

APPENDIX TABLE 2  
 MAN YEARS OF LABOR INPUT BY SECTOR (FULL-TIME EQUIVALENT): FIVE-YEAR MOVING AVERAGES  
 AND PERCENTAGE OF TOTAL LABOR FORCE, YAMANASHI PREFECTURE, 1879-1911

| Years   | Number of FTE, Five-Year Average     |        |                          |         |          |       | Percentage of Labor Input |               |          |
|---------|--------------------------------------|--------|--------------------------|---------|----------|-------|---------------------------|---------------|----------|
|         | Agriculture,<br>Forestry,<br>Fishery |        | Mining,<br>Manufacturing |         | Services | Total | Agriculture               | Manufacturing | Services |
|         |                                      |        |                          |         |          |       |                           |               |          |
| 1879-83 | 187,373                              | 31,623 | 19,080                   | 238,076 | 78.7     | 13.3  | 8.0                       |               |          |
| 1880-84 | 189,479                              | 31,023 | 19,700                   | 240,202 | 78.9     | 12.9  | 8.2                       |               |          |
| 1881-85 | 190,813                              | 30,733 | 20,428                   | 241,974 | 78.8     | 12.7  | 8.4                       |               |          |
| 1882-86 | 192,477                              | 30,593 | 20,669                   | 243,738 | 79.0     | 12.6  | 8.5                       |               |          |
| 1883-87 | 193,674                              | 31,820 | 20,715                   | 246,208 | 78.7     | 12.9  | 8.4                       |               |          |
| 1884-88 | 194,801                              | 32,920 | 21,071                   | 248,792 | 78.3     | 13.2  | 8.5                       |               |          |
| 1885-89 | 194,038                              | 35,510 | 21,958                   | 251,506 | 77.1     | 14.1  | 8.7                       |               |          |
| 1886-90 | 195,254                              | 36,297 | 22,761                   | 254,312 | 76.8     | 14.3  | 8.9                       |               |          |
| 1887-91 | 195,410                              | 37,714 | 23,924                   | 257,048 | 76.0     | 14.7  | 9.3                       |               |          |
| 1888-92 | 196,028                              | 38,369 | 25,105                   | 259,502 | 75.5     | 14.8  | 9.7                       |               |          |
| 1889-93 | 196,423                              | 39,129 | 26,207                   | 261,758 | 75.0     | 14.9  | 10.0                      |               |          |
| 1890-94 | 197,629                              | 38,895 | 26,692                   | 263,216 | 75.1     | 14.8  | 10.1                      |               |          |
| 1891-95 | 196,764                              | 40,121 | 27,203                   | 264,088 | 74.5     | 15.2  | 10.3                      |               |          |
| 1892-96 | 197,739                              | 40,874 | 27,858                   | 266,170 | 74.3     | 15.4  | 10.4                      |               |          |
| 1893-97 | 198,593                              | 41,376 | 28,178                   | 268,146 | 74.1     | 15.4  | 10.5                      |               |          |
| 1894-98 | 199,283                              | 42,078 | 28,585                   | 269,946 | 73.8     | 15.6  | 10.6                      |               |          |
| 1895-99 | 199,844                              | 43,317 | 29,082                   | 272,242 | 73.4     | 15.9  | 10.7                      |               |          |
| 1896-00 | 202,219                              | 43,102 | 29,573                   | 274,894 | 73.6     | 15.7  | 10.8                      |               |          |
| 1897-01 | 203,578                              | 42,734 | 29,990                   | 276,294 | 73.7     | 15.5  | 10.9                      |               |          |

APPENDIX TABLE 2 (Continued)

| Years   | Number of FTE, Five-Year Average     |                          |          |         | Percentage of Labor Input |               |          |
|---------|--------------------------------------|--------------------------|----------|---------|---------------------------|---------------|----------|
|         | Agriculture,<br>Forestry,<br>Fishery | Mining,<br>Manufacturing | Services | Total   | Agriculture               | Manufacturing | Services |
| 1898-02 | 204,125                              | 43,409                   | 30,132   | 277,666 | 73.5                      | 15.6          | 10.8     |
| 1899-03 | 207,324                              | 43,025                   | 30,312   | 280,660 | 73.9                      | 15.3          | 10.8     |
| 1900-04 | 211,994                              | 41,876                   | 30,604   | 284,422 | 74.5                      | 14.7          | 10.8     |
| 1901-05 | 214,561                              | 42,264                   | 30,887   | 287,712 | 74.6                      | 14.7          | 10.7     |
| 1902-06 | 217,047                              | 42,968                   | 31,265   | 291,280 | 74.5                      | 14.8          | 10.7     |
| 1903-07 | 220,625                              | 42,765                   | 31,894   | 295,284 | 74.7                      | 14.5          | 10.8     |
| 1904-08 | 220,763                              | 44,182                   | 32,791   | 297,736 | 74.2                      | 14.8          | 11.0     |
| 1905-09 | 220,041                              | 45,573                   | 33,592   | 299,206 | 73.5                      | 15.2          | 11.2     |
| 1906-10 | 219,027                              | 47,826                   | 34,418   | 301,270 | 72.7                      | 15.9          | 11.4     |
| 1907-11 | 218,849                              | 49,248                   | 35,249   | 303,346 | 72.1                      | 16.2          | 11.6     |

APPENDIX TABLE 3  
LABOR INPUT, FULL-TIME EQUIVALENTS, SILK-REELING INDUSTRY:  
YAMANASHI PREFECTURE, 1873-1911

| Year | Silk-Reeling Factories |         |       | Households |         |       | Total |         |        |
|------|------------------------|---------|-------|------------|---------|-------|-------|---------|--------|
|      | Males                  | Females | Total | Males      | Females | Total | Males | Females | Total  |
|      | 1873                   | 95      | 591   | 1,277      | 37      | 2,144 | 2,181 | 132     | 2,735  |
| 1874 | 147                    | 895     | 1,042 | 21         | 1,235   | 1,256 | 168   | 2,130   | 2,298  |
| 1875 | 170                    | 1,025   | 1,195 | 37         | 2,164   | 2,201 | 197   | 3,189   | 3,386  |
| 1876 | 171                    | 1,104   | 1,275 | 28         | 1,649   | 1,677 | 199   | 2,753   | 2,952  |
| 1877 | 203                    | 1,233   | 1,436 | 46         | 2,682   | 2,728 | 249   | 3,905   | 4,154  |
| 1878 | 230                    | 1,390   | 1,620 | 75         | 4,333   | 4,408 | 305   | 5,723   | 6,028  |
| 1879 | 242                    | 1,537   | 1,773 | 78         | 4,516   | 4,594 | 320   | 6,047   | 6,367  |
| 1880 | 287                    | 1,883   | 2,170 | 85         | 4,631   | 4,716 | 372   | 6,514   | 6,886  |
| 1881 | 314                    | 2,119   | 2,747 | 91         | 4,485   | 4,576 | 405   | 6,604   | 7,009  |
| 1882 | 358                    | 2,594   | 2,950 | 72         | 3,524   | 3,587 | 429   | 6,118   | 6,547  |
| 1883 | 402                    | 2,662   | 3,075 | 61         | 2,732   | 2,793 | 463   | 5,394   | 5,857  |
| 1884 | 385                    | 2,885   | 3,047 | 35         | 1,465   | 1,500 | 420   | 4,347   | 4,767  |
| 1885 | 462                    | 3,627   | 3,347 | 48         | 1,897   | 1,945 | 510   | 5,524   | 6,034  |
| 1886 | 563                    | 3,949   | 4,190 | 100        | 2,571   | 2,640 | 632   | 6,520   | 7,152  |
| 1887 | 740                    | 4,163   | 4,689 | 69         | 3,481   | 3,581 | 840   | 7,644   | 8,484  |
| 1888 | 642                    | 4,487   | 4,805 | 48         | 1,566   | 1,614 | 690   | 6,053   | 6,734  |
| 1889 | 628                    | 5,467   | 5,115 | 145        | 4,466   | 4,611 | 773   | 9,933   | 10,706 |
| 1890 | 684                    | 5,781   | 6,151 | 87         | 2,522   | 2,609 | 771   | 8,303   | 9,074  |
| 1891 | 683                    | 5,768   | 6,451 | 180        | 4,883   | 5,063 | 863   | 10,651  | 11,514 |
| 1892 | 670                    | 5,372   | 6,442 | 185        | 4,717   | 4,902 | 855   | 10,489  | 11,344 |
| 1893 | 680                    | 6,292   | 6,962 | 190        | 4,545   | 4,735 | 870   | 10,837  | 11,707 |
| 1894 | 669                    | 6,254   | 6,923 | 221        | 4,946   | 5,167 | 890   | 11,200  | 12,090 |
| 1895 | 740                    | 6,669   | 7,409 | 203        | 4,251   | 4,454 | 943   | 10,947  | 11,890 |
| 1896 | 763                    | 7,016   | 7,779 | 258        | 5,069   | 5,327 | 1,021 | 12,085  | 13,106 |
| 1897 | 820                    | 7,608   | 8,428 | 265        | 4,886   | 5,151 | 1,085 | 12,494  | 13,579 |

APPENDIX TABLE 3 (Continued)

| Year | Silk-Reeling Factories |         |        | Households |         |        | Total |         |        |
|------|------------------------|---------|--------|------------|---------|--------|-------|---------|--------|
|      | Males                  | Females | Total  | Males      | Females | Total  | Males | Females | Total  |
|      | 1898                   | 697     | 6,453  | 7,150      | 328     | 5,661  | 5,989 | 1,025   | 12,096 |
| 1899 | 592                    | 5,713   | 6,305  | 627        | 10,138  | 10,765 | 1,219 | 15,851  | 17,070 |
| 1900 | 560                    | 4,985   | 5,545  | 403        | 6,097   | 6,500  | 963   | 11,082  | 12,045 |
| 1901 | 569                    | 5,247   | 5,816  | 374        | 5,309   | 5,683  | 943   | 10,556  | 11,499 |
| 1902 | 599                    | 5,301   | 5,900  | 792        | 10,514  | 11,306 | 1,391 | 15,815  | 17,206 |
| 1903 | 676                    | 6,063   | 6,739  | 554        | 6,885   | 7,439  | 1,230 | 12,948  | 14,178 |
| 1904 | 810                    | 6,897   | 7,707  | 454        | 4,957   | 5,411  | 1,264 | 11,854  | 13,118 |
| 1905 | 865                    | 7,560   | 8,425  | 489        | 4,888   | 5,377  | 1,354 | 12,448  | 13,802 |
| 1906 | 1,083                  | 9,730   | 10,813 | 503        | 4,632   | 5,135  | 1,586 | 14,362  | 15,948 |
| 1907 | 1,170                  | 10,534  | 11,704 | 637        | 5,601   | 6,238  | 1,807 | 16,135  | 17,942 |
| 1908 | 1,416                  | 11,692  | 13,108 | 429        | 5,407   | 5,836  | 1,845 | 17,099  | 18,944 |
| 1909 | 1,461                  | 12,404  | 13,865 | 213        | 2,854   | 3,067  | 1,674 | 15,258  | 16,932 |
| 1910 | 1,990                  | 12,887  | 14,877 | 515        | 5,518   | 6,033  | 2,505 | 18,405  | 20,910 |
| 1911 | 1,513                  | 12,977  | 14,490 | 377        | 5,485   | 5,862  | 1,890 | 18,462  | 20,352 |

Source: Arlon Tussing, doctoral dissertation (cited in n. 13), appendix.

APPENDIX TABLE 4  
 NUMBER OF OPERATIVES, SILK-REELING FACTORIES;  
 AVERAGE WORKING DAY AND NUMBER OF DAYS  
 OF OPERATION PER YEAR: YAMANASHI  
 PREFECTURE, 1878-1911\*

| <i>Year</i> | <i>Number<br/>of Operatives<br/>(1)</i> | <i>Working Day<br/>(Hours)<br/>(2)</i> | <i>Days of Factory<br/>Operation Per Year<br/>(3)</i> |
|-------------|---|--|---|
| 1878        | 3,105                                   |  |   |
| 1879        | 3,307                                   |  |   |
| 1880        | 4,175                                   |  |   |
| 1881        | 4,687                                   |  |   |
| 1882        | 5,703                                   |  |   |
| 1883        | 5,923                                   | 11.5                                   | 139.8   |
| 1884        | 5,844                                   | 11.5                                   | 140.6   |
| 1885        | 6,440                                   | 11.5                                   | 139.5   |
| 1886        | 7,693                                   | 11.5                                   | 146.4   |
| 1887        | 8,422                                   | 11.5                                   | 148.2   |
| 1888        | 8,540                                   | 11.6                                   | 152.9   |
| 1889        | 9,448                                   | 11.7                                   | 156.2   |
| 1890        | 10,617                                  | 11.7                                   | 157.2   |
| 1891        | 11,005                                  | 11.7                                   | 159.4   |
| 1892        | 10,818                                  | 11.7                                   | 162.2   |
| 1893        | 11,498                                  | 11.8                                   | 165.2   |
| 1894        | 11,051                                  | 11.8                                   | 171.0   |
| 1895        | 11,507                                  | 11.9                                   | 175.5   |
| 1896        | 11,970                                  | 11.9                                   | 180.0   |
| 1897        | 12,609                                  | 11.9                                   | 182.4   |
| 1898        | 10,427                                  | 12.0                                   | 187.1   |
| 1899        | 8,574                                   | 12.3                                   | 200.9   |
| 1900        | 8,280                                   | 11.8                                   | 182.5   |
| 1901        | 8,444                                   | 11.9                                   | 187.9   |
| 1902        | 8,348                                   | 11.9                                   | 192.5   |
| 1903        | 9,565                                   | 12.5                                   | 191.9   |
| 1904        | 9,908                                   | 12.6                                   | 211.6   |
| 1905        | 10,411                                  | n.a.                                   | n.a.  |
| 1906        | 12,870                                  | 12.5                                   | 229.0   |
| 1907        | 14,090                                  | 12.4                                   | 226.4   |
| 1908        | 15,624                                  | 13.3                                   | 233.3   |
| 1909        | 15,332                                  | 13.1                                   | 246.0   |
| 1910        | 15,078                                  | 13.1                                   | 260.1   |
| 1911        | 14,860                                  | 12.8                                   | 265.3   |

\* The columns are as follows: (1) male and female reeling operatives, excluding salaried personnel and general laborers; (2) hours of operation by factory, weighted by number of operatives; (3) days of operation by factory, weighted by number of operatives.

**Sources:** Number of operatives (1)—for 1883-84, 1886-1904, and 1906-11, the figure is total number of operatives by individual factory, from the corresponding years' *Yamanashi Ken Tōkeisho*; for 1885, the number of man-days of labor, divided by number of days of operation, by factory, in the No. 2 *Nōshōmu Tōkeihyō*; for 1879, the census figure. For a description of the method of establishing year-to-year comparability, and of interpolating 1880-82 and 1905 figures, see Tussing dissertation (cited in n. 13), ch. iv. The working day (2) and days of factory operation (3) for 1885 are by factory, from the No. 2 *Nōshōmu Tōkeihyō*, in each case weighted by the number of operatives per factory. The values for 1883-84 and 1886-98 were derived by applying linear rates of increase between the 1885 and 1898 values for six different factory-size groups, weighting each year's values by the number of workers employed in each factory-size group.



APPENDIX TABLE 5  
 CONSUMER PRICE DEFLATORS, KÖFU, 1880-1911  
 (1885-87 = 100)

| Year | Unweighted | Constant Weights |                  |
|------|------------|------------------|------------------|
|      |            | Housing Excluded | Housing Included |
| 1880 | 151        | 153              | 146              |
| 1881 | 173        | 184              | 174              |
| 1882 | 146        | 138              | 130              |
| 1883 | 110        | 104              | 101              |
| 1884 | 93         | 95               | 94               |
| 1885 | 110        | 112              | 110              |
| 1886 | 94         | 96               | 97               |
| 1887 | 96         | 92               | 93               |
| 1888 | 100        | 88               | 92               |
| 1889 | 92         | 96               | 100              |
| 1890 | 128        | 116              | 122              |
| 1891 | 120        | 126              | 130              |
| 1892 | 127        | 131              | 133              |
| 1893 | 111        | 121              | 125              |
| 1894 | 112        | 117              | 121              |
| 1895 | 131        | 130              | 136              |
| 1896 | 153        | 150              | 153              |
| 1897 | 200        | 217              | 221              |
| 1898 | 180        | 188              | 193              |
| 1899 | 184        | 243              | 247              |
| 1900 | 187        | 199              | 199              |
| 1901 | 197        | 217              | 222              |
| 1902 | 182        | 177              | 183              |
| 1903 | 191        | 206              | 212              |
| 1904 | 180        | 177              | 182              |
| 1905 | 201        | 187              | 193              |
| 1906 | 209        | 215              | 221              |
| 1907 | 241        | 237              | 244              |
| 1908 | 243        | 235              | 242              |
| 1909 | 243        | 222              | 227              |
| 1910 | 255        | 227              | 234              |
| 1911 | 257        | 246              | 253              |

Sources: The unweighted index is the geometric mean of price relatives, Kōfu retail prices of polished rice, barley, *sake*, *miso*, *shōyu*, table salt, vegetable oil, firewood, and charcoal, Saruhashi prices of *kaiki* silk fabric, 1880-1903, linked to Kōfu price of *hanairo* silk fabric, 1903-11, from the corresponding years' *Yamanashi Ken Tōkeisho*, and Tokyo wholesale price of white cotton cloth, from *Tōkyō Fu Tōkeisho* ("Tokyo Metropolitan Statistical Yearbook"; annual, 1876- ), 1892-1911. The weighted index excluding housing uses the same price data, weighted for rice, barley, *sake*, *miso*, *shōyu*, and vegetable oil by the average physical quantity produced in Japan in 1903-07, according to the *Nōshōmu Tōkeihyō* ("Yearbook of Agriculture and Commerce"; annual, 1884- ). The prices of the silk- and cotton-textile items were weighted by the domestic physical output of all silk textiles, including silk-cotton mixtures, and all cotton textiles, respectively, in the *Nihon Teikoku Tōkei Nenkan* ("Statistical Yearbook of the Japanese Empire"; annual, 1883- ) in *tan*, plus imports, minus exports, of each, in the *Nihon Bōeki Seiran* (Tōyō Keizai Shimpōsha; "Foreign Trade of Japan; A Statistical Survey," 1935) on the basis 1 square yard = 1 yard = 1/8.6 *tan*, in the same years. Table salt, firewood, and charcoal were arbitrarily assigned weights which made each account for 3.5 per cent of total value in 1903-07. Housing cost was added to the weighted index by multiplying it by the ratio of Ohkawa's consumer price deflators (Kazushi Ohkawa, "Price Deflators," unpublished paper for Hitotsubashi University Institute of Economic Research, 1962) including and excluding housing for Japan, for the corresponding years. This last, the consumer price index including housing, was used as the price deflator in the tables in this paper.

APPENDIX TABLE 6  
 WAGES OF FEMALE WORKERS, CONSTANT PRICES (1885-7), SILK  
 REELING-FACTORIES: YAMANASHI PREFECTURE, 1885-1911

| Year | Real<br>Daily<br>Wage<br>(Sen) | Real<br>Hourly<br>Wage<br>(Sen) | Real<br>Annual<br>Earnings<br>(Yen) | Index (1885-7 = 100)  |                        |                            |
|------|--------------------------------|---------------------------------|-------------------------------------|-----------------------|------------------------|----------------------------|
|      |                                |                                 |                                     | Real<br>Daily<br>Wage | Real<br>Hourly<br>Wage | Real<br>Annual<br>Earnings |
| 1885 | 10.7                           | .93                             | 15.00                               | 92                    | 92                     | 89                         |
| 1886 | 11.4                           | 1.00                            | 16.80                               | 98                    | 99                     | 100                        |
| 1887 | 12.7                           | 1.11                            | 18.80                               | 109                   | 110                    | 112                        |
| 1888 | 12.8                           | 1.10                            | 20.00                               | 110                   | 109                    | 119                        |
| 1889 | 12.0                           | 1.02                            | 18.70                               | 103                   | 101                    | 111                        |
| 1890 | 11.9                           | 1.02                            | 22.70                               | 103                   | 101                    | 135                        |
| 1891 | 11.5                           | .98                             | 18.30                               | 99                    | 97                     | 109                        |
| 1892 | 11.1                           | .95                             | 18.10                               | 96                    | 94                     | 107                        |
| 1893 | 15.0                           | 1.27                            | 24.80                               | 129                   | 125                    | 147                        |
| 1894 | 15.6                           | 1.32                            | 26.60                               | 134                   | 130                    | 158                        |
| 1895 | 15.2                           | 1.28                            | 26.00                               | 131                   | 126                    | 154                        |
| 1896 | 14.7                           | 1.24                            | 26.50                               | 127                   | 122                    | 157                        |
| 1897 | 10.1                           | .85                             | 18.50                               | 87                    | 84                     | 110                        |
| 1898 | 12.6                           | 1.05                            | 23.70                               | 109                   | 104                    | 141                        |
| 1899 | 11.0                           | .90                             | 22.20                               | 95                    | 89                     | 131                        |
| 1900 | 13.5                           | 1.14                            | 24.60                               | 116                   | 113                    | 146                        |
| 1901 | 11.1                           | .93                             | 20.90                               | 96                    | 92                     | 124                        |
| 1902 | 14.2                           | 1.20                            | 27.40                               | 122                   | 118                    | 163                        |
| 1903 | 13.1                           | 1.05                            | 25.20                               | 113                   | 104                    | 149                        |
| 1904 | 13.5                           | 1.07                            | 28.60                               | 116                   | 106                    | 170                        |
| 1905 |                                |                                 |                                     |                       |                        |                            |
| 1906 | 12.5                           | 1.00                            | 28.60                               | 108                   | 99                     | 170                        |
| 1907 | 11.5                           | .92                             | 26.00                               | 99                    | 91                     | 154                        |
| 1908 | 12.3                           | 1.00                            | 28.80                               | 106                   | 99                     | 171                        |
| 1909 | 13.5                           | 1.03                            | 33.20                               | 116                   | 102                    | 197                        |
| 1910 | 13.6                           | 1.04                            | 35.30                               | 117                   | 103                    | 209                        |
| 1911 | 12.8                           | 1.00                            | 36.10                               | 110                   | 99                     | 214                        |

Sources: Daily wages in money terms were calculated for 1885 for individual factories by dividing the number of man-days labor time for each category of worker into the wage bill for the same category, in the No. 2 *Nōshōmu Tōkeihyō*. For 1902-11, daily wages were obtained for each category of worker, by factory, directly from the factory statistics in the corresponding years' *Yamanashi Ken Tōkeisho*. The prefectural figure in each case is the mean of the individual factory figures, weighted by the total number of operatives. Another series, for 1885-1902, was obtained from the tables of wage quotations for various categories of laborers and craftsmen in the yearbooks, by *gun* (subdivision of the prefecture), weighted by the number of silk-reeling factory operatives in each *gun*. This latter series, linked logarithmically to the former in 1885 and 1902, was used to interpolate values for 1886-1901. Hourly wage rates were obtained by dividing the daily rates by the working day, and annual earnings were obtained by multiplying the daily rates by the mean number of days of factory operation, from Appendix Table 4. The price deflator was the weighted consumer price index, including housing, from Appendix Table 5.