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Regional Labour Market Integration and "Standard of Livings" in Japan; Four Sections of Workers, the 1890s to the 1930s *

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1. Introduction

Japan witnessed the rapid industrialization from the late nineteenth century and its economy and society changed greatly. We have been constructing data-base of wages and prices in many sections of industries, using mainly governmental statistics, by regions and prefectures, from the late 1890s onward and examining how labour markets in Modern Japan were being regionally integrated during the industrialization.[1] Our previous researches, on the labour-market integration of carpenters and male agricultural labourers between 1899 and 1940, have shown that the both markets were increasingly integrated in terms of narrowing wage-differentials.[2] In addition, by using cointegration test and error correction model (ECM), we have shown that some of once integrated markets in the pre-modern period, such as the labour market of carpenters in Kyoto, the former capital of Japan, were disintegrated in terms of the synchronization of wage-movement.

In this paper, we will expand our research interest to wider dimensions and discuss more sections of the industry; general labourers and metal workers. Against this background, this paper has two targets. Firstly, it will examine the pattern of market integration. Although many types of indicators for standard of livings have been examined recently, we will see just "classical" indicator of living-standards, real wages, in this section. Secondly, we will explore the relationship between labour market integration and changes in real wages. Thirdly, we will consider what factors affected on the market integration by trades. By investigating them we will try to the characteristics of industrialization in modern Japan.

2. Data and Method

We illustrate briefly on what data our discussions are based on and their characteristics. The governmental department which begun to collect records of prices and wages was the Department of Agriculture and Commerce (Noshomu-Sho), which was established in 1881, and its data are almost consistently available for statistical analysis from the 1890s. Although the number of prefectures available in its statistical gazette reduced to 13 after 1919, the data are obtainable basically to the end of

* This is part of research project funded by Ministry of Education, Culture, Sport, Science and Technology, Japan, called "Research Project on Risk Communication and Management based on Reki-Show Authoring Tool".

[1] For further information, see<http://www.fcronos.gsec.keio.ac.jp/englishsite/e_home.html>.

[2] K. Saito, 'Market Integration and the Standard livings in Modern Japan, with special reference to skilled workers and agricultural labourers, 1899-1940', *Mita Gakkai Zasshi (Mita Journal of Economics)*Vol.97, no.4, (2005); K. Saito, K. Tomobe and T. Hirayama, 'Market Integration and the Standard livings in Modern Japan, with special reference to skilled workers and agricultural labourers, 1899-1940', paper presented to Fifth World Congress of the Cliometric Society, July 2004.

the 1930s.[3] The method taken to survey by the Department and its successors was, what is called, "representative sampling". Data in Kanagawa prefecture, for instance, is not an average of data recoded over the prefecture but a sample regarded as "typical" by the officers of the Chamber of Commerce, which researched on behalf of the Department, in the region, Yokohama, the capital of Kanagawa, in this case.[4] And, all the data of wages discussed in this paper are daily wages and were originally recorded by three ranks, i.e., upper wage, medium wage and lower wage, until the 1910s. Figures we will show are arithmetic averages calculated from all the data in each case.

In this paper, we will discuss wages in four groups of workers, agricultural labourers, carpenters, metal workers and general labourers. Each is representative respectively of the traditional and unskilled section, the traditional and skilled section, the modern and skilled section and the modern and unskilled section. Metal workers here means iron smiths, iron founders and turners, and the figures are the average of the data of these three types of workers. All the wages of the four sections are collected by the 13 regional series mentioned above.

Touching quickly on the features of the workers, agricultural labourers and carpenters can be, needless to say here, seen typical groups as traditional workers in Japan as in other countries.[5] On the other hands, metal workers and general labourers are classified in the modern section. Workers in this section were central to the Japanese modernization their wage rose in the 1930s when the munitions industry grew especially. However, some types of metal workers, e.g., smiths, in Japan were in the transitional phase from the traditional feature to the modern one because the Japanese society was introducing a lot of Western technology and skills in this period, thus it is difficult to discern its changes in the statistics. And, general labourers, "Hiyatoi-ninpu", were daily and casual workers who were engaged in auxiliary work to construction workers i.e. carpenters and builders, engineering work, and many types of transporting jobs. Again, it is not easy to say how far general labourers were modern type workers and it is thought that many types, from relatively traditional ones to modern ones, are included in this classification. However, they were workers who were generated in the process of the modernization and, in many cases, were employed as temporary workers in modern factories.

Four Categories of workers

	Unskilled	***Skilled***
Traditional	Agricultural Labourers	Carpenters

[3] The 13 prefectures(cities where actually records were collected) are the followings; Hokkaido(Otaru), Miyagi (Sendai), Tokyo (Tokyo), Kanagawa(Yokohama), Niigata(Niigata), Aichi(Nagoya), Ishikawa(Kanazawa), Kyoto(Kyoto), Osaka(Osaka), Hyogo(Kobe), Hiroshima(Hiroshima), Kochi(Kochi), Fukuoka(Fukuoka).

[4] As for the feature of governmental statistics in this age, see, Y. Matsuda(ed.), Institute of Economic Research, Hitotsubashi University, *Meiji Fukei no Soukatsu Tokeisho Kaidai (1)* [On the Governmental Statistics by the Prefectures in Meiji] (1980).

[5] The governmental statistics divided them into two types; day-workers and yearly-employed workers. And, even in the same category, what they actually worked depended on seasonality and regional variations. In that sense, the following observation can sketch out only one aspect of the discussion.

Modern	General Labourers	Metal Workers : Turners : Iron Smiths : Iron Founde r s

After collecting the data of wages, nominal wages, we calculated real wages as an index of standard of living. Usually, the real wage is calculated by deflating nominal wage series by the corresponding cost of living index. However, the calculation of the cost of living index at the level of prefectures is in progress in our project and not perfectly available yet. Therefore, in this paper, we use the price of rice as the deflator to the real wage.[6] In other words, "real wages" in this paper are, what are called, "grain wages". Needless to say, rice is the staple grain on which the Japanese people have lived and no problem to be used to calculate grain wages.

By using regional wages series and series of rice price, the real wages are calculated; 13 series for carpenters, metal workers and general labourers and 8 series for agricultural labourers. Because some regions recording wages of agricultural labourers were not matched with the series of other sections and rice price, the number of regional real wages series of agricultural labourers has had to come smaller than others. Real wages of the four sections can be seen in Figure 1.[7]

3. Real Wages

Many economic historians of modern Japan largely agree that standards of livings in Japan in general started to rise from the middle of the 1920s.[8] Figure 1 shows real wages of the four sections between 1899 and 1939 and it seems that we can see the same trends in our "grain wage". We will summarize briefly the characteristics of the movement.

We divide all the years in to five phases; (I) 1899-1913, (II) 1913-18, (III) 1918-25. (VI) 1925-31, (V)1931-39.And, firstly, we observe the followings. In Phase I, the real wages did not change or slightly deceased. Phase II was during the First World War and the real wages rose and fell rapidly. Phase III and IV are a relatively long upswing phases. Phase III is a quite turbulent period because it includes the Rice Riot in 1818 and the Great Earth Quake in 1923. From 1925, although there were still some fluctuations, real wages tended to increase until 1931. And, in the Phase V, the wages began to fall again. Although, we will use this observation in the next section, it is really important to point out that we can see the very

[6] Because data of retail price of rice are not available between 1923 and 1929, we used wholesale prices instead, weighting the average ratio of the latter to the former respectively for 5 years before and after the period with no retail-data.

[7] As the result, data of different, but geographically near, regions are used for data of some regions; data of Miyagi for Iwate between 1901 and 1939 and Aichi for Mie.

[8] R. Minami, Turning Point in the Japanese Economy, (Sobunsha, 1970), p.19. ; K. Odaka, Analysis in the Labour Market,(Iwanami, 1984), P. 95. For longer period, See, Saito,O., 'Rethinking wage-fluctuations in the late Edo to the early Meiji era', in *Keizai Kenkyu*, Vol.44, No.4(1993); Umemura, M., 'Real wages of building workers, 1726-1958', in *Keizai Kenkyu*, Vol.12, No.2(1961).

similar movement of the real wages among the four sections.

Since our real wages are grain wages, the fluctuations of the real wages owe much to those of rice-price. And, as seen in Figure 2, which shows the price of rice, the prices at the national level decreased a lot between 1925 and 1931 and it is the reason why the real wages in the Phase IV rose. Secondly, in the large part of the period, obviously rank of the wages were very stable among the sections; carpenters in the highest, metal workers in the second high, general labourers in the third and then agricultural labourers. Although we have not shown here, female agricultural labourers' wages were lower than male's one. Thirdly, relating to the second point, in 1931, the real wage of the metal workers overtook that of carpenters. 1931 was the year when the Manchuria case, a military action by the Japanese Army, occurred. It seems that needs for the metal workers, especially for engineering workers, were accelerated by the munitions industry and then their wage jumped up from that year.

4. Regional labour market integration

In this section we will see regional market-integration and its relationship with the real wages. In the First place, we will see the market integration by using the index of the dispersion of the wages. Figure 3-1 to 3-4 show the convergence between the regions in nominal and real wages in the four sections of workers at the national level. In order to see the convergence, coefficient of variation is applied to.

From these Figures, the followings can be observed. Firstly, except for the early part of the indices of the agricultural labourers, CVs of the real wage moved almost together with those of the nominal wages. This means that the influence of the price-fluctuation over the country was almost same over the country. In fact, as Figure 2 shows, CVs of rice price over the regions almost kept on decreasing and stayed on quite low level. Secondly, both the CVs of the real wages and the nominal wages tended to decrease until 1931 and then to 1939, except for those of metal workers whose CVs rose between 1931 and 39. Thirdly, the Wage movement of general labourers depicts almost same shape as that of carpenters, but the influence of the economic crisis between 1929 and 33 was greater than carpenter. Relating to the third point, although CVs of carpenters' wages were decreasing over the years, the synchronization of wage-movement was diverging and the disaster in 1923, the Great Earthquake, seems to have had an essential impact. Certainly, the CV of carpenters' wage in 1923 is on a peak around the year. On the other hand, CVs' movement of wages of general labourers are quite different from that of carpenters. We can see three features; (i) CVs of general labourers are more volatile than those of carpenters, but (ii) unlike the case of the carpenters, there is no peak in 1923 on series of CVs of general labourers. (iii) General labourer's CVs have two obvious peaks on 1818, the year of the Rice Riot, and on 1933, the end of recession. This shows that even within the same kind of industry, i.e., carpenters and general labourers, the influence of "crisis" varied.

In the second place we briefly examine the relationship between the integration and the standard of livings. Industrialization, it is often said, led to the market integration and then to rise in standards of livings.[9] However, a few cases have been examined quantitatively in the Japanese industrialization on this and the following is an attempt to observe it.

Firstly, we will try to see how the market integration linked with real wages. As seen, almost over the years, the CVs of the four sections tended to decrease. We, therefore, expect a negative relationship between the real wages and the CVs. Table 1 show the influence of Market Integration on the Real Wages; between

[9] For instance, see, E.H. Hunt, 'Industrialization and Regional Inequality: Wages in Britain, 1760-1914', Journal of Economic History, Vol. 56, No.4 (1986); W.B. Rothenberg, 'The Emergence of Farm Labor Markets and the Transformation of the Rural Economy: Massachusetts, 1750-1855', Journal of Economic History, Vol. 58, No.3, (1988).

1899 and 1939 by sections of workers.

Secondly, in order to examine the relationship between the real wages and the market integration, we estimate the number of mutually integrated markets by using three of five Phases which we have divided in the previous section. Our basis idea is that when two, or more, data-series are integrated, it can be interpreted that there is a long-term (equilibrium) relationship between the series. We use cointegration test for this. Our procedure is the followings. In this case, we use wage data of 14 regions of the period, and in the first step, we make all possible combinations of two regions from the 14 regions and test whether or not a set of the two regions has a cointegration relationship. Doing so, for instance, if there are ten sets of mutually cointegarted markets in a country and then the number increase thereafter, we think that the country has become more integrated about the market in question. Table 2-1 shows the result of the test for Phase I, 1899-1913. In this case, the wage series of the tested prefectures are the followings; Akita, Miyagi, Ibaragi, Niigata, Nagano, Aichi, Osaka, Hiroshima, Shimane, Kochi, Tokushima and Nagasaki. Because of the discontinuity of the record-keeping, prefectures included in the second and the third period are different from the first one and the followings have been tested; Hokkaido, Akita, Iwate, Ibaragi, Niigata, Shizuoka, Nagano, Mie, Osaka, Hiroshima, Shimane, Kochi, Tokushima and Fukuoka. Table 2-2 shows the result of Phase VI, 1925-31, and Table 2-2 shows that of Phase V. From Phase I to Phase IV, the number of cointegration-couple increased drastically; 20 to 66. This is a marvellous "improvement". From Phase IV to Phase V, the number of couple kept on increasing but more moderately; 66 to 73. Therefore, from these results, we can say that labour markets of agricultural workers at the national level were increasingly being integrated over the years.[10]

5. Explaining the integration

Because it is observed that the speed and degree of market integration differed among trades, as a next step, we will examine briefly what actually affected on the market integration by the trades. We will see the influence of price of rice, the mobility of people and construction work on the convergence of wages.

Firstly we will examine the influence of convergence of rice-price on the convergence of wages. Rice was, needless to say, one of typical staple products in Japan. And, as seen in Figure 2, CVs of rice-price tended to decrease until 1919 and then started to fluctuate. However, although CVs of rice price begun to increase earlier than those of the workers' wages, there is largely expected to be a positive relationship between the variable and CVs of the agricultural wages, also and other trades. In the agricultural sector its wages were observed to be largely based on the price of rice.[11] Secondly, we have seen how people's mobility accounted for the wage convergence. "Rule of One Price" tell us that industrialization accelerates arbitration of wages and prices. If the industrialization speeds up the mobility of people, the latter accelerates integration. As an indicator for it, railway passengers-kilometres is adopted because we might be able to expect that as the increase of number of passengers and kilometres in railway there would be an increase in mobility of people. We, therefore, expect a negative relationship between the variable and the CVs. Thirdly, the amount of expenditure for public work by local governments is taken as a variable to account for vitalization in the construction work. Carpenters and general labourers should be affected by the amount of construction work. The wages in agriculture might also be accounted for by it because mobility of the labour force can be thought to have existed between the two sectors.

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[10] We have estimated adjustment coefficients for these cointegrated combinations. The details were reported as"*Real wages and the Market Integration in Modern Japan:*Male agricultural labourers, the 1890s to the 1930s" at the second International Conference on Economics and Human Biology in 2002.

11 S. Senda, *A Study of Agricultural Employment* (Tokyo, 1971).

The result is shown in Table 4. As for the impact of rice price, unexpectedly, only the wage movement of male agricultural labourers has a nearly significant relationship, and all the other trades have no significant sign. As for the variable for mobility, all the workers have strong relationship and carpenters have an especially strong relationship in particular. Carpenters are traditionally a type of tramping artisan, and therefore this is quite understandable.[12] About public work, we can also point out the strong influence on carpenters again. However, its effect is insignificant on general labourers whereas significant to agricultural labourers. Finally, because we could not find any distinctive variable to explain the integration of general labourers' market, we have tested the number of cart, which has shown significant sign. This result might reflect the fact that the range of jobs covered under the classification of general labourers is large and daily transport work is one of them.

6. Concluding Remarks

In this paper, we have discussed how labour markets in modern Japan changed, focusing on the movement of real and nominal wages in the four sections of workers. If we conclude very safely, our claim is that from the early 20th century to the ear1y 1930s the market integration and real wages increased together. However, we cannot generalize this happy relationship in the long run. Almost in the 1930s, although the number of integrated markets increased, real wages was in the decreasing direction. In this paper we can show only preliminary results and our picture from it is still vague. In order to discuss the picture in the details, we need to examine the relationships between the market integration and real wages at more inter-regional level, by using not only governmental statistics but also other sources. In addition, the impact of the industrialization depends on what a labour market in question is and we have to know the internal structure of industries and markets. In addition to that, as Figure 1 also shows, wage movement of some modern section of industry, such as engineering, is different from traditional one, e.g., carpenters' one. In Japan of this period wage-level of the former was overtaking the latter and it is said to be have come a threshold of creating "dual labour markets". In these senses, again, this paper is a just preliminary study for it. We are going to discuss them soon.

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[12] This is true of many countries. For the English case, see G.R Boyers and T. Hatton, 'Regional Labour Market Integration in England and Wales, 1850-1913', in G. Grantham and M. MacKinnon (eds.), *Labour Market Evolution: The Economic History of Market Integration,Wage Flexibility and the Employment Relations* (London, 1994); E.H. Hunt, 'Industrialization and Regional Inequality: Wages in Britain, 1760-1914', *The Journal of Economic History*, Vol. 56, No.4 (1986).

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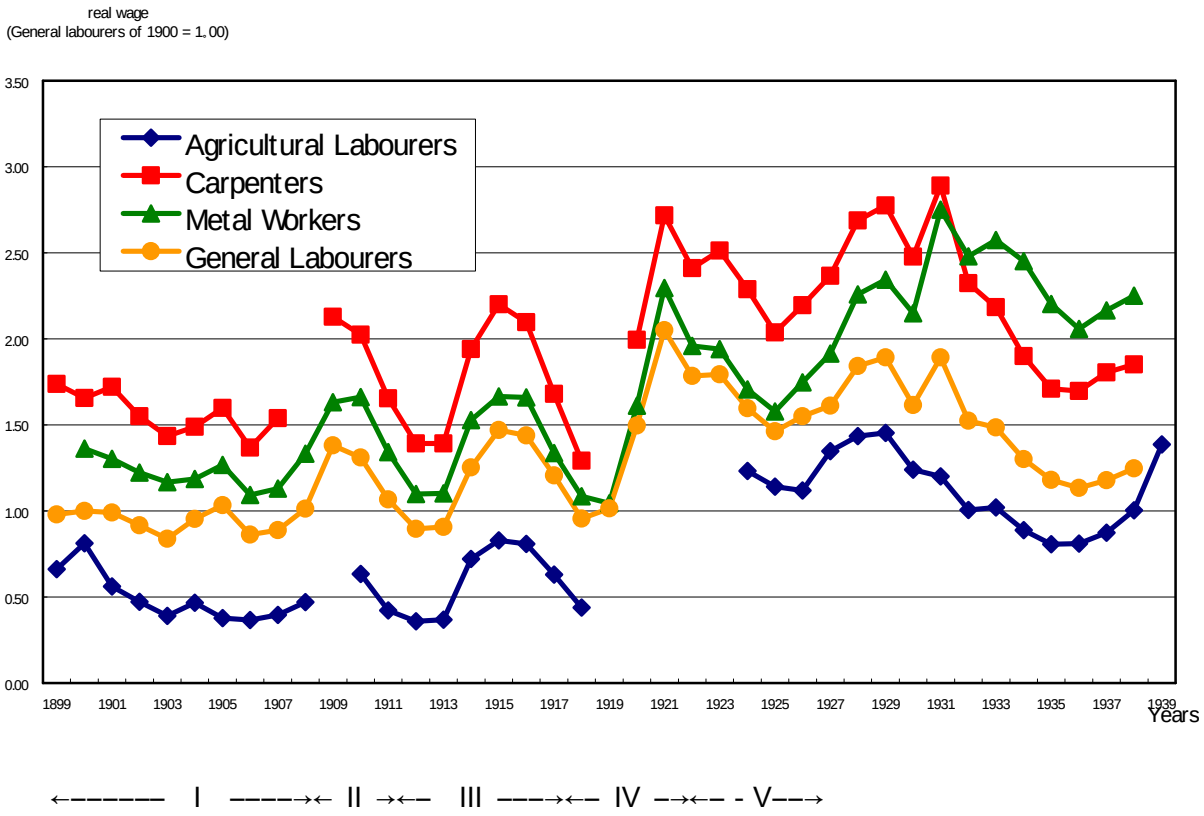
Figure 1. Real wages of all sections of workers, 1899-1939



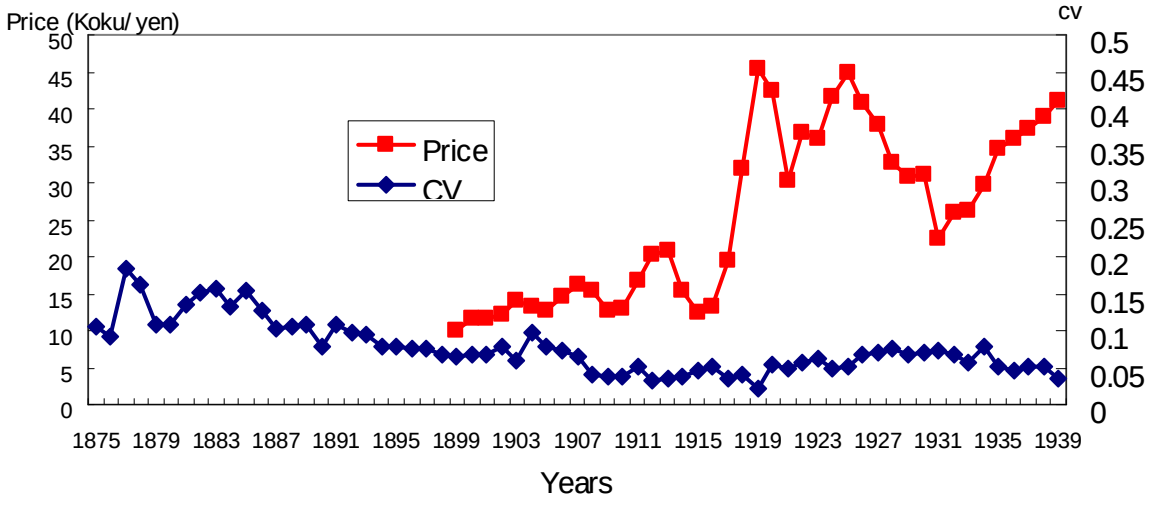
Sources: Statistics of the Department of Agriculture and Commerce (Noshomu-Sho) and the Department of Commerce and Industry (Shoko-Sho).

Note : (1) All the period is divided into fives phases. Years in each the phases are the followings;

I : 1899 - 1913, II: 1913-18, III: 1918-25, IV: 1925-31 V:1931-39.

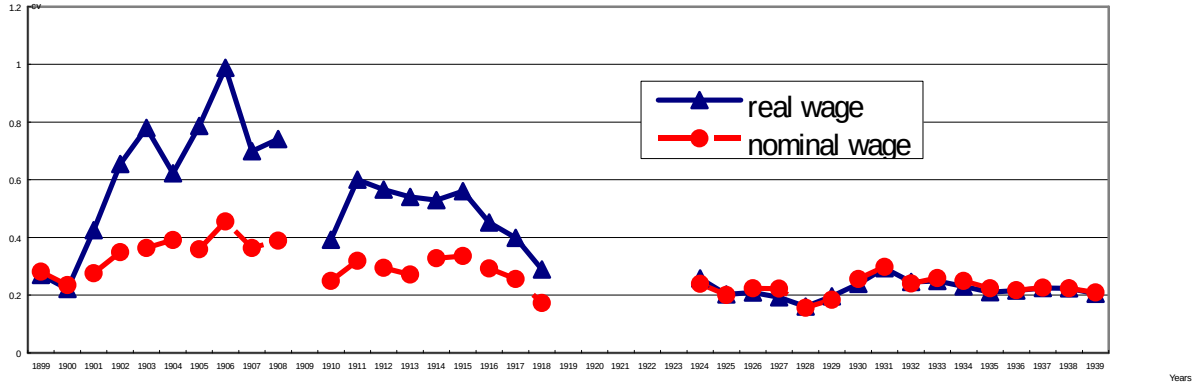
(2) “real wages” in this figure are “grain wages” and the price of rice is used as the deflator.

Figure 2. Rice: Price and CVs, 1873-1939



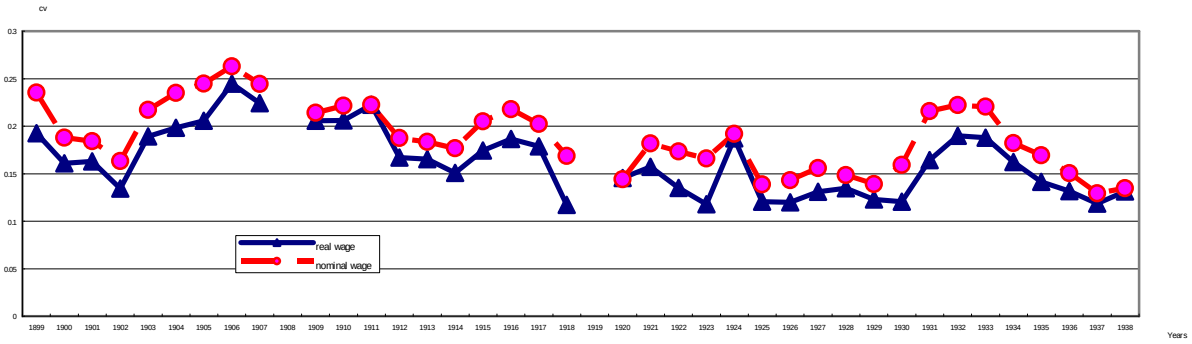
Note: CV before 1899 are estimated by N.Oiwa, The market of rice in Modern Japan (2003, Tokyo), otherwise see 'Sources'.
Sources; the Department of Agriculture and Commerce (Noshomu-Sho) and the Ministry of Agriculture (Norin-Sho)

Figure 3-1. Convergence in nominal and real wages at the national level: Agricultural labourers, 1899-1939



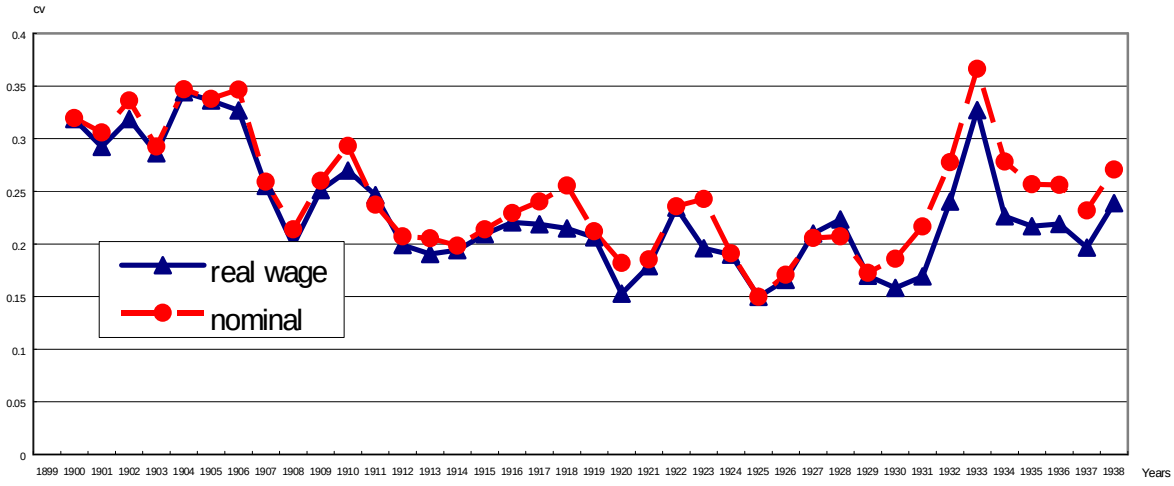
Sources; the Department of Agriculture and Commerce (Noshomu-Sho) and the Ministry of Agriculture (Norin-Sho)
Note:

Figure 3-2. Convergence in nominal and real wages at the national level: Carpenters, 1899-1938



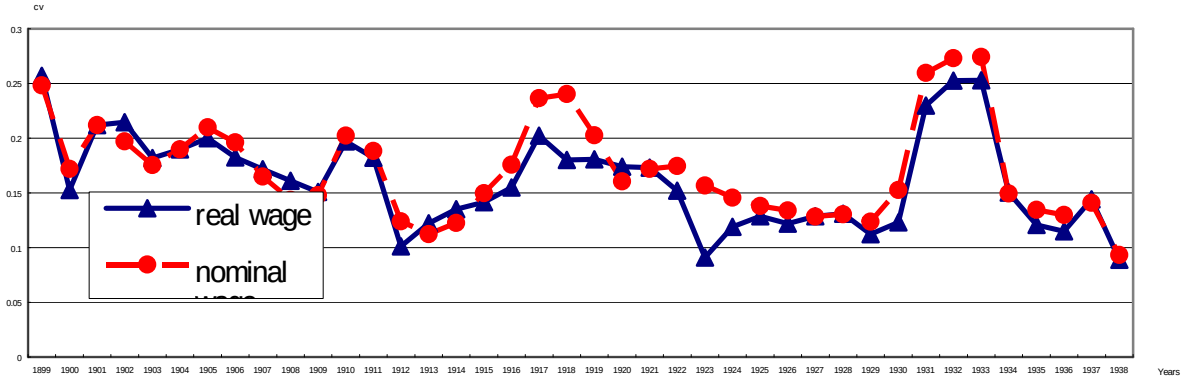
Sources; Same as Figure 3-2. Note:

Figure 3-3. Convergence in nominal and real wages at the national level: Metal workers, 1900-1938



Sources; Same as Figure 3-1. Note:

Figure 3-4. Convergence in nominal and real wages at the national level: General labourers, 1899-1938



Sources; Same as Figure 3-1. Notes

Table 1 Influence of Market Integration on the Real Wages; 1899-1939, by sections of workers

	Agricultural Labourers	Carpenters	Metal Workers	General Labourers
All Period	-2.32	-11.77	-7.36	-4.25
(t-value)	(-6.53)	(-2.18)	(-2.03)	(-1.25)
(observations)	(35)	(38)	(39)	(40)

Note: significant at 5 %.
Source: Same as Figure 1

Table 2-1. Cointegration Test: Wages of agricultural labourers by 13 major prefectures: 1899-1913:

	Akita	Nagasaki	Hiroshima	Ibaragi	Miyagi	Kochi	Aichi	Nagano	Niigata	Osaka	Shimane	Tokushima
Akita	---		16.96**									
Nagasaki		---									22.30*	
Hiroshima			---	26.59*	21.18*		15.48**		21.99*	17.15**	20.62*	16.32**
Ibaragi				---		23.82*			17.49**			20.78*
Miyagi					---	17.88**					20.78*	
Kochi						---					17.34**	
Aichi							---				21.65*	
Nagano								---		20.35*		
Niigata									---		21.47*	
Osaka										---	17.48**	
Shimane											---	19.44**
Tokushima												---

Note: Trace statistics, * : significant at 1 %, * * : significant at 5 %.

Source: Same as Figure 1

Table 2-2. Cointegration Test: Wages of agricultural labourers by 13 major prefectures: 1925-1931 :

	Akita	Fukuoka	Hiroshima	Hokkaido	Ibaragi	Iwate	Kochi	Mie	Nagano	Niigata	Osaka	Shimane	Shizuoka	Tokushima
Akita	---	22.99*	18.74**	21.73*	33.78*	27.68*	34.26*	28.08*	24.35*	23.57*	31.88*	22.69*	24.21*	30.80*
Fukuoka		---		18.10**	22.72*	18.76**	22.39*			19.58**	20.16*		18.39**	
Hiroshima			---		19.34**	23.16*	25.65*				15.73**		20.56*	19.05**
Hokkaido				---		26.25*		15.79**		19.14**			24.44*	
Ibaragi					---	32.06*	36.67*	18.89**	27.94*	23.03*	28.34*	24.84*	35.57*	23.27*
Iwate						---	26.66*	16.55**	23.06*	23.84*	23.65*	22.73*	20.39*	23.94*
Kochi							---	24.15*		23.96*	33.68*	29.39*	28.24*	27.29*
Mie								---		15.61**	19.55**		15.43**	22.08*
Nagano									---	26.13*			24.77*	
Niigata										---	19.44**		28.45*	
Osaka											---	19.12**	25.86*	15.50**
Shimane												---		16.50**
Shizuoka													---	22.80*
Tokushima														---

Note: Trace statistics, * : significant at 1 %, * * : significant at 5 %.

Source: Same as Figure 1

Table .2-3. Cointegration Test: Wages of agricultural labourers by 13 major prefectures: 1931-1936 :

	Akita	Fukuoka	Hiroshima	Hokkaido	Ibaragi	Iwate	Kochi	Mie	Nagano	Niigata	Osaka	Shimane	Shizuoka	Tokushima
Akita	---	44.26*	17.52**		30.92*	23.16*	17.13**	39.40*	23.77*	30.33*	30.07*		30.53*	18.99**
Fukuoka		---	41.68*	51.09*	55.49*	38.60*	37.19*	55.80*	44.58*	51.68*	47.96*	34.58*	58.43*	40.21*
Hiroshima			---		31.26*	19.66**		25.32*	20.51*	27.29*	21.89*		31.38*	
Hokkaido				---	17.92**								32.04*	
Ibaragi					---	28.37*	25.33*	46.22*	33.16*	38.07*	40.14*	24.67*	45.81*	24.27*
Iwate						---	15.98**	37.19*	18.93*	29.28*	28.48*		26.58*	17.72**
Kochi							---	41.61*	17.52**	20.97*	19.67**		23.43*	
Mie								---	38.06*	37.48*	31.74*	36.01*	25.49*	20.61*
Nagano									---	24.80*	29.26*	16.29**	33.55*	16.02**
Niigata										---	34.48*	18.66**	35.68*	21.09*
Osaka											---	18.21**	39.89*	20.07*
Shimane												---	22.32*	
Shizuoka													---	30.29*
Tokushima														---

Note: Trace statistics, * : significant at 1 %, * * : significant at 5 %.
Source: Same as Figure 1

Table 4. Explanation of the wage convergence by occupations, the 1890s to the 1930s

	(1)	(2)	(3)	(4)
CVs of rice price	0.31	0.1	0.73	0.21
(t-statistics)	(0.81)	(0.22)	(1.9)	(0.40)
R^2	0.01	0.001	0.1	0.005
Observations	38	40	34	36
Railway passenger-kilometers	-0.0000022	-0.0000017	-0.0000012	-0.0000012
(t-statistics)	(-5.56)	(-2.90)	(-3.36)	(-2.1)
R^2	0.46	0.16	0.26	0.12
Observations	38	45	35	36
Public work	-0.00015	-0.000077	-0.00011	-0.00014
(t-statistics)	(-4.47)	(-1.61)	(-3.06)	(-2.79)
R^2	0.36	0.059	0.22	0.19
Observations	38	43	35	36
Number of cart		-0.0000004		
(t-statistics)		(-2.37)		
R^2		0.12		
Observations		44		

Note: (1) Carpenters (2) General labourers (3) Agricultural labourers (Male) (4) Agricultural labourers (Female)

:Railway passenger-kilometers=the number of passengers between stations × kilometres between the stations

: Public works= Amount of expenditures by local governments on constructing public goods

Sources Price of rice: Statistics of the Department of Agriculture and Commerce (Noshomu-Sho) the Department of Commerce and Industry (Shoko-Sho) and the Ministry of Agriculture (Norin-Sho);Railway passenger-kilometres: *Estimates of Long-term Economic Statistics of Japan* (Choki Keizai Tokei), 12. Railway and Electricity; Public work: Statistical Gazette of the Japanese Empire (Nihon Teikoku Tokei Nenkan); Number of carts: *Estimates of Long-term Economic Statistics of Japan*, 4. Capital Formation.