INDICES OF THE EXCESS DEMAND FOR LABOR IN PREWAR JAPAN, 1929–39: A PRELIMINARY STUDY*

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I

It conforms to the tradition of the neo-classical economic thinking to express the price of labor services in terms of real wages. Consequently, relatively little effort was made to study the behavior of money wages until the series of papers were published by Phillips and Lipsey in the late 1950's and the early 60's.[1] After their publication, however, a large number of similar attempts has been reported covering various advanced nations. With regard to the contemporary Japanese economy, the researches conducted by Watanabe and Ono have presented the results generally favorable to the Phillips-Lipsey hypothesis.[2]

The present study owes its motivation to the desire to understand the behavior of money wages in the manufacturing industries of prewar Japan by reëxamining and extending a contribution by Watanabe.[3] The purpose of this paper, however, is quite a modest one. It intends merely to prepare a basic foundation for the further empirical investigations by carefully exploring various statistical data which may be found useful in explaining the movements of manufacturing wages prior to WWII. Special emphasis is laid on the discussion of the indices of the excess demand for labor, and a case will be made for favoring the indices other than the unemployment rate. In addition, a structural characteristic of the labor market will be pointed out as a result of the empirical investigation à la Phillips. The period of 1929–39 is selected, as the prewar unemployment statistics are available only for these years.

II

In this section, the following five ratios will be briefly discussed as the possible candidates

* This work is supported in part by a grant from the Seimeikai Foundation. In addition, a portion of the data processing has been assisted by Tokyo Center for Economic Research. Most of the computations has been carried out by the NEAC electronic computer system at the Institute of Economic Research, Hitotsubashi University. The writer wishes to acknowledge valuable advices and encouragements extended to him at various stages of the research. Not all of the comments on an earlier draft of the paper has been incorporated in the present version; had the writer done so, the entire reorientation of the work would have been necessary.

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[1] Even before the contribution by Phillips the same kind of formulation was attempted by others (e.g. Klein-Goldberger [7]). However, it was only after the appearance of the Phillips-Lipsey papers that the issue of money wages attracted wide attention, especially in connection with the problem of rising prices.

[2] See Watanabe [21, 22] and Ono [12, 13].

[3] Watanabe [21].

for the index of the excess demand for labor :[4]

(1) Unemployment rate ;
(2) Separation rate ;
(3) Accession rate ;
(4) Competition index ; and
(5) Placement ratio.

Let it be noted in the beginning that these statistics are, if anything, no more than ordinal indicators of the conditions of the market.[5]

(1) Unemployment Rate (U)

One might argue that the unemployment rate bears little significance in an economy like Japan, which has been characterized by the highly elastic supply of labor as well as by the existence of the so-called "disguised unemployment."[6] This argument cannot be lightly shoved away. Nevertheless, one should recognize that the unemployment rate serves at least as a partial gauge of the conditions of the labor market in general, as amply demonstrated by Umemura's computation.[7]

Unfortunately, the unemployment statistics in the prewar days seem unfit for any serious analytical purposes. An examination of the making of the data leaves a strong impression that the series were artificially manufactured for lack of a better method. (After all, what could one expect in those days when no labor force survey existed?) An unemployed person was defined in the prewar surveys as the one who was currently unemployed and seeking a new job. With respect to the day laborers, it referred to those who had been unemployed for more than ten days during the past month.[8] The figures were estimated by local governors and tabulated at *Shakaikyoku* [Social Welfare Bureau, Ministry of Interior].

It is not hard to imagine that the method of the estimation varied from one place to another. In the case of the City of Osaka, for instance, the current unemployment rate was figured out by multiplying the 1925 rate, derived from *Taishō 14 nen shitsugyō tōkei chōsa* [the 1925 Unemployment Census],[9] to the inverted arithmetic average of the following six numbers (set unity for 1925) purporting to be the indices of the business conditions of the City : wholesale prices, the turnover of the bills of exchange, warehousing activity, the number of electric train passengers, the ratio of new hires to discharges, and the number of placements in the unemployment relief project.[10]

[4] In recent years, the index of unfilled vacancies has become increasingly popular especially in the U.K. and the U.S. It has been contended that the index is valuable in detecting the presence of the so-called "structural" unemployment. Such data are not available for the years in consideration. See NBER [10].

[5] The same remark has been made by Dow and Dicks-Mireaux [3] concerning the statistics of unfilled vacancies and the unemployment rate (p. 1).

[6] As a corollary to this type of argument, some contends that it is misleading, if not erroneous, to apply the Phillips-Lipsey model to Japanese economy. See Tsujimura [19], pp. 204-05.

[7] Umemura [20].

[8] Prior to July 1931, the unemployed among day laborers were defined to be those who were both currently *and* had been unemployed for more than a quarter of the previous month. For a presentation of the prewar unemployment statistics, see Minoguchi [9].

[9] The first of the two prewar unemployment censuses, the second one being administered in 1930. According to these censuses, the amount of unemployment was 110,000 (in 24 municipal areas only) or 4.5% in 1925, and 320,000 (all nation) or 1.1% in 1930. One may suspect that the latter figures are underestimation.

[10] Osaka City [15].

To give another example, the following procedure was observed in the City of Kyoto :[11]

$$U_t = \frac{S_{1925}}{L_t} \cdot \frac{Y_t}{Y_{1925}}$$

where U = unemployment rate ;
S = the number of the unemployed in the area according to the *1925 Unemployment Census* ;
Y = the number of workers applying for jobs at the City Labor Exchange Bureau ; and
L = (labor participation rate estimated from the *1925 Unemplopment Census*) × (estimated current population).

It seems obvious that the statistics collected in such manner as above do not warrant much reliability.

Finally, the unemployment rate scores lower than the other four indices in that it does not provide sexual breakdowns, which, if available, may be instructive for analytical investgation.

(2) Separation Rate

The separation rate is defined as the ratio,

$$\frac{\text{the number of workers who disengaged themselves from work during the month}}{\text{the number of employment at the end of the previous month}}.$$

The tightness of the market condition is reflected on this rate, since good offers are relatively plentiful and the workers more inclined to seek new jobs during the upswing and vice versa during the downswing. In fact, a negative correlation between the separation rates and the money wage levels was discovered as early as 1941.[12] A major defect of the rate, as pointed out by Fujibayashi and others,[13] is that it is a product of several factors which do not necessarily move in the same direction. Broadly speaking, the ratio is composed of the three elements : (a) quits, (b) discharges, and (c) business failures.

In theory, the quit rate is preferrable to the (gross) separation rate as an index of the excess demand for labor, insofar as the data are available.[14] When the number of quits is not separately reported, however, it seems that the rate of entry to factory employment (discussed in (3) below) is a better substitute for the separation rate.[15] For this reason, the separation rate has been excluded from the present computation.

(3) Accession Rate (E)

The accession rate is a concept analogous to the separation rate and is defined as

$$E = \frac{\text{the number of hires during the month}}{\text{the number of employment at the end of the previous month}}.$$

It is clear that this rate reflects largely the state of demand rather than that of supply.

The accession rate has been calculated on the basis of the Bank of Japan's *Statistics of Factory Labour*. It has been discovered during the process of computation that the rate registers relatively sharp upswings at spring and fall, corresponding presumably to the increases of new hires. In particular, an exceptionally large peak is found in April 1931, which might be

[11] Quoted in [16], p. 26.

[12] Fujibayashi [4]; see also Dow and Dicks-Mireaux [3], p. 29, fn. 2.

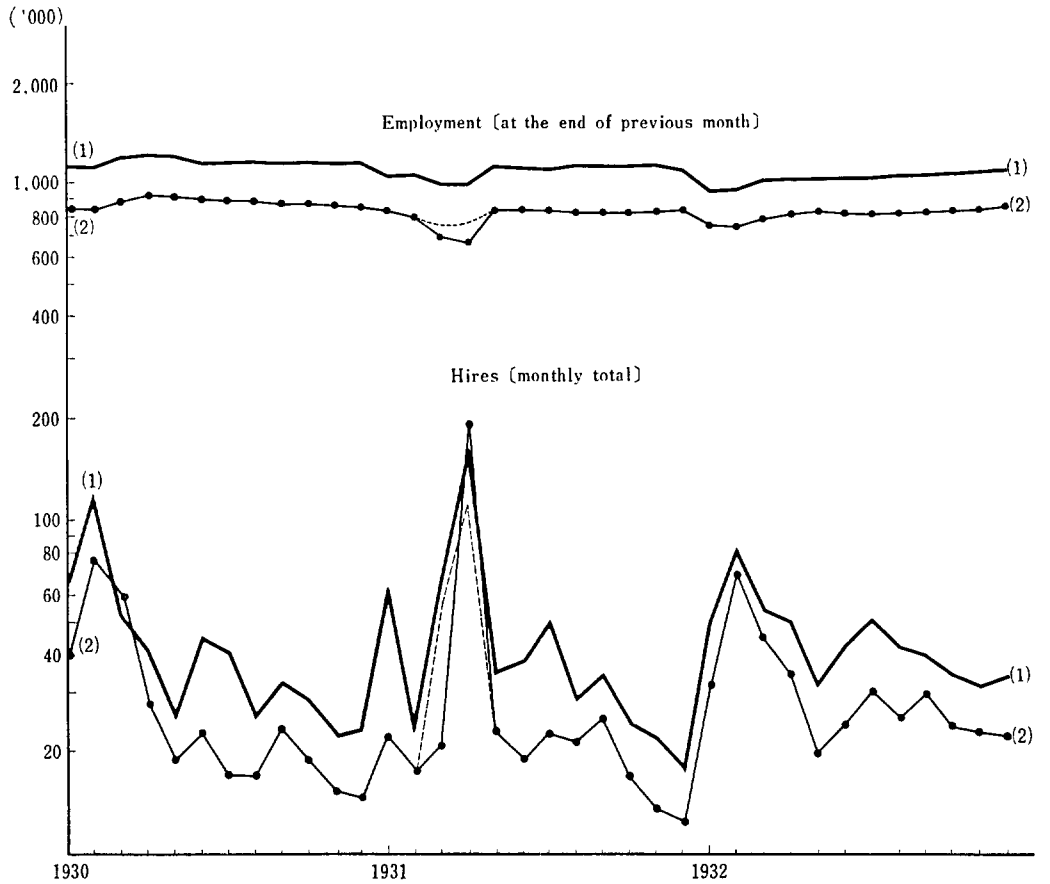
[13] Fujibayashi [4, 5] and Nishikawa [11], p. 54.

[14] See Behman [1], who reports a highly significant relationship between the rate of change in money wages and the quit rate for the case of the postwar American economy.

[15] An examination of the postwar data seems to confirm this expectation. See [6], for instance.

judged as an error in the original data. An examination of the employment data has shown that the sharp rise is due mostly to the silk-reeling industry, which was heavily curtailing its operation during the previous year. Moreover, the general pattern of the number of entries to factory employment is confirmed by an independent survey conducted by the Social Welfare Bureau (see Figure 1).[16] Hence, it was decided to accept the original statistics with only slight alterations.[17]

FIG. 1. TWO SOURCES OF EMPLOYMENT STATISTICS



Notes: The data are for both sexes, (1) being derived from the Ministry of Interior data and (2) from the Bank of Japan data. Neither of them are corrected for seasonal variations.

[16] This survey covered the factories with more than fifty production workers (Takada [17], p. 229). It provides the statistics for both mining and manufacturing industries; no breakdown is available by sex, however.

[17] The dotted lines in Figure 1 indicate the alterations. The modifications were carried out on the following three principles: (i) to minimize the number of changes; (ii) to take the movement of total employment as the standard of reference in the correction; and (iii) to make alterations only in the female figures.

In actual computation of the accession rate, adjustments have been made for industrial and sexual compositions of the production workers. Exactly the same procedure has been followed as that for the adjusted wage series ($\dot{w}'$) (see Section IV) but one difference: manufacturing industries were classified into five, instead of nine, groups due to the limitation of the data.

(4) Competion Index (V)

The competion index,[18] together with the placement ratio described below, is based on the statistics compiled by *Chuō Shokugyō Shōkai Jimukyoku* [the Central Labor Exchange Bureau]; it is defined as

$$V = \frac{\text{the number of new applications submitted during the month}}{\text{the number of new job openings during the month}}.$$

Surprisingly little attention has been directed to the work of the Labor Exchange Bureau in the prewar years. It was 1923 that the central government established the first public employment bureaus in Tokyo and Osaka. Prior to this date, however, private labor exchange offices had been operating in the City of Tokyo since 1906 (run by the Salvation Army) and in the City of Osaka since 1910 (run by Osaka YMCA). The municipal authority of Tokyo City initiated its own bureau in 1911, and that of Osaka City in 1919.[19] According to *Shokugyō shōkai hō* [the Employment Exchange Regulation] of 1921, the state would support the local authorities (cities, towns, and villages) by bearing one-half of the initial, opening expenditure (including the construction cost) and one-sixth of the current expenses thereafter.

Theoretically speaking, the competition index is highly suitable for describing the state of the excess demand for labor, because both demand and supply conditions are represented in this simple formulation. There are difficulties with the statistics, however. First, the domain of the Bureau's influence was neither uniform nor universal. Not only was it largely confined to municipal areas but it might also have failed to encompass big, leading concerns. Second, the value of V is not uniquely determined in the sense that both employers and workers may duplicate their orders or applications. In other words, there may be no one-one correspondence between the ordering of the real excess demand for labor and that of the magnitude of the V-value.[20]

Notwithstanding these defects, it seems to the present writer that there is a *prima facie* reason for preferring the competition index to the other indices discussed in this paper.

(5) Placement Ratio (Z)

The placement ratio, which is defined as

$$Z = \frac{\text{the number of new placements during the month}}{\text{the number of new applications submitted during the month}},$$

may be valuable to supplement the competition index (V). During the business upturns, the number of new applications for jobs will decrease, whereas that of new placements tends to increase; and vice versa during the recessions. Consequently, it is expected that Z is inversely related to the movement of V. Needless to say, the placement ratio shares the same problems which were pointed out with respect to the competition index.

III

The indices of the excess demand for labor are displayed in Figures 2-3 below. In addition,

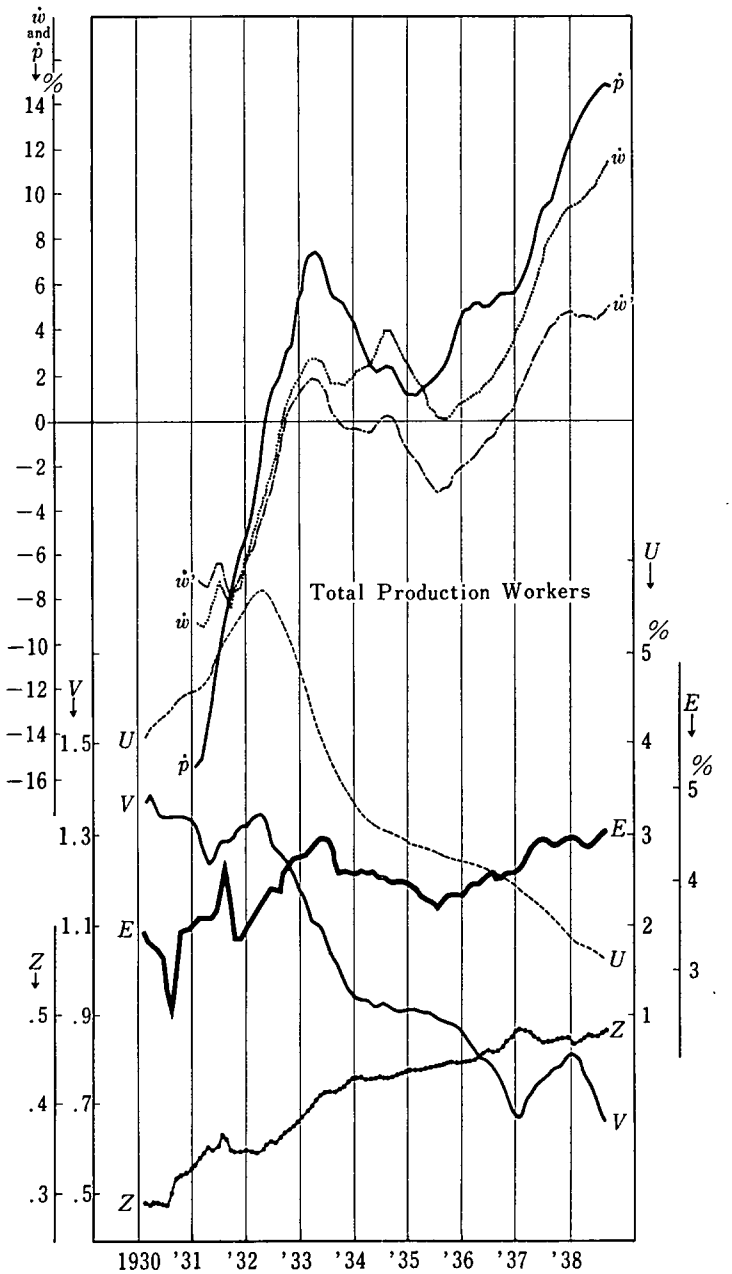
[18] Commonly referred to in the Japanese as *sattō ritsu*.

[19] Osaka City [14] and Tokyo City [18].

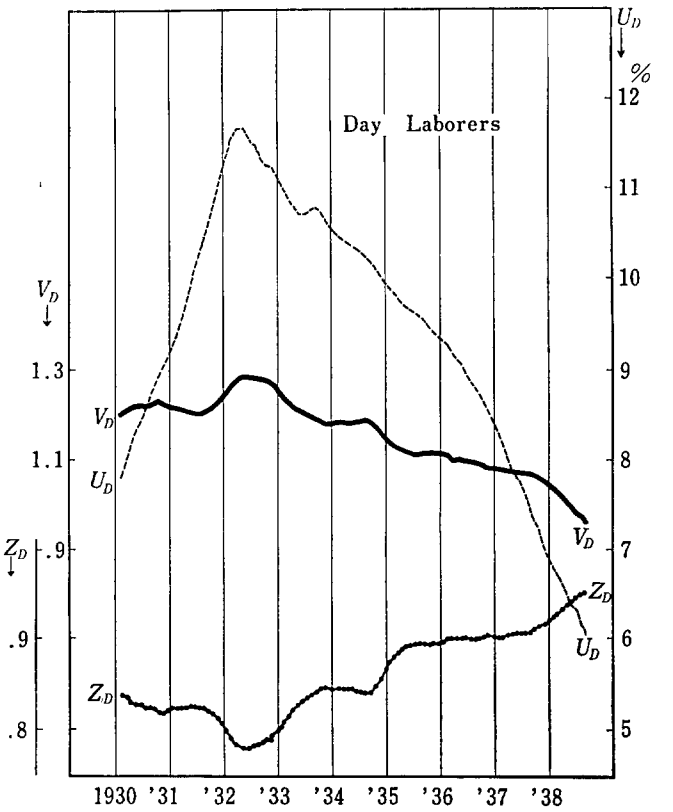
[20] The same point is made by Dow and Dicks-Mireaux [3] in connection with the statistics of unfilled vacancies (p. 2).

FIG. 2. INDICES OF THE EXCESS DEMAND FOR LABOR AND THE RATES OF CHANGE IN WAGES AND IN PRICES

(a)



(b)



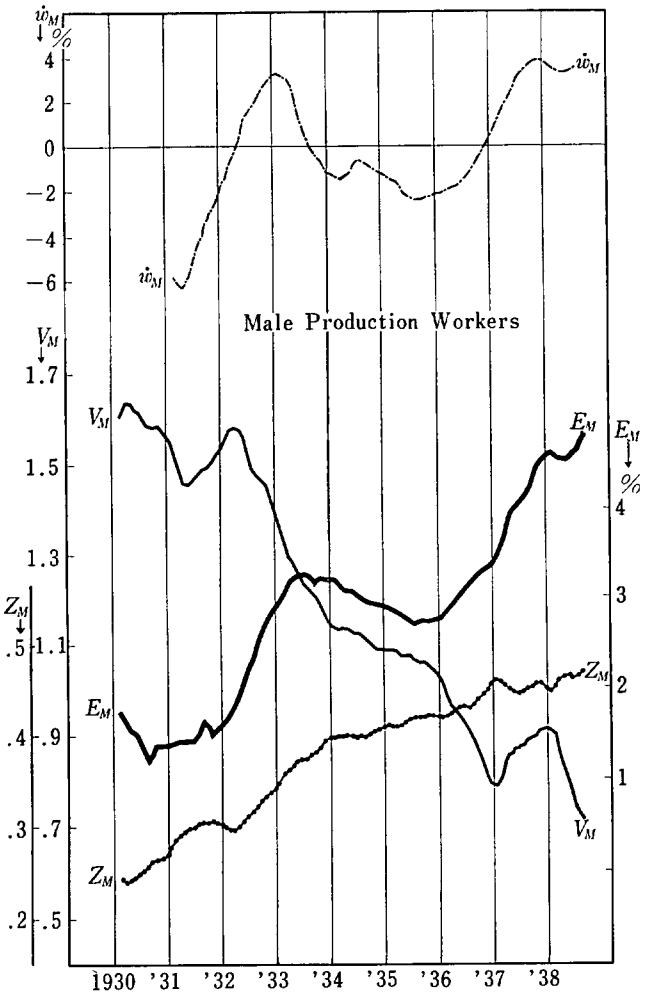
[Notation]

U: unemployment rate
E: accession rate
V: competition index
Z: placement ratio
$\dot{w}$: annual rate of change in daily wages of production workers
$\dot{p}$: annual rate of change in Tokyo retail prices

Notes: 1) For the explanation of the series $\dot{w}'$, see Section IV below.
2) All the series are based on seasonally adjusted, monthly statistics. The data sources are given in the Statistical Appendix.

FIG. 3. INDICES OF THE EXCESS DEMAND FOR LABOR BY SEX

(a)



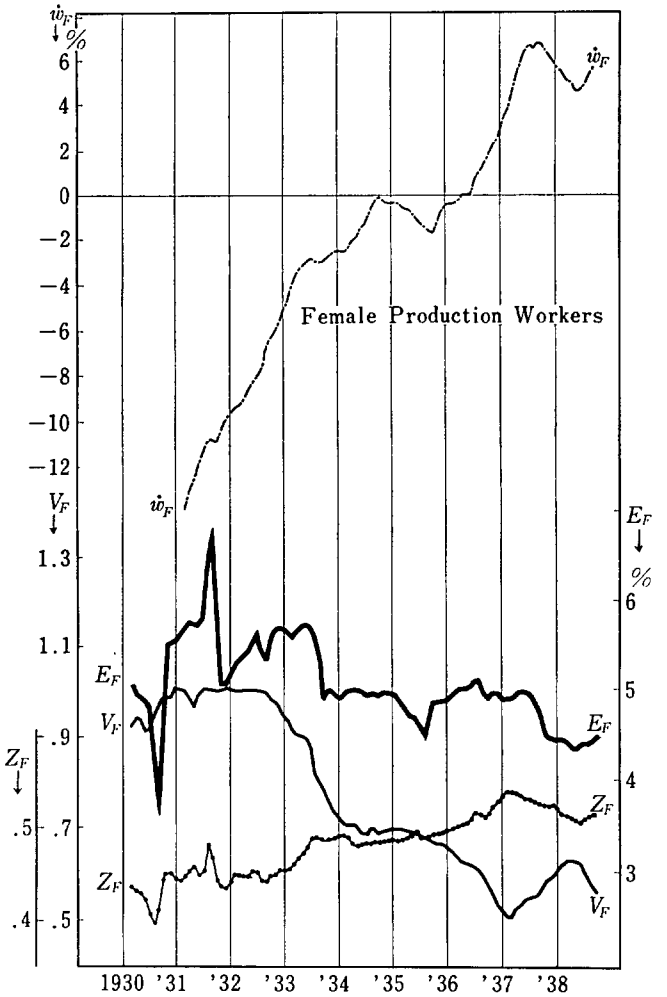
Notes: All the series are based on seasonally adjusted, monthly statistics. The data sources are given in the Statistical Appendix.

the rates of change in money wages ($\dot{w}$) and those in retail prices ($\dot{p}$) have been computed on the basis of the Bank of Japan's monthly reports. The wage statistics adopted here cover, in principle, the private factories employing more than fifty production workers.[21] The price data are arithmetic averages of the retail prices of one hundred consumer goods in the City of Tokyo.[22] All the original data were, first, adjusted for seasonal variations by applying the

[21] The Bank of Japan, *Rōdō tōkei* (Statistics of Factory Labour). This survey encompassed a larger number of manufacturing factories than the other available series collected by Naikaku Tōkeikyoku (Bureau of Statistics, Prime Minister's Office).

[22] To be distinguished from the *CPI* index; for one thing, the price index used here does not include service charges and house rent.

(b)



method of twelve-month moving averages (centered) and, second, transformed to quarterly bases by calculating the arithmetic averages over the adjacent three-month periods: January-March, April-June, July-September, and October-December.[23] After the adjustments were complete, the original series were divided through by the corrected series to test the existence of seasonal factors.

The behavior of the four indices of the excess demand conforms by and large to the *a priori* expectation, despite the several discrepancies in their movements such as observed in the portions of E_M and V_M. It may be noted, on the other hand, that the unemployment rate (U) is the smoothest of all the curves, although its overall behavior does not grossly

[23] It was judged that the nature and the lengths of the original statistics did not justify the use of more elaborate methods for seasonal corrections (e.g. the Census Method XI).

contradict with that of the others.[24] Moreover, the evidence of seasonal fluctuations is least apparent in the U series. These points confirm one's suspicion that the unemployment statistics were probably artificially constructed.

In the remainder of this section and the one immediately following attempts will be made to explore the extent to which these indices are capable of explaining the movements of money wages in the manufacturing industry. In this connection, one observes first of all that all the indices, except for Z, show fairly high degrees of association with the rate of change in money wages (Table 1). At the same time, however, it seems also clear that not all of the fluctuations in the rate of change in money wages can be explained by the index of the excess demand; a great deal more may be explained by taking into consideration the behavior of the retail price index (Figure 2).

TABLE 1. SIMPLE CORRELATION COEFFICIENTS BETWEEN $\dot{w}$ AND THE INDEPENDENT VARIABLES (X)

X	$r_{\dot{w}X}$	X	$r_{\dot{w}X}$
U	−.749	Z	.080
$\dot{U}$	−.753	$\dot{Z}$	−.543
E	.775	$\dot{p}$	.929
$\dot{E}$	−.212	$\dot{p}_{-1}$	.929
V	−.810	$\dot{p}_{-2}$	.914
$\dot{V}$	−.060	$\dot{p}_{-3}$	.889

Note: The dot on the variable indicates the annual (quarter-to-quarter) rate of change.
[Data Sources] See the Statistical Appendix.

In order to put each of the variables to the more concrete test for its explanatory power on the movement of the dependent variable ($\dot{w}$), the following type of linear regressions has been computed:

$$\dot{w} = a + bX + c\dot{X} + d\dot{p},$$

where w stands for money wages, X for the excess-demand index in question, and p for price levels. The dot on the variable indicates the annual rate of change, in percentage terms, measured between the equivalent quarters of the successive years.[25] Table 2 summarizes the outcome of the computations.

A few remarks are in order concerning the results of the regression analysis. First, Table 2 indicates that it is in only three cases out of ten that the regressions are free from serial correlations.[26] This comes to us as no surprise, because the method of moving averages has been adopted, as explained above. It would be desirable that some improvement be attempted in this respect in the future. Secondly, $\dot{V}$, Z, $\dot{Z}$ and $\dot{E}$ do not satisfy the sign conditions (equations 3-7 and 8-11). Thirdly, the unemployment rate again marks fairly high

[24] Note that U in Figure 3 excludes both salaried employees and day laborers; U_D in the same diagram corresponds to day laborers only.

[25] In symbols, $\dot{X}_t = \dfrac{X_t - X_{t-4}}{X_{t-4}} \times 100$.

[26] The lower and upper limits (at the 5% level) of the Durbin-Watson statistic, in the case when $n=30$, are 1.21 and 1.65, respectively, if the number of independent variables (K) is 3; similarly, they are 1.28 and 1.57, respectively, if $K=2$.

TABLE 2. THE PHILLIPS CURVE, 1931-38 (QUARTERLY)

Regression Number	X	a	b	c	d	$\bar{R}^2$	Durbin-Watson Statistic	Remarks
1	U	2.436	− .822	−.011	.608	.880	1.923	
		(.356)	(.371)	(.036)	(.080)			
2	U	5.918	−1.626	−.149		.628	.973	
		(.615)	(.627)	(.055)				
3	V	7.824	−7.785	.041	.558	.897	2.017	
		(.330)	(2.196)	(.035)	(.071)			
4	V	22.575	−20.558	.101		.665	.805	
		(.584)	(2.670)	(.061)				
5	V	7.453	−6.452	.085	.544	.896	2.155	$\dot{p}_{-1}$ is used instead of $\dot{p}$
		(.331)	(2.337)	(.034)	(.070)			
6	V	6.571	−4.723	.119	.547	.876	1.949	$\dot{p}_{-2}$ is used instead of $\dot{p}$
		(.362)	(2.824)	(.037)	(.080)			
7	V	5.408	−2.820	.142	.561	.841	1.554	$\dot{p}_{-3}$ is used instead of $\dot{p}$
		(.410)	(3.691)	(.043)	(.101)			
8	Z	−.022	− .272	−.054	.724	.853	1.570	
		(.394)	(.322)	(.074)	(.068)			
9	Z	5.055	− .160	−.475		.244	.497	
		(.877)	(.729)	(.143)				
10	E	−22.142	5.646	−.098	.517	.869	1.646	
		(.372)	(3.144)	(.049)	(.133)			
11	E	−64.609	16.789	−.233		.800	1.306	
		(.451)	(1.590)	(.042)				

Note: Figures in the parentheses show the standard errors of the estimates.
[Data Sources] See the Statistical Appendix.

in its explanatory power (equations 1-2). One might argue that the unemployment data for this period are good enough after all and that U may serve as a proxy index of the excess demand for labor. Be that as it may, it seems best to the present writer, in the light of the discussion in Section II, to avoid its use as far as possible. Fourthly, as expected, the inclusion of the price variable increases significantly the explained portion of the variance in the dependent variable. This fact alone, however, does not warrant an inference on the causal relations between $\dot{w}$ and $\dot{p}$, for they are both endogenous variables in the system.[27] Fifthly, it is apparent from these findings that there exist multicollinearities between $\dot{p}$ and the excess-demand indices. Finally, in connection with the movement of prices, the inclusion of lagged values did not produce particularly noteworthy results (equations 5-7).

In any event, it suffices for the present to establish that the indices of the excess demand for labor explain, with an exception of Z, significant portions of the behavior of money wages during the period concerned. It is perhaps instructive, however, to compare the above results with a similar study for the post-WWII period. Ono has estimated in the aforementioned work the following linear equation for the period of 1954 I-63 IV :

[27] As trade unions in the prewar days were capable of exerting only limited—if at all—influence, it seems a dubious procedure to use price as a variable representing the strength of union activities, as some authors have done in the past (cf., e.g., Dicks-Mireaux and Dow [2]). This point will be elaborated at a later stage of the research by introducing a variable which is related more directly to the union activities.

$$\dot{w} = 2.43 - 1.58V + 0.46\dot{p} + 0.07\dot{y} + 0.76\theta, \qquad \bar{R}^2 = 0.792 \qquad (12),$$

where y signifies average value productivity of labor and θ the percentage of employment engaged in labor disputes.[28] Since $\dot{y}$ has only negligible relationship with V and so does $\dot{V}$ with V ($r_{V\dot{V}}=0.143$), the inclusion (or omission) of these two variables has little effect on the magnitude of the coefficient of V. By the same token, the interactions of $\dot{p}$ with the other independent variables are also quite limited except for those with V. Moreover, the influence of union activities was practically invisible before WWII so that θ may be safely ignored for the period. All in all, one may be justified in regarding the coefficients of V and of $\dot{p}$ in the equation (12) as roughly comparable to those in the equation (3) in Table 2.[29] Setting the both equations side by side, one observes that the coefficients of V and $\dot{p}$, especially the former, are much larger in absolute terms for the prewar years. This finding is consistent with the view that the market mechanism functioned more smoothly in the prewar period than the postwar decade and that the institutional framework which hinders its operation has developed since WWII.

[28] Ono [12], pp. 380, 385.

[29] The levels of the equations (namely the magnitudes of the constant terms) are not directly comparable to each other, because the set of independent variables used in the estimation of (3) is different from the one used in (12). One may argue, however, that they become roughly comparable if one (i) eliminates the impacts of union activities and price changes by assuming $\theta=\dot{p}=0$ and (ii) adjusts the constant terms by setting $\dot{y}=\text{Ave}(\dot{y})=5.52$ (%) and $\dot{V}=\text{Ave}(\dot{V})=-6.94$(%). In this case one obtains

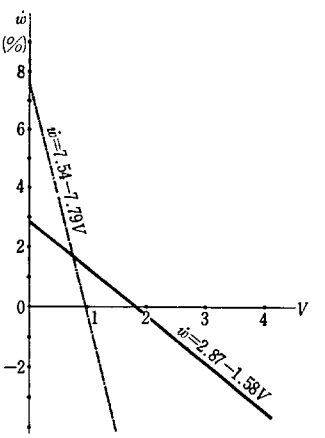
$$\dot{w} = 7.54 - 7.79V \qquad (3')$$

from (3), and similarly

$$\dot{w} = 2.87 - 1.58V \qquad (12')$$

from (12). Both (3′) and (12′) are depicted in Figure 4 below. It is interesting to note that not only the postwar wages respond more slowly to the conditions of the labor market but also they tend to be pulled up even when there is no excess demand (i.e. $V=1$).

FIG. 4.



IV

Referring again to Figures 2 and 3, the pattern of movements in the excess-demand indices draws some contrasts between male and female workers on one hand and between regular production workers and day laborers on the other. This finding suggests that it may be worth-while to recognize a minimum degree of heterogeneity in labor in carrying out the empirical analyses.

When labor is not wholly homogeneous in quality and attributes, it follows necessarily that the actual movements of wages are affected not only by purely short-run, economic forces such as fluctuations in the demand for labor, but also by structural factors such as transformation in the industrial distribution of the labor force, in the sex and age composition of workers, and so on. As a matter of fact, the employment figures in Table 3 reflect the significant changes which took place in Japanese manufacturing industries during the 1930's.

Accordingly an experiment has been made, whereby the original wage series was converted to the fixed-weight basis in the following manner by allowing for the changes in the industrial

TABLE 3. INDUSTRIAL DISTRIBUTION OF PRODUCTION WORKERS

Sex	Industrial Classification	Census of Mfrs.*			Labor Statistics*		
		1930	1934	1938	1930	1934	1938
		%	%	%	%	%	%
M	Textile	24.8	16.9	8.0	27.1	21.3	14.2
	Metal and Machinery	37.4	49.4	65.8	39.3	48.8	63.0
	Ceramics and Chemicals	20.7	21.0	18.2	18.0	17.0	14.6
	Food	5.5	3.7	2.4	4.6	3.4	2.2
	Others	11.6	9.0	5.6	11.0	9.5	6.1
	Total	100.0	100.0	100.0	100.0	100.0	100.1
F	Textile	84.5	77.3	64.6	87.1	82.7	73.1
	Metal and Machinery	2.0	4.5	12.2	2.3	4.5	11.1
	Ceramics and Chemicals	6.1	9.9	11.8	4.9	6.0	8.0
	Food	1.7	2.1	3.8	1.3	1.5	2.1
	Others	5.6	6.2	7.6	4.4	5.4	5.6
	Total	99.9	100.0	100.0	100.0	100.1	99.9
Total	Textile	58.9	47.8	29.9	59.5	52.3	37.4
	Metal and Machinery	17.2	26.4	45.1	19.3	26.4	42.6
	Ceramics and Chemicals	12.4	15.3	15.7	10.9	11.4	12.0
	Food	3.4	2.9	2.9	2.8	2.5	2.2
	Others	8.2	7.6	6.4	7.4	7.4	5.9
	Total	100.1	100.0	100.0	99.9	99.9	100.1

* For the factories with fifty or more production workers; as of December 31.

and sexual compositions of the work force.[30] First, the weights were calculated from the employment data taken from *Kōjō tōkei hyō* [Census of Manufactures].[31] The industrial and sexual compositions of the production workers in the year 1934 (as of December 31) were chosen as the bases of the calculation. In constructing the industrial weight the manufacturing industries were classified into nine categories, according to the standard industrial classification for the prewar period proposed in *Kōgyō tōkei 50-nenshi* [The Fifty Year History of the Census of Manufactures].[32] The 1934 weights, both industrial and sexual, were then applied to the December reports of the Bank of Japan wage series for the successive eleven years (1928-38). The results of this computation were compared with the original data, the former being divided by the latter (see Table 4). Next, these ratios were linearly interpolated between the adjacent years to yield the monthly adjustment factors.[33] After the revision was made, the data were corrected for seasonal variations.

The annual rates of change in money wages have been computed for both original ($\dot{w}$) and the adjusted ($\dot{w}'$) series and depicted in Figure 2 (a) above. Clearly the gap between the two series widens gradually towards the end of the 1930's, and, furthermore, its size is much larger than the one observed by Ono for the postwar decade (1954-63).[34]

In view of the fact that the labor market experienced such tremendous transformations

[30] Other important factors which might be controlled are: age of the workers, size of the firms, and working hours. Cf. Ono [12, 13].

[31] The Bank of Japan survey was based presumably on a relatively fixed number of factories; consequently, the employment figures reported by the Bank and the *Census of Manufactures* show some discrepancies, as shown in Table 3. Needless to say, care must be taken of the fact that the latter survey covered all the factories operating with more than five employees. In order to make the both data comparable to each other, the factories reported in the *Census of Manufactures* as employing less than fifty production workers have been excluded from the computation for Table 3. It seems safe to judge that the employment statistics reported by the *Census* were much closer to the reality.

[32] *Cf.* Minami [8]. There is no specific reason for selecting 1934 as the base year except that it is a middle point of the period in question. On the other hand, neither the initial (1929) nor the end years (1938/39) could be considered appropriate as the base year, for the former marked the beginning of the Great Depression and the latter that of the war economy. The industrial and sexual weights were calculated as follows:

(*a*) *The Industrial Distribution of Production Workers:*

Industry	*Male*	*Female*
(1) Textile	17.65%	78.97%
(2) Metal	17.08	1.12
(3) Machinery	32.28	3.36
(4) Ceramics	6.03	1.61
(5) Chemicals	14.95	8.25
(6) Wood Products	2.40	.41
(7) Printing	3.28	.63
(8) Food	3.74	2.14
(9) Others	2.59	3.52
Total	100.00	100.01

(*b*) *Sexual Distribution of Production Workers:*

Male : Female = 48.92% : 51.08%.

[33] For the months of January-March 1939, the line for the preceding period (December 1937-December 1938) was linearly extrapolated.

[34] Ono [12], p. 375.

TABLE 4. THE RATIO OF FIXED- (1934) TO VARIABLE-WEIGHT WAGES

Year*	Total	Male	Female
1928	1.0408	1.0565	.9962
1929	1.0367	1.0589	.9990
1930	1.0735	1.0591	1.0142
1931	1.0691	1.0572	1.0199
1932	1.0674	1.0589	1.0194
1933	1.0466	1.0373	1.0098
1934	1.0034	1.0079	1.0098
1935	.9764	1.0041	1.0014
1936	.9540	.9986	.9972
1937	.9153	.9797	.9922
1938	.8561	.9512	.9809

* As of December 31.

as reflected in the discrepancy between the two series, $\dot{w}$ and $\dot{w}'$, it is only natural that one attempts at the sectoral decomposition of the market in order to discover its structural characteristics. As a starting point, one may take up a sexual difference in the behavior of the variables. Even a visual inspection reveals that the correspondence between the wage change and the competition index appears to be closer for female than for male workers (Fig. 3). This observation may be substantiated by computation; if one regresses the rates of change in male wages ($\dot{w}_M$) on the competition index for male workers (V_M), one obtains

$$\dot{w}_M = \underset{(0.464)}{5.664} - \underset{(1.798)}{4.503}\dot{V}_M + \underset{(0.054)}{0.081}\dot{V}_M, \quad \bar{R}^2 = 0.152, \quad DW = 0.211,$$

whereas the female data yield

$$\dot{w}_F = \underset{(0.370)}{20.595} - \underset{(2.078)}{29.164}\dot{V}_F + \underset{(0.032)}{0.059}V_F, \quad \bar{R}^2 = 0.872, \quad DW = 0.384.^{35}$$

One notes that the absolute value of the coefficient of V is much larger in the case of female than male workers.

The above finding poses an intriguing question: why the difference? As a working hypothesis, one may postulate that the higher is the proportion of unskilled workers, the stronger becomes the excess-demand effect on wages. A corollary to this proposition would be that the wages in the light industries are more sensitive, in comparison with those in the heavy industries, to the demand-supply conditions of the labor market in general. Major reasons for this inference are: (1) that the heavy industries require a relatively large number of skilled and technical workers, and (2) that the renumerations for such personnels are governed more heavily by considerations for their training costs, which are necessarily of

[35] DW stands for the Durbin-Watson statistic. Note that the performance of the male accession rate (E_M) is better compared with that of the competition index (V_M); and conversely with regard to the performances of E_F vs. V_F:

$$\dot{w}_M = \underset{(0.375)}{-1.677} + \underset{(0.062)}{0.067}E_M + \underset{(0.014)}{0.070}\dot{E}_M, \quad \bar{R}^2 = 0.446, \quad DW = 0.221, \text{ and}$$

$$\dot{w}_F = \underset{(0.600)}{60.163} - \underset{(1.832)}{12.104}E_F + \underset{(0.066)}{0.126}\dot{E}_F, \quad \bar{R}^2 = 0.665, \quad DW = 0.615.$$

longer-run in nature than the mere short-run tightening (or slackening) of the labor market. It is presumed here that the two kinds of market mentioned above are practically independent to each other so that it is meaningful to treat them separately—an acceptable proposition, particularly when one is concerned with the short-run adjustment mechanism of the labor market.

It will be recalled that the competition index (V) indicates the relative tightness of the labor market, whereas the accession rate (E) reflects mostly the conditions of the demand for labor. If the inference in the preceding paragraph may claim a certain degree of validity, one may expect that V will demonstrate a higher explanatory power than E on the behavior of wages in the light industries, and vice versa for the heavy industries. In order to check the consistency of this expectation with the empirical observation, the three industrial groups were selected: textiles as an example of the light industry and metals as an example of the heavy industry. In addition, the chemicals industry may serve as an intermediate case.[36]

TABLE 5. WAGE EQUATIONS BY INDUSTRIAL GROUP
(Male Production Workers)

Independent Variable (X)	Textiles				Chemicals				Metals			
	Constant	X	$\dot{X}$	$\bar{R}^2$	Constant	X	$\dot{X}$	$\bar{R}^2$	Constant	X	$\dot{X}$	$\bar{R}^2$
$X=V_M$	10.349	− 9.245	.120*	.664	9.878	− 8.568	.105*	.410	.984	− .104	.054*	.000
	(.316)	(1.224)	(.037)		(.478)	(1.851)	(.055)		(.619)	(2.395)	(.071)	
$X=V_D$	33.674	−30.096	.112*	.621	28.386	−25.413	−.029	.434	3.742	−2.372	.240*	.000
	(.336)	(5.241)	(.119)		(.468)	(7.303)	(.166)		(.606)	(9.456)	(.215)	
$X=E_M$	−1.662	.103	.012	.000	−1.638	.058	.041	.048	−1.753	.027	.109	.747
	(.549)	(.091)	(.021)		(.607)	(.101)	(.023)		(.304)	(.050)	(.012)	

[Data Sources] See the Statistical Appendix.

Table 5 summarizes the result of the regression analyses by the sectoral decomposition. It should be noted here (a) that the computations have been made only for male production workers and (b) that V_D corresponds to *all* the day laborers of both sexes (disregarding their industrial distribution) while V_M and E_M relate to the *entire* male labor force excluding the day laborers.[37] In five cases out of nine the coefficients of $\dot{X}$ have wrong signs (marked *). However, one's expectation is born out in these computations: V has the highest explanatory power (i.e. large values of $\bar{R}^2$) in textiles, whereas E in metals. Chemicals is in the middle of the ground in this respect.

V

The purpose of this paper has been to construct consistent statistical indicators which reflect the general conditions of the labor market in a prewar period and to test their usefulness as the variables explaining the behavior of the rates of change in money wages. Among the five possible candidates it has been argued that the competition index, V, is perhaps

[36] This seems to be an appropriate description of the industry for the prewar period.

[37] In other words, the decomposition of the data was made only with respect to the wage series; the data for the independent variables (X's) were common for the three industrial groups.

the best gauge of the excess demand for labor for the period in question. The empirical work à la Phillips utilizing these indices may not be termed highly successful, however, as it leaves many things to be desired ; for one thing, the treatment and the interpretation of the price variable requires careful reëxamination. On the other hand, it has been found that the skill-composition hypothesis seems consistent with the statistical observations—namely, that the greater is the proportion of the unskilled workers, the more responsive are money wages to the excess demand conditions of the labor market in general.

Obviously the work is only a beginning and one should refrain from drawing too hasty a conclusion from the meager evidences at hand. In the future, the research will be extended to cover a longer span of period and also a wider geographical area if possible.

STATISTICAL APPENDIX

DATA I: BOTH SEXES

Period	U	$\dot{U}$	E	$\dot{E}$	V	$\dot{V}$	Z	$\dot{Z}$	$\dot{w}$	$\dot{p}$
	%	%		%		%		%	%	%
1930III	—	—	—	—	—	—	—	—	—	−15.51
IV	—	—	—	—	—	—	—	—	—	−16.24
'31 I	—	—	—	—	—	—	—	—	—	−15.77
II	4.730	12.94	3.587	9.86	1.248	− 8.24	.348	20.00	− 8.97	−14.20
III	5.061	17.02	3.957	42.13	1.279	− 3.98	.360	22.45	− 7.60	−10.57
IV	5.315	19.20	3.469	5.44	1.297	− 2.77	.348	8.07	− 7.68	− 7.43
'32 I	5.551	21.73	3.488	− 1.39	1.321	.53	.348	4.19	− 5.89	− 4.70
II	5.658	19.62	3.716	3.60	1.332	6.73	.351	.86	− 3.84	− .88
III	5.468	8.04	3.883	− 1.87	1.270	− .70	.360	0.00	− 1.76	1.85
IV	5.127	− 3.54	4.168	20.15	1.231	− 5.09	.373	7.18	.97	4.01
'33 I	4.694	−15.44	4.277	22.62	1.160	−12.19	.386	10.92	2.26	6.65
II	4.201	−25.75	4.409	18.65	1.105	−17.04	.404	15.10	2.71	7.09
III	3.812	−30.29	4.335	11.64	1.042	−17.95	.414	15.00	1.80	5.66
IV	3.527	−31.21	4.080	− 2.11	.983	−20.15	.420	12.60	1.63	4.86
'34 I	3.286	−30.00	4.071	− 4.82	.939	−19.05	.428	10.88	1.99	3.64
II	3.124	−25.64	4.075	− 7.58	.926	−16.20	.426	5.45	2.57	2.48
III	3.043	−20.17	4.006	− 7.59	.921	−11.61	.428	3.38	3.75	2.33
IV	2.971	−15.76	3.977	− 2.52	.909	− 7.53	.432	2.86	3.21	1.77
'35 I	2.899	−11.78	3.919	− 3.73	.911	− 2.98	.436	1.87	2.17	1.22
II	2.844	− 8.96	3.790	− 6.99	.904	− 2.38	.438	2.82	1.07	1.55
III	2.787	− 8.41	3.714	− 7.29	.891	− 3.26	.442	3.27	.21	2.28
IV	2.733	− 8.01	3.806	− 4.70	.880	− 3.19	.445	3.01	.42	3.75
'36 I	2.693	− 7.11	3.853	− 1.68	.848	− 6.92	.446	2.29	.92	4.94
II	2.642	− 7.10	3.964	4.59	.804	−11.06	.452	3.20	1.42	5.04
III	2.571	− 7.75	4.048	8.99	.775	−13.02	.458	3.62	1.98	5.44
IV	2.493	− 8.78	4.053	6.49	.713	−18.98	.469	5.39	2.96	5.61
'37 I	2.383	−11.51	4.124	7.03	.675	−20.40	.482	8.07	4.49	6.36
II	2.262	−14.38	4.371	10.27	.726	− 9.70	.474	4.87	6.21	8.39
III	2.125	−17.35	4.410	8.94	.756	− 2.45	.469	2.40	7.83	9.76
IV	1.965	−21.18	4.391	8.34	.782	9.68	.472	.64	8.96	11.30
'38 I	1.817	−23.75	4.449	7.88	.800	18.52	.466	− 3.32	9.53	12.98
II	1.737	−23.21	4.362	− .21	.749	3.17	.474	0.00	10.12	14.09
III	1.645	−22.59	4.457	1.07	.681	− 9.92	.477	1.71	11.18	14.90

DATA II: MALE

Period	E_M	$\dot{E}_M$	V_M	$\dot{V}_M$	Z_M	$\dot{Z}_M$	$\dot{w}_M$			
							Total	Textile	Metal	Chemicals
		%		%		%	%	%	%	%
1931 II	1.421	− 8.97	1.465	−10.07	.295	21.40	−6.14	−5.15	−6.73	−5.69
III	1.535	13.87	1.477	− 7.63	.303	19.76	−4.64	−4.19	−4.09	−4.94
IV	1.538	13.34	1.507	− 4.80	.305	15.53	−3.07	−4.04	−1.46	−3.90
'32 I	1.659	17.91	1.558	.91	.300	7.53	−1.58	−3.36	.31	−3.44
II	1.952	37.37	1.574	7.44	.301	2.03	.14	−3.05	2.33	−2.76
III	2.320	51.14	1.498	1.42	.316	4.29	1.65	−3.07	4.77	−2.05
IV	2.696	75.29	1.452	− 3.65	.332	8.85	2.71	−2.55	6.05	− .90
'33 I	2.963	78.60	1.360	−12.71	.348	16.00	3.22	−2.36	6.80	1.01
II	3.212	64.55	1.280	−18.68	.366	21.59	2.56	−2.03	5.73	1.71
III	3.254	40.26	1.230	−12.89	.375	18.67	.68	−1.83	2.37	.80
IV	3.212	19.14	1.185	−18.39	.386	16.27	− .58	−1.84	− .04	−1.06
'34 I	3.207	8.23	1.141	−16.10	.396	13.79	−1.20	−1.71	−1.22	−3.32
II	3.092	− 3.74	1.132	−11.56	.398	8.74	−1.25	−1.64	−1.40	−4.21
III	3.011	− 7.47	1.120	− 8.94	.398	6.13	− .67	−1.29	− .54	−3.88
IV	2.945	− 8.31	1.094	− 7.68	.403	4.40	− .95	−1.23	− .33	−2.96
'35 I	2.883	−10.10	1.089	− 4.56	.409	3.28	−1.40	−1.38	− .73	−1.80
II	2.807	− 9.22	1.077	− 4.86	.411	3.27	−1.85	−1.89	−1.42	−1.15
III	2.743	− 8.90	1.066	− 4.82	.417	4.77	−2.39	−2.47	−2.36	− .66
IV	2.752	− 6.55	1.054	− 3.66	.419	3.97	−2.27	−2.48	−2.77	− .44
'36 I	2.800	− 2.88	1.012	− 7.07	.419	2.44	−2.06	−2.50	−2.79	− .61
II	2.960	5.45	.950	−11.79	.426	3.65	−1.84	−2.22	−2.58	− .72
III	3.115	13.56	.901	−15.48	.430	3.12	−1.25	−1.79	−1.71	− .89
IV	3.271	18.86	.831	−21.16	.442	5.49	− .37	−1.12	− .53	−1.06
'37 I	3.459	23.54	.791	−21.84	.457	9.07	.93	.15	1.02	− .73
II	3.908	32.03	.847	−10.84	.449	5.40	2.30	1.97	2.39	.17
III	4.137	32.81	.877	− 2.66	.446	3.72	3.37	3.42	3.14	1.57
IV	4.437	35.65	.896	7.82	.453	2.49	3.87	4.09	3.24	3.49
'38 I	4.623	33.65	.903	14.16	.449	−1.75	3.56	4.36	2.32	5.23
II	4.549	16.40	.820	− 3.19	.461	2.67	3.39	4.53	1.78	6.65
III	4.690	13.37	.732	−16.53	.464	4.04	3.67	6.09	2.13	8.07

DATA III: FEMALE

Period	E_F	$\dot{E}_F$	V_F	$\dot{V}_F$	Z_F	$\dot{Z}_F$	$\dot{w}_F$
		%		%		%	%
1931 II	5.744	16.75	.981	5.48	.453	6.09	−12.57
III	6.369	52.33	1.035	9.99	.469	15.80	−10.97
IV	5.350	2.18	1.038	5.17	.438	− 2.23	−10.30
'32 I	5.275	− 6.97	1.041	2.97	.447	.45	− 9.56
II	5.474	− 4.70	1.048	6.83	.451	− .44	− 8.72
III	5.465	−14.19	1.003	− 3.09	.445	− 5.12	− 7.55
IV	5.666	5.91	.975	− 6.07	.451	2.97	− 6.06
'33 I	5.635	6.82	.929	−10.76	.457	2.24	− 4.36
II	5.707	4.26	.903	−13.84	.473	4.88	− 3.10
III	5.491	.48	.827	−17.55	.489	9.89	− 2.99
IV	4.991	−11.91	.757	−22.37	.487	7.98	− 2.75
'34 I	4.962	−11.94	.717	−22.82	.491	7.22	− 2.49
II	5.003	−12.34	.699	−22.59	.482	1.90	− 1.94
III	4.966	− 9.56	.693	−16.32	.484	− 1.02	− .84
IV	4.986	− .10	.692	− 8.59	.485	− .41	− .28
'35 I	4.935	− .54	.698	− 2.65	.486	− .82	− .42
II	4.745	− 5.16	.692	− 1.00	.489	1.45	− .85
III	4.661	− 6.14	.677	− 2.17	.489	1.03	− 1.41
IV	4.887	− 1.99	.666	− 3.76	.494	1.86	− 1.13
'36 I	4.949	.28	.648	− 7.16	.499	2.67	− .43
II	5.032	6.05	.622	−10.12	.505	3.27	0.00
III	5.057	8.50	.605	−10.77	.514	5.11	1.00
IV	4.944	1.17	.553	−16.97	.523	5.87	2.15
'37 I	4.919	− .61	.510	−21.30	.537	7.62	3.71
II	4.979	− 1.05	.534	−14.15	.539	5.74	5.71
III	4.844	− 4.21	.552	− 8.76	.528	2.72	6.53
IV	4.520	− 8.58	.584	5.61	.523	0.00	6.31
'38 I	4.459	− 9.35	.616	20.78	.515	− 4.10	5.37
II	4.367	−12.29	.623	16.67	.507	− 5.06	4.59
III	4.433	− 8.48	.581	5.25	.512	− 3.03	5.33

DATA IV: DAY LABORERS

Period	U_D	$\dot{U}_D$	V_D	$\dot{V}_D$	Z_D	$\dot{Z}_D$
	%	%		%		%
1931 II	9.602	18.94	1.207	0.00	.824	− .60
III	10.126	19.88	1.200	− 1.15	.823	− .12
IV	10.605	20.16	1.210	− .90	.815	− .49
'32 I	11.195	21.76	1.243	2.47	.797	− 3.04
II	11.591	20.71	1.272	5.39	.781	− 5.22
III	11.456	13.13	1.279	6.58	.781	− 5.10
IV	11.217	5.77	1.272	5.12	.787	− 3.44
'33 I	11.044	− 1.35	1.250	.56	.800	.38
II	10.761	− 7.16	1.216	− 4.40	.819	4.87
III	10.669	− 6.87	1.199	− 6.25	.832	6.53
IV	10.681	− 4.78	1.184	− 6.92	.841	6.86
'34 I	10.491	− 5.01	1.179	− 5.68	.843	5.38
II	10.353	− 3.79	1.178	− 3.12	.842	2.81
III	10.250	− 3.93	1.182	− 1.42	.838	.72
IV	10.092	− 5.51	1.171	− 1.10	.846	.59
'35 I	9.887	− 5.76	1.135	− 3.73	.871	3.32
II	9.694	− 6.37	1.118	− 5.09	.885	5.11
III	9.573	− 6.60	1.110	− 6.09	.891	6.32
IV	9.441	− 6.45	1.109	− 5.29	.890	5.20
'36 I	9.291	− 6.03	1.104	− 2.73	.894	2.64
II	9.095	− 6.18	1.094	− 2.15	.896	1.24
III	8.844	− 7.62	1.088	− 1.98	.897	.67
IV	8.578	− 9.14	1.078	− 2.80	.899	1.01
'37 I	8.274	−10.95	1.072	− 2.90	.900	.67
II	7.927	−12.84	1.069	− 2.29	.901	.56
III	7.557	−14.55	1.065	− 2.11	.903	.67
IV	7.172	−16.39	1.051	− 2.50	.911	1.33
'38 I	6.780	−18.06	1.026	− 4.29	.921	2.33
II	6.437	−18.80	.994	− 7.02	.934	3.66
III	6.121	−19.00	.963	− 9.58	.946	4.76

Notes to the Statistical Appendix:

1) The original, monthly data for the period of September 1929–March 1939 were first adjusted for seasonal variations by the method of twelve-month moving averages (centered) and then bound together to form quarterly series by computing arithmetic averages of the neighboring three months (January–March, April–June, July–September, and October–December).

2) The E-series were adjusted for industrial and sexual compositions with the 1929 distributions as weights. Similarly, w_M (all industries) and w_F series were adjusted for industrial compositions.

3) The following notations have been used.

U:	unemployment rate	p:	retail prices
E:	accession rate	D:	day laborers
V:	competition index	M:	male
Z:	placement ratio	F:	female

w: daily wages of production workers

The dot on the variable indicates the annual (quarter-to-quarter) rate of change.

The Data Sources:

Unemployment rate: Naimushō Shakaikyoku [Social Welfare Bureau, Ministry of Interior] (later, Kōseishō Shokugyōbu [Department of Occupational Affairs, Ministry of Welfare]), *Shitsugyō jōkyō suitei geppō gaiyō* [Monthly Review of Unemployment Estimates].

Accession rate: Nippon Ginkō (The Bank of Japan), *Rōdō tōkei* (Statistics of Factory Labour), monthly.

Competition index: 1929–35: Chuō Shokugyō Shōkai Jimukyoku [Central Labor Exchange Bureau], *Shokugyō shōkai nempō* [Occupational Placement Yearbook]; 1936–37: Kōseishō [Ministry of Welfare], *Shokugyō shōkai tōkei* [Statistics of Occupational Placements]; 1938–39: Kōseishō Shokugyōbu [Department of Occupational Affairs, Ministry of Welfare], *Shokugyō jihō* [Monthly Bulletin of Occupational Affairs].

Placement ratio: *Ibid.*

Wages: Nippon Ginkō (The Bank of Japan) *Rōdō tōkei* (Statistics of Factory Labour), monthly.

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