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DOMESTIC LABOR MIGRATION IN JAPAN*

by

Shunsaku Nishikawa

The paper is intended to obtain some empirical findings on domestic labor migration in Japan in its relation to such economic incentives as income level and wage rate, and to develop some economic hypotheses on inter-regional mobility of labor. These informations and hypotheses may be served as a clue to further understanding of the past rapid growth of Japanese economy and have significance for the problems of manpower recruitment and mobilization planning in her future course of development. However, the study does not attempt to project any forthcoming changes in regional mobility of labor.

I. Introduction

It is generally observed in many developing countries that labor migrates from rural agricultural to urban industrial areas. Also in Japan, as illustrated in appendix Table A, population moves from backward to advanced regions. These advanced cities (regions) of in-migration, i.e. Tōkyō, Yokohama (Kanagawa Pref.), Nagoya (Aichi Pref.), Kyōto, Osaka, Kōbe (Hyōgo Pref.), and Fukuoka (Fukuoka Pref.), are densely populated and highly industrialized cities of the country. The other regions of out-migration are, more or less, underdeveloped agricultural areas. The industrial structures of employment in these regions are given in appendix Table B. Combining these data, both of which are quoted from *Population of Japan*[1]), we could have a broad picture of the size and the process of labor migration.

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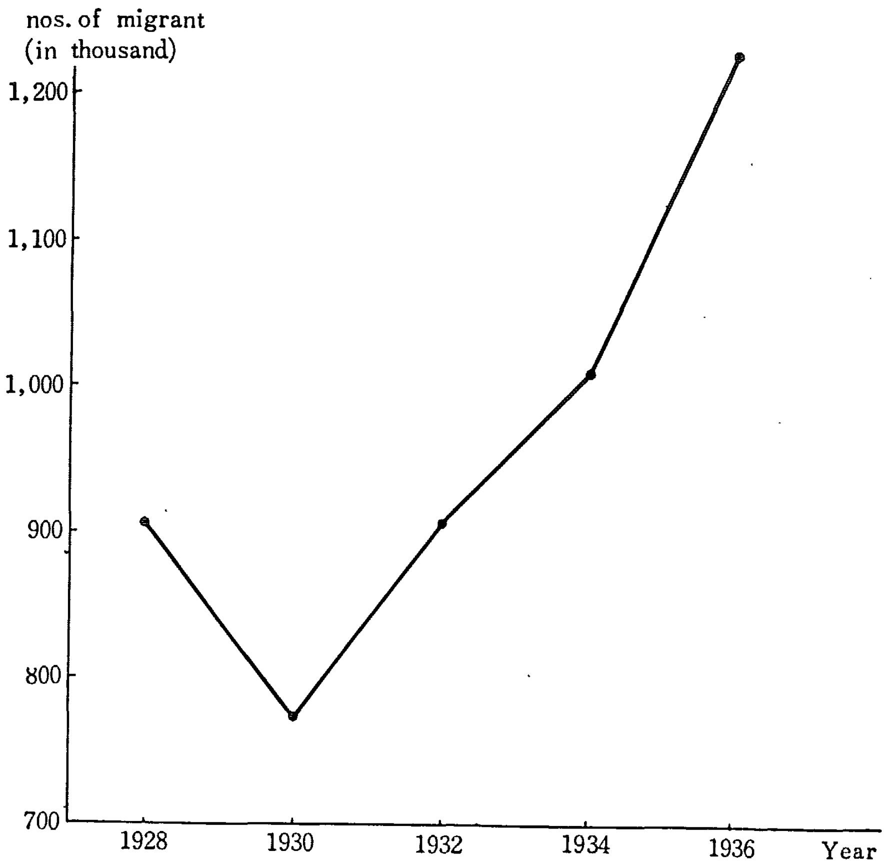
Obi and Nishikawa (1), *Keizaigaku Nenpō* 4, 1960
Nishikawa (2), *Mita Shōgaku Kenkyū* 4–2, 1961
Nishikawa (3), *Mita Gakkai Zasshi* 55–5, 1962
Nishikawa (4), *Shōgaku Nenpō* 3, 1962
Nishikawa (5), this paper, *Keio Business Review* 1, 1962
Nishikawa (6), *Keizai Kenkyū* 13–1, 1962

1) The original titles of the following surveys are fully given in the appendix 1.

The gross totals of the net migrations amount to about 1.5 million and 2.4 million, respectively during the two pre- and post-War five years. Or, the net migrations per year are 300 thousand and 500 thousand respectively. The data, however, is related to *net* migration of *population*. It may easily be understood that *gross* migration exceeds *net* figure, while *labor* migration is less than migration of *population*. The above totals do not contain any interflow of labor among regions which cancells out each other, nor some temporal (that is, seasonal, yearly and within-a-few-years) migration. On the other hand, both the associated (net) movement of population and any other sociological (net) migration would possibly be included. *The Survey of Labor Migrants* shows, the *gross* migration of *labor* is about one million or more per year during the same pre-War period. The total figures are shown in the Chart below during 1928–1936 every other year. The decrease from 1928 to 1930 might be perhaps due to severe depression, which caused a considerable reduction of over-all employment. Further periodical change in migration is unforeseen.

Chart Total Migrant, 1928—1936



As regards the post-War period there is no comparable data with the pre-War's, but some fragmental surveys are only available for the gross migration of labor. *The Survey of Vocational Education, 1954* and *the Demand and Supply of New Graduates etc. 1960* provide us that the numbers of new graduate labor are about 160 thousand in 1954 and 220 thousand in 1960. *The Demand and*

Supply of Interregional Migrants, 1958 shows the seasonal and other general migrant is 150 thousand in 1958. Even if we add up these two figures, the gross migration in 1958/1960 amounts to 370 thousand per year, which is even below a half of the pre-War level. But the Interregional survey involves no other than the migrants through public employment office and school, nor the New Graduate survey contains the quick return and re-migration. Whether these excluded elements could fill the gap or not, and whether the difference between 1954 and 1960 may be due to the business conditions or to the survey differences, will be answered by further investigations.

II. Out-Migration and Family Income: Pre-War

Some preceding analyses[2)] have suggested that the labor migration out of farm family tends to negatively associate with the agricultural earning or the (average) productivity of farm family.

Such negative relationship is also found out of our pre-War data. Among the four variables, the first two, $\log M_j$ and $\log M^f{}_j$, stand for the logarithms of male and female migrants, and of female migrants from the j-th region[3)], and the third and the fourth, $(M/P)_j$ and $(M^f/P)_j$, stand for the migration ratios to the total population P_j in the j-th region. Agricultural products (in money term) per farm family in the j-th region A_j is used for as a crude index of the farm-family income. It is calculated from *the Statistical Annals of the Ministry of Agriculture and Forestry* by summing up the individual items of products, and then adjusted by the numbers of farm family. Table 1 gives the correlation coefficient between $\log M_j$, $\log M^f{}_j$, $(M/P)_j$ and $(M^f/P)_j$, and A_j across regions for 1928–1936 every other year.

The findings are in order:

(1) The correlation coefficients are all negative and with a few excep-

Table 1

variables	$\log M_j$	$\log M^f{}_j$	$(M/P)_j$	$(M^f/P)_j$
year	A_j	A_j	A_j	A_j
1928	−.324*	−.507**	−.422**	−.456**
1930	−.352*	−.206	−.406**	−.366*
1932	−.333*	♯	−.363*	♯
1934	−.018	−.050	−.031	−.106
1936	−.104	−.206	−.307*	−.405**

* significant at 95% level
** significant at 99% level
♯ not computed because of data limitation.

2) S. Watanabe, *Agricultural Population in Japan*, 1938, (*Nihon Nōson Jinkō Ron*), and S. Nojiri, *The Empirical Surveys on the Migration of Agricultural Population*, 1942, (*Nōmin Rison no Jisshōteki Kenkyū.*)

3) Some preliminary experiments yield the better results in the transformation into logarithmic values than in absolute terms.

tions, are significantly different from zero at 95% level or higher ($d.f. = 44$ or 45).

(2) The ratio variables $(M/P)_j$ and $(M^f/P)_j$ seem to be more closely correlated with A_j than the logarithmic ones, $logM_j$ and $logM^f{}_j$.

(3) There is no significant difference between male and female, and female only, hence the sex difference in migration is inconclusive at this stage of investigation.

(4) In 1934 the associations are rather disturbed, that may perhaps be due to any considerable interview bias. There are no other serious intertemporal differences.

The implications of these findings will be discussed fully in the next section.

III Out-Migration and Family Income: Post-War

In this section the same relationship is estimated from the post-War data. Table 2 illustrates the correlation coefficients between the gross migration of new graduates labor and some income statistics across regions. The four variables $logN_j$, $logN^f{}_j$, $(N/P)_j$ and $(N^f/P)_j$ are specified as in the previous section. The notations are the same, except that N is used instead of M. Both of the 1954 and 1960 data of new graduates are classified by the educational status, namely secondary school graduates and high school graduates. However, the status have not own particular notation and are specified in the second column of the Table. As an income index, yearly per capita income y is used in 1954 and yearly average self-employer's income Y_j is used in 1960. The y_j is quoted from *the National Income Accounts*, 1953, and Y_j from *the Survey of Employment Status*, 1959.

Table 2

year \ education \ variables		$logN_j$	$logN^f{}_j$	$(N/P)_j$	$(N^f/P)_j$
		y_j or Y_j	y_j or Y_j	y_j or Y_j	y_j or Y_j
1954	second. school graduates	−.552**	♯	−.592**	♯
	high school graduates	+.031	♯	−.388*	♯
1960	second. school graduates	−.651**	−.605**	−.698**	−.652**
	high school graduates	−.297	−.337	−.277	−.267

♯ data unavailable

(5) Our findings (1) and (2) are also supported by the post-War experiences. The correlations are all negative and highly significant ($d.f. = 33$ for 1954 and 44 for 1960), and the differences between ratio variables and logarithmic values are rather apparent. (But the correlations for high school

graduates in 1960 are out of the rules.) The sex difference is inconclusive too. However, it may be due to our inseparated uses of migration data, i.e. M or N, which are sums of male and female numbers, while M^f or N^f are female numbers. If male numbers M^m or N^m were used, any significant differences would have been resulted. As regards the intertemporal differences it seems possible to show the differences among the pre-War, 1954 and 1960 being attributable to the different sources of income statistics utilized in each period.

The 1960 ratio variables $(M/P)_j$ and $(N^f/P)_j$ for secondary school graduates are selected to be correlated alternatively with the agricultural products per farm family in 1959, A'_j and with the per capita income in 1959, y_j, those are respectively equivalents to A_j in the last section and to y_j in this section. The order of the correlation coefficients (Table 3) in 1960, namely the coefficient with A_j in the lowest, while the one with Y is the higest and the one with y_j is between these two, corresponds well to the intertemporal orders among the pre-War, 1954 and 1960. It may be concluded that the intertemporal differences are reduced to the income data differences. There is, of course, any possibility that the differences in migration data would affect the correlation coefficients in each period. It is generally said[4] that younger workers are more flexible to economic incentives than older workers. According to this widely

Table 3

income / migration	A'_j	y_j†	Y_j
$(N/P)_j$	−.248	−.673**	−.693**
$(N^f/P)_j$	−.322	−.557**	−.652**

† $d.f.=26$, otherwise' $d.f.=44$

accepted view, our post-War estimates of correlation coefficient should naturally be higher than the pre-War ones, because the post-War migration data are of younger new-graduates, while the pre-War of younger an dolder migrants. But as will be seen in the following paragraph, during the post-War period, we have obtained fairly high correlation coefficients between income and, seasonal and other general migration that consists of various migrants older than new-graduates. It is, therefore, considered that the migration data differences would not contribute so much to the above differences in our results.

Another implication of our findings will be discussed here. The inverse correlations between labor migration ratio and per capita income in the j-th region, means that (a) the y_j, *as a measure of the goodness of job opportunity* in the region, will negatively affect the migration from the region; and that (b) the y_j, *as a determinant of supply price of labor migrant* from the region, has negative influence on the migration from the region. However, both A_j

4) We are indebted to Professor Kuznets for first drawing our attention to this point. The reader would find one of empirical evidence on it in the volume, Margot Jefferys, *Mobility in the Labour Market*, 1954.

and Y_j are indices of family income, and then affect the migration as (b) factor, but not as (a) factor. In these context we have in mind that the observed income effect would show the (b) effect. The (a) effect will be discussed further in the next section.

Table 4 gives the correlation coefficients between the interregional migration of seasonal labor S_j and other general (non-seasonal and non-new-graduate) labor[5] T_j, and per capita income in 1959 y_j. (Agricultural and self-employer's income, A_j and Y_j are not available.) The notation U_j means sum of S_j and T_j, i.e. $U_j = S_j + T_j$. As illustrated in Table 4, the correlation coefficients reach the highest levels at case (1) for $logS_j$, while for $logT_j$ at case (2). In case (2) the sets of observation from Tōkyō, Kanagawa, Ōsaka and Hyōgo, i.e. 4 major industrial centers, are excluded. S_j mainly consists of seasonal, agricultural and other related migrants, while T_j of non-seasonal industrial and commercial migrants. In case (3), where the less industrialized regions, Aichi, Kyōto and Fukuoka are excluded further, the correlations level off. In conclusion:

Table 4

variables \ case	case (1) all observations‡	case (2) Tōkyō, Kanagawa, Ōsaka, Hyōgo are excluded.	case (3) Aichi, Kyōto, Fukuoka are excluded further.
$logS_j$	−.456*	−.347*	−.203
$logT_j$	−.529**	−.658**	−.619**
$logU_j$	−.472**	−.559**	−.481*

‡ $d.f.=43$ for S_j and 44 for T_j and U_j

(6) The negative correlations, thus far, are found between the seasonal and other migration during the post-War years and income level of migrants.

Before closing the section, it would be useful to note the marked difference between the educational status of migrants in Table 2. The secondary school graduates are rather more mobile among regions than the high school graduates. The ratio of migrants to total employed of the former is higher than that of the latter.

(7) The correlation coefficients are higher for the secondary school graduates than for the high school graduates. This perhaps means that family income had already an effect at the time of their enrollment to high school and also that they face at relatively easy job hunting in the neighbour areas.

IV *In-Migration and Wage Earning: Pre- and Post-War*

The sections II and III discuss the gross out-migration from the j-th region in its relation to their own family income. In turn, the gross in-migration

5) These types of migrants are included in the pre-War data.

to the j-th region will be discussed here in its relation to the wage rate paid in the i-th region.

The Demand and Supply of New Graduates and etc. reports also the regional wage earning (per month) received *first* by the graduates labor migrated into the i-th region. The wage earnings,[6] averaged over industries, are denoted by W^m_i and W^f_i, where the superscripts m and f represent male and female, while for educational status any notation is not prepared and the status are specified only by the second column of the Table 5, as was in the previous section. The logarithms of migrants to the i-th region $logN^m_i$ and $logN^f_i$ (in 1960) are correlated with W^m_i and W^f_i respectively.

(8) the post-War correlation coefficients are all highly significant ($d.f.=44$) and have positive signs. The higher the wage earning is, the more migrant does inflow to the region.

Nevertheless, during pre-War period (1930 and 1936) it is hardly to observe such unambiguous correlation between the in-migration and wage rate (cf. also the upper parts of Table 5). The wage rate w_i are quoted from the *Census of Manufacturing Factories*, which is the only available source of prefectural wages. In this context the two industries, i.e. silk reeling and spinning are specified. The in-migration $log\ n_i$ of silk reeling and spinning worker are quoted from the *Annals of Labor Recruitment.*

Table 5

year	sex	industry or education	correlation coefficient
1930	male & female	spinning	+.190
		silk reeling	−.032
1936	male & female	spinning	+.038
		silk reeling	−.211
1960	male	s.s. graduates	+.829**
		h.s. graduates	+.844**
	female	s.s. graduates	+.855**
		h.s. graduates	+.748**

(9) The pre-War correlation coefficients are not so high as significant at sufficiently higher level. In particular, the negative value contradicts our *a priori* expectation.

Such meaningless outcome is likely to depend on the following reasons. As well known, in Japan the life-time commitment system is prevailing and the wage rate is proportional to the continuation of employment. Moreover, the wage differentials are considerably sharp by sex and by education. These peculiar structures of employment and wage systems unfavourably affect our pre-War estimates, which are estimated from the *average* wage rates. On the contrary

6) They are averaged over industries, but different across regions (and also by sex and by educational status).

the post-War wage earnings are classified by sex, education and continuation of employment (but in this case of new graduates labor the continuation of service is reduced to zero order), so that they generate highly good and significant correlation coefficients.

The reader could easily understand that our finding (8) from the in-migration side is the same as the referred effect (a) in the previous section. The (wage) income of migrants will perhaps affect positively to their in-migration and, in turn, negatively to their out-migration.

V Job Application Equation

Our major findings may be summarized:

[1] *The out-migration of labor depends on the principal income of the family;* and

[2] *The in-migration of labor depends on the wage earning of the migrant.*[7]

These finding [1] and [2] suggest a hypothesis that the labor migration to the i-th region from the j-th region, $n^i{}_j$, depends on both the (average) family income in the j-th region and the (average) wage rate in the i-th region. This can be postulated as follows:

$$n^i{}_j = f(w_i,\ Y_j), \qquad (1)$$

The equation (1) may be conveniently called as *job application equation*, which is assumed to have semi-logarithmic form.

$$n^i{}_j = exp\ [\alpha_0 + \alpha_1(w^p{}_j/w_i) + \alpha_2 Y_j], \text{ or}$$
$$log\, n^i{}_j = \alpha_0 + \alpha_1(w^p{}_j/w_i) + \alpha_2 Y_j. \qquad (2)$$

In this specification the new variable $w^p{}_j$ is additionally introduced as an index of "average wage" rate to be given to the migrants from the j-th region except to some specific i-th region. The $w^p{}_j$'s are computed by the formula:

$$w^p{}_j = \sum_p n^p{}_j w_i / \sum_p n^p{}_j$$

The superscript p means "the exclusion of some specific i" from the whole regions of in-migration from the j-th region. Thus the term $(w^p{}_j/w_i)$ presents the wage difference between the in-migrants in the i-th region and those in the other regions from the j-th region.

The job application equation is applied to the 1960 migration from Niigata ($j = 15$ is fixed) and to the 1960 migration to Aichi ($i = 23$ is fixed)[8]. In these cases the equation takes the form:

for $j = 15$

$$log\, n^i{}_{15} = \beta_0 + \beta_1(w^p{}_{15}/w_i) + u(i), \qquad (3)$$

for $i = 23$

7) If the variations of working hours per month or day are in the narrower range, the finding (2) should be read: The in-migration of labor depends on the wage *rate* of the migrant.

8) The procedure means that we have implicitly assumed the coefficients being different between out-migrations from Niigata and in-migrations to Aichi. But the procedure is undertaken in order to show *empirically* how far the two sets of coefficients differ, because no one could have known the values of parameters *a priori*.

$$log\ n^{23}{}_j=\gamma_0+\gamma_1 w^p{}_j+\gamma_2 Y_j+v(j). \qquad (4)$$

The variables Y_j in (3) and w_i in (4) are invariate in each samples.[9] It follows respectively that $\beta_0=\alpha_0+\alpha_2 Y_{15}$ in (3) and $\gamma_0=\alpha_0+\alpha_1(1/w_{23})$. The u and v are random variables assumed to be normally distributed with zero mean and finite variance σ_u and σ_v. The notation i and j in parenthesis behind u and v denote that the equations are regressed between the i- and j- variates, respectively. The estimated parameters are given in Table 6. They are significantly different from zero at reasonably high levels and consistent with our hypothetical setting.

Table 6

sample	*const.*	$(w^p{}_j/w_i)$	Y_j	*R*	*d. f.*
in-migrations to Aichi ($i=23$ fixed)	8.408	#−4.148 (2.227)	0.154 (0.039)	0.566**	38
out-migrations from Niigata ($j=15$ fixed)	5.798	−3.834 (1.021)	—	##−0.643**	20
in-migrations to Gifu~Mie ($i=21\sim24$ pooled)	6.394	−2.852 (0.866)	−0.117 (0.026)	0.439**	118
out-migrations from Niigata~Nagano ($j=15\sim20$ pooled)	5.755	−2.338 (0.834)	−0.115 (0.051)	0.352**	76

the coefficient to the ratio $(w^p{}_j/w_i)$, though w_i is constant here.
simple correlation coefficient between $log\ n^i{}_{15}$ and $(w^p{}_{15}/w_i)$

Next, the equation (2) is, in its full stand, applied to the combined samples with some selected regions. The cases of out-migration from $j=15$, ..., 20 and of in-migration to $i=21$, ..., 24 are chosen to test the hypothesis. Table 6 illustrates the estimates in both cases, and the estimated coefficients are in all highly significant. It seems interesting to note the sets of estimated parameters $(\alpha_0, \alpha_1, \alpha_2)$ being approximate to each other. This means these two approaches from the out-migration side and the in-migration side do bring the approximate results.[10]

Although the hypothesis is not rejected by the data, the coefficients of determination R^2 have shown that there remain some other dominant factors influencing on labor mobility. Our further concern should be forcused on these

9) In these post-War experiments the intraregional movement are excluded because that they deviate considerably from the regression planes, though in the succeeding experiments for the pre-War period. Their inclusion into the sample brings such undesirable result.

10) The result suggests that:
(2′) *The inter-migration of labor depends on the interregional wage differentials.*
This may be considered as an extension of our finding (2), because the positive dependence of n^i on w_i in finding (2) are included within the negative dependence of $n^i{}_j$ on $(w^p{}_j/w_i)$ in finding (2′).

"third" factors. The hypothesis may be reformulated as follows:

$$n^i_j = g(w_i,\ Y_j,\ \psi^i_j), \tag{5}$$

where the factor ψ^i_j is some "third" unspecified factors.

VI Geographical Distance and Past History of Migration

In the following sections VI, VII and VIII the n^i_j—s mean the numbers of migration of spinning workers from the j-th to the i-th region (*the Annals of Labor Recruitment*)[11] and the w_i—s stand for their hourly wage rates in the i-th region (*the Census of Manufacturing Factory.*) The w^p_j—s refer such as "average" wage rates as in the previous sections.

In order to find what are the "third" factors, the familiar technique of unspecified factor analysis is employed.[12] That is, without any further specification alternatively some interregional factor f_t and intertemporal factor f_j are supposed to affect the migration from the j-th to the (fixed) i-th region. The hypothesis may written as follows:

$$log\ n^i_j = f_j + f_t + \gamma_1(w^p_j/w_i) + \gamma_2 A_j + u(jt), \tag{6}$$

Table 7

region of out-migration	$\hat{f}_j$	year	$\hat{f}_t$
28 Hyōgo	1.729	1930	1.845
31 Tottori	1.937		
32 Shimane	1.772	1931	2.134
33 Okayama	3.123		
34 Hiroshima	2.476	1932	2.120
35 Yamaguchi	1.580		
36 Tokushima	1.739	1933	2.045
37 Kagawa	2.366		
38 Ehime	1.851	1934	2.138
39 Kōchi	1.822		
40 Fukuoka	1.184	1935	2.198
41 Saga	1.725		
42 Nagasaki	2.148	1936	1.776
43 Kumamoto	1.319		
44 Ōita	1.918	1937	2.069
45 Miyazaki	1.793		
46 Kagoshima	2.119		
47 Okinawa	2.260		
Var ($\hat{f}_j$)	0.1956	Var ($\hat{f}_t$)	0.0147

11) Data from *the Survey of Labor Migrants* could not be used here because of the lack of any corresponding wage data across regions.

12) Cf. Stefan Valavanis, *Econometrics*, 1959, esp. chapter 11 and also C.E.V. Leser, "*Production Function and British Coal Mining,*" *Econometrica*, vol. 23, no. 4, Oct. 1955.

where the notations in the parenthesis behind u show the dimensions of variables. If we have the data being arrayed by two dimensions, i.e. j and t, either the f_j-s or the f_t-s can be alternatively estimated from our data, corresponding to assuming either $ave[j]u(jt)=0$ and $ave[jt]u(jt)=0$, or $ave[t]u(jt)=0$ and $ave[jt]u(jt)=0$. The samples of in-migration to Okayama ($i=33$) are selected for our hypothesis testing[13]. The estimated $\hat{f}_j$ ($j=28,\ldots, 47$), $\hat{f}_t$ ($t=1930,\ldots, 1937$) and $\hat{\gamma}_1$, $_2\hat{\gamma}$ are illustrated in Table 7. The variances of $\hat{f}_j$ and $\hat{f}_t$ are 0.1956 and 0.0147 respectively, so that relative contribution to total variance of n^i_j is clearly larger in $\hat{f}_j$ than in $\hat{f}_t$. Roughly speaking, it is observed (see the Map in Appendix) that our estimate $\hat{f}_j$ seems to correspond to geographical distance[14] from the j-th region to Okayama. The longer the distance is, the smaller the $\hat{f}_j$ becomes, say, $\hat{f}_{33}$ for Okayama itself is the largest and $\hat{f}_{45}$ for Miyazaki, one of the far distant regions, is the smallest. The $\hat{f}_j$-s for the regions located between these two, for example, Hiroshima and Tokushima, are within the range between $\hat{f}_{33}=3.123$ and $\hat{f}_{45}=1.793$. However, $\hat{f}_{32}$ and $\hat{f}_{46}$ are the exceptions, because these two figures do not well correspond to their distances

Table 8

	const.	$(w^p{}_j/w_i)$	A_j	$N^i{}_j$	R	*d.f.*
1930	−0.5484	+0.2849	−0.0025	—	0.4869	13
	(1.7718)	(0.1631)	(0.0018)			
1932	+2.0677	+0.0383	−0.0013	—	0.1922	17
	(1.1377)	(0.1215)	(0.0016)			
1934	+4.1387	−0.0784	−0.0036	—	0.4933	16
	(1.7224)	(0.2183)	(0.0018)			
1936	+3.1196	+0.0437	−0.0031	—	0.4121	20
	(2.5280)	(0.3102)	(0.0015)			
1930	−0.6746	+0.2419	−0.0014	+0.0009	0.8914**	12
	(0.9665)	(0.0899)	(0.0010)	(0.0002)		
1932	+1.9662	+0.0206	−0.0012	+0.0005	0.6736*	16
	(0.8837)	(0.0945)	(0.0012)	(0.00001)		
1934	+3.1693	+0.0588	−0.0047	+0.0003	0.8258**	15
	(1.1728)	(0.1493)	(0.0012)	(0.0001)		
1936	+2.1652	+0.0926	−0.0026	+0.0003	0.6916**	19
	(2.0758)	(0.2528)	(0.0013)	(0.0001)		

13) Some regions of out-migration are omitted, for they did not continuously supply workers to Okayama. In other expression, some columns with lacunes (empty cells) over two years are excluded from the recutangular array of data.

14) Professor Myers, in his summary essay on labor mobility, suggests, "Distance has ordinary been thought of as an important obstacle to mobility between geographical regions. Little mention has been made, however, of the importance of distance as a barrier even within a local labor market," refering to H. Makower, J. Marschak and R. Robinson, "*Studies in the Mobility of Labour*," *Oxford Economic Papers*, nos. 1, 2 and 4, 1938–40. Cf. Charles A. Myers, "*Labor Mobility in Two Communities*," in *Labor Mobility and Economic Opportunity*, 1954, pp. 70–71.

to Okayama, although Shimane ($j=32$) is one of the neighbour regions and in turn Kagoshima ($j=46$) is one of the most distant regions. If only the geographical distance affected $n^{33}{}_j$-s, $\hat{f}_{32}$ should have been under $\hat{f}_{33}$ and $\hat{f}_{46}$ over $\hat{f}_{45}$. This suggests that the "third" factors other than geographical distance are involved in interregional factors f_j.

Kagoshima and Shimane are well-known as the typical regions of out-migration, while another type of exceptions, Hyōgo and Fukuoka as main industrialized centers. Past history of out-migration may perhaps ease to migrate out of local community,[15] and industrial job opportunity may possibly prevent to out-migration to other regions[16]. Suppose the accumulated numbers of migration from the j-th to the i-th region $N^i{}_j(t)=\sum_{\tau=1928}^{t-1} n^i{}_j(\tau)$, as an index of those factors such as geographical distance, past history of migration and job opportunity (these were, of course, affected with each other during the past days). It is observed that the correlation coefficient between f_j and $N^{33}{}_j(1936)=\sum_{\tau=1923}^{1935} n^i{}_j(\tau)$ is positively high. The introduction of $N^i{}_j(t)$ into the job application equation leads to better fittness to the observed data than the equation without $N^i{}_j$ term (cf. Table 8).

$$\log n^{33}{}_j=\gamma_0+\gamma_1(w^p{}_j/w_{33})+\gamma_2 A_j+\gamma_3 N^{33}{}_j+u(j). \qquad (7)$$

VII Industrial Structure of Employment

The additional factor $N^i{}_j$ contributed much to the leveling up of multiple

Table 9

	const.	$w^p{}_j/w_i)$	$N^i{}_j$	R	*d.f.*
1930	+2.0917	−0.2091	+0.0008	0.9268*	5
	(0.3457)	(0.3623	(0.0002)		
1932	+2.7777	−0.5138	+0.0001	0.5975	8
	(0.9846)	(0.8835)	(0.0001)		
1934	+2.0013	+0.3425	+0.0001	0.6041	11
	(0.6788)	(0.6657)	(0.00004)		
1936	+2.3699	−0.0863	+0.0001	0.7976*	10
	(0.5729)	(0.5463)	(0.00003)		

15) This is because the people in these regions may have social customs of migration and some psychological familiarities to urbanized regions of in-migration. Job hunting or obtaining through families, relatives and friends, which are most dominant means of securing job, could probably accelerate these tendencies. As for the channels of employment see Lloyd G. Reynolds and Joseph Shister, *Job Horizons*, 1949 and Gladys L. Palmer, *"Interpreting Patters of Labor Mobility,"* in *Labor Mobility and Economic Opportunity*, 1954. Also see Natalie Rogog, *Recent Trends in Occupational Mobility*, 1953 and Gladys L. Palmer, *Labor Mobility in Six Cities*, 1954 as for family succession of occupation.

16) The effects of industrial structure are analysed in Makower, Marschak and Robinson's paper cited at footnote 14) above, especially in the first article subtitled by *"A Tentative Statistical Measure,"* in the case of migration into Oxford during the pre-War period. And also see the following analyses in sections VII and VIII.

correlation. Table 9 illustrates the estimated parameters, from the samples[17] of the out-migration from Niigata ($j=15$ fixed), during 1930-1933 and 1934-1937. The *R-s are* remarkably higher in the equation with N^i_j—*s* than the one without them. However, the introduction of N^i_j seems not necessarily to improve the estimated coefficients, because the coefficients have not so well been estimated in this case as expected. The standard errors are relatively large, especially for β_1. We should have in mind the possibility that there remain other factors influencing regional labor mobility. Dividing the whole regions of in-migration from Niigata into two areas according to the relative ratios of silk reeling mill employees to total textile workers, it is observed that (see the Map in Appendix) in the neighbour regions the ratios are extremely high, while the ratios of spinning workers to total textile workers are rather important in the other distant regions. Nagano, Aichi, Gifu and Shizuoka are grouped into the former, and Tōkyō, Kanagawa, Osaka, and Hyōgo are examples in the latter group[18].

Table 10 shows the estimated coefficients of job application equation (8),

$$log\ n^i_{15}=\beta_0+\beta_1(w^p_{15}/w_i)+\beta_2A_{15}+\beta_3N^i_{15}+u(it), \qquad (8)$$

that are applied to these two plausibly stratified areas of regions. The notation E and F stand respectively for the former neighbour mono-silk-reeling area and the latter distant mono-spinning area. Subscripts 1 and 2 stand for the period 1930–1933 (pooled) and 1934–1937 (pooled). Our hypothesis under testing is that among E-area there remain any factors other than N^i_j and, on

Table 1

	const.	(w^p_j/w_j)	A_i	N^i_j	R	*d.f.*
F_1	+3.012	−0.4249	−0.0015	+0.0007	0.731**	19
		(0.2818)	(0.0012)	(0.0002)		
F_2	+2.857	+0.0353	−0.0017	+0.0003	0.785**	26
		(0.2518)	(0.0005)	(0.0001)		
$(F+E)_1$	+2.089	−0.0324	−0.0003	+0.0002	0.649**	37
		(0.3108)	(0.0011)	(0.00004)		
$(F+E)_2$	+2.847	−0.2800	−0.0005	+0.0001	0.680**	52
		(0.2998)	(0.0005)	(0.0002)		
F_1+F_2	+2.857	−0.1550	+0.0014	+0.0003	0.715**	49
		(0.1947)	(0.0004)	(0.00005)		

the contrary, there is no such factors among F-area. As expected, for F_1 the estimates of β_1 and β_2 become significant from zero at a rather high probability level. However, they are still insignificant for E_1 and E_2. For F_2 the estimated β_1 does not seem significant, too. The scatter diagram between (w^p_{15}/w_i) and μ_i,

17) In the computations, the n^i_{15}—*s* less than 50 are excluded from the sample.
18) More exactly, Tōkyō, Kanagawa, Gumma, Kyōto, Ōsaka, Hyōgo, Nara and Wakayama are included in the former and, in turn, Nagano, Yamanashi, Aichi, Shizuoka, Gifu, Mie, Fukui, Toyama are in the latter.

$$\mu_i(t) = \log n^i_{15} - \log \tilde{n}^i_{15} = \beta_0 + \beta_1 (w^p_j / w_i) + u(it), \qquad (9)$$

informs us that the weak correlation between these two terms is owing to some large deviations from the $(w^p_j/w_i) - \mu_i$ correlation, for Gumma and Kanagawa. Both regions had experienced considerable decreases of silk reeling workers during 1934–1937[19]. The reader would also remind that the regions within E(E_1 and E_2) belong to mono-silk-reeling area, and after 1930 the whole employment of silk reeling mills continued to decrease in numbers year after year. It may, therefore, be concluded that silk reeling worker's employment (accordingly, their regional mobility) could possibly have some influences on spinning worker's mobility among regions.

VIII Changing Textile Labor Market

Concerned with the effects of an overall decrease of employment (or of

Table 11

region of out-migration	$\hat{f}_j$	region of out-migration	$\hat{f}_t$
5 Akita	0.182	25 Shiga	0.211
6 Yamagata	0.446	29 Nara	−0.433
7 Fukushima	0.762	31 Tottori	0.535
15 Niigata	1.927	32 Shimane	0.410
16 Toyama	1.224	33 Okayama	−0.141
17 Ishikawa	−0.108	40 Fukuoka	0.015
18 Fukui	0.397	43 Kumamoto	−0.076
19 Yamanashi	0.375	45 Miyazaki	−0.307
20 Nagano	1.817	46 Kagoshima	0.529
21 Gifu	1.275	47 Okinawa	0.305
22 Shizuoka	1.415		
23 Aichi	1.704		
24 Mie	1.017	Var $(\hat{f}_j)$	0.690

year	$\hat{f}_t$
1930	0.343
1931	0.684
1932	0.668
1933	0.524
1934	0.613
1935	0.510
1936	0.526
1937	0.779
Var $(\hat{f}_t)$	0.134

19) This suggests that it would be better to include these two regions within E instead of within F.

migration) in silk reeling, we have an another empirical evidence. The job application equation (6) is fitted to the sample on the in-migration to Aichi ($i=23$ fixed) during 1930–1937, and then f_j and f_t are estimated, variances of which become 0.690 and 0.196 respectively (cf. Table 11). Again, the intertemporal factors may be safely neglected in our following discussions.

During the pre-War period covered by the study, silk reeling is declining, while spinning is expanding. Average annual growth rates of output (in terms of current price) are -1.1% for reeling industry and $+20.6\%$ for spinning industry during 1930–1937, and in the former employment decreases from 423,462 to 237,523, while in the latter increases from 184,323 to 280,600. Correspondingly the numbers of migrant changes from 201,625 to 126,686 for silk reeling mills, while from 27,750 to 114,116 for spinning mills. If the reproduction rates of population changes within a reasonably narrower range and a certain percentage of migrants returning to their own country to those who do not return is also invariate, the laid-off and quit workers from silk reeling mills would depress labor market of (female) textile workers, and then acceralate, *cetris paribus*, the migration of spinning workers.[20]

To test the validity of the hypothesis the correlation coefficients are computed between the estimated $\hat{f}_j$ and some following variables across regions of out-migration:

$\varDelta R_j$ (1930–35) = Decrease in out-migration of silk workers from the j-th region during 1930–1935, and

$\varDelta S_j$ (1930–35) = Decrease in employment of silk workers in the j-th region during 1930–1935.

The correlation coefficients $\hat{f}_j-\varDelta R_j$ (1930–35) and $\hat{f}_j-\varDelta S_j$ (1930–35) are $+0.680$ and $+0.520$, both of them are highly significant under the given degrees of freedom.[21] Our hypothesis has, thus, been supported that migration of silk reeling workers has a negative effect on migration of spinning workers. Decrease in silk reeling employment makes ease recruitment of spinning workers through depressing the female labor market.[22] It should be noted here that neither of the correlations, separately, provides sufficient support to the hypothesis, but the joint results do so. If any information about either changes in returning ratio of laid-off workers to their native regions or in hiring ratio of internally-born to externally-born workers were available, only one of the above evidence might be enough to support the hypothesis.

20) The wage rate of (cotton) spinning workers did, in fact, not increase during the period except for 1936 and 1937, though the employment was steadily increasing. Cf. S. Nishikawa, "Changes in Wages and Wage Differentials in Japanese Cotton Spinning Mills," *Mita Shōgaku Kenkyū*, 3–5, 1960 ("Men Bōsekigyo no Chingin Hendō to Chingin Kakusa"). This paper will be published somewhere in English.

21) In the case of Okayama where silk-reeling employment did not play so important role in the local labor market as in Aichi. The similar correlation coefficients are—.138 and—.187, those are in-significant.

22) Related experiences after textile mill shutdown were discussed in a New England local labor market field study by Professors Myers and Schultz. Cf. Charles A. Myers and George P. Schultz, *The Dynamics of A Labor Market*, 1951. Also, the effect of industrial structures on labor mobility was reported in Professor Palmer's article, "*Mobility of Weavers in Three Textile Centers.*" *Quarterly Journal of conomics*, May 1941 and a number of related WPA reports on Philadelphia labor market surveys.

Summing up these last three sections, we could reasonably draw a conclusion such as,

[3] *The interregional (and moreover, interindustrial) mobility of labor depends on the "third" factors as geographical distance, past history of migration*[23] *and industrial structure of employment across regions.* These variables mentioned above are all some elementary components of "labor market structure" among regions and industries. Even though the N^i_j—s seem not to be the best proxy variable, they may, however, be indecies of the complexity of those influencing factors. The φ^i_j—s in section V are, therefore, considered to be specified as the N^i_j—s at this (, but not final,) stage of investigation.

IX Concluding Remarks

Our fragmental and partial analyses described thus far could successfully clarify the movement of labor force in regional networks and its dependence on economic and non-economic as well as partial and temporal factors. The job application equation, being presented and tested above, will provide a rather well analytical tool for interregional manpower supply and demand. As additional information becomes available and as further investigation becomes possible, it also supply a bexible, but at the same time internally consistent, general equilibrium framework by which one can predict forthcoming changes in recruitment and application of labor.

First of all it should be necessary to build a more over-all multiregional model containing any labor demand equation which states mutual dependence of the quantity and quality of labor demanded in each region and of those determining factors, namely wage rate, working conditions and so on.[24] In the model the job application equation is essentially a type of equation stating the relationships between labor application and its incentives (and barriers,) though in this paper the characteristics being more or less ambiguous because our one-sided approach cannot help introducing into the term N_j^i that perhaps include any behavioral determinants belong to demand side such as hiring preferences.

23) To be exhaustive, hiring preference, given to workers from the j-th region by spinners in the i-th region, and occupational preference, attached to cotton spinning in the i-th region by applicants in the j-th region, be involved in the past history of migration from the j-th to the i-th region. Some empirical evidences on these factors' influences are given in the following series of "labor market survey" reports (in Japanese) being published by central and local public employment offices. *Survey of Female Silk Reeling Workers, 1923 (, Kannai Seishi Jokō Chōsa): Survey of Female Migrants, 1928 (, Dekasegi Jokō ni kansuru Chōsa): Survey of Female Workers in Spinning Mills, 1929 (, Bōseki Rōdō-Fujin Chōsa): Present Situation of Labor Market (in Nagano), 1935 (, Zenkoku Rōdō-Shijō Tenbō, Nagano).*

24) In the application of equation (7) to the out-migration of silk reeling worker from Nagano where silk reeling mills intensively centered, the fitness is not so good as in the other regions, which might be improved if we introduce the demand equation explicitly. As silk reeling was rapidly declining, these changing demand conditions would perhaps had yield such fruitless results.

In his lecture[25] Professor T. Haavelmo has developed a migration equation quite similar to our job application equation. In our notation, it is

$$n^i{}_j = v_{ij}\left(x^*_{ij},\ \frac{X_j}{N_j}\right), \tag{10}$$

where X_j and N_j denote respectively the net outpui and population in the j-th region, and then (X_j/N_j) becomes the average productivity in the j-th region. The x^*_{ij} denotes the average output in the i-th region as "visualized" by a prospective emigrant for the j-th region.

$$x^*_{ij} = \frac{1}{N_i}\psi_i\,(N_i,\ K_i,\ S_j), \tag{11}$$

where ψ_i is the production function of the i-th region as visualized from the j-th region when the "technical skill" or "education" S_i is replaced by S_j, (while capital K_i and population N_i are those of the i-th region). The equation describes the behavior of (prospective) migrants. On the other hand the demand for labor or population in the i-th region is set as follows,

$$N_i = \psi_i\,(X_i,\ N_i,\ K_i,\ S_i) + \sum_j n^i{}_j - \sum_j n^j{}_i. \tag{12}$$

The difference between the two sums on the right hand side is the net annual in-migration into the j-th region. Equations (11) and (12), together describing "pull" and "push" forces, provide the migration equation (10).

However closely do resemble with our job application equation (1) or (5), his migration equation is of "market adjustment" equation, but our job application equation is not. We can identify this property of our equation in an empirical way. Professors K. Obi and I. Ozaki[26] analyzing the family budget survey data have observed that labor force participation of family member other than family head depends on family head income level. The more the family head earns, the less does the family participate into the labor force. Such negative dependence will be revealed in our empirical analysis as finding [1], i.e. the correlation coefficient between N_j and Y_j is negative, or as negative coefficient to A_j in job application equation. Because, our factual informations are of family members other than head, in other word our migrants are mainly female spinning workers (pre-War) and new graduates (post-War) who do not occupy the position of head in their families. Finding [2], i.e. the correlation coefficient between N_i and W_i is positive, or positive coefficient to W_i in job application equation has been also supported by Obi and Ozaki's work. It is quite natural for the applicant to be motivated by the wage level (and more generally working conditions) presented. Accordingly our equation state the schedule of labor application (supply) and if we enlarge the scope over the demand side we could derive the relationship such as Haavelmo's migration equation.

Provided that empirical survey data distinguishing the wage rates before and after the move were available, the job application equation would not be

25) Trygve Haavelmo, *A Study in the Theory of Economic Evolution, Contributions to Economic Analysis III*, 1954, esp. Chapter 21 "*Fragments of a theory of migration*," pp. 101 ff.

26) Keiichirō Obi and Iwao Ozaki, "*Microeconomic Analysis of Labor Force Participation*," *Keizai Bunseki*, no. 6, 1961 ("*Kinrō Kakei Yūgyōritsu no Kenkyū*").

couch in younger and family member worker's participation, but extend over older and family head worker's mobility. Professor K. Fujibayashi's pioneering study[27] on the mobility of factory workers supports this prospect. His finding that the ratio of separated workers to total employed is negatively dependent on the wage earning, is an elemental core of our study.

27) Keizō Fujibayashi, "*An Empirical Study of Factory Worker Mobility in Japanese Industry*," *Mita Gakkai Zasshi*, 35–3, 1941 *("Wagakuni Kō-kōgyō Rōdō Idō no Kenkyū")* and ditto, *Labor Policy and Labor Science*, 1941 (*Rōdōsha Seisaku to Rōdō Kagaku*.) Fujibayashi's hypothesis is under test for the post-War data in my paper, "*Separation Rate and Wage Level*," *Mita Shōgaku Kenkyū*, 4–2, 1962 *("Rōdō no Idōritsu to Chingin Suijun.)*

Appendix 1 **List of the Data Sources****

1 *Population of Japan, Summary of the Results of 1955 Population Census of Japan*, 1960, Bureau of Statistics, Office of the Prime Minister.

2 *The Survey of Labor Migrants, 1924, '28, '30, 32, '34, and '36*, Central Public Employment Office. (*Do-Fu-Ken-gai Dekasegisha Chōsa Gaiyō, Taishō 14, Showa 3, 5, 7, 9, 11*, Chuō Syokugyō-shōkai Jimukyoku.)

3 *The Annals of Labor Recruitment, 1928, '29, ..., '36 and '37*, Bureau of Social Affairs. (*Rōdōsha Boshū Nenpō, Shōwa 3, 4, ..., 11, 12*, Shakai Kyoku.)

4 *The Survey of Vocational Education, 1954*, Ministry of Education. *(Sangyō Kyōiku Chōsa, Shōwa* 29, Monbu-shō.)

5 *The Demand and Supply of New Graduates etc., 1960*, Ministry of Labor. [mimeographed] *(Shinki Gakusotsusha no Shokugyō-shōkai Jōkyō oyobi Shoninkyū Chōsa*, Shōwa 35, Rōdō-shō.)

6 *The Demand and Supply of Interregional Migrants, 1954*, Ministry of Labor. [stenciled] (*Chiiki-kan Idō-rōmu Jukyū Chōsa, Shōwa 33*, Rōdō-shō.)

7 *The Statistical Annals of the Ministry of Agriculture and Forestry. (Nōrin-shō Tōkei-hyō.)*

8 *The National Income Accounts*, Economic Planning Agency. (*Kokumin Shotoku Hakusho*, Keizai Kikaku-chō.)

9 *The Survey of Employment Status, 1959*, Bureau of Statistics, Office of the Prime Minister.

10 *The Census of Manufacturing Factory*, Ministry of Trade and Industry. (*Kōjō Tōkei-hyō*, Shōkō-shō.)

** The titles of sources and the names of governmental institutions are tentatively given by the author except for (1) and (9).

Appendix 2 **Table A Increases in Population, by Region**

No.	Region \ Increments \ Period	1930 to 1935 Total Increase	1930 to 1935 Natural Increase	1930 to 1935 Net Migration	1950 to 1955 Total Increase	1950 to 1955 Natural Increase	1950 to 1955 Net Migration
1	Hokkaidō	255947	291852	35905	476133	432044	−44089
2	Aomori	87215	102600	15385	98326	130771	32445
3	Iwate	70340	93131	22791	80456	124517	44061
4	Miyagi	92017	121786	29769	64176	147568	83392
5	Akita	50038	103841	53803	40190	108753	68563
6	Yamagata	36788	96854	60066	−3445	93362	96807
7	Fukushima	73413	147461	74048	33384	179505	146121
8	Ibaraki	61894	124369	62475	24429	146233	121804
9	Tochigi	53320	105148	51828	−3025	114322	117347
10	Gumma	56373	100850	44477	12060	108305	96245
11	Saitama	69682	107784	38102	115241	148326	33085
12	Chiba	76273	100536	24263	65821	131438	65617
13	Tōkyō	961241	420688	−540553	1740205	429124	−1311081
14	Kanagawa	220399	127544	−92855	425299	180398	−244901
15	Niigata	62451	154966	92515	12804	174089	161285
16	Toyama	19937	50506	30569	12252	55532	43280
17	Ishikawa	11581	30599	19018	8929	50332	41403
18	Fukui	28515	27161	−1354	1958	44163	42205
19	Yamanashi	15685	54533	38848	−4472	54736	59208
20	Nagano	−3118	127390	130508	39106	106058	145164
21	Gifu	47394	86208	38814	37970	95354	57384
22	Shizuoka	142055	162213	20158	178447	191069	12622
23	Aichi	295288	193876	−101412	372679	212114	−160565
24	Mie	17188	73805	56617	24203	79854	55651
25	Shiga	19805	34666	14861	−7002	43174	50176
26	Kyōto	149676	78695	−70981	97433	83420	−14013
27	Ōsaka	757157	212143	−545014	739717	246030	−493687
28	Hyōgo	276948	164906	−112042	305191	203510	−101681
29	Nara	24246	32769	8523	12285	40497	28212
30	Wakayama	33339	50844	17505	24608	51289	26681
31	Tottori	1195	28343	27148	14384	38959	24575
32	Shimane	7612	36351	28739	16143	52736	36593
33	Okayama	48685	73272	24587	30031	84230	54199
34	Hiroshima	112780	107596	−5184	68938	115631	46693
35	Yamaguchi	54905	62517	7612	67602	94485	26883
36	Tokushima	12204	49154	36950	−300	56375	56675
37	Kagawa	15840	53850	38010	−1710	50567	52277
38	Ehime	22776	88178	65402	18375	107976	89601
39	Kōchi	−3172	40664	43836	8917	45991	37074
40	Fukuoka	228685	181254	−47431	327857	287897	−39960
41	Saga	−5448	48284	53732	28553	78172	49619
42	Nagasaki	63521	93584	30063	100487	160113	59626
43	Kumamoto	33061	98842	65781	68704	144736	76032
44	Ōita	34687	62992	28305	23557	82269	58712
45	Miyazaki	63964	71487	7523	47580	97554	49974
46	Kagoshima	33776	137372	102596	240238	164559	−75.679

Source : *Population of Japan, Summary of the Results of 1955 Population Census of Japan*, 1960, Bureau of Statistics, Office of the Prime Minister.

Appendix 2 Table B Employment Structures, by Region

No.	Region \ Industry \ Year	1930 Primary	1930 Secondary	1930 Tertiary	1955 Primary	1955 Secondary	1955 Tertiary
1	Hokkaidō	54.9%	15.2%	29.3%	42.9%	21.0%	36.1%
2	Aomori	67.7	9.6	22.6	62.3	9.9	27.8
3	Iwate	73.2	10.2	16.4	63.5	12.5	24.2
4	Miyagi	63.2	11.2	25.6	53.7	12.8	33.5
5	Akita	67.2	11.7	21.2	61.5	13.0	25.5
6	Yamagata	64.1	14.5	21.5	58.3	15.2	26.6
7	Fukushima	65.9	14.9	19.2	57.4	16.0	26.5
8	Ibaraki	70.8	10.3	18.9	63.9	12.4	23.5
9	Tochigi	60.5	16.0	23.4	52.4	19.0	28.6
10	Gumma	55.5	22.5	22.0	50.9	21.2	27.9
11	Saitama	61.4	17.0	21.8	45.5	23.5	31.0
12	Chiba	65.9	9.9	24.2	56.1	13.6	30.3
13	Tōkyō	6.8	32.6	60.1	3.9	37.6	58.6
14	Kanagawa	27.0	24.6	47.9	15.9	31.6	52.3
15	Niigata	63.0	14.4	22.4	55.7	17.3	27.2
16	Toyama	57.1	16.5	26.3	46.5	22.7	30.8
17	Ishikawa	53.2	21.2	25.6	45.0	23.5	31.5
18	Fukui	54.0	22.1	23.8	46.4	25.0	28.6
19	Yamanashi	60.5	18.8	20.5	51.4	21.7	29.5
20	Nagano	59.4	22.1	18.4	57.2	16.2	26.8
21	Gifu	57.4	20.8	22.0	43.8	26.7	29.6
22	Shizuoka	53.7	20.4	25.6	38.9	28.0	33.2
23	Aichi	37.4	30.2	32.2	26.5	37.7	35.8
24	Mie	57.0	18.8	24.1	48.2	22.3	29.6
25	Shiga	60.6	17.5	21.8	51.4	20.5	28.0
26	Kyōto	26.5	29.5	43.6	23.0	30.3	46.6
27	Ōsaka	10.9	36.8	51.6	8.1	42.8	49.1
28	Hyōgo	36.6	24.9	37.9	28.2	30.9	41.0
29	Nara	48.7	18.0	33.3	41.5	22.8	35.7
30	Wakayama	46.6	23.7	29.4	41.1	25.3	33.5
31	Tottori	66.9	13.1	20.0	57.1	13.0	30.0
32	Shimane	67.9	11.9	20.1	59.5	13.7	26.6
33	Okayama	59.8	17.9	22.4	50.7	20.8	28.4
34	Hiroshima	50.9	19.3	29.7	40.8	22.0	37.1
35	Yamaguchi	55.3	17.3	27.3	42.4	22.4	35.1
36	Tokushima	62.3	15.3	22.3	53.9	17.7	28.4
37	Kagawa	59.4	15.9	24.5	49.5	17.9	32.6
38	Ehime	57.7	19.2	23.2	49.8	20.3	30.0
39	Kōchi	62.7	15.0	22.0	58.6	13.2	28.0
40	Fukuoka	34.3	31.9	33.3	26.9	30.6	42.5
41	Saga	57.0	18.3	24.6	50.0	18.0	32.1
42	Nagasaki	53.0	18.2	28.3	48.0	17.5	34.7
43	Kumamoto	63.8	12.6	23.7	55.7	13.8	30.5
44	Ōita	66.3	11.9	21.7	55.8	14.0	30.2
45	Miyzaki	66.1	13.4	20.4	59.1	14.0	27.0
46	Kagoshima	73.2	10.4	16.2	67.8	8.4	23.8
	Average	49.3	20.4	30.1	41.0	23.5	35.5

Source : *Population of Japan, Summary of the Results of 1955 Population Census of Japan*, 1960, Bureau of Statistics, Office of the Prime Minister.

Appendix 3 **Map of Japan**

1	Hokkaido	24	Mie
2	Aomori	25	Shiga
3	Iwate	26	Kyōto
4	Miyagi	27	Ōsaka
5	Akita	28	Hyōgo
6	Yamagata	29	Nara
7	Fukushima	30	Wakayama
8	Ibaragi	31	Tottori
9	Tochigi	32	Shimane
10	Gumma	33	Okayama
11	Saitama	34	Hiroshima
12	Chiba	35	Yamaguchi
13	Tōkyō	36	Tokushima
14	Kanagawa	37	Kagawa
15	Niigata	38	Ehime
16	Toyama	39	Kōchi
17	Ishikawa	40	Fukuoka
18	Fukui	41	Saga
19	Yamanashi	42	Nagasaki
20	Nagano	43	Kumamoto
21	Gifu	44	Ōita
22	Shizuoka	45	Miyazaki
23	Aichi	46	Kagoshima