Regional Divergences in Unemployment Rates in Japan and Their Factors†

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1. Introduction

The objective of this paper is to quantitatively understand the impact that regional labor market structure has on the regional divergences in unemployment rates and "non-employment rates."

In the past, many researchers have pointed out the rigid structure of regional divergences in unemployment rates in Japan. For example, Mizuno (1992) confirmed the extremely high correlation among unemployment rates in 47 prefectures at different times between 1970 and 1980, and concluded that the regional unemployment patterns were stable. These trends can also be observed in recent years. In fact, the correlation coefficient between unemployment rates by prefecture in 1990 and 2000 is 0.9320. The stickiness of regional unemployment rates can still be observed.[1]

The lack of market functions to adjust through labor mobility has been pointed out as one of the factors contributing to the rigid divergence structure (Montgomery (1993); Ohta and Ohkusa (1996)). Ohta and Ohkusa (1996), who analyzed regional labor markets based on data from the latter halves of the 1970s and 1980s, claimed that while expansion of regional divergences in unemployment rates significantly increased interregional labor mobility, the results of simulation showed that differences in unemployment rates caused by temporary shocks would not be diminished for at least 10 years. Todate (1999), who attempted to explain the sustainability of the divergences from the standpoint of the demand for labor, elucidated that the structure of demand shocks in each major industrial division in each region explained unemployment rates, and that interregional divergences in unemployment rates were sustainable

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1 This is also true when the period of unemployment is taken into consideration. According to Shinozaki (2004), the relation between short-term unemployment rate of less than a year of unemployment and long-term unemployment rate of a year or longer is stable in each prefecture from 1992 to 2002.

because this structure was more or less unchanged over 20 years from 1975 to 1995.

The fact that the divergences in unemployment rates over time are stable obviously gives rise to an interest in the causes of static regional divergences at a given time. Several researches have attributed the cause of static divergences to regional difference (characteristics) in the labor market structure, and have reported significant correlation between regional demographic attributes and industrial structures on one hand and regional unemployment rates on the other (Mizuno (1992); OECD (2000); Ministry of Health, Labor and Welfare (2003)). This research, however, does not mention to what degree each of these attributes explain the actual regional divergences. Therefore, in this paper we examine, more directly, the impact that labor supply attributes (such as gender, age, and schooling) and the labor demand structure (represented by the composition of workers by industry) have on the regional divergences in unemployment rates. At the same time, we attempt to gauge such divergences in unemployment rates when the effect of these attributes is removed (hereinafter called the "control").

In analysis of unemployment rates, only those in the labor force and active in the labor market are usually examined. It has been pointed out, however, that those not in the labor force are also responsive to economic fluctuations. As seen in Europe, policies for activating the entire population have been proposed since the 1990s. From this point of view, attention is also focused on the behavior of those not in the labor force. In Japan too, efficient utilization of those not in the labor force, including unemployed youth, women and senior citizens, would be the key to stimulating the economy in areas where there is a significant decline in the birth rate and rapid aging of the population. Therefore, in this paper, we introduce the term, "non-employment rate," as an indicator of underutilized labor, including those who are wholly unemployed, and quantitatively grasp regional divergences after controlling the labor supply attributes.[2]

Here we look at the unemployment rates and non-employment rates in the unit of prefectures (there are 47 prefectures). The focus is on the cross-section

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[2] For the purpose of this paper, non-employment rate is defined as the percentage of wholly unemployed people and those not in the labor force (those engaged solely in housework, study, or others) in the population aged fifteen and above.

comparison at the time of each survey rather than on the time-series change. The data from the *Population Census* of 1990 and 2000 are used for the analysis. Naturally, some reservation is called for in a static analysis that focuses on the unit of prefectures. In prefectures where large cities are located, the labor market is not necessarily divided in the unit of prefectures, and it is, therefore, preferable to take into consideration those who commute from region to region.[3] At any rate, when we consider local governments' industrial policies and employment measures, the focus on the prefectures as administrative units has more than a small meaning.

The contents of this paper are as follows: In 2, we quantitatively measure regional divergences in unemployment rates when the effects of the labor market structure are removed, and examine the regional factors that create the controlled divergences. In 3, we measure the regional divergences in non-employment rates with the effects of demographic attributes removed, and analyze the relation between those divergences and the controlled regional divergences in unemployment rates. Lastly, in 4, we summarize the results of the analysis and state the policy implications obtained from the results.

2. Analysis of divergences in unemployment rates among prefectures

2.1 Effect of labor supply and demand attributes

Firstly, in measuring the divergences in unemployment rates among prefectures, we assume the following linear unemployment rate function:

$$u_i = \alpha_0 + \alpha_1 X_i + \alpha_2 D_i + \varepsilon_i \qquad (1)$$

where u_i is the average unemployment rate of group i calculated from labor force statuses by prefecture of residence, gender, age group, and educational level; X_i is the group's labor supply and demand attributes (female dummy, age group dummies, schooling dummies, and composition of workers in difference major industrial divisions within the group); D_i is the prefecture of residence dummies; α_0 is the constant term; and ε_i is the error term.

The explanatory variables are as follows. For the age group, dummy

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[3] In recent years, an attempt has been made to define the area of a labor market ("area of urban employment") from the percentage of those who commute to and from different municipalities and to analyze the economic development of each urban area (Kanemoto and Tokuoka (2002)).

variables are used for the five age groups of 15-24, 25-34, 35-54, 55-64, and 65 and over. For the schooling dummies, there are four divisions: completed primary and junior high school, completed senior high school, completed junior college or technical college, and completed university or graduate school. For indicators of regional differences in the labor demand structure, we introduce the composition of workers in difference major industrial divisions of the workers in each group. More specifically, the ratio of workers in the manufacturing industry is used as an indicator of low turnover rate and tight labor situation in each industry, while the ratio of workers in the service industry and the ratio of workers in the wholesale, retail trade, and restaurant industries are used as a factor promoting high turnover rate and generating structural/frictional unemployment.[4]

The data used for the estimation are from the *Population Census* of 1990 and 2000, which allow for the calculation of unemployment rates by gender, age group, and schooling in each prefecture.[5] Additionally, because the published statistics of the population censuses do not indicate the educational levels and employment statuses of those who are currently in school, we limit our sample to those who have completed school education.[6]

Through the estimation of the unemployment rate function of the formula (1) by the ordinary least squares method, the variations in the estimated coefficients of the prefecture dummies can be regarded as the extent of the

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[4] When we look at the correlation between the active opening rate by prefecture and age group in 1990 and 2000 on one hand and the composition of workers by industry on the other, there is a significant positive correlation between the ratio of the manufacturing industry and the effective job offer ratio for both years (0.516 in 1990 and 0.323 in 2000), but there is no significant correlation with the ratio of the service industry. With respect to the ratio of the wholesale, retail trade, and restaurant industries, there is positive correlation with the active opening rate; however, the turnover rate in each industry is high, and the net effect on raising or reducing the unemployment rate is not clear a priori. On the other hand, there is some criticism of discussing the effect of industrial structure when dealing with static regional divergences (Todate (1999)). In this paper, we limit ourselves to discussing the effect that the industrial structure, by way of the tightness of labor conditions and turnover rate in each industry, has on unemployment rates "by definition."

[5] Therefore, the number of observations per survey year is 47 (prefectures)×2 (gender)×5 (age groups)×4 (educational levels) = 1,880.

[6] The samples of those currently in school make up 1.4 percent and 1.6 percent of the whole in 1990 and 2000, respectively. By limiting the sample, the average unemployment rate of the nation increases slightly from 3.01 percent to 3.02 percent and from 4.72 percent to 4.80 percent in 1990 and 2000, respectively.

divergences in unemployment rates among the prefectures. Here we compare the difference among the case where all explanatory variables are used (Full-Control), the case where one of the variables is left out, and the case where only the prefecture dummies are used (No-Control). For the indicator of the variations in the estimated coefficients of the prefecture dummies, we use the standard deviation adjusted by the share of the labor force in each region (Weight Adjusted Standard Deviation: WASD).[7] The results of the calculation are shown on Table 1.

Firstly, if we look at the WASD of No-Control, the figure in 2000 is 12.905 compared with 9.322 in 1990, which indicates that the regional divergences in unemployment rates widened in recent years. However, the results of Full-Control, where the effect of all labor supply and demand attributes are removed, show that it is 1.830 in 1990 and 0.571 in 2000, which indicates that the controlled regional divergences are substantially narrowed in both years (the rate of decline in the standard deviation is 80.4 percent in 1990 and 95.6 percent in 2000). Moreover, the results of Full-Control also show that the regional divergences in unemployment rates are smaller in recent years.

Table 1. Divergences in Unemployment Rates Among Prefectures (WASD)

Removed variables	1990	2000
Full-Control	1.830	0.571
Age	1.711	3.776
Gender	6.079	9.343
Schooling	7.024	9.022
Industry	9.344	12.940
No-Control	9.322	12.905

Note: For details about WASD (Weight Adjusted Standard Deviation), see the body text and footnote 7.

7 $WASD = \left[\sum_j (s_j\beta_j - \sum_j s_j\beta_j)^2 - \sum_j s_j\delta_j^2\right]^{\frac{1}{2}}$. It is an indicator of divergences often used in the empirical analysis, of inter-industrial wage differentials. s_j is the weight of the labor force in prefecture j, β_j is the coefficient, and δ_j is the standard error. Similar to Krueger and Summers (1988), who analyzed inter-industrial wage differentials, the covariance term among the variables are not taken into consideration.

In addition, Table 1 also shows which variables have an influence on the regional divergences. In 1990, the standard deviation increases the most when the composition of workers in each industry is excluded from Full-Control, followed by schooling dummies, gender dummies, and age group dummies. In 2000, too, the effect of the industrial structure variable is the largest, but it is followed by gender, schooling, and age, in that order, as the effect of schooling attributes in reducing the measured regional divergences declines. This probably reflects the narrowing of divergences in unemployment rates among those of different educational levels in recent years. This is a result of the rising unemployment rates among educated workers who have graduated from universities and graduate schools.

2.2 Level of controlled divergences

The results of Table 1 indicate that much of the apparently observable divergences in unemployment rates are attributed to the regional differences in the labor market structure. It is also noteworthy that when factors related to the industrial structure are controlled, the regional divergences are substantially reduced. Against this backdrop, in this section we examine the levels of regional divergences in unemployment rates when gender, age, and schooling are controlled (Estimation 1) and when the composition of workers in each industry is added to the explanatory variables (Estimation 2). To normalize the estimated coefficients of regional dummies (based on Nagano Prefecture, which has the lowest unemployment rate) in Estimation 1 and 2, the difference with the average value weighted by the labor force in each prefecture is calculated as the regional divergences in unemployment rates.[8] The results of the calculation are shown on Table 2.

Firstly, if we look at the divergences after removing the effect of the labor supply attributes (Estimation 1), the divergences in unemployment rates after the control are narrowed more, in comparison with the actual divergences, in rural areas where there is a relatively large number of groups with high

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[8] Here the regional divergences are expressed as $d_i = \hat{\beta}_i - \left(\sum_j s_j \hat{\beta}_j\right)$, where d_i is the divergences in unemployment rate of prefecture i and $\hat{\beta}_i$ is the estimated coefficient of the prefecture's regional dummies. The second term on the right-hand side is the average value of the regional dummy coefficient weighted by the labor force weight (s_j) of each prefecture.

unemployment rates, such as youths and those with less years of schooling. For example, the actual unemployment rate of Aomori Prefecture in 1990 is 1.46 points higher than the national average, but when the effect of gender, age, and schooling on increasing the unemployment rate (net) is controlled, the divergence is narrowed by about 0.3 points. In contrast, in Tokyo, Osaka and Fukuoka prefectures and their environs, while there are a large number of youths, there are also people with many years of schooling who tend to lower the unemployment rate. As a result, the divergences after the control are increased. In Tokyo Prefecture (1990), the divergence after the control increased to 0.25 point compared with the actual divergence of 0.10 point.

The results of Estimation 1 show that there are still many areas in which the divergence from the national average is 1 point or more. The results of Estimation 2 indicate the divergences in unemployment rates when the effect of the ratio of the manufacturing industry to lower unemployment rates and the effect of the ratio of the tertiary industry (the ratios of wholesale, retail trade and restaurant industries and of service industry) to raise unemployment rates are controlled. They show that, relatively speaking, unemployment rates after the control rise in areas where there are many workers in the manufacturing industry and fewer workers in the tertiary industry.

For example, the results for Aichi Prefecture (2000), where there is a concentration of automotive and other manufacturing firms and a sound demand for labor, indicate that the difference with the average unemployment rates after controlling the industrial structure is 0.39 point, whereas the difference is -0.90 point before the control. The difference of 1.29 points is considered to be the decrease in the unemployment rate brought about by the leaning towards the manufacturing industry. A similar trend is notable in the northern Kanto, Koshin and Tokai regions. In the Tohoku region, it is observable in Yamagata and Fukushima prefectures. In western Japan, it is evident in Shiga Prefecture, Chugoku region (excluding Shimane and Yamaguchi prefectures) and the Shikoku region (excluding Kochi Prefecture).

In contrast, in areas leaning heavily towards the tertiary industry such as wholesale, retail trade, and restaurant industries, the industrial structure has an effect to raise unemployment rates, and as a result the divergences after the control narrow. This trend is particularly notable in Okinawa Prefecture, where the ratio of workers in the manufacturing industry is the lowest in Japan and the ratio of workers in the service industry the highest. When the

Table 2. Divergences in Unemployment Rates Among Prefectures

	1990			2000			Changes in 10 years	
	Actual divergence	Estimation 1	Estimation 2	Actual divergence	Estimation 1	Estimation 2	Actual divergence	Estimation 2
Hokkaido Prefecture	0.62	0.47	-1.06	0.05	0.08	-1.42	-0.57	-0.36
Aomori Prefecture	1.46	1.11	0.29	0.66	0.56	-0.19	-0.80	-0.48
Iwate Prefecture	-0.39	-0.56	-0.37	-0.74	-0.78	-0.59	-0.35	-0.21
Miyagi Prefecture	-0.28	-0.31	-0.81	0.18	0.17	-0.67	0.46	0.15
Akita Prefecture	-0.30	-0.12	-0.22	-0.46	-0.33	-0.61	-0.15	-0.39
Yamagata Prefecture	-1.28	-1.20	-0.41	-1.43	-1.41	-0.33	-0.15	0.08
Fukushima Prefecture	-0.60	-0.68	0.08	-0.48	-0.56	0.35	0.12	0.27
Saitama Prefecture	-0.34	-0.12	0.67	-0.01	0.10	0.69	0.33	0.02
Chiba Prefecture	-0.35	-0.13	-0.12	-0.02	0.15	-0.45	0.33	-0.33
Tokyo Prefecture	0.10	0.25	-0.68	0.14	0.31	-1.13	0.04	-0.46
Kanagawa Prefecture	-0.03	0.32	0.33	0.11	0.33	-0.24	0.14	-0.57
Ibaraki Prefecture	-0.64	-0.71	0.27	-0.51	-0.57	0.62	0.13	0.35
Tochigi Prefecture	-0.76	-0.95	0.24	-0.64	-0.78	0.60	0.11	0.36
Gunma Prefecture	-0.56	-0.76	0.36	-0.64	-0.85	0.70	-0.08	0.35
Yamanashi Prefecture	-0.60	-0.65	0.80	-0.97	-0.98	0.64	-0.36	-0.16
Nagano Prefecture	-1.29	-1.39	0.28	-1.67	-1.93	0.11	-0.38	-0.17
Niigata Prefecture	-1.00	-1.13	-1.08	-0.91	-1.03	-0.77	0.09	0.31
Toyama Prefecture	-1.03	-1.03	-0.36	-1.32	-1.64	-0.36	-0.29	0.00
Ishikawa Prefecture	-0.76	-0.94	-1.06	-1.10	-1.22	-0.91	-0.34	0.15
Fukui Prefecture	-1.13	-1.34	-0.21	-1.69	-2.05	-0.61	-0.56	-0.40
Gifu Prefecture	-0.98	-1.25	-0.27	-1.03	-1.37	0.22	-0.05	0.49
Shizuoka Prefecture	-0.66	-0.89	0.09	-0.97	-1.28	0.38	-0.31	0.29
Aichi Prefecture	-0.55	-0.69	0.07	-0.70	-0.90	0.39	-0.15	0.32
Mie Prefecture	-0.42	-0.76	-0.07	-0.89	-1.17	0.02	-0.47	0.08
Shiga Prefecture	-0.86	-0.88	0.53	-1.08	-1.14	1.06	-0.22	0.53
Kyoto Prefecture	-0.15	-0.11	-0.27	0.22	0.37	0.29	0.37	0.56
Osaka Prefecture	1.24	1.27	0.88	2.34	2.29	1.93	1.11	1.05
Hyogo Prefecture	0.33	0.37	0.33	0.65	0.75	0.95	0.32	0.62
Nara Prefecture	-0.15	0.17	0.27	0.23	0.71	1.02	0.38	0.75
Wakayama Prefecture	0.41	-0.06	-0.22	0.20	0.03	-0.07	-0.21	0.15
Tottori Prefecture	-0.54	-0.51	0.15	-1.19	-1.57	-0.83	-0.65	-0.98
Shimane Prefecture	-1.07	-1.31	-1.18	-1.81	-2.22	-2.13	-0.74	-0.95
Okayama Prefecture	-0.08	-0.08	0.63	-0.40	-0.41	0.43	-0.32	-0.20
Hiroshima Prefecture	-0.46	-0.51	-0.25	-0.46	-0.47	-0.27	0.00	-0.02
Yamaguchi Prefecture	-0.18	-0.28	-0.26	-0.69	-0.78	-0.69	-0.52	-0.43
Tokushima Prefecture	0.87	0.82	1.21	0.15	0.16	0.80	-0.72	-0.41
Kagawa Prefecture	0.09	0.15	0.18	-0.02	-0.07	0.20	-0.10	0.02
Ehime Prefecture	0.64	0.50	0.86	0.25	0.22	0.61	-0.39	-0.25
Kochi Prefecture	1.74	1.26	0.12	0.57	0.31	-0.91	-1.17	-1.03
Fukuoka Prefecture	1.48	1.66	0.42	1.17	1.36	-0.05	-0.31	-0.47
Saga Prefecture	-0.26	-0.40	-0.59	-0.32	-0.26	-0.49	-0.07	0.10
Nagasaki Prefecture	0.48	0.23	-1.04	0.10	0.14	-1.23	-0.38	-0.19
Kumamoto Prefecture	0.17	0.19	-0.30	-0.32	-0.13	-0.69	-0.49	-0.40
Oita Prefecture	0.32	0.43	-0.02	-0.30	-0.23	-0.63	-0.62	-0.61
Miyazaki Prefecture	0.36	0.23	-0.29	0.24	0.28	-0.45	-0.12	-0.16
Kagoshima Prefecture	0.37	0.50	-0.03	0.16	0.22	-0.58	-0.21	-0.55
Okinawa Prefecture	4.73	4.04	1.58	4.71	4.12	1.43	-0.02	-0.15

Note: Divergences are differences with the national average that has been weighted by the labor force (unit: % point). The "Actual divergence" is the difference between the unemployment rate of each prefecture (excluding those in school) and the national average. In Estimation 1, the gender, age, and schooling dummies are controlled. In Estimation 2, the composition of workers in each industry is controlled in addition to the control of Estimation 1.

prefecture's relative leaning towards the tertiary industry is controlled, the difference with the national average is reduced to less than half. A similar trend can be observed in prefectures such as Hokkaido, Miyagi, Tokyo, Kyoto, Osaka, and Fukuoka, which have a large city within the prefecture and which are the major center for the surrounding prefectures. The industrial structure's effect on raising the unemployment rate can also be found in Aomori Prefecture, Kochi Prefecture, and all prefectures in the Kyushu region. By the definition of this analysis, the leaning towards the tertiary industry generates a structural/frictional type of unemployment as a result of the high average turnover rate. In these areas, reinforcement of the matching function through job placement and so on is considered to be one of the essential measures for lowering the regional unemployment rates.

2.3 Correlation with other regional attributes

We examined above how the regional divergences are considerably reduced when the labor supply and demand structure is controlled. In the approach adopted in this paper of taking into consideration only the regional dummies, however, regional factors cannot be elucidated in greater detail. In addition, as shown in Table 2, there are regions in which the divergences after the control widened during the period from 1990 to 2000, and there is a need to examine the causes.

Therefore, we examine the correlation between the controlled regional divergences and various regional attributes that have not yet been taken into consideration. The regional economic indicators we examine include (1) the difference between the growth of real gross prefectural product (per capita) of the last five years (log difference) and the growth of real gross domestic product (per capita) (% point); (2) the difference between the growth of industrial production in the last five years and the national average (% point); (3) the difference between the regional "real" minimum wages, which were revised in October last year, and the national average (log difference);[9] (4) the

[9] To obtain the real value of the regional minimum wages, regional difference indexes of consumer prices excluding imputed rent (national=100) from the Ministry of Internal Affairs and Communications' *National Survey of Prices* of 1987 and 1997 were used. There is, however, room for argument on to what extent regional minimum wages influence regional labor markets. In fact, according to Abe (2001), while positive correlation can be observed between regional minimum wages and

net migration rate of a year as percentage of the total population of a prefecture (%, weighted by population by prefecture); (5) comparison of the composition of workers by major industrial division of each prefecture and of the nation (specialization coefficient); and (6) the Hirshman-Herfindahl Index, which is an indicator of the degree of specialization of an industrial structure as compared with the national average.[10]

Because of limited space, we present below only the results of regional variables that had statistically significant correlation at the level of 5 percent with the regional divergences after the control.

Firstly, with respect to the difference with the growth of real per-capita GDP, the correlation coefficient of the regional real economic growth rate from 1995 to 2000 and the regional divergences in unemployment rates in 2000 is statistically significant at -0.2938. This shows that the regional difference in the contractions in demand during the latter half of the 1990s, when the Japanese economy faltered considerably, brought about divergences in unemployment rates of recent years.

The difference in regional real minimum wages also has significant positive correlation with the divergences in unemployment rates in 2000 (correlation coefficient of 0.5753). The minimum wages tend to be high in areas where large cities are located, but there is a possibility that the apparently observable unemployment rates in those areas may be high because of commuters from prefectures from the outside. Therefore, we calculated the regional divergences in unemployment rates separately by controlling gender,

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the average wages of part-timers, the divergences between part-timers' wages and the minimum wages differed significantly among D-ranked prefectures with the lowest minimum wages. Therefore, we use minimum wages not as a variable that should be controlled by policy, but as an indicator representing regional divergences in average wages.

[10] The specialization coefficient $f_{ij} = p_{ij} / p_i$, where p_{ij} is the composition of employees of industry i in prefecture j and p_i is the national average of the composition of industry i. The Hirshman-Herfindahl Index of $RS_j = \sum_j \left| p_{ij} - p_i \right|$ takes a value between 0 and 2. The higher the value, the more specialized the industrial structure of prefecture j in comparison to the national average. The lower the value (the closer to 0), the closer the industrial structure is to the national average. It has also been pointed out that areas with narrower industrial distribution or a higher degree of specialization are more likely to be affected by the demand shock within that industry, and therefore such areas have a greater risk of higher unemployment rates (Krugman (1993)).

age, and industrial structure, based on the data on the place of employment in 2000, and examine their relationship with the difference in regional real minimum wages. As a result, significant positive correlation can still be observed at the correlation coefficient of 0.5181.[11] Although the factors related to schooling are not controlled because of the limitations of data on place of employment, there is positive correlation between the controlled divergences in unemployment rates and the differences in real wages, even when the effect from commuters is taken into consideration.

With regard to specialization coefficient by industry, the more specialized an area is in the tertiary industry (less specialization in the primary industry), the higher the unemployment rate in comparison with the national average. This trend was particularly noticeable in 2000. On the other hand, with respect to the net migration rate of the last one year and the Hirshman-Herfindhl Index, which shows the relative trend of specialization of the industrial structure of a particular region, significant correlation with regional divergences in unemployment rates cannot be observed in both years.

Secondly, we examine the factors contributing to increasing or decreasing changes in the regional divergences of unemployment rates after the control from 1990 to 2000. The results show that there is a statistically significant negative correlation between differences in the real economic growth rates by region and the changes in the divergences in unemployment rates after the control from 1990 to 2000, with correlation coefficient of -0.3295. In particular, in Hyogo, Kyoto, and Osaka prefectures and other prefectures in the Kinki region where unemployment rates continue to be high, there was a fairly rapid decline in the regional economy during the 10-year period, and the divergences in unemployment rates after the control increased the most. With respect to changes in other indicators of regional economy during the same period, however, there is no significant correlation with the changes in the divergences in unemployment rates. The correlation with the differences in

[11] The place-of-employment-based unemployment rates are calculated based on the following formula: the number of wholly unemployed persons/ (the number of wholly unemployed persons + the number of workers in the place of employment). It should be noted that, because of the limitations imposed by the survey items of the population census, the estimated values are based on the somewhat strong assumption that “unemployed persons only engage in job search activities in the place of permanent residence.”

the growth of real minimum wages between 1989 and 1999 is negative and not significant, with the correlation coefficient of -0.0343. Therefore, it cannot be said that the rise in minimum wages by region during the 1990s contribute to expanding the regional divergences in unemployment rates. In Kinki region, where the unemployment rate after the control rises, the growth in real minimum wages during the 10-year period is smaller than the national average. Therefore, it can be interpreted that the region's ability to adjust wages in response to the rise in unemployment rate is weak, resulting in the significant positive correlation in 2000 as mentioned earlier.

The above indicates that the effect of regional attributes on regional divergences in unemployment rates after the control (estimated in the previous section) cannot be observed during boom periods. However, it also indicates that, during low growth periods, the regional divergences in real wage costs and regional differences in contractions in demand have increased regional divergences in unemployment rates in recent years.

3. Examination of divergences in non-employment rates

3.1 Divergences in non-employment rates when demographic attributes are considered

Table 3. Divergences in Non-Employment Rates Among Prefectures (WASD)

Removed variables	1990	2000
Full-Control	37.366	40.070
Age	37.101	39.814
Gender	37.242	39.994
Schooling	37.353	40.053
No-Control	(37.481)	(40.181)

Note: The WASD of No-Control is the reference values, since the null hypothesis that all regional dummy coefficients are 0 could not be rejected at the level of 1%.

In this section, we measure regional divergences in non-employment rates (among those aged 15 and over) by prefecture, gender, age, and schooling, using a similar method as with the unemployment rate function of the previous section and removing the effect of regional attributes on the regional divergences. Because the effect of the regional demand structure on the non-employment rates has not yet been explicitly determined (unlike in cases dealing with unemployment rates), only the demographic attributes of gender,

age, and schooling are controlled in examining the regional divergences. Again, because the published statistics of the population censuses do not indicate the educational levels and employment statuses of those who are currently in school, we limit our sample to those who have completed their school education. Consequently, it should be noted that, unlike in the case of generally used non-employment rates, the rates are at the lowest for the age group 15 to 24 because of the large number of students.[12]

Table 3 shows divergences in non-employment rates by prefecture, which are obtained by using a similar method used in the previous section. With respect to No-Control, however, no statistically significant regional divergences can be detected. For all variables of demographic attributes, the regional divergences increase after the control. From the estimated results, it is clear that the decrease in the non-employment rates resulting from controlling the demographic attributes is greater in rural areas (the opposite is true in urban areas), and that dispersion in regional divergences becomes greater in rural areas. In addition, with regard to the regional divergences in which all demographic attributes are controlled, the divergences tend to widen during the 10-year period, which is similar to the widening divergences in unemployment rates when the industrial structure is not controlled in the previous section.

3.2 Divergences in non-employment rates and demand-related factors

The differences in the conditions of the regional labor markets are obviously one of the factors affecting the divergences in non-employment rates after the control in 1990 and 2000 and the changes in the divergences during the period of 10 years. Therefore, we lastly examine the relation between the regional divergences of non-employment rates and unemployment rates.

The correlation coefficient of the regional divergences in unemployment rates, estimated based on Full-Control, (Estimation 2 in the previous section) and divergences in non-employment rates is 0.3840 and 0.4821 in 1990 and

[12] When students, who are not in the labor force, are excluded, the nation's average non-employment rate drops from 38.4 percent to 30.1 percent and from 40.2 percent to 33.0 percent in 1990 and 2000, respectively. However, while the non-employment rate in Okinawa Prefecture declines by about 4 percentage points, in other areas there is hardly any difference with the national average. Therefore, it is considered that the exclusion of students is not a major problem in the analysis of regional divergences in non-employment rates.

2000, respectively. Therefore, there is significant positive correlation between the two in both years, while this trend is more marked in 2000. As for the changes in 10 years, the correlation coefficient of the changes in the controlled unemployment rates and the changes in the controlled non-employment rates is 0.5442. This shows that in areas with high unemployment rates or in which unemployment rates rose during the 10-year period, there is a stronger tendency for people to give up searching for a job in the labor market (hereinafter called the "Discouraged Worker Effect"), and that this trend is also more marked in 2000.[13]

Considering that students are not covered by the non-employment rates used in this paper, it is clear that the Discouraged Worker Effect increases the number of those not in the labor force who are classified, by the definition of the *Population Census*, as "engaged in housework" or "others." The latter, in particular, are considered as serious cases of nonparticipation in society and are reportedly increasing in recent years (Ministry of Health, Labor and Welfare (2004)). Kosugi (2004) defined those aged between 15 and 34 who are classified as "others" as the Japanese version of NEETs (Not in Education, Employment or Training), and discovered a positive correlation between youth unemployment rates and percentage of NEETs in the population in each region. In this paper, we follow Kosugi (2004)'s definition, calculate the percentage of those classified as "others" (hereinafter called the "NEETs") among those not in the labor force in the age groups of (1) 15 to 34 years, (2) 35 to 54 years, and (3) 55 years and over in 1990 and 2000, and examine their relation to the controlled divergences in unemployment rates at each given time (Estimation 2).[14] The results are shown on Table 4.

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[13] Because the non-employment rates cover those who are unemployed, the correlation between the unemployment rates and non-employment rates is naturally strong by definition. However, we separately examined the correlation involving the nonparticipation rates and found that the trend was unchanged. The positive correlation between regional divergences in nonparticipation rates and unemployment rates, controlled for gender, age, and schooling, became stronger from 0.3055 in 1990 to 0.4940 in 2000. Also the correlation coefficient of the changes during the 10-year period was 0.3319, which, although lower than in the case of the non-employment rates, shows significant positive correlation.

[14] Kosugi (2004) defined the Japanese version of NEETs as those not in the labor force (1) who are 15 to 34 years of age, (2) who have completed their school education, and (3) who are neither engaged in housework nor attending school (statistically they are classified as "others" among those who are not in the labor force). In a

In 1990 (section (a) of Table 4), there is no significant correlation between the controlled divergences in unemployment rates and the percentage of NEETs among those not in the labor force in each age group. As we have seen above, the non-employment rates have positive correlation with unemployment rates, and the Discouraged Worker Effect resulted, in 1990, in evenly increasing those classified as "students or engaging in housework" and those classified as "others." In 2000 (section (b)), however, there is a difference in the way that those between 15 and 34 and those 35 and over moved out of the labor force. Among those between 35 and 54 years of age, the regional unemployment conditions significantly added to the the weight of "housework and students." On the other hand, among those aged between 15 and 34, the correlation coefficient, although not statistically significant, is positive, and it is suggested that among the youths, the percentage of NEETs is high in areas of high unemployment rates. As for changes during the 10-year period shown in section (c), it is also implied that an increase in the number of NEETs among youths is more prominent in areas where regional divergences in unemployment rates widen after the control.

Obviously, the increase in the percentage of NEETs among youths is affected not only by deterioration in the unemployment conditions, but also by the supply-side factors, such as changes in school education (increase in dropouts, changes in the way high schools provide career guidance) and changes in the behavior of households (assistance provided by parents). Nonetheless, when we consider the unemployment and nonparticipation of youths in Japan, we cannot ignore the results indicating that, in recent years, non-employment rates as well as the percentage of NEETs among youths are both high in areas with high unemployment rates.[15]

slight deviation from Kosugi (2004), we examine, for the analysis in this paper, how regional unemployment conditions led those in different age groups to leave the labor force.

[15] In 2000, the correlation coefficient of divergences in non-employment rates, used in the previous section, and the percentage of NEETs is 0.5790 among those of 15 to 34 years, -0.2838 among those of 35 to 54 years, and -0.3275 among those of 55 years and over. (In 1999, it was -0.988 (not significant), -0.3600, and -0.2069, respectively.)

Table 4. Correlation between Divergences in Unemployment Rates and the Percentage of "Others" Among Those not in the Labor Force (i.e. Percentage of NEETs)

a. 1990

		Divergences in unemployment rates (Estimation 2)	Percentage of NEETs among those not in the labor force		
			Age 15-34	Age 35-54	Age 55 and over
Divergences in unemployment rates (Estimation 2)		1			
Percentage of NEETs among those not in the labor force	Age 15-34	-0.0769	1		
	Age 35-54	-0.1747	0.7572***	1	
	Age 55 and over	0.0006	0.5173***	0.6364**	1

b. 2000

		Divergences in unemployment rates (Estimation 2)	Percentage of NEETs among those not in the labor force		
			Age 15-34	Age 35-54	Age 55 and over
Divergences in unemployment rates (Estimation 2)		1			
Percentage of NEETs among those not in the labor force	Age 15-34	0.1826	1		
	Age 35-54	-0.4082***	0.1363	1	
	Age 55 and over	-0.0953	-0.0968	0.6505***	1

c. Change from 1990 to 2000

		Divergences in unemployment rates (Estimation 2)	Percentage of NEETs among those not in the labor force		
			Age 15-34	Age 35-54	Age 55 and over
Divergences in unemployment rates (Estimation 2)		1			
Percentage of NEETs among those not in the labor force	Age 15-34	0.1643	1		
	Age 35-54	-0.2294	0.5592***	1	
	Age 55 and over	-0.0041	0.2130	0.1204	1

Note: *** and ** indicate statistical significance of 1% and 5%, respectively.

4. Summary and conclusion

In this paper, we measured the regional divergences in unemployment rates and non-employment rates in each prefecture by controlling demographic attributes such as gender and age and attributes related to the labor supply and demand, such as schooling and industrial structure. At the same time, we used basic methods to examine the factors that created such divergences. The results are summarized below.

(1) The apparent regional divergences in unemployment rates tended to widen during the period from 1990 to 2000. However, when regional labor supply and demand attributes were controlled, the regional divergences were substantially narrowed in both years; they also showed a decline during the 10-year period. Regional differences in the industrial structure, in particular, explain much about the dispersion in the divergences among different prefectures.

(2) While the controlled regional divergences in unemployment rates during the boom period in 1990 showed that the effect of regional attributes was generally controlled, it was implied, under the recession in 2000, that the divergences in unemployment rates increased as a result of the regional differences in real wage costs and in contractions in demand.

(3) Divergences in non-employment rates among prefectures, with the effect of demographic attributes removed, had strong positive correlation with controlled divergences in unemployment rates, and it was observed that the Discouraged Worker Effect was more significant in areas with high unemployment rates or where unemployment rates rose during the 10-year period.

(4) During the boom period in 1990, the Discouraged Worker Effect acted on those not in the labor force in general regardless of the categories of "students," "engaging in housework," or "others." In 2000, however, it was implied that, relatively speaking, it increased the number of youths classified as "others." This trend was also marked in areas where the controlled unemployment rates rose during the 10-year period. It was suggested that the number of youths who become NEETs is increasing more prominently in areas with deteriorating labor market conditions.

The results of the analysis of this paper that the regional divergences in unemployment rates are significantly narrowed when labor supply attributes

are controlled confirm that the regional unemployment issue in Japan arises, first of all, from the "regional characteristics" pertaining to the labor force and uneven regional distribution of industry. They also indicate that in addressing the regional employment issue, employment measures suited to the situation in each region are needed. Within the context of deregulation, local governments, including prefectural governments and municipalities, are promoting their own regional industry and employment policies, and the effectiveness of individual policies will need to be examined in the future through case studies.

On the other hand, the results of this paper also showed that real wage costs and a downturn in the regional economy resulted in raising unemployment rates in some areas. In Kinki region, in particular, where there is a rapid decline of the regional economy, comprehensive measures are needed through cooperation with the central government in promoting changes in the industrial structure. In addition, regional real minimum wages need also be examined (after verifying the extent of their effect on the regional labor markets) as one of the means of the central government's regional labor market policy.

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