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# THE EFFECTS OF WORKERS' REGION OF BIRTH ON LABOR MARKET OUTCOMES IN THE REPUBLIC OF KOREA

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In this paper, we investigate empirically whether there are differences in labor market outcomes according to workers' region of birth. We also investigate whether wage differentials by region of birth are due to taste discrimination, statistical discrimination as measurement error, or both of these things. The empirical analyses based on the Korean Labor and Income Panel Study (KLIPS) data show the following. First, Honam-born workers have a higher migration ratio to other regions than Youngnam-born workers. Second, workers born in other regions have a higher propensity to become contingent workers and are paid significantly lower wages than Seoul/Kyonggi-born workers. Finally, our empirical tests support the third hypothesis that wage differentials by region of birth are attributable partly to statistical discrimination as measurement error and partly to taste discrimination. We rejected a hypothesis based solely on taste discrimination as well as a hypothesis based solely on statistical discrimination as measurement error.

## I. INTRODUCTION

ONE of the most serious problems in the society of the Republic of Korea is regional conflict. Voting patterns in presidential elections since 1987 have vividly shown how acute this conflict has been. In the presidential elections, more than 90 percent of people born in Honam region have consistently voted for candidates who share their own regional origin. Likewise, an absolute majority of people who were born in Youngnam region have voted for candidates from their own region.

Many scholars report that regional conflicts remain active in Korean society. For example, Kim (1991) shows that negative sentiments towards people of Honam origin are much stronger than those towards people belonging to other regions.

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According to a survey conducted by the Korean Sociological Association in 1988, while 23 percent of nationwide respondents were reluctant to make friends with people of Honam origin, only 4 percent were reluctant to make friends with people from regions other than Honam. Kim argues that regional conflict is not only a matter of negative sentiments towards people from a specific region, but also a matter of discrimination embedded in the social structure. He compares the origin of various elite groups by region of birth between 1961 and 1987 with a baseline, namely, the composition of the elite population by region of origin as of 1943. He finds that with the exception of the judiciary, Honam region's contribution to elites is lower than it was in 1943.

This trend was reversed after Kim Dae Jung, who was born in Honam, was elected president of the Republic of Korea in 1998. Since then, a remarkable number of personnel of Honam origin have advanced to top positions in various leading organizations such as government, the police, financial institutions, and public enterprises. This phenomenon has led to allegations that nepotism is occurring in favor of Honam personnel and has given rise to debates on the need for legislation against regional discrimination (Lee 1999).

In this paper, we investigate how and to what extent workers' region of birth affects their performance in labor markets using the Korean Labor and Income Panel Study (KLIPS) data set. Korea Labor and Income Panel Study is a nationwide household survey on various labor and income variables, which covers about five thousand households and fifteen thousand individuals. Using the KLIPS data, we test whether wage differentials by region of birth are due to taste discrimination, statistical discrimination as measurement error, or both. The composition of the paper is as follows. In Section II, we compare workers' region of birth with their region of residence during their early teenage years and current residence to see if there are migratory differences according to their region of birth. In Section III, we examine whether workers' region of birth affects their status as regards economic activity, type of work, and size of the firm they work for. In Section IV, a model of statistical discrimination as measurement error is suggested and, in Section V, wage functions are estimated to test whether wage differentials by region of birth are due to taste discrimination (Becker 1957), statistical discrimination as measurement error, or both. We then proceed to gauge the extent of taste discrimination and statistical discrimination as measurement error. Section VI concludes the paper with a summary.

## II. MIGRATION BY REGION OF BIRTH

In this paper, the birthplace of individuals in the sample is given in terms of four major regions of Korea: Seoul/Kyonggi, Youngnam, Honam, and Chungchong/Kangwon. Seoul/Kyonggi is the region that contains Seoul, the capital of Korea,

Fig. 1. The Republic of Korea, Showing Four Major Regions

and its neighboring province of Kyonggi-do. Youngnam is a major region comprising three large cities—Pusan, Taegu, and Ulsan—and two southeastern provinces, Kyongsangbuk-do and Kyongsangnam-do. The region of Honam consists of one large city, Kwangju, and two provinces, Chollabuk-do and Chollanam-do. Chungchong/Kangwon is a region made up of three provinces, Chungchongbuk-do, Chungchongnam-do, and Kangwon-do (see Figure 1). Workers who were born in Cheju province, in the Democratic People's Republic of Korea, and in foreign countries are excluded from the data set.

Table I shows that 24.2%, 34.2%, 21.6%, and 19.9% of the 1998 KLIPS sample were born in Seoul/Kyonggi, Youngnam, Honam, and Chungchong/Kangwon respectively. The total number of individuals covered by the sample is 12,967. However, 48.9%, 30.2%, 10.1%, and 10.8% of the sample are now living in Seoul/Kyonggi, Youngnam, Honam, and Chungchong/Kangwon respectively. A salient feature is the migration of population to the Seoul/Kyonggi region. While only about a quarter of the workers in the sample were born in the Seoul/Kyonggi region, nearly a half of them now live there.

While 92.4% of those born in Seoul/Kyonggi now live in Seoul/Kyonggi, 49.8% of those born in Chungchong/Kangwon and 45.5% of those born in Honam have migrated to Seoul/Kyonggi. By contrast, while 77% of those born in Youngnam still live in Youngnam, only 19.7% of them have migrated to Seoul/Kyonggi. While 7.6% of those born in Honam have migrated to Youngnam, only 0.5% of those born in Youngnam have migrated to Honam. Given the farthest distance to Seoul/Kyonggi, individuals born in Honam seem to have made a lot more effort to migrate to Seoul/Kyonggi than those born in Chungchong/Kangwon, a region adjacent to Seoul/

TABLE I

DISTRIBUTION OF PEOPLE'S REGIONS OF BIRTH AND CURRENT RESIDENCE
(Number of Individuals)

| Region of Birth | Current Residence | | | | |
|---|---|---|---|---|---|
| | Seoul/ Kyonggi | Youngnam | Honam | Chungchong/ Kangwon | Total |
| Seoul/Kyonggi | 2,904 | 100 | 29 | 111 | 3,144 |
| | (92.4) | (3.2) | (0.9) | (3.5) | (24.2) |
| Youngnam | 877 | 3,418 | 21 | 125 | 4,441 |
| | (19.7) | (77.0) | (0.5) | (2.8) | (34.2) |
| Honam | 1,276 | 212 | 1,219 | 97 | 2,804 |
| | (45.5) | (7.6) | (43.5) | (3.5) | (21.6) |
| Chungchong/Kangwon | 1,283 | 186 | 40 | 1,069 | 2,578 |
| | (49.8) | (7.2) | (1.5) | (41.5) | (19.9) |
| Total | 6,340 | 3,916 | 1,309 | 1,402 | 12,967 |
| | (48.9) | (30.2) | (10.1) | (10.8) | (100.0) |

Note: Numbers in parentheses are percentages.

Kyonggi. The percentage of those born in Honam who have migrated to Seoul/Kyonggi is 2.3 times higher than that of those born in Youngnam who have migrated to Seoul/Kyonggi.

There are large differences in migration ratio among groups of various regional origins. Honam is the least preferred region for people to migrate to. Only 0.9% of those born in Seoul/Kyonggi, 1.5% of those born in Chungchong/Kangwon, and 0.5% of those born in Youngnam now live in Honam region. By contrast, migration to Youngnam has been more pronounced. Some 3.2% of those born in Seoul/Kyonggi, 7.2% of those born in Chungchong/Kangwon, and 7.6% of those born in Honam

TABLE II

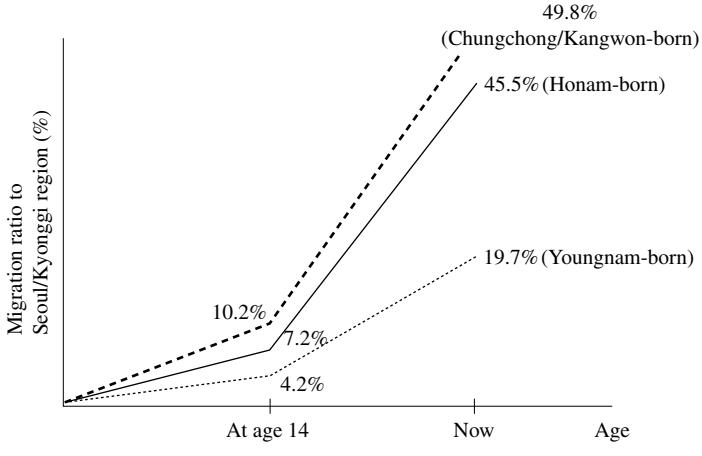
RESIDENCE IN EARLY TEENAGE YEARS BY REGION OF BIRTH

(No.)

| Region of Birth | Region of Residence at Age 14 | | | | |
|---|---|---|---|---|---|
| | Seoul/ Kyonggi | Youngnam | Honam | Chungchong/ Kangwon | Total |
| Seoul/Kyonggi | 3,002 | 56 | 30 | 56 | 3,144 |
| | (95.5) | (1.8) | (1.0) | (1.8) | (24.2) |
| Youngnam | 188 | 4,185 | 18 | 50 | 4,441 |
| | (4.2) | (94.2) | (0.4) | (1.1) | (34.2) |
| Honam | 201 | 33 | 2,548 | 22 | 2,804 |
| | (7.2) | (1.2) | (90.9) | (0.8) | (21.6) |
| Chungchong/Kangwon | 263 | 62 | 14 | 2,239 | 2,578 |
| | (10.2) | (2.4) | (0.5) | (86.9) | (19.9) |
| Total | 3,654 | 4,336 | 2,610 | 2,367 | 12,967 |
| | (28.2) | (33.4) | (20.1) | (18.3) | (100.0) |

Note: Numbers in parentheses are percentages.

Fig. 2. Trend of Migration to Seoul/Kyonggi by Region of Birth



now live in Youngnam region. The difference in cross-migration ratio between Honam-to-Youngnam and Youngnam-to-Honam is very large: the former is 15.2 times higher than the latter.

People began to migrate from other regions to Seoul/Kyonggi in their teens. According to Table II, 10.2% of those born in Chungchong/Kangwon, 7.2% of those born in Honam, and 4.2% of those born in Youngnam lived in Seoul/Kyonggi at the age of fourteen. Figure 2 shows that migration from other regions to Seoul/Kyonggi increases with age.

## III. STATUS OF ECONOMIC ACTIVITY, TYPE OF WORKERS, AND FIRM SIZE

In this section, we illustrate the differences in status of economic activity, type of workers, and the size of the firm according to workers' region of birth. Table III shows the status of economic activity by region of birth. First, the labor force participation rates of those born in Seoul/Kyonggi, Youngnam, Honam, and Chungchong/Kangwon are 54.5%, 56.7%, 62.1%, and 60.5% respectively. The labor force participation rate of those born in Seoul/Kyonggi is the lowest and that of those born in Honam is the highest. Second, the unemployment rates of those born in Seoul/Kyonggi, Youngnam, Honam, and Chungchong/Kangwon are 18.4%, 16.7%, 15.7%, and 14.6% respectively. The unemployment rate of those born in Seoul/Kyonggi is the highest and that of those born in Chungchong/Kangwon is the lowest. Third, the employment ratio is the lowest for those born in Seoul/Kyonggi and the highest for those born in Honam. While those born in Seoul/Kyonggi are paid higher wages, as will be seen later in the paper, they have a lower labor force participation rate and a higher unemployment rate than those born in other regions. While those born in Honam are paid lower wages, another feature that will be discussed later, they have a higher labor force participation rate and a lower unemployment rate than those born in other regions. A possible explanation for the lower wages, higher labor force participation rate, and lower unemployment rate of those born in Honam is that they are less likely to earn nonlabor or family incomes. Unfortunately, they are not included in the KLIPS survey.

Table IV shows the type of workers according to their region of birth. First, the contribution of the number of regular or temporary workers to the total number of employed is the highest for those born in Seoul/Kyonggi and the lowest for those born in Honam. For those born in Honam, the contributions of the number of regular workers and temporary workers to the total number of employed are 46.9% and 4.8% respectively. These percentages are the lowest of all the regional groups. By contrast, the contributions of day workers, self-employed, and unpaid family workers to the employed are 8.2%, 30.3%, and 9.8% respectively. These percentages are the highest of all the regional groups.

TABLE III

STATUS OF ECONOMIC ACTIVITY BY REGION OF BIRTH

(No.)

| Region of Birth | Age 15 or Older | | | | Age 15 or Older Total | Unemployment Rate (%) | Labor Force Participation Rate (%) | Employment Ratio (%) |
|---|---|---|---|---|---|---|---|---|
| | Labor Force | | | Non–Labor Force | | | | |
| | Employed | | Unemployed | | | | | |
| | Wageworkers | Non-wageworkers | | | | | | |
| Seoul/Kyonggi | 964 (30.7) | 435 (13.9) | 316 (10.1) | 1,429 (45.5) | 3,144 (24.2) | 18.4 | 54.5 | 44.5 |
| Youngnam | 1,278 (28.8) | 821 (18.5) | 420 (9.5) | 1,922 (43.3) | 4,441 (34.2) | 16.7 | 56.7 | 47.3 |
| Honam | 880 (31.4) | 588 (21.0) | 274 (9.8) | 1,062 (37.9) | 2,804 (21.6) | 15.7 | 62.1 | 52.4 |
| Chungchong/Kangwon | 821 (31.8) | 511 (19.8) | 227 (8.8) | 1,019 (39.5) | 2,578 (19.9) | 14.6 | 60.5 | 51.7 |
| Total | 3,943 (30.4) | 2,355 (18.2) | 1,237 (9.5) | 5,432 (41.9) | 12,967 (100.0) | 16.4 | 58.1 | 48.6 |

Notes: 1. Numbers in parentheses are percentages.
2. Employment ratio = employed / age 15 or older.

TABLE IV

STATUS OF WORKERS BY REGION OF BIRTH

(No.)

| Region of Birth | Status of Workers | | | | | Employed Total |
|---|---|---|---|---|---|---|
| | Wageworkers | | | Non-wageworkers | | |
| | Regular Workers | Temporary Workers | Day Workers | Self-Employed | Unpaid Family Workers | |
| Seoul/Kyonggi | 815 | 90 | 56 | 348 | 87 | 1,396 |
| | (58.4) | (6.5) | (4.0) | (24.9) | (6.2) | (22.2) |
| Youngnam | 1,017 | 140 | 121 | 616 | 205 | 2,099 |
| | (48.5) | (6.7) | (5.8) | (29.4) | (9.8) | (33.3) |
| Honam | 688 | 71 | 120 | 445 | 143 | 1,467 |
| | (46.9) | (4.8) | (8.2) | (30.3) | (9.8) | (23.3) |
| Chungchong/Kangwon | 664 | 76 | 80 | 384 | 127 | 1,331 |
| | (49.9) | (5.7) | (6.0) | (28.9) | (9.5) | (21.2) |
| Total | 3,184 | 377 | 377 | 1,793 | 562 | 6,293 |
| | (50.6) | (6.0) | (6.0) | (28.5) | (8.9) | (100.0) |

Note: Numbers in parentheses are percentages.

The proportions of day workers to wageworkers in the Seoul/Kyonggi, Youngnam, Honam, and Chungchong/Kangwon regions are 5.8%, 9.5%, 13.7%, and 9.8% respectively. The contribution of the Honam group is the highest whereas that of Seoul/Kyonggi is the lowest. Since it is hard to assume a difference in labor supply for different types of workers, those of Seoul/Kyonggi origin have a higher chance of becoming regular workers than those from other regions. The figures in Table IV suggest that it is relatively difficult for workers of Honam origin to have stable jobs that last longer than a month. Even if they find a job, they have a higher chance of becoming day workers (defined as having a labor contract of less than a month), self-employed, or unpaid family workers than those from other regions.

Table V shows the composition of wageworkers in each of the regions. The categorization of wageworkers is based on self-reports given by respondents in the KLIPS survey. Wageworkers in our sample are divided into standard and contingent workers. Contingent workers are short-period contract, temporary, or day workers. The remainder of the workers are standard workers. The percentages of contingent workers in the Seoul/Kyonggi, Youngnam, Honam, and Chungchong/Kangwon regions are 18.7%, 23.9%, 27.5%, and 25.0% respectively. Consistent with the results given earlier, the proportion of contingent workers is highest in the Honam region, and lowest in Seoul/Kyonggi.

Since workers of Seoul/Kyonggi origin represent a greater human capital stock (reflected in more years spent in education) than workers belonging to other re-

TABLE V

TYPE OF WAGEWORKERS BY REGION OF BIRTH

(No.)

| Region of Birth | Type of Wageworkers | | Total |
|---|---|---|---|
| | Standard Workers | Contingent Workers | |
| Seoul/Kyonggi | 782 | 180 | 962 |
| | (81.3) | (18.7) | (24.4) |
| Youngnam | 973 | 305 | 1,278 |
| | (76.1) | (23.9) | (32.4) |
| Honam | 637 | 241 | 878 |
| | (72.6) | (27.5) | (22.3) |
| Chungchong/Kangwon | 616 | 205 | 821 |
| | (75.0) | (25.0) | (20.8) |
| Total | 3,008 | 931 | 3,939 |
| | (76.4) | (23.6) | (100.0) |

Note: Numbers in parentheses are percentages.

TABLE VI

EDUCATIONAL LEVEL BY REGION OF BIRTH

(No.)

| Region of Birth | Educational Level | | | | | | Total |
|---|---|---|---|---|---|---|---|
| | No Education | Primary School | Middle School | High School | Junior College | College or More | |
| Seoul/Kyonggi | 87 | 237 | 269 | 1,496 | 267 | 788 | 3,144 |
| | (2.8) | (7.5) | (8.6) | (47.6) | (8.5) | (25.1) | (24.2) |
| Youngnam | 303 | 586 | 639 | 1,763 | 355 | 795 | 4,441 |
| | (6.8) | (13.2) | (14.4) | (39.7) | (8.0) | (17.9) | (34.2) |
| Honam | 222 | 419 | 453 | 1,065 | 170 | 475 | 2,804 |
| | (7.9) | (14.9) | (16.2) | (38.0) | (6.1) | (16.9) | (21.6) |
| Chungchong/Kangwon | 199 | 396 | 352 | 1,071 | 187 | 373 | 2,578 |
| | (7.7) | (15.4) | (13.7) | (41.5) | (7.3) | (14.5) | (19.9) |
| Total | 811 | 1,638 | 1,713 | 5,395 | 979 | 2,431 | 12,967 |
| | (6.3) | (12.6) | (13.2) | (41.6) | (7.6) | (18.7) | (100.0) |

Note: Numbers in parentheses are percentages.

gional groups (see Table VI), they probably have a lower chance of becoming contingent workers.

In order to control human capital and other demographic variables, logit estimations have been conducted. In Table VII, the more the education years the workers have, the higher their chance of becoming standard workers. Workers who served in the military have a higher chance of becoming standard workers than workers who did not. Males have a higher chance of becoming standard workers than females. The married have a higher chance of becoming standard workers than the unmarried. After controlling for these variables, workers of Seoul/Kyonggi origin

TABLE VII

LOGIT ESTIMATION OF PROPENSITY TO BECOME STANDARD WORKERS

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Intercept | 1.469*** | 2.382*** | 0.015 | 0.270 | 0.270 |
| | (0.083) | (0.148) | (0.132) | (0.246) | (0.247) |
| Youngnam (D) | –0.309*** | –0.221** | –0.092 | –0.148 | –0.149 |
| | (0.106) | (0.107) | (0.111) | (0.112) | (0.114) |
| Honam (D) | –0.500*** | –0.387*** | –0.216* | –0.242** | –0.244* |
| | (0.112) | (0.114) | (0.118) | (0.120) | (0.129) |
| Chungchong/Kangwon (D) | –0.369*** | –0.267** | –0.117 | –0.177 | –0.179 |
| | (0.116) | (0.117) | (0.121) | (0.123) | (0.134) |
| Age | | –0.026 *** | | –0.012 ** | –0.012 ** |
| | | (0.003) | | (0.005) | (0.005) |
| Male (D) | | | | 0.254 ** | 0.254 ** |
| | | | | (0.115) | (0.115) |
| Elementary or middle school (D) | | | 0.651*** | 0.485*** | 0.485*** |
| | | | (0.138) | (0.145) | (0.145) |
| High school (D) | | | 1.302*** | 1.032*** | 1.032*** |
| | | | (0.116) | (0.138) | (0.139) |
| Junior college (D) | | | 2.018*** | 1.736*** | 1.736*** |
| | | | (0.183) | (0.206) | (0.206) |
| College or more (D) | | | 2.162*** | 1.839*** | 1.839*** |
| | | | (0.143) | (0.162) | (0.163) |
| Military service (D) | | | | 0.336*** | 0.336*** |
| | | | | (0.120) | (0.120) |
| Married (D) | | | | 0.216* | 0.216* |
| | | | | (0.122) | (0.122) |
| Migration to Seoul/Kyonggi (D) | | | | | –0.003 |
| | | | | | (0.096) |
| *N* | 3,939 | 3,939 | 3,939 | 3,939 | 3,939 |
| –2log*L* | 4,286.72 | 4,228.14 | 3,973.787 | 3,927.33 | 3,927.33 |
| Pseudo-$R^2$ | 0.005 | 0.020 | 0.081 | 0.092 | 0.092 |

Note: (D) = dummy variables.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

have a higher chance of being standard workers than those of other regions. Workers originating from Honam region have a significantly lower chance of becoming standard workers than those of Seoul/Kyonggi. While they have a lower chance of becoming standard workers than those of Youngnam or Chungchong/Kangwon origin, the difference was not significant.

Table VIII shows the size of the firm in which workers are employed by region of birth. The percentages of wageworkers of Seoul/Kyonggi, Youngnam, Honam, and Chungchong/Kangwon origin in the large firms with 300 workers or more, are 20.3%, 23.7%, 19.9%, and 20.0% respectively. Consistent with the results given earlier, Honam has the lowest percentage of all the regions.

TABLE VIII

FIRM SIZE BY WORKERS' REGION OF BIRTH

| Region of Birth | Firm Size | | | | Total |
|---|---|---|---|---|---|
| | ≤ 49 | 50∼299 | 300∼999 | ≥ 1000 | |
| Seoul/Kyonggi | 633 | 134 | 62 | 133 | 962 |
| | (65.8) | (13.9) | (6.4) | (13.8) | (24.4) |
| Youngnam | 784 | 191 | 84 | 219 | 1,278 |
| | (61.4) | (15.0) | (6.6) | (17.1) | (32.4) |
| Honam | 589 | 114 | 50 | 125 | 878 |
| | (67.1) | (13.0) | (5.7) | (14.2) | (22.3) |
| Chungchong/Kangwon | 553 | 104 | 52 | 112 | 821 |
| | (67.4) | (12.7) | (6.3) | (13.6) | (20.8) |
| Total | 2,559 | 543 | 248 | 589 | 3,939 |
| | (65.0) | (13.8) | (6.3) | (15.0) | (100.0) |

Note: Numbers in parentheses are percentages.

## IV. TASTE DISCRIMINATION OR STATISTICAL DISCRIMINATION AS MEASUREMENT ERROR

We consider the following model in order to test whether wage differentials based on the region of birth are due to taste discrimination, statistical discrimination, or both.

$$w_i = \alpha P_i^* + \beta R_i + \varepsilon_i, \tag{1}$$

where $w_i$, $P_i^*$, $R_i$, and $\varepsilon_i$ are the $i$th worker's wage, productivity, region of birth, and error term, respectively. If there is no taste discrimination, $\beta$ is equal to zero. While the firm knows the worker's productivity, third parties can only estimate it by indications.

Hence our statistical discrimination occurs as measurement error. On the other hand, in the literature, statistical discrimination occurs when the employer uses the information of the group to which the worker belongs in evaluating his productivity (Phelps 1972; Aigner and Cain 1977; Lundberg and Startz 1983; Neumark 1999).[1] However, both approaches assume that average productivities of different groups are not equal.

The worker's productivity and its signal are related in the following way.

$$P_i = P_i^* + \eta_i, \quad \eta_i \perp P_i^*, \tag{2}$$

where $P_i$ and $\eta_i$ are the $i$th worker's observed productivity signal and orthogonal

[1] In this sense, our model is different from Neumark (1999), although ours is heavily dependent on his framework.

noise. For example, education is the observed productivity signal. It is related to productivity by equation (2). From equations (1) and (2), we get the following estimated equation.

$$w_i = \alpha P_i + \beta R_i + \varepsilon_i - \alpha\eta_i. \tag{3}$$

From equation (2), we know that $P_i$ and the error term of equation (3) ($\varepsilon_i - \alpha\eta_i$) are negatively correlated. And if firms realize that $P_i^*$ is lower on average for workers from a specific region ($R_i = 1$) than those from other regions, $R_i$ and the error term of equation (3) ($\varepsilon_i - \alpha\eta_i$) are also negatively correlated. For example, let us assume that employers realize that workers from regions other than Seoul/Kyonggi have lower productivity and hence are paid lower wages regardless of having the same level of education. Although it might appear as though workers from other regions are discriminated against relative to those from Seoul/Kyonggi in estimating equation (3) with OLS, they are, in fact, not discriminated against, given the above assumption. They are paid wages in proportion to their productivity. Given the assumption, we know from equation (2) that $\eta_i$'s for workers from other regions than Seoul/Kyonggi are relatively higher, and hence that $R_i$ for workers from other regions than Seoul/Kyonggi and $\varepsilon_i - \alpha\eta_i$ are negatively correlated.

Therefore, when estimating equation (3), the OLS estimate of $\alpha$ ($\alpha_{OLS}$) is likely to be downward biased. Specifically, the bias is calculated as follows. Let $\text{plim}\frac{1}{n}[PR]'[PR] = Q$, where $n$ is the number of observations, $P$ and $R$ are $n$ column vectors of $P_i$'s and $R_i$'s, respectively, and $Q$ is a positive definite matrix. The probability limit of OLS estimate of $\alpha$ ($\alpha_{OLS}$) is:

$$\text{plim}\alpha_{OLS} = \alpha + q^{11}\text{plim}\left\{\frac{1}{n}P'(\varepsilon - \alpha\eta)\right\} + q^{12}\text{plim}\left\{\frac{1}{n}R'(\varepsilon - \alpha\eta)\right\}, \tag{4}$$

where $q^{ij}$ is the $(i, j)$th element of $Q^{-1}$ and $q^{ii}$ is positive. The right-hand side of equation (4) is smaller than $\alpha$ unless $q^{12}$ is a very large negative number.

In the same way, the probability limit of OLS estimate of $\beta$ ($\beta_{OLS}$) is:

$$\text{plim}\beta_{OLS} = \beta + q^{21}\text{plim}\left\{\frac{1}{n}P'(\varepsilon - \alpha\eta)\right\} + q^{22}\text{plim}\left\{\frac{1}{n}R'(\varepsilon - \alpha\eta)\right\}. \tag{5}$$

The right-hand side of equation (5) is smaller than $\beta$ unless $q^{21}$ is a very large negative number. Therefore, the OLS estimate of $\beta$ ($\beta_{OLS}$) is also likely to be downward biased.

To correct the bias, we have conducted the instrumental variable (IV) estimation. The IV estimation eliminates bias due to statistical discrimination as measurement error in OLS estimation and reveals only taste discrimination if there is any. If wage differentials based on the region of birth are entirely due to taste discrimination in Korean labor markets, the IV estimate ($\beta_{IV}$) and OLS estimate of $\beta$ should be the same. On the other hand, if they are entirely due to statistical discrimination as

measurement error, the IV estimate of $\beta$ ($\beta_{IV}$) is zero, which means there is no taste discrimination. If wage differentials are partly due to statistical discrimination as measurement error and partly due to taste discrimination, $\beta_{IV}$ is not zero, and $\beta_{OLS}$ is less than $\beta_{IV}$. Therefore Hausman's (1978) test will show whether they are entirely due to taste discrimination, statistical discrimination, or both. If the result of Hausman's test confirms that wage differentials are in part due to statistical discrimination as measurement error, the difference between OLS and IV estimates of $\beta$ ($\beta_{OLS} - \beta_{IV}$) indicates the extent of statistical discrimination as measurement error.

## V. WAGE FUNCTION ESTIMATION

We estimated wage function based on information relating to 3,372 wage or salary workers in our data set. Table IX shows sample means and standard deviations of variables by region of birth.

Column (1) of Table X shows OLS estimates of wage function. The dependent variable is the logarithm of the monthly wage. In column (1), the estimated coeffi-

TABLE IX

MEANS AND STANDARD DEVIATIONS OF VARIABLES BY REGION OF BIRTH

| | Seoul/ Kyonggi | Youngnam | Honam | Chungchong/ Kangwon | Total |
|---|---|---|---|---|---|
| Monthly wage (10,000 wons) | 1,221.9 | 1,196.3 | 1,161.9 | 1,234.9 | 1,203.0 |
| | (700.4) | (683.1) | (614.0) | (667.8) | (670.4) |
| Female (D) | 0.406 | 0.339 | 0.378 | 0.338 | 0.364 |
| | (0.491) | (0.474) | (0.485) | (0.473) | (0.481) |
| Age (years) | 33.0 | 36.9 | 37.2 | 37.5 | 36.1 |
| | (9.99) | (10.9) | (10.9) | (10.2) | (10.7) |
| Education years | 13.2 | 12.3 | 12.1 | 12.3 | 12.5 |
| | (2.85) | (3.28) | (3.42) | (3.35) | (3.25) |
| Father's education years | 9.09 | 6.67 | 6.51 | 6.70 | 7.24 |
| | (4.49) | (4.70) | (4.72) | (4.67) | (4.76) |
| Tenure (years) | 4.54 | 6.12 | 6.04 | 6.55 | 5.80 |
| | (5.63) | (6.97) | (7.47) | (7.43) | (6.91) |
| Married (D) | 0.556 | 0.722 | 0.750 | 0.790 | 0.700 |
| | (0.497) | (0.448) | (0.434) | (0.408) | (0.458) |
| Military service (D) | 0.478 | 0.530 | 0.461 | 0.543 | 0.505 |
| | (0.500) | (0.499) | (0.499) | (0.498) | (0.500) |
| Migration to Seoul/Kyonggi (D) | 0.000 | 0.229 | 0.479 | 0.530 | 0.286 |
| | (0.000) | (0.420) | (0.500) | (0.499) | (0.452) |
| Number of observations | 835 | 1,133 | 723 | 681 | 3,372 |

Source: The 1998 KLIPS.

Notes: 1. Numbers in parentheses are standard deviations.
2. (D) = dummy variables.
3. Workers with monthly wages lower than 300,000 won adjusted by CPI of the year 2000 were deleted from the analyses.

TABLE X

OLS AND IV ESTIMATION OF WAGE FUNCTION

| | (1) OLS | (2) IV |
|---|---|---|
| Intercept | 12.279*** | 12.033*** |
| | (0.119) | (0.159) |
| Female (D) | –0.360*** | –0.361*** |
| | (0.026) | (0.026) |
| Youngnam (D) | –0.092*** | –0.078*** |
| | (0.022) | (0.023) |
| Honam (D) | –0.124*** | –0.105*** |
| | (0.026) | (0.027) |
| Chungchong/Kangwon (D) | –0.085*** | –0.066** |
| | (0.027) | (0.028) |
| Age (years) | 0.044*** | 0.044*** |
| | (0.0060) | (0.0061) |
| Age squared (years) | –0.00054*** | –0.00051*** |
| | (0.0000704) | (0.00071) |
| Education years | 0.060*** | 0.077*** |
| | (0.0029) | (0.0078) |
| Tenure (years) | 0.026*** | 0.0024*** |
| | (0.0014) | (0.0017) |
| Married (D) | 0.056** | 0.053* |
| | (0.028) | (0.028) |
| Military service (D) | –0.020 | –0.047* |
| | (0.025) | (0.028) |
| Migration to Seoul/Kyonggi (D) | 0.084*** | 0.072*** |
| | (0.020) | (0.021) |
| *N* | 3,372 | 3,372 |
| Adjusted $R^2$ | 0.4129 | — |
| *p* from Hausman test: | | |
| Education years | — | 0.019 |
| Female (D) | — | 0.721 |
| Youngnam (D) | — | 0.024 |
| Honam (D) | — | 0.023 |
| Chungchong/Kangwon (D) | — | 0.023 |

Source: The 1998 KLIPS.

Notes: 1. The dependent variable is the logarithm of monthly income.
2. (D) = dummy variables.
3. Workers with monthly wages lower than 300,000 won adjusted by CPI of the year 2000 were deleted from the analyses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

cients of all regional dummies are significantly negative, which means that workers originating from Youngnam, Honam, and Chungchong/Kangwon are paid lower wages than those from Seoul/Kyonggi.

How can we explain this phenomenon? A first hypothesis is that workers originating from other regions are discriminated against relative to workers from Seoul/

Kyonggi. If the employer prefers workers from Seoul/Kyonggi and hence harbors negative feelings towards workers from other regions, he will provide higher wages for workers from Seoul/Kyonggi. Becker (1957) has called this phenomenon taste discrimination and Park (1990) has found evidence of it within Korean firms.

A second hypothesis is that workers born in Seoul/Kyonggi have a higher unobserved productivity than workers born in other regions. Let us suppose that workers from Seoul/Kyonggi have undergone the same number of years of education as those from other regions. If employers know that workers born in Seoul/Kyonggi have higher-quality education (regardless of the number of years spent in education), have better social networks, or are more diligent, they will pay workers from Seoul/Kyonggi higher wages than those from other regions. While employers are aware of the productivity of their workers and pay them wages accordingly, a third party cannot exactly measure their productivity, but can only estimate it by regarding the years spent in education as indicative of their productivity. Since the third party regresses wages, as in column (1) of Table X, on workers' years of education as indicative of their productivity and the regional dummies, he may consider negatively estimated coefficients of regional dummies as evidence of discrimination. However, workers from other regions are, in fact, not discriminated against, from the employer's point of view, since they are paid wages according to their productivity. We call this statistical discrimination as measurement error.

A third hypothesis is that workers born in other regions are paid lower wages than those born in Seoul/Kyonggi partly because of taste discrimination and partly because of statistical discrimination as measurement error. According to this hypothesis, workers born in other regions are paid less than those born in Seoul/Kyonggi not only because employers discriminate against them based on taste but also because workers from other regions have lower unobserved productivity than those from Seoul/Kyonggi.

We now proceed to test which hypothesis explains wage differentials by region of birth in Korean labor markets. We then go on to measure the extents of taste discrimination and statistical discrimination as measurement error, as suggested in Section IV.

The instrumental variable should be correlated with the indication of productivity but uncorrelated with $\eta_i$, and should not appear in equation (1). The father's education is correlated with the worker's education but uncorrelated with $\eta_i$, and is unrelated to his wage conditional on productivity ($P_i^*$).

Column (2) in Table X shows IV estimates of log wage function using the father's years in education as an instrument for the worker's education years. A comparison of columns (1) and (2) shows that the coefficients of education years and all regional dummies in OLS estimation are lower than the ones in IV estimation. This means, as derived in Section IV, that OLS estimates of coefficients of education years and all regional dummies are biased downward. Hausman's (1978) test for

the statistical significance of each difference between OLS and IV estimates has the marginal significance level lower than 0.05. Therefore, the first hypothesis that wage differentials by region of birth are entirely due to taste discrimination is rejected.

The estimated coefficients of regional dummies are significantly negative in column (2). Hence the second hypothesis that wage differentials by region of birth are entirely due to statistical discrimination as measurement error is also rejected.

Significant results of Hausman's test and significantly negative estimated coefficients of regional dummies support our third hypothesis. Lower wages for workers from regions other than Seoul/Kyonggi can be interpreted as partly due to statistical discrimination as measurement error and partly due to taste discrimination. Specifically, 15.2%, 15.3%, and 22.4% of wage differentials of workers originating from Youngnam, Honam, and Chungchong/Kangwon respectively, can be attributed to statistical discrimination as measurement error in OLS estimation.[2] On the other hand, 84.8%, 84.7%, and 87.6% of wage differentials of workers from the above regions can be attributed to taste discrimination.

In column (2), eliminating this statistical discrimination as measurement error, workers originating from Youngnam, Honam, and Chungchong/Kangwon are paid lower wages than those from Seoul/Kyonggi by 7.8%, 10.5%, and 6.6% respectively. These percentages indicate the extents of taste discrimination against workers originating from Youngnam, Honam, and Chungchong/Kangwon respectively.

In addition, we conducted a test to determine whether a wage differential based on gender is due to taste discrimination, statistical discrimination as measurement error, or both. Since the OLS estimated coefficient of the female dummy is almost equal to the IV one, relatively lower wages of female workers is entirely due to taste discrimination. According to column (2), female workers are paid lower wages than male workers by 36.1%, which is similar to the estimates in the literature (e.g., Uh 1991).

In column (2), workers who have migrated to Seoul/Kyonggi region are paid by 7.2% more than those who stayed in the region where they were born. If the skills-wage profile of workers in Seoul/Kyonggi is steeper than those in other regions, workers who have migrated to Seoul/Kyonggi are likely to be more skilled than those living in other regions (Borjas 1987).

## VI. CONCLUSION

In this paper, we have investigated how and to what extent workers' region of birth affects their performance in labor markets. We have examined the migration ratio

[2] The percentage is the difference in estimated coefficient of the regional dummy between OLS and IV divided by the estimated coefficient of the regional dummy in OLS.

and the type of employment by workers' region of birth. We have also estimated wage functions and tested whether wage differentials by region of birth are due to taste discrimination, statistical discrimination as measurement error, or both. And we have calibrated the extents of two types of discrimination.

We have found that Honam-born workers have a higher migration ratio to other regions than Youngnam-born workers. Specifically, the migration ratio of Honam-born workers to the Seoul/Kyonggi region is 2.3 times higher than that of Youngnam-born workers. Workers born in other regions have a higher propensity to become contingent workers than Seoul/Kyonggi-born workers.

An estimation of wage function showed that workers originating from other regions are paid significantly lower wages than those from Seoul/Kyonggi. The first hypothesis that wage differentials by region of birth are entirely due to taste discrimination was rejected. The second hypothesis that wage differentials by region of birth are entirely due to statistical discrimination as measurement error was also rejected. The statistical significance of Hausman's test and significantly negative estimated coefficients of regional dummies support our third hypothesis. Our results show that wage differentials by region of birth are attributed partly to statistical discrimination as measurement error and partly to taste discrimination. Specifically, 15.2%, 15.3%, and 22.4% of wage differentials of workers originated from Youngnam, Honam, and Chungchong/Kangwon respectively, can be attributed to statistical discrimination as measurement error in OLS estimation. The remaining percentages can be attributed to taste discrimination.

In IV estimation, eliminating the statistical discrimination as measurement error, workers born in Youngnam, Honam, and Chungchong/Kangwon are paid lower wages than those born in Seoul/Kyonggi by 7.8%, 10.5%, and 6.6% respectively. These percentages indicate the extents of taste discrimination against workers born in Youngnam, Honam, and Chungchong/Kangwon respectively.

We have found that significantly large portions of wage differentials by region of birth are due to taste discrimination. Although taste discrimination is based on people's preferences, the realized taste discrimination in the labor markets decreases as output markets become more competitive (Becker 1957). It follows that government policies stimulating competition in the markets can mitigate the realized taste discrimination (Park 1990).

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