

Kim, Mi-Ok; Huh, Sung-Joon; Jung, Hyung-Rok

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A Study on the Wage Disparity between Employees with and without Disabilities: Evidence from South Korea

Mi-Ok Kim^a, SungJoon Huh^{a†}, Hyung-Rok Jung^b

^aThe Catholic University of Korea

^bKyung Hee University

ABSTRACT

Purpose: The purpose of this study is to identify whether wage discrimination against people with disabilities exists in the Korean labor market and, if so, to understand the cause and level of wage discrimination.

Design/methodology/approach: We first conducted Heckman's two-stage model to control human resource and market characteristics, using the Korean Labor Panel and the Employment Panel for Persons with Disabilities. Next, we analyzed the existence and cause of wage discrimination through reverse regression and the decomposition model. Lastly, we calculated the amount of wage discrimination according to disability.

Findings: The wage disparity due to market characteristics shows a 163.39% total wage disparity, which indicates that there is serious wage discrimination. Finally, the amount of wage discrimination according to disability is 427,020 KRW (372.42 USD) per month. Despite the incentives provided to firms to employ persons with disabilities in Korea, those with disabilities still receive lower wages than those without disabilities.

Research limitations/implications: We provide the basis for calculating the appropriate contributions and incentives for the current in-force employment inducement system for individuals with disabilities.

Originality/value: This study provides important implications for employment and wage policies for people with disabilities by identifying which factors among human resource characteristics and market characteristics cause the total wage gap between the disabled and non-disabled people and whether the cause is resource effect or wage discrimination.

Keywords: Wage Disparity, Wage Discrimination, Employees With Disabilities, Employees Without Disabilities

I. Introduction

Employment discrimination means an act of discrimination by a firm based on nationality, race, religion, gender, or age. The International Labor Organization's 1983 agreement No. 159 and recommend-

ation No. 168 define people with disabilities, ensuring equal opportunities and treatment in employment and the formulation and implementation of national policies on vocational rehabilitation and employment of people with disabilities (Cho, 2004).

Following The International Labor Organization, Korea enacted the Act on the Prohibition of Discrimination against Persons with Disabilities, Rights and Relief in 2007, which came into effect in 2008, to prohibit discrimination based on disability and to remedy the rights of persons with disabilities.

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† Corresponding author: SungJoon Huh

E-mail: shuh5@catholic.ac.kr

According to the Korea Employment Agency for Persons with Disabilities¹⁾, the disability employment quota is the obligation of employers of national and local governments, public organizations, and private companies who employ 50 workers or more, and they must employ a certain percentage of persons with disabilities. These percentages are called mandatory employment rates for persons with disabilities. Focusing on job-centered abilities rather than appearance when hiring employees can fundamentally enhance the efficiency of human resource management (Kim & Lee, 2023).

Nevertheless, the economic activity participation rate of persons with disabilities was 37%, and the employment rate was 34%; just over half of the economic activity participation rate of 63.9% and employment rate of 61.3% of the total population according to a 2018 survey by the Ministry of Employment and Labor of Korea. The average wage level of employees with disabilities is 70% of the average employee wage. In addition, over 60% of employees with disabilities are part-time employees (Ministry of Employment and Labor of Korea).

Therefore, the Korean government introduced employment contribution and incentive systems for persons with disabilities to alleviate this phenomenon, according to the Korea Employment Agency for Persons with Disabilities. First, there is the Employment Contribution for Persons with Disabilities, which is an employment contribution system for persons with disabilities. The contribution shall be paid by employers who hire fewer persons with disabilities than the mandatory employment rate. Second, there is the employment incentive system for persons with disabilities. It is a system that gives a certain amount of incentives to employers who employ more persons with disabilities than the mandatory employment rate to promote job stability and employment of persons with disabilities. The range of the incentives is from 150,000 KRW (130.82 USD) to 800,000 KRW (697.71 USD) per person per month, depending on the degree of disability, gender, and length of employment of

the person with the disability.

The purpose of this study is to confirm the existence of wage discrimination between employees with and without disabilities in the Korean labor market, calculate the cause of discrimination and the amount of discrimination, and provide an appropriate burden.

II. Literature Review

A. Prior Research on the Wage Disparity Research Model

Park (2011) analyzed the wage disparity between the genders of persons with disabilities in Korea and suggested that there may be a sample selection bias related to the economic activity participation in the survey of the person with a disability. To correct this sample selection bias, the author used the Heckman (1979) two-stage model to estimate potential variables representing the disparity between the employer's wage proposal and the wage of the employee with a disability in the first stage and to analyze the wages of the employee with a disability in the second stage.

Kamalich and Polachek (1982) analyzed whether wage discrimination exists between the two groups through a reverse regression analysis of the wage function. In this method, discrimination is defined as the situation whereby minorities need to be more qualified to receive a given wage rate. Discrimination does not exist when no disparity in qualification exists under conditions of wage parity.

Oaxaca (1973) analyzed wage disparity using a decomposition model. Wage disparity is the wage of the employee without a disability minus the wage of the employee with a disability, which is divided into resource and compensation effects. The resource effect is the disparity in productivity due to the accumulation of human capital. Compensation effects are the disparity in systems or practices even though productivity is the same, also called wage discrimination. Resource and compensation effects can be

1) <https://www.kead.or.kr/english/>

further categorized into individual human resource characteristics and the employing firm's market characteristics. Wages and capital intensity increase labor productivity (Nguyen, 2023).

B. Prior Research on the Wage Disparity

Johnson and Lambrinos (1985) analyzed wage disparity between persons with and without disabilities in the US by categorizing disparity and discrimination. The results show that the wages of male employees with disabilities were 16% lower than those of male employees without disabilities, and 32% of that was due to discrimination. Wages of female employees with disabilities were 60% lower than those of female employees without disabilities, and 40% of that was due to discrimination. Baldwin and Johnson (1994; 1995) estimated wage disparity and wage discrimination between persons with and without disabilities by gender. Both papers' results indicated that the wage gap between the person with and without disabilities exists regardless of gender.

C. Purpose

This study examined the following three issues using employment panel data. First, we confirmed whether there is a wage disparity according to disability. This preliminary analysis was to confirm whether wage discrimination based on disability will exist in the future. Second, we investigated whether the wage disparity comes from wage discrimination when all other conditions are the same. We calculated the amount of discrimination and compared it with the amount of the contribution or incentive system in Korea. Third, we analyzed the cause of wage discrimination by dividing it into resource effect and market effect through the wage decomposition model. The resource effect is the evaluation of an individual's ability, and the market effect is caused by the characteristics of a market or a company that the individual does not control. Through the above

analysis, it was expected that it would be possible to verify the effectiveness of the employment policy for people who are disabled in Korea.

III. Methods

A. Research Instruments

Kamalich and Polachek (1982) assume that wage discrimination exists under the conditions of wage disparity. Therefore, this study analyzed the wage disparity due to disability through the following steps. First, we confirmed the existence of wage disparity in the Korean labor market. Once confirmed, we proved that wage disparity came from disability discrimination and calculated the amount of wage discrimination. Lastly, we analyzed the cause of discrimination and compared the size of discrimination.

B. Wage Function Estimation Model (Heckman (1979) Two-Stage Model)

This study attempted to select a sample that reflects labor market characteristics. Since we only work when the market wage is greater than the reservation wage, a self-selection bias may occur when the wage function is estimated only by wage employees. Therefore, we statistically measured and reflected employment probability, that is, economic activity participation rate in wage model estimation. Following Park (2011) and Yoo (2011), we conducted a two-stage analysis using Heckman's (1979) lambda (Inverse Mill's Ratio) to control human resource and market characteristics.

$$\text{Prob}(Z_i^* > 0) = \text{Prob}(\epsilon_i > -\gamma H_i) = \Phi(\gamma H_i) \quad \text{1st Stage (Eq. 1.1)}$$

$$\log W_i | Z_i^* > 0 = \beta X_i + \theta \lambda_i + \epsilon_i \quad \text{2nd Stage (Eq. 1.2)}$$

The first stage of the two-stage model calculates the economic activity participation rate λ_i which represents the probability of being selected as a sample using the probit model. In (Eq. 1.1), Z_i^* is a latent variable that is not directly observed about employment status and H_i is a vector of factors that determine employment status. The second stage (Eq. 1.2) is the wage function of the employees with and without disabilities reflecting economic activity participation rate λ_i . λ_i is the Inverse Mill's Ratio (IMR) which is the expected value of the error term of the wage function. By including λ_i in the wage function, we can control a non-zero error term and obtain a consistent estimate value corrected for selection bias. The dependent variable $W_i|Z_i^* > 0$ in (Eq. 1.2) is employment status and the independent variable X_i is a determinant of market wages. ϵ_i in (Eq. 1.2) is the error term, and wages were taken as natural logarithms for market wages to alleviate the biased structure of the wage distribution of the employees with and without disabilities.

C. Reverse Regression Model (Kamalich and Polachek, 1982)

Next, wage discrimination was uncovered using the reverse regression of the wage function from Kamalich and Polachek (1982). Kamalich and Polachek (1982) used the log of hourly wages as the dependent variable to confirm that discrimination exists between the two groups when all other conditions are the same. However, in Korea, only 12.7% of people receive wages by the hour, and 87.3% of those are paid by monthly or annual salary (Kim, 2008). Therefore, if the monthly or annual salary system is converted into hourly wages and compared to the average employees' wages, the results are rather misleading (Shin & Kong, 2008). Additionally, since the disabled employment contribution is also calculated on a monthly basis, this study set monthly wage as the dependent variable of the reverse regression model to compare disabled employment contribution.

$$W = \beta X + \alpha E + \epsilon$$

reverse regression model of wage function (Eq. 2.1)

$$T = \beta X + \alpha E + \epsilon$$

reverse regression model of work period function (Eq. 2.2)

The dependent variable W of (Eq. 2.1) is the monthly wage, and the dependent variable T of (Eq. 2.2) is the work period. X is an explanatory variable vector consisting of factors that affect wages, and E is a dummy variable representing the disability status (Eq. 2.1). The wage function confirms whether the wage level of a person with a disability is different from a person without a disability if all other conditions are equal. The coefficient value of (Eq. 2.1) refers to the amount received less than a person without a disability because of the disability, even though all other conditions are equal (Eq. 2.2); the work period function confirms whether the work period of a person with a disability is different from a person without a disability if all other conditions are equal including wages.

D. Wage Discrimination Decomposition Model (Oaxaca, 1973)

Through the estimation results of the wage function and the reverse regression model, it is possible to prove that discrimination according to disabilities exists in the Korean labor market. However, the reverse regression model can only determine the existence of discrimination but does not reveal the size and cause of discrimination. Therefore, we conducted additional analysis through Oaxaca's (1973) wage discrimination decomposition model. To decompose the wage discrimination for the two groups, the people with and without disabilities. If the wage of the employee with a disability is the $\log W^d$, the wage of the employee without a disability is the $\log W^n$, and the explanatory variable for each wage is X_j^d and X_j^n , the estimated equations for the wage function of the two groups of employees can be rewritten

as follows.

$$\log W^d = \beta_0^n + \beta_j^d X_j^d + \theta^d \lambda^d + \epsilon^d$$

wage function of the employee with a disability
(Eq. 3.1)

$$\log W^n = \beta_0^n + \beta_j^n X_j^n + \theta^n \lambda^n + \epsilon^n$$

wage function of the employee without a disability
(Eq. 3.2)

Where β_0 is a constant term. Estimating the coefficients of β and θ using the wage function of (Eq. 3.1) and (Eq. 3.2) and assuming the average values of the wage $\log W$ and explanatory variable X_j vector is $\log \bar{W}$ and \bar{X} , respectively. The average wage discrimination is divided as follows.

$$(\log \bar{W}^n - \log \bar{W}^d) = \hat{\beta}_0^n - \hat{\beta}_0^d + (\hat{\beta}_j^n \bar{X}_j^n - \hat{\beta}_j^d \bar{X}_j^d) + (\hat{\theta}^n \bar{\lambda}^n - \hat{\theta}^d \bar{\lambda}^d) \quad (\text{Eq. 3.3})$$

In this study, to clarify the wage discrimination between employees with and without disabilities, we removed the constant term, and the optional term was considered as an individual element of the wage disparity. Rewriting the wage discrimination model by manipulating $\hat{\beta}_j^n \bar{X}_j^d$ in terms of $\hat{\beta}_j^n (\bar{X}_j^n - \bar{X}_j^d)$ is as follows.

$$(\log \bar{W}^n - \log \bar{W}^d) = \hat{\beta}_j^n (\bar{X}_j^n - \bar{X}_j^d) + \bar{X}_j^n (\hat{\beta}_j^n - \hat{\beta}_j^d)$$

wage discrimination decomposition model (Eq. 3.4)

In the wage discrimination decomposition model, $\hat{\beta}_j^n (\bar{X}_j^n - \bar{X}_j^d)$ is the wage discrimination caused by the difference of the endowed resource, which means the resource effect and $\bar{X}_j^n (\hat{\beta}_j^n - \hat{\beta}_j^d)$ is the wage discrimination of the compensation evaluated in the market for the same resource, which means the compensation effect.

E. Participants

Table 1 shows population data and sample status. To determine the wage disparity between employees with and without disabilities, we used the 2016 Korea Panel Survey of Employment for the Disabled (KPSSED) in the Korea Employment Agency for Persons with Disabilities, Employment Development Institute (2016). For persons without disabilities, we used the 2015 Korean Labor and Income Panel Study (KLIPS) in the Korea Labor Institute (2015).²⁾ The KPSSED included a wage employee sample of 1,296 people with disabilities and 3,581 full samples, whereas KLIPS had a wage employee sample of 3,298 people without disabilities; the full sample is 6,973. We also obtained a sample of unemployed people to estimate the economic activity participation function, which is the first stage of the two-stage model.

Table 1. Sample selection

Classification	Items	Employees with disabilities	Employees without disabilities
Source	Wage, human resource characteristic variables, market characteristic variables	KPSSED of 2016	KLIPS of 2015
	Employees	1,296	3,298
Observations	Unemployed people	2,285	3,675
	Total	3,581	6,973

2) In the 2015 KPSSED, it is impossible to acquire human resource characteristic variables (vocational training, work period). All data can be obtained from the 2016 KPSSED (second wave).

F. Variables

To analyze empirical models, we used average monthly wage and hourly wage as our dependent variables. The average monthly wage was used in reverse regression to confirm the existence of wage discrimination for disability. The sum of basic pay, bonus, and allowance is calculated as the average monthly wage. The Hourly wage was used in the wage function and decomposition model and calculated by dividing the average monthly wage by business hours. Human resources and the external environment determine the wage disparity in participation in economic activity. Therefore, we included socio-demographic characteristics, human capital resources, and labor market characteristics as control variables following the prior literature (Kamalich & Polachek, 1982; Oaxaca, 1973; Park, 2011; Yoo, 2011). We also included gender, age, and marital status to control for the socio-demographic characteristics. Also, we added education career, the experience of vocational training, and the work period to capture the effect of human capital resources. Finally, we included the characteristics of the labor market. The number of total employees calculated the firm size; the type of employment was considered full-time and occupational categories. The existence of a labor union and the firm's location were also reflected. Labor unions aim to protect unionized worker's benefits, rights, and job security, they should also perform a monitoring role to increase firms' long-term sustainability (Chun & Shin, 2017)

IV. Results

A. Descriptive Statistics

Table 2 represents the mean and standard deviation of the variables for employees with and without disabilities. The average monthly wage was 1,838,000 KRW (1,602.99 USD) for an employee with a disability and 2,499,000 KRW (2,179.47 USD) for

an employee without a disability. The wage of an employee with a disability is 73.5% of the wage of an employee without a disability. The level of education shows similar levels of college education, with 36.5% of employees with disabilities and 36.9% of employees without disabilities. Vocational training reflects 3.7% of employees with a disability and 9.4% of employees without a disability, which means employees with a disability had less experience than employees without disabilities in vocational training. The work period was 5.2 years for employees with a disability and 8 years for employees without a disability. The difference in the work period can be attributed to the difference between the full-time job rate and the occupational category of type of employment. When the firm size is less than 50 employees, 17.1% are employees with disabilities, and 27.9% are employees without disabilities 27.9%. For firms with 50~299 employees, employees with disabilities count for 8.3%, and employees without disabilities count for 13.9%. For firms with 300 and above employees, 2.3% are employees with disabilities, and 6.8% are employees without disabilities. This shows that more employees with disabilities are working in medium firms than in larger firms. Therefore, firm size is expected to affect wage disparity. The full-time job rate is 52.6% for employees with disabilities and 73.4% for employees without disabilities. Working rates in high-wage occupational categories, such as management work, are 15.2% for those with a disability and 31.4% without a disability. Conversely, in low-wage occupational category rates, such as simple labor work, employees with a disability account for more than three times the employees without a disability, with 27.7% of employees with a disability versus 9.9% of employees without a disability. Thus, the type of employment and occupational categories are likely to affect wage disparity.

Table 2. Descriptive statistics of employees with disabilities and employees without disabilities

Variables	Employees with disabilities		Employees without disabilities		Disability to non-disability ratio (C)=(A+B) ×100
	Mean (A)	Standard deviation	Mean (B)	Standard deviation	
Average monthly wage	1,838	860	2,499	1,072	73.53%
Log (hourly wage)	9.231	0.434	9.514	0.452	97.03%
Gender	0.755	0.430	0.562	0.496	134.34%
Age (year)	41.400	10.816	40.981	10.265	101.02%
Education	0.365	0.482	0.369	0.483	98.92%
Experience in vocational training	0.037	0.189	0.094	0.292	39.36%
Marital status	0.549	0.498	0.683	0.465	80.38%
Work period (year)	5.250	6.049	8.063	6.669	65.11%
Firm size					
Less than 50	0.171	0.377	0.279	0.449	61.29%
50~299	0.083	0.275	0.139	0.346	59.71%
Over 300	0.023	0.150	0.068	0.252	33.82%
Type of employment	0.526	0.500	0.734	0.442	71.66%
Occupational Category					
Management work	0.152	0.359	0.314	0.464	48.41%
Office work	0.183	0.387	0.270	0.444	67.78%
Service or sales work	0.128	0.334	0.179	0.383	71.51%
Highly skilled work	0.245	0.430	0.138	0.345	177.54%
Simple labor work	0.277	0.448	0.099	0.298	279.80%
Existence of labor union	0.125	0.331	0.183	0.386	68.31%
Location	0.461	0.499	0.484	0.500	95.25%
Observations	1,296		3,298		

1) Variable definitions: average monthly wage = basic pay + bonus + allowance; hourly wage = average monthly wage÷business hour; gender = dummy variable having the value of one if male, and zero otherwise; age = continuous variables(16~65); education = dummy variable having the value of one if college graduation or more, and zero otherwise; experience of vocational trainings = dummy variable having the value of one if participate in vocational training, and zero otherwise; marriage = dummy variable having the value of one if married, and zero otherwise; work period = continuous variables(year); firm size = dummy variable having the value of one if proportion of employee satisfies condition, and zero otherwise; type of employment = dummy variable having the value of one if full-time job, and zero otherwise; occupational category = dummy variable having the value of one if proportion of occupational category satisfies condition, and zero otherwise; existence of labor union = dummy variable having the value of one if labor union exists, and zero otherwise; location = dummy variable having the value of one if firm locates in metropolitan city, and zero otherwise.

B. Regression Result of Wage Function Estimation Model

We used the Heckman two-stage model (Heckman, 1979) to control the self-selection bias of the wage function. There is a possibility that the personal characteristics of economic activity status would affect wages. Wages are paid only when a person participates in economic activities, so the economic activity participation model is set as the first stage. Factors determining whether to participate in economic

activities included gender, age, level of education, the experience of vocational training, and marital status.

The results of the economic activity participation model (first-stage) analysis using a full sample are shown in Table 3. These results show that the coefficients of gender, age, level of education, experience of vocational training, and marital status are all statistically significant positive values in the economic activity participation model. This result means that for employees without a disability, the older the male is, the older the age, the higher the

level of education, the more vocational training, and the higher the probability of participating in economic activities. The equivalent analysis for employees with a disability showed that the coefficients of gender, level of education, and marital status had statistically significant positive values, and age had statistically

significant negative values. This means that for employees with disabilities, the younger the age and the higher the level of education, the higher the chances of participating in economic activities.

Next, we analyzed the wage function (second stage), considering the economic activity participation

Table 3. Regression result of wage function (Two-stage model)

Variables	Employees with disabilities		Employees without disabilities	
	Coef.	t-value	Coef.	t-value
he function of economic activity participation (1st stage)				
Intercept	-0.845***	-9.446	-1.125***	-20.590
Gender	0.587***	12.140	0.756***	22.781
Age	-0.009***	-4.536	0.009***	6.389
Education (over-college education)	0.635***	11.895	0.642***	17.124
Experience in vocational training	0.118	0.910	1.272***	13.285
Marital status(married)	0.786***	15.483	0.283***	7.161
Wage function (2nd stage)				
Intercept	9.010***	102.064	9.232***	85.612
Gender(female)	0.087***	2.740	0.142***	4.401
Age(year)	0.002*	1.673	-0.002*	-1.769
Education (over-college education)	0.051	1.626	0.020	0.708
Experience in vocational training	-0.106*	-1.862	-0.110**	-2.489
Work period(year)	0.015***	8.506	0.018***	19.136
Firm size				
50~299 employees	0.048	1.299	0.076***	4.732
Over 300 employees	0.049	0.717	0.191***	8.229
Type of employment (full-time job)	0.133***	5.884	0.180***	13.443
Occupational category				
Management work	0.185***	5.131	0.299***	13.892
Office work	0.237***	7.150	0.229***	10.518
Service or sales work	0.069**	2.047	0.089***	4.191
Highly skilled work	0.115***	4.008	0.149***	6.559
Existence of labor union	0.097***	3.074	0.129***	8.170
Location (metropolitan city)	-0.006	-0.309	0.011	1.018
Lambda (λ_u)	-0.227***	-5.106	-0.355***	-5.355
Statistics				
Rho/Sigma	-1.413965087		-2.129901961	
Wald Chi-square(χ^2)	297.312***		1,808.056***	
Observations	3,581		6,973	

1) See <Table 4> for variable definitions.

2) ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

model (first stage). The λ value indicating whether the sample selection bias affected the wage function was negative (-) 0.227 for the wage function of the employee with a disability and (-) 0.355 for the wage function of the employee without a disability. This result means that sample selection bias affected the wage level.

The wage function analysis of employees with a disability showed that gender, age, type of employment, work period, occupational category, and labor union had statistically significant effects on wages. The gender (male) coefficient was 0.087, indicating that the wage of the male employees with a disability was 8.7% higher than the female employees with a disability. The coefficient of the work period was 0.015, which meant a 1.5% increase in wages when the work period was longer than one year. The labor union coefficient was 0.097, which showed that there was a labor union wage premium 9.7% higher when working in the labor union than at a workplace without a labor union.

The wage function analysis for employees without a disability showed statistically significant coefficients for all variables except the level of education and location. The younger the age, the longer the work period, the larger the firm size, the higher the wage category, and the higher the wage. For example, if the firm size was between 50 and 299 employees, the wage was 7.6% higher, and a full-time job was 18% higher than a part-time job. The labor union wage premium was 12.9% higher for employees without a disability compared to 9.7% for employees with a disability. In sum, the results supported the existence of wage disparity due to disability.

C. Reverse Regression result of Wage Disparity

In the wage disparity analysis, it was difficult to distinguish the wage disparity between employees with and without disabilities due to differences in productivity or discrimination against compensation even at the same productivity. All factors other than productivity cannot be considered discrimination

since it was difficult to estimate the wage function, which included all productivity factors of employees with and without disabilities. Therefore, this study modified the reverse regression analysis of wage functions based on Kamalich and Polachek (1982) before decomposing wage discrimination. Reverse regression analysis overcomes the limitation of the wage discrimination decomposition model of Oaxaca (1973) and confirms whether wage discrimination exists between employees with and without disabilities. Reverse regression analysis is not a comparison of wages through human resources among groups but a comparison of the same wages by the difference in human capital, indicating the existence of discrimination.

Table 4 shows the results of the wage disparity reverse regression analysis. Both the wage model and the work period model support the existence of wage discrimination due to disability. The coefficient of disability in the wage model is statistically significant negative values, which means that the wage level of employees with disabilities is lower than that of employees without disabilities. Also, the coefficient value of disability (-) 42.702 means that employees with disabilities are paid 427,020 KRW (372.42 USD) per month less than employees without disabilities for discrimination. The coefficient of disability in the work period model is (-) 0.950. Statistically significant, which means that all other things being equal, the tenure of a person with a disability is shorter than that of a person without a disability due to discrimination.

As such, the wage function and reverse regression analysis of Table 4 are consistent, indicating that there is discrimination against persons with disabilities in the Korean labor market. To determine the magnitude and cause of the discrimination, an additional analysis was conducted using Oaxaca's (1973) wage discrimination decomposition model.

D. Result of Wage Discrimination Decomposition Model

Table 5 decomposes the wage discrimination using

Table 4. Reverse regression result of wage disparity

Variables	Dep. Var. = monthly wage		Dep. Var. = work period	
	Coef.	t-value	Coef.	t-value
Intercept	48.611***	7.475	-6.329***	-13.069
Disability	-42.702***	-16.291	-0.761***	-3.750
Gender (female)	73.531***	30.914	-0.750***	-3.813
Age (year)	0.768***	6.517	0.188***	22.193
Education (over-college education)	32.012***	12.615	-0.978***	-5.038
Experience in vocational training	14.215***	3.497	0.507*	1.653
Work period (year)	4.301***	23.190	-	-
Firm size				
50~299 employees	14.720***	4.431	-0.847***	-3.379
Over 300 employees	52.788***	10.763	-0.496	-1.326
Type of employment (full-time job)	0.171***	46.954	17.892	1.344
Occupational category				
Management work	51.924***	13.020	-0.196	-0.641
Office work	38.011***	9.566	0.745**	2.466
Service or sales work	27.725***	6.972	-0.317	-1.053
Highly skilled work	26.216***	6.727	0.034	0.114
Existence of labor union	27.141***	8.688	2.116***	8.990
Location (metropolitan city)	1.029	0.477	-0.015	-0.093
log (hourly wage)	-	-	0.024***	23.190
Statistics				
F-value/R-square	346.528***/0.532		142.194***/0.318	
Observations	4,594		4,594	

1) See <Table 4> for variable definitions.

2) ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 5. Result of wage discrimination decomposition model

Variables	Resource effect (R)		Compensation effect (C)		Log (Total wage disparity) (R+C)	
	$\widehat{\beta}_j^n(\overline{X_j^n} - \overline{X_j^d})$	Proportion	$\overline{X_j^d}(\widehat{\beta}_j^n - \widehat{\beta}_j^d)$	Proportion	Total	Proportion
Human resource characteristic						
Gender(female)	-0.02747	-24.32%	0.04204	37.22%	0.01457	12.90%
Age(year)	0.00064	0.57%	-0.13602	-120.41%	-0.13538	-119.85%
Education(over-college education)	0.00008	0.07%	-0.01117	-9.89%	-0.01109	-9.82%
Experience in vocational training	-0.00627	-5.55%	-0.00014	-0.12%	-0.00641	-5.67%
Work period(year)	0.05110	45.24%	0.01560	13.81%	0.06670	59.05%
Subtotal (1)	0.01808	16.01%	-0.08969	-79.40%	-0.07161	-63.39%
Market characteristic						
Firm size(50~299 employees)	0.00424	3.75%	0.00233	2.06%	0.01457	12.90%
Firm size(over 300 employees)	0.00860	7.61%	0.00328	2.90%	0.01457	12.90%
Type of employment(full-time job)	0.03745	33.15%	0.02495	22.09%	0.01457	12.90%

Table 5. Continued

Variables	Resource effect (R)		Compensation effect (C)		Log (Total wage disparity) (R+C)	
	$\widehat{\beta}_j^n(\overline{X_j^n} - \overline{X_j^d})$	Proportion	$\overline{X_j^d}(\widehat{\beta}_j^n - \widehat{\beta}_j^d)$	Proportion	Total	Proportion
Management work	0.04849	42.93%	0.01742	15.42%	0.06591	58.35%
Office work	0.01991	17.63%	-0.00147	-1.30%	0.01844	16.32%
Service or sales work	0.00455	4.03%	0.00256	2.27%	0.00711	6.29%
Highly skilled work	-0.01595	-14.12%	0.00846	7.49%	-0.00749	-6.63%
Existence of labor union	0.00749	6.63%	0.00406	3.59%	0.01155	10.22%
Location(metropolitan city)	0.00025	0.22%	0.00795	7.04%	0.00820	7.26%
Subtotal (2)	0.11503	101.83%	0.06954	61.56%	0.18457	163.39%
Total (3) = (1)+(2)	0.13311	117.84%	-0.02015	-17.84%	0.11296	100.00%

1) See <Table 4> for variable definitions.

2) ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively

the mean of the employees with and without disabilities in Table 2 and the coefficient of wage function in Table 3.

First, the resource effect refers to the wage discrepancy caused by the difference in endowed resources due to human resource and market characteristics of employees with and without disabilities. When the wage disparity explained by the wage decomposition model of 0.11296 was taken as 100%, the wage disparity according to the resource effect was 117%. This result means that the wage disparity due to the resource effect was greater than the wage disparity described by the wage decomposition model. Decomposing the resource effect into the human resource and market characteristics, the wage disparity due to the difference in human resources was 16.01% of the total wage disparity. Among the resource effects, the proportion of gender was (-) 24.32%, which means that being a male employee with a disability reduces total wage disparity.

In other words, the gender of the people with disabilities decreased the wage disparity, and age, level of education, and work period increased the wage disparity. As a result, wage disparity increased due to human resources differences. Human resource variables that are directly related to productivity are the level of education and work period. Of these, the wage disparity caused by the difference in the work period is 45.24% of the total wage disparity,

indicating that the difference in the work period is a major factor in productivity decline. This difference is a result of lower productivity because the employees with disabilities have a shorter work period due to the smaller share of full-time jobs compared to employees without disabilities.

Among the resource effects, wage disparity due to market characteristics was 101.83%, slightly above the total wage disparity. All factors except the highly skilled work of the market characteristics resulted in wage disparity. In particular, the difference in the occupational category was the factor that had the greatest effect on wage disparity. By occupational category, management work accounted for 42.93%, office work accounted for 17.63%, and service or sales work accounted for 4.03%. The employee with a disability had a high proportion of low-wage work, increasing wage disparity. Type of employment was the second largest factor in the wage disparity between employees with and without disabilities. Since employees with disabilities had fewer full-time jobs than employees without disabilities, the work period was shorter, which doubled the wage disparity. Although the effect was not great, wage disparity occurred because the proportion of workplaces with people with disabilities within labor unions is small. The wage disparity by location was minimal.

Secondly, wage discrimination called the compensation effect, was similar to the human resource

and market characteristics of employees with and without disabilities. Still, different compensation mechanisms caused this wage disparity due to the specifics of the employee with a disability. Out of the total wage disparities, wage disparity caused by wage discrimination against employees with disabilities was negative (-) 17.84%, indicating reverse discrimination. However, interpreting the wage disparity due to wage discrimination should be done cautiously. This wage disparity results from the adverse effect of human resource and market characteristics, not the result of the mitigation of wage discrimination. Wage discrimination was negative (-) 79.40% according to the human resource characteristic. In particular, age was negative at (-) 120.41%, which means that the wage of the employee with a disability is much higher than the employee without a disability, which is the main cause of reverse discrimination. This result appears to be because the younger the age of the employees with disabilities, the higher the probability of their participation in economic activities. The level of education was also negative at (-) 9.89%, resulting in reverse discrimination because the wages of employees with disabilities for over-college education are higher than those of employees without disabilities. The relatively high educational level of persons with disabilities can be a proxy for outstanding abilities. As a result, employees with disabilities with high educational levels are superior to employees without disabilities, and this is reflected in their wages.

In contrast, gender and work periods still generate wage discrimination. Wage discrimination was 61.56% according to market characteristics, indicating that discrimination still exists. By factor wage discrimination can be found across all factors. In particular, in the types of employment and occupational categories, management work was a major factor in generating wage discrimination. Wage discrimination based on location and labor union increased the total wage disparity.

Finally, total wage disparity is the sum of resource and compensation effects, which collectively represents wage disparity between employees with and without

disabilities. First, we found that wage discrimination due to the human resource characteristic was actually at (-) 63.39% of the total wage disparity. This result shows that the reverse discrimination effect of age is much larger than the discrimination effects of gender and work period. This means that the wage disparity of the human resource effect is countered by reverse discrimination of the compensation effect rather than discrimination by the resource effect. In other words, there is reverse wage discrimination due to human resources.

The wage disparity due to the market characteristic was 163.39% of the total wage disparity, and there was serious discrimination beyond the total wage disparity. It can be seen that wage disparity according to market characteristics has severe discrimination in both resource effect and compensation effect. In particular, management work in the type of employment and occupational categories was found to have both a resource effect and a compensation effect.

V. Conclusion

Increasing employment opportunities and possibilities is a necessary condition for the labor market. However, wage discrimination due to disability lowers morale and increases social inequality. For this reason, this study identified the existence and amount of wage discrimination due to disability and classified the causes of discrimination into resource and market effects. We explored three parts of wage disparity: understanding the wage function, the existence, and the cause of wage discrimination.

As the result of wage function, we found that individual characteristics (gender, age, marital status) and abilities (vocational training, education) affected the economic participation of employees with and without disabilities. Our findings prove that using a two-stage model was appropriate. Additionally, the results of the second stage confirmed that wage is affected by individual, employment, and organizational

level factors. This result mirrors previous research findings on the wage gap and disparity between the genders of persons with disabilities in Korea (Park, 2011).

According to our findings, wage discrimination existed in both the wage model and the work period model. Statistically significant and negative values, (-) 42.702 in the wage model, revealed that employees with disabilities are paid less than employees without disabilities due to discrimination. The pattern appears to be similar to the work period model. The tenure of people with disabilities is shorter than that of people without disabilities. Both results confirmed the existence and amount of wage disparity. Prior research (Baldwin & Johnson, 1994; 1995; DeLeire, 2001; Johnson & Lambrinos, 1985; Park, 2011; Yoo, 2011) focuses on the existence of wage disparity, while this study provided the amount of wage disparity due to disability. The amount of discrimination corresponds to about 23.23% ($=372.42 \text{ USD}/1,602.99 \text{ USD}$) of the monthly wage. These findings reinforce that the government's policy should shift from equal employment opportunity to fair wages.

Finally, our findings also revealed the cause of discrimination using classification by resource effect and market effect. Resource effect, gender, age, level of education, and work period are significant factors affecting wage disparity. Therefore, government policy for individual growth concentrates on providing more education opportunities. From the perspective of market effects, type of job and employment are key factors in increasing wage disparity; therefore, these results are connected to previous results on resource effect. As the resource effect is alleviated, the market effect is also alleviated.

Taken together, wage disparity and wage discrimination have different meanings. Depending on individual abilities, characteristics of the company, and the market situation, wage differences may exist. However, even after controlling for them, the wage disparity, according to disability, means wage discrimination. This result means discrimination against equal work and economic loss is caused by prejudice against people with disabilities. This

situation means that the rights of employees with disabilities are not respected, which destabilizes their lives. Even if the same work is done, a smaller remuneration due to discrimination is equivalent to providing low-cost labor. If the existing government policy focuses primarily on securing employment opportunities for the disabled, government policy support that can guarantee fair wages is needed in the future.

We found that wage disparity exists between employees with and without disabilities. We confirmed that wage disparity comes from discrimination that occurs even though all other conditions are the same between employees with and without disabilities.

Wage disparity due to the difference in resource effects accounted for 117.84% of the total wage discrimination. In addition, wage discrimination between employees with and without disabilities is mainly due to differences in resource effects (i.e., differences in productivity). Compared to employees without disabilities, the proportion of employees with disabilities with high education and a full-time job was low, and the proportion of employees with disabilities in service or sales work and simple labor work was high. Lastly, employees with disabilities were paid 427,020 KRW (372.42 USD) monthly less than employees without disabilities.

It is not fair to discriminate against people simply because they have a disability, and we must treat others fairly without considering their disabilities. Therefore, it is very important to determine whether the wage gap between disabled and non-disabled people is a simple difference, a difference in productivity, or due to discrimination that occurs even though all other conditions are equal. This is because the background of discrimination should not be based on disability factors, but on the skills a person possesses. Through this study, it was found that the wage gap between disabled and non-disabled people is not a simple difference but is caused by discrimination and that the main cause of discrimination is market characteristics. Therefore, in terms of market demand, employment and wage policies for the disabled must be implemented to alleviate entry

barriers. In addition, despite the government's efforts, the fact that disabled people still receive lower wages than non-disabled people serves as the basis for calculating the basis for appropriate burden.

Even after Korea enacted the Act on Prohibition of Discrimination, Rights and Relief against Persons with Disabilities in 2007 and implemented it in 2008, wage discrimination against persons with disabilities has continued to be reported in many studies, news, and analyses. Future research is needed on not only the factors of the wage gap between the disabled and non-disabled analyzed in this study but also how the wage disparity has actually changed whenever employment policies for the disabled have frequently changed.

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