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A Comparative Analysis of Wage Inequality in Korea and Japan Using UQR and Oaxaca-RIF Decomposition Method

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| 목 차 |

| 논문요약 |

This paper purports to reveal the factors associated with wage inequality in Korea and Japan by using two micro panel data sets on households from 2014 to 2018, before COVID-19: Korea Labor & Income Panel Study (KLIPS) and Keio/Japan Household Panel Survey (KHPS/JHPS), respectively. This study employs an unconditional quantile regression (UQR) method to have robust estimation in measuring the wage inequality, as well as a recentered influence function (RIF)_Oaxaca decomposition method. The empirical results show that first, age, education, gender wage gap, dual structures of conglomerates vs. SMEs and regular vs. non-regular workers are the common sources of wage inequality in two countries. Second, in Japan, union

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members neither receive higher pay than non-union members nor have a smaller wage gap compared to their counterparts. However, they do in the middle and upper tails in Korea. Furthermore, an interesting finding lies in the relationship between unemployment and wages, which is that a higher unemployment rate contributes to a wage gap in Korea, while it does not have the same effect in Japan. Finally, the decomposition analysis suggests that the wage inequality is not sufficiently explained by the explanatory variables in each quantile of the two countries. Thus, this paper suggests that policy implication for resolving wage inequality should be associated with country-specific factors, including different institutions, industries, and social behaviors when establishing labor market-related policies.

▪ Key words: Labor Markets in Korea, Labor Markets in Japan, Wage Inequality, UQR, Oaxaca-RIF Decomposition

Ⅰ. Introduction

The economies of Korea and Japan have developed under similar economic policies, including export-led growth and conglomerate-focused strategies. Consequently, there are notable similarities in their labor markets. For example, according to the OECD, in 2022, Korea was ranked 45th out of 45 countries for the largest gender wage gap, which measures the difference between median earnings of men and women among full-time and self-employed workers. Japan was ranked just slightly better at 43rd. Second, the ratio of non-regular workers was 41.4% in Korea in 2022 and 38.0% in Japan in 2020. This ratio has been increasing in both countries since 2000 and remains significantly higher than the OECD average.

On the other hand, a striking difference between the labor market

performance of the two countries is the ratio of self-employment, often considered 'near-unemployment' by many scholars, including Poschke (2017). In Korea, this ratio is significantly high at 23.9%, while in Japan, it was relatively low at 9.8% in 2021. Additionally, the part-time employment ratio rose to 25.6% in Japan, compared to 16.1% in Korea in the same year. The OECD average was 16.5%. Another notable difference lies in the 'firm-wage gap'. In Korea, the average annual wage for firms with more than 300 employees was 69.68 million won (excluding excess pay) in 2023, whereas it was 42.96 million won for small and medium-sized enterprises (SMEs), representing 61.7% of the wage at large firms. For Japan, this ratio was 73.7% in 2022.

Notwithstanding the miraculous economic growth in both countries, numerous research papers and reports highlight significant wage inequality in Korea and Japan. However, fewer studies have attempted to compare the factors contributing to wage inequality in the two countries. This paper aims to examine the different levels of wage inequality in Korea and Japan by using two micro-panel data sets on households from 2014 to 2018, prior to the onset of COVID-19: the Korea Labor & Income Panel Study (KLIPS) and the Keio/Japan Household Panel Survey (KHPS/JHPS), respectively. The study employs an unconditional quantile regression (UQR) method, combining the recentered influence function (RIF) introduced by Firpo, Fortin, and Lemieux (FFL 2009) with the Oaxaca-Blinder (OB) decomposition method.

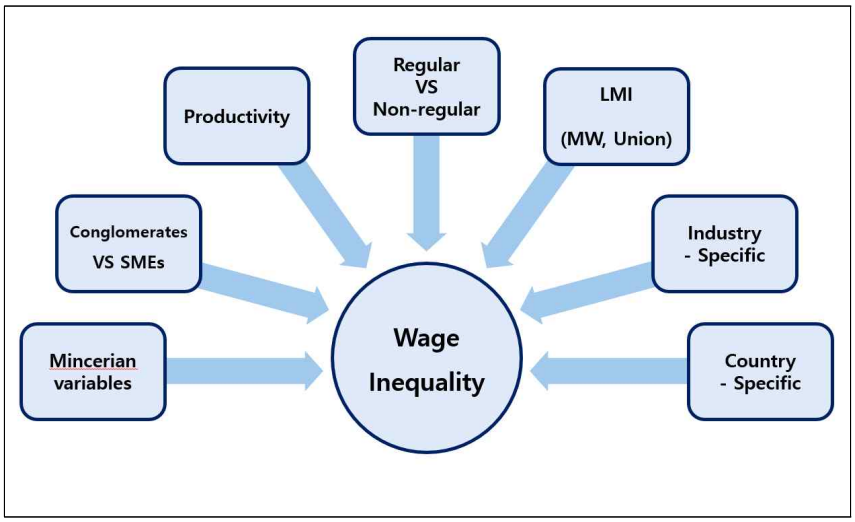
The paper is organized as follows. The second section reviews the existing literature on factors affecting wage inequality, focusing on studies that use UQR, RIF, and OB decomposition methods to investigate Korea and Japan's labor markets. The third section presents model specification, data sources, descriptive statistics for the variables used, and results of the empirical analysis. The final section offers concluding remarks, including policy suggestions.

Ⅱ. Literature Review on Wage Inequality

1. Theoretical Background

Significant attention has been given to wage inequality since 2000, when labor rights aimed at improving the standard of living in Korea and Japan began to be recognized. Starting with the classical works of Mincer (1974), Katz and Murphy (1992), and Juhn, Murphy, and Pierce (JMP 1993), and later expanded by Lee (1999), Lemieux (2006), Autor, Katz, and Kearney (2008), and Autor, Manning, and Smith (2016), research on wage inequality has evolved with various enhanced methodologies. Additionally, a significant body of scholars has examined specific determinants of wage inequality, such as skills (Broecke 2016), technology and trade (Reenen 2011), and globalization and gender wage inequality (Chen et al. 2013; Helpman 2018).

<Figure 1> Factors Affecting Wage Inequality in Korea and Japan



<Figure 1> illustrates the factors affecting wage inequality in Korea and

Japan that scholars have primarily researched: Mincerian variables (such as age, experience, and educational level), the wage gap between men and women, conglomerates and SMEs, productivity, the distinction between regular and non-regular workers, the effects of labor market institutions (LMIs) like minimum wage and labor unions, as well as industry-specific and other country-specific factors. Examples of country-specific factors include paternalistic social behavior and regional discrimination.

Furthermore, the development of quantile regression (QR) analysis by scholars such as Buchinsky (1994) and Machado and Mata (2005) has made it possible to examine the full scope of the inequality problem. While least squares methods estimate the conditional mean of the response variable across the predictor variables, QR estimates the conditional median, providing a different perspective. There are several advantages to using the QR method: First, QR estimates are more robust against outliers in the response variable. Second, the analysis of different measures of central tendency and statistical dispersion across each quantile (or quartile) allows for a more comprehensive understanding of the relationship between variables, such as wages and their determinants. Third, QR does not require unrealistic statistical assumptions like normality and homoskedasticity, which are necessary for least squares methods. Additionally, QR analysis avoids the sample selection bias discussed by many scholars, as it uses all observations by assigning different weights to each quantile, focusing on the conditional quantile of the dependent variable (Cho et al. 2018). Perhaps the most compelling argument in favor of QR is its potential to mitigate endogeneity in the dependent variable within the wage equation (Kunze 2006; Joe & Moon 2020).

The quantile regression (QR) framework offers a pragmatic approach to understanding the differential impacts of covariates across the distribution of an outcome. In the literature, two methods are frequently used to evaluate distributional effects: conditional quantile regression (CQR) and unconditional

quantile regression (UQR). According to Borgen (2016), UQR gained popularity rapidly after being introduced by Firpo, Fortin, and Lemieux (FFL) in 2009. Borgen (2016) also noted that implementing UQR with high-dimensional fixed effects, such as a large number of groups, can be quite burdensome, especially when bootstrapped standard errors are desired. He began his explanation of UQR by defining the recentered influence function (RIF), a statistical tool that has been widely used in the analysis of CQR.

$$RIF(Y;q_\tau, F_Y) = q_\tau + \frac{\tau - 1Y \leq q_\tau}{f_Y(q_\tau)} \quad (1)$$

where q_τ is the value of the outcome variable, Y, at the quantile τ. F_Y is the cumulative distribution function of Y, and $f_Y(q_\tau)$ is the density of Y at q_τ. The indicator function, $1Y \leq q_\tau$ identifies whether the value of the outcome variable, Y, for the individual is below q_τ. He further stated that the RIF could serve as the outcome variable in an OLS model. To include fixed effects in this model, one could simply add the fixed effects as a set of dummy variable.

According to Alejo et al. (2021), let Y be the response variable and X be a $p \times 1$ dimensional vector of covariates. Mean regression (MR) considers the effect of X on Y through the conditional mean model,

$$E(Y|X) = X'\beta_M, \quad (2)$$

where in this model β_M is $p \times 1$ dimensional vector of coefficients. In QR, CQ of Y are of interest through the models,

$$Q_Y(\tau|X) = X'\beta(\tau) \text{for } \tau \in (0,1) \quad (3)$$

The parameters $\beta(\tau)$ measure the conditional quantile partial effect (CQPE) of increasing X, the effect of marginally changing X withing the group of individuals characterized by the same conditional level of response, indexed by τ, that is,

$$CQPE(\tau) = \frac{\partial Q_Y(\tau|X)}{\partial X} = \beta(\tau) \tag{4}$$

Comparing to CQR, Alejo et al. (2021) further explains UQR, defined as,

$$Q_Y(\eta) \text{for } \eta \in (0,1). \tag{5}$$

Let us find a framework to study changes in the distribution of X on the quantiles of Y in the joint distribution of (Y, X). Assuming the quantiles are non-linear operators, as such, while the law of expected iterations can be applied to the conditional mean, that is not valid in general for conditional and unconditional quantiles,

$$Q_Y(\eta) \neq E[Q_Y(\eta|X) = E[X]'\beta(\eta) \text{for } \eta \in (0,1) \tag{6}$$

Therefore, the CQPE cannot be used directly to study effects in $Q_Y(\eta)$. With influence function theory (Huber & Ronchetti 2009), the influence function $IF\ of\ v, (v)F$ that summarizes the marginal impact of a particular observation or group in the value of the functional. Moreover it provides a unified approach for computing variances and covariances for general functionals. The IF is the directional derivative of $v(F_Y)\ at\ F_Y$ and it measures the effect of a small perturbation in F_Y. Let y be an additional data point in a large sample that adds a perturbation to the distribution with probability mass δ_y. H_Y is then $H_Y(y) = 1[Y \geq y]$ and $h_Y(y)$ is a density function with value 0 except at y.

$$IF(y;v;F_Y) = \lim_{t\to 0} \frac{v[t\delta_y + (1-t)F_Y] - v(F_Y)}{t} \quad (7)$$

That is, unlike CQR, this IF of a distributional statistic measures the relative effect of a small perturbation in the underlying outcome distribution on the statistic of interest. In applied economic literature, the term 'conditional' means that we are controlling for the effect of other covariates. On the other hand, UQR has been an issue after the UQR uses a weighted average of conditional effects, and this approach can be used to overcome the limitations of the CQR approach, including difficulty of cross-study comparison (FFL 2009). Akay and Komuryakan (2021) also estimated the wage inequality in Turkish labor force using both CQR and UQR. The results indicate that CQR underestimated the wage inequality than it actually is, while UQR's estimates for the wage inequality is significantly higher. They further stated that UQR estimates are more interpretable and generalizable coefficients that CQR as it marginalized the effect over the distributions of other explanatory variables in the model. Alejo et al. (2021) also stated that the values that UQR coefficients can take and provides a way to detect misspecification.

On decomposition method, using the concept of RIF in equation (1), the cumulative distribution of Y conditional on T can be written as,

$$F_{Y|T=k} = \int F_{Y|T=k}\, dF_{X|T=k} \quad (8)$$

The difference between groups 0 and 1, the cumulative conditional distribution of Y can be used to calculate the gap in the distributional statistic v (Rios-Avila 2020),

$$\Delta v = v_1 - v_0 = v(F_{Y|T=1}) - v(F_{Y|T=0}) \text{ or} \quad (9)$$

$$\Delta v = v(\int F_{Y|X,\,T=1}\, dF_{X|T=1}) - v(\int F_{Y|X,\,T=0}\, dF_{X|T=0}) \quad (10)$$

Oaxaca_RIF Decomposition method measures whether the difference between groups are explained or unexplained by the variables used in the regression.

2. Literature Review on Wage Inequality in Korea and Japan

In Korea, the recent development of national survey data since 2000, such as the Korean Labor & Income Panel Study (KLIPS), Household Expenditure Survey (HES), Basic Survey of Wage Structure (BSWS), and National Survey of Tax and Benefit (NSTB), has enabled researchers to study wage inequality more comprehensively. Various QR methods have been used to analyze the wage distributions of lower tail and upper tail workers in Korea, including studies by Choe and Chung (in Korean, 2016) (non-regular workers), Lee and Lee (2006) (wage determinants), Cho, Choi, and Kang (in Korean, 2018) (college graduates), Y. Choi (in Korean, 2020) (temporary vs. permanent contracts using UQR, which is an application of the RIF), and Choi and Jeong (2007) (educational wage premium and technological change on wage distributions).

After the pioneering work of Card and Krueger (1993), Newmark and Wascher (1992; 1995), and DiNardo, Fortin, and Lemieux (1996), research on the effects of the minimum wage on wage inequality has become an important issue, particularly in Korea since the Moon administration raised the minimum wage by 16.4% in 2018. The literature predominantly concludes negative impacts, including studies by Lee and Hwang (in Korean, 2016) and Kim and Lee (in Korean, 2019), which examine the relationship between minimum wage and wage inequality. Notably, the results of Kim and Lee (in Korean, 2019) indicate that a one-percentage-point increase in the minimum wage reduced the employment growth rate by 0.14 to 0.16

percentage points in 2018. Meanwhile, Kang (in Korean, 2017) investigated the impact of the minimum wage on employment by utilizing government progressiveness as an instrumental variable and found that the growth rate of the minimum wage reduces employment. However, some studies, such as Sung (2014), argued that changes in the minimum wage level did not affect wage inequality.

In Japan's case, Yokoyama, Kodama, and Higuchi (2016) demonstrated the extent to which wage inequality between men and women increased from 1989 to 2013. They employed the Dinardo, Fortin, and Lemieux (DFL) and Firpo, Fortin, and Lemieux (FFL) decomposition methods. Their findings indicated that wage rate increases occurred across all quantiles for both genders during the 1990s, while real wage rate inequality remained unchanged. Furthermore, they discovered that the wage rates of middle-wage workers had decreased by more than half compared to any other group since 2000. Various researchers investigated the causes of the gender wage gap in Japan, including Yamaguchi (2019) and Tagami (2023). Especially, Hara (2018) examined the gender wage gap in Japan across the distribution for the years 1990, 2000, and 2014 using the BSWS. By applying the FFL decomposition, she identified more significant wage structure effects at the top and bottom of the wage distribution, highlighting the glass ceiling and sticky floor phenomena. Interestingly, Lise et al. (2014) investigated the wage inequality in Japan, especially in boom and lost periods.

In Japan, Kambayashi, Kawaguchi, and Yamada (hereafter, KKY 2013) examined the impact of raising the minimum wage from 1994 to 2003 on wage inequality and employment. They found that an increased minimum wage led to a reduction in lower tail inequality among women in Japan. In contrast, a study by Morikawa (2019) investigated the longer term effects of the minimum wage on labor productivity. Using prefecture and firm-level panel data, he found no evidence that an increase in the minimum wage

improves Japan's labor productivity. Additionally, KKY (2013) provided interesting insights into wage distribution within Japan's deflationary wage economy. They discovered that the minimum wage increase resulted in employment loss, particularly for women, thereby raising wage inequality during the period from 1994 to 2003.

Ⅲ. Empirical Study

1. Model Specification

Manipulating the Mincerian wage equation gives the linearized model determining the wage inequality as follow:

$$\log v(wage)_{i,j,t} = \beta_0 + \beta_1 \gamma_{i,j,t} + \beta_2 \lambda_{i,j,t} + \beta_3 \eta_{i,j,t} + \mu_{i,j,t} \qquad (11)$$

where the dependent variable is natural log of wage variance measuring the dispersion of a worker's wage from the mean value in the ith country and jth quantile in time t. Some researchers used Gini Coefficient[1] and Theil Index (Sitepu et al. 2017), instead of using the variance of wage. These indices explain income inequality compared to the variance of wage. γ is a vector of Mincerian variables, including age (experience) and education, while λ is a vector of dummy variables of interest, including sex, size, union, and regular workers. η contains some macroeconomic variables, such as effective minimum wage and unemployment rate, while μ is statistical white noise. β_1 through β_3 illustrate coefficient vectors. In order to analyze the effect of small change at each quantile in independent

1) Hasell, Joe (2023), "Measuring Inequality: What Is the Gini Coefficient?", www.ourworlindata.org/what-is-the-gini-coefficient. (accessed on May 1, 2024)

variables on the dependent variable, UQR is performed based on the above model (11), and RIF_Oaxaca decomposition method is utilized to measure whether the mean wages are explained by the independent variables.

2. Sources of the Data Used

There is a consensus that macroeconomic analysis using aggregated data sets has a pitfall: the results from aggregation may not accurately reflect the effects of individual labor or household characteristics. Therefore, this paper conducts an empirical study of wage determinants for both Korea and Japan using surveyed micro-level data sets as follows: KLIPS has been utilized for Korean data, which is a longitudinal survey of the labor market and income activities of households and individuals residing in urban areas. The Korea Labor Institute (KLI) launched the first wave of KLIPS in 1988 amid an unprecedented economic crisis and labor market turmoil. This paper uses panel data from the years 2014 to 2018, prior to the COVID-19 pandemic. Wages are analyzed by sex and employment types, including conglomerates vs. SMEs and regular vs. non-regular workers. The data are extracted from KLIPS, KLI, and OECD. Additionally, age, the number of academic years, and labor union membership are also utilized. On the other hand, the same data sets are extracted from KHPS/JHPS at the Panel Data Research Center at Keio University for the same period in Japan. The labor market institutions data, including minimum wage/average wage ratios and annual unemployment rates are sourced from the Labor Force Survey (LFS) conducted by the Statistics Bureau of Japan. <Table 1> presents the definitions of the data used in Korea and Japan.

It is worth noting that although the definition is the same for both Korea and Japan, the nature or function may differ. For example, first, non-regular workers are those who do not have regular employment status. According to J. Y. Kim (2010), non-regular workers in Korea can be categorized as

a 'substitutional' type, meaning that most of these workers wish to participate in regular jobs but are unable to secure proper regular employment. In contrast, Kim further states that non-regular workers in Japan are more similar to 'complementary' workers who voluntarily choose to engage in non-regular jobs.

<Table 1> Definitions of the Variables Used

variables used	Definition
lnvarwage	Natural log of wage variance which shows wage gaps. Wage is a monthly wage in ten thousand won in Korea and thousand yen in Japan.
lnage	natural log of age
$lnage^2$	natural log of age squared testing for non-linearity
lnedu	number of years educated in natural log (high school graduates=12, junior college graduates=14, college graduates=16, graduate school graduates=18)
sex	a dummy variable for men (=1) and women (=0)
size	a dummy variable for conglomerates=1, SMEs=0 (If the number of employees in the company you usually work is larger than 500, then it is considered as conglomerates for both countries.)
union	a dummy variable for the labor union (members=1, otherwise 0)
regular	a dummy variable for regular workers=1, one who works on a full-time basis on regularly scheduled shifts of a continuing nature, and non-regular=0
ratio	ratio of minimum wage divided by average wage =effective minimum wage rate
unemp	annual unemployment rate

Second, regarding the minimum wage, there is a coercive national minimum wage in Korea, but it varies by region and industry in Japan. If regional and industrial minimum wages differ, the higher of the two applies. Third, the $lnage^2$ variable has been highly significant in the equation, indicating a non-linear characteristic of the wage equation, and is not used in the regression due to the multi-collinearity problem.

3. Descriptive Statistics of the Variables Used

<Table 2> presents basic descriptive statistics of the various wages used, including the average, standard deviation, maximum values, and minimum values for wages across total, men, women, conglomerates, SMEs, union-joined, union-non-joined, regular, and non-regular workers wages in Korea and Japan. According to <Table 2>, several significant wage statistics can be observed.

<Table 2> Descriptive Statistics for Various Wages

Wages (no. of samples)	Average		St. Dev.		Min. Value		Max. Value	
	Korea	Japan	Korea	Japan	Korea	Japan	Korea	Japan
total (15,171) 16370/26084	285.26	331.21	159.42	211.34	0	15	4,200	3,900
men (10,340)	318.49	395.31	167.33	195.98	15	15	4,200	3,900
women (6,030)	195.34	240.51	111.93	108.72	20	25	1,000	915
conglomerates (2,322)	355.97	374.23	188.91	210.93	60	24	1,200	3,900
SMEs (5527)	256.64	297.11	138.18	165.43	0	5	4,200	2,000
union-joined (1,485)	392.51	290.73	183.74	171.11	50	8	1,350	2,000
union-non-joined(13,686)	273.65	378.32	152.08	212.44	0	5	4,200	1,700
regular (10,170)	330.23	380.66	163.95	173.46	0	50	4,200	3,900
non-regular (3,501)	183.94	168.72	94.72	125.42	20	25	800	750

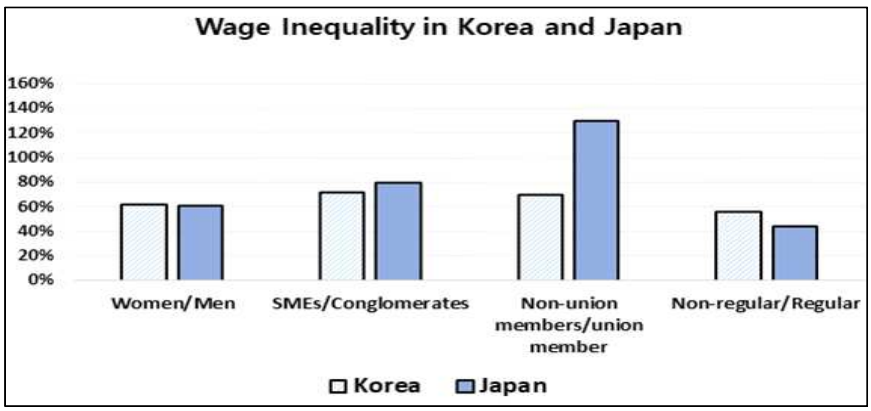
▪ Unit is 10,000 won in Korea and 1,000 yen in Japan.

First, the average wage ratio of men to women in Korea is 61.3%, while in Japan it is 60.8%, indicating a substantial gender wage gap. However, it is striking to note that the wage ratio of SMEs to conglomerates in Korea

is 72.1%, while in Japan it is significantly higher at 79.4%. Additionally, the ratio of wages for non-union members to the union members in Korea is 69.7%, whereas in Japan it stands at an impressive 130.1%. In terms of the ratio of non-regular to regular workers, Japan's figure is 44.3%, compared to 55.7% in Korea. <Figure 2> illustrates these wage inequalities.

In <Table 3>, descriptive statistics for several variables, including the level of education, age, wage ratio, and unemployment rate, are summarized. The average level of education in Korea is 14.01, which is very similar to Japan's average of 14.02. The average age in Korea is 44.12, younger than Japan's average of 48.98. The wage ratio, representing the average minimum wage to average wage ratio, is 0.42 in Korea and 0.40 in Japan. Finally, the average unemployment rate is 3.62% in Korea and 3.10% in Japan.

<Figure 2> Various Wage Inequality Comparison in Korea and Japan



<Table 3> Descriptive Statistics for Variables Used

Variables	Average		St. Dev.		Min. Value		Max. Value	
	Korea	Japan	Korea	Japan	Korea	Japan	Korea	Japan
age	44.12	48.98	9.37	10.77	18	23	65	88
edu	14.01	14.02	2.00	1.97	12	12	18	18
ratio	0.42	0.40	0.03	0.02	0.39	0.37	0.48	0.68
unemp	3.62	3.10	0.07	0.03	3.47	2.95	3.68	1.03

4. Results of the Empirical Study

<Table 4> presents the results of the unconditional quantile regression (UQR) estimation, incorporating a fixed effect model with 200 bootstrap iterations. The quantiles examined are rif_0.25, rif_0.50, and rif_0.75 of wages for both Korea and Japan. The dependent variable is the natural log of wage variance (lnvarwage).

<Table 4> UQR Estimation with Fixed Effect and 200 Bootstrap

variable	rif_0.25		rif_0.50		rif_0.75	
	Korea	Japan	Korea	Japan	Korea	Japan
lnage	1.995 (3.80)***	0.011 (9.16)***	1.954 (12.19)***	0.035 (12.23)***	2.034 (15.47)***	0.066 (13.69)***
lnedu	0.424 (0.99)	0.010 (5.90)***	0.805 (2.34)**	0.041 (9.66)***	1.849 (10.09)***	0.079 (11.45)***
sex	-0.984 (-4.90)***	-0.003 (-5.24)***	-0.756 (-7.93)***	-0.002 (-1.89)*	-0.215 (-4.44)***	-0.011 (-5.32)***
size	0.878 (3.90)***	0.002 (2.25)**	0.986 (7.76)***	0.008 (6.85)***	1.121 (19.82)***	0.017 (6.42)***
union	0.071 (1.08)	-0.002 (-6.24)***	0.152 (2.36)**	-0.009 (-7.21)***	0.209 (4.52)***	-0.010 (-4.10)***
reg	-0.475 (-3.96)***	-0.006 (-11.09)***	-0.490 (-5.41)***	-0.024 (-12.28)***	-0.272 (-4.67)***	-0.061 (-18.81)***
ratio	-2.352 (-0.04)	-0.001 (-0.55)	-1.477 (-0.02)	-0.000 (-0.79)	-1.261 (-0.13)	-0.000 (-0.20)
unemp	0.132 (3.87)***	0.022 (2.22)**	0.046 (3.44)***	-0.004 (-1.10)	0.013 (3.13)***	0.007 (1.57)
cons	0.448 (0.02)	-0.059 (-8.87)***	0.689 (0.03)	-0.197 (-11.75)***	-1.869 (-0.45)	-0.344 (-12.18)***
sigma_u	0.098	0.0002	0.068	0.0004	0.064	0.001
sigma_e	3.190	0.022	2.132	0.045	1.819	0.089
rho	0.000	0.0001	0.001	0.0001	0.001	0.000
F-stat1 F-stat2	(4.11)*** (63.77)***	(0.27) (53.2)***	(4.15)*** (128.32)***	(0.19) (140.36)***	(4.46)*** (163.97)***	(0.09) (165.43)***

▪ 1. rho is fraction of variance due to u_i. 2. The numbers in the parentheses show t-statistics and ***, **, and * denote the level of significance at α=1%, 5%, and 10%, respectively. 3. F-stat1 tests that all u_i=0, F-stat2 is F statistics for the regression.

It appears that age and education significantly affect wage gap in both countries. All variables are strongly significant regardless of the quantiles, except for lnedu in Korea at rif_0.25. The coefficients in both countries increase from the lower to the upper tail, suggesting that the impact of age and education is greater at the upper tail of the wage gap distribution.

We test four dummy variables. First, for the gender wage gap, the sex dummy variable is highly significant at α=1% level and shows a negative relationship with wage inequality: Women experience a larger wage gap compared to men. It is also worth noting that the coefficients decrease from the lower to the upper tail, indicating that the impact of wage inequality is more pronounced at the lower end of the wage gap distribution. One may also acknowledge that the coefficients in Korea are significantly larger than those in Japan. Second, on the size dummy variable, the dual structure of the labor market in both countries – conglomerates vs. SMEs – not only contributes to wage inequality between enterprises, but also creates wage inequality within quantiles. Regarding the union dummy variable, interesting to note that in Korea, no significant relationship exists between the union membership and wage gap in the lower tail. However, there is a strong and positive relationship observed in the middle and upper tails. In Japan, unlike Korea, it appears that there constantly exists a negative relationship in all quantiles, suggesting that non-union members experience a higher wage gap than that of the unionized counterparts with the effect becoming stronger from lower to upper tail. This result may be attributed to the higher wages of non-union members in Japan, potentially due to the weaker presence of labor unions. Furthermore, the negative coefficient increases from the lower to upper tail. In addition, the results show that regular job workers have a negative impact on wage inequality, in other words, non-regular workers show higher wage inequality across all quantiles with strong statistical significance at the α=1% level in both Korea and Japan. The impact on wage inequality is notably higher in the lower tail.

The ratio variable, which represents the effective minimum wage is not statistically significant in either country. Finally, it is interesting that a higher unemployment rate worsens wage inequality in Korea across all quantiles, with impact decreasing from the lower to the upper tail. In Japan, however, the unemployment rate does not have a statistically significant effect on wage inequality. Sigma_u and sigma_e represent the estimates of the 'between subject' and 'within subject' standard deviations, respectively, while rho indicates the fraction of variance due to (u_i). The F-stat 1 tests the hypothesis that all (u_i=0), while F-stat 2 denotes F-statistics in the regression.

<Table 5> illustrates the results of Oaxaca_RIF decomposition for two major groups: men vs. women, conglomerates vs. SMEs, union members vs. non-union members, and regular vs. non-regular workers. In the decomposition by sex, the mean wage gap for group 2 (women) is higher in both countries. The wage differences are -0.984 in Korea and -0.070 in Japan. Of these differences, 89.2% in Korea and 4.5% in Japan are explained by the variables included in the regression, while 10.5% in Korea and 94.5% in Japan remain unexplained. The values of group 1, group 2, difference, explained and unexplained components are mostly statistically significant across all regressions. In the second decomposition by size, the mean wage gap for group 1 (conglomerates) is higher in both countries. It seems similar in that the explained part of the variables used in the regression is around 20% for both countries. The third decomposition based on union status, shows that the mean wage for union members (group 1) is higher than for non-union members (group 2) in Korea, but not significant difference is found in Japan. The final decomposition examines the wage gap for regular workers (group 1). In both countries, the mean wage gap of non-regular (group 2) is higher. The wage gap for regular job workers (group 1) is explained by only 10.3% in Korea and 4.3% in Japan, respectively.

<Table 5> Results of Oaxaca_rif Decomposition

lnvarwage	by sex (group 1=men, group 2=women)		by size (group 1=conglomerates, group 2=S&M enterprises)		by union (group 1=joined, group 2=not-jointed)		by reg (group 1=regular job, group 2=non-regular job)	
	Korea	Japan	Korea	Japan	Korea	Japan	Korea	Japan
overall								
group 1	8.527 (273.34)***	0.048 (40.05)***	9.328 (194.94)***	0.067 (31.28)***	9.041 (126.02)***	0.007 (28.38)***	8.574 (293.91)***	0.043 (43.70)***
group 2	8.957 (265.76)***	0.118 (26.24)***	8.396 (315.30)***	0.071 (32.75)***	8.600 (342.79)***	0.069 (21.37)***	8.925 (230.00)***	0.183 (26.83)***
difference	-0.984 (-4.90)***	-0.070 (-14.85)***	0.932 (17.02)***	-0.004 (-1.35)	0.441 (5.80)***	0.001 (1.40)	-0.351 (-7.22)***	-0.140 (-20.33)***
explained	-0.878 (3.90)*** (89.2%)	-0.003 (-1.71)* (4.5%)	0.191 (4.15)*** (20.5%)	0.002 (1.22) (25.0%)	0.917 (9.49)*** (65.7%)	0.005 (2.25)** (55.5%)	0.034 (1.00) (10.3%)	-0.005 (-4.10)*** (4.3%)
unexplained	-0.071 (1.08) (10.8%)	-0.067 (0.005)*** (94.5%)	0.740 (11.18)*** (79.5%)	-0.006 (-1.95)** (75.0%)	-0.477 (-4.14)*** (107.9%)	-0.004 (-1.55) (44.5%)	-0.384 (6.79)*** (89.7%)	-0.134 (-19.25)*** (95.9%)
rif	mean							
group 1	sex, size, union, reg=1 x1*b1							
group C	x2*b1							
group 2	sex, size, union, reg=0 x2*b2							

▪ *** denotes statistical significance at α=1% level in Z-statistics.

Ⅳ. Concluding Remarks

Korea and Japan have both pursued similar economic development strategies, including the export-led and conglomerates-oriented policies. Thus, one may infer that the labor market performance exhibits similarities to some extent. Indeed, our empirical study shows that the factors affecting the wage inequality in both countries are significantly similar: Age, education, and the gender wage gap are key common contributors to the wage inequality. Furthermore, the dual structure of conglomerates and SMEs also exacerbates wage disparities in both countries, while non-regular workers show higher wage inequality across all quantiles, with strong statistical significance.

However, despite having similarities, this study also shows some disparities in the role of the labor union in two countries: In Korea, the wages of unionized workers are higher than those of non-unionized workers, resulting in a large wage gap between two groups as well as within each quantile of union members, whereas in Japan, the opposite phenomenon is observed. Additionally, while a higher unemployment rate increases wage gaps in Korea, this effect is not observed in Japan. Therefore, this study suggests that addressing wage inequality requires country-specific policies tailored to each nation's unique industrial, social, and public policy environment. For instance, if most female employees in Korea and Japan voluntarily (or being forced to be voluntary) choose part-time work, then policies aimed at resolving the gender wage gap should focus on changing this voluntary behavior. It is important to ensure that women are able to continue their careers without breaks due to family matters such as childcare or caregiving and society's discrimination for women. However, substantially, women's part-time employment in both societies is mostly involuntary in reality. Then, creating high-value-added jobs for women could help reduce the gender wage gap. Finally, the

limitations of this study can be summarized in two-fold. First, it is worth noting that selecting the COVID-19 period would enhance the comparability of this study. Second, more research is needed to identify the differences between Korea and Japan highlighted by our empirical study.

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| 국문초록 |

무조건부 분위회귀(UQR)와 Oaxaca-재중심영향함수(RIF) 분해법을 이용한 한국과 일본의 임금불평등에 관한 비교분석

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본 논문의 목적은 한국과 일본의 노동시장에서 임금에 대한 불평등요소를 비교·분석하는 것이다. 자료는 2014년부터 2018년까지 KLIPS(한국) 및 KHPS/JHPS(일본)의 미시적 데이터를 사용하였고, 방법론은 강건한 측정을 유도하는 무조건부 분위회귀(UQR)와 불평등요소를 분해하는 Oaxaca-재중심영향함수(RIF) 분해법을 사용하였다. 실증분석의 결과, 첫째, 나이, 성별, 교육연수, 대기업집단과 중소기업 및 정규직과 비정규직의 이중구조는 두 나라 모두 임금불평등을 모든 임금격차의 분위에서 야기하는 요소로 작용하였다. 둘째, 일본에서는 노조에 가입한 근로자들이 더 높은 임금을 받지도 않을뿐더러 그들의 임금격차가 비노조가입자에 비해 크지도 않았지만, 한국에서는, 특히 임금격차가 심한 중·상위분위의 근로자들이 더 큰 임금불평등을 야기하였다. 또한, 한국에서는 실업률의 상승이 모든 분위에서 임금불균형에 부(-)의 영향을 주었지만, 일본에서는 그렇지 않은 것으로 나타났다. 마지막으로, 두 나라 모두에서 임금불균형이 본 연구에서 사용된 설명변수에 의해 크게 설명되지 않는 것으로 나타났다. 따라서, 본 연구는 두 나라에 있어서 임금불균형의 문제는 한국과 일본 특유의 요인, 즉 제도적, 산업적, 사회적 현상의 요인에 의해 영향을 받기 때문에 정책수립 시 보다 비획일적이며 면밀한 사전 조사가 필요하다는 시사점을 제공한다.

▪ 주제어: 한국노동시장, 일본노동시장, 임금불평등, 무조건부 분위회귀(UQR), Oaxaca-재중심영향함수(RIF) 분해