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Minimum Wage Effects on the Wage Distribution in South Korea*

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This paper examines whether an increase in the minimum wage reduces wage gaps in Korea. To address the issue, we use a panel regression for wage percentiles with data by Survey on Labor Conditions by Employment Type, which covers from 2009 to 2018. Through the panel regression, we find that an increase in the minimum wage contributes to compressing the wage distribution within an industry and at aggregate level, especially below the median wage. Further, we observe evidence that a rise in the minimum wage also leads to the wage compression across industries at a given percentile below the median wage.

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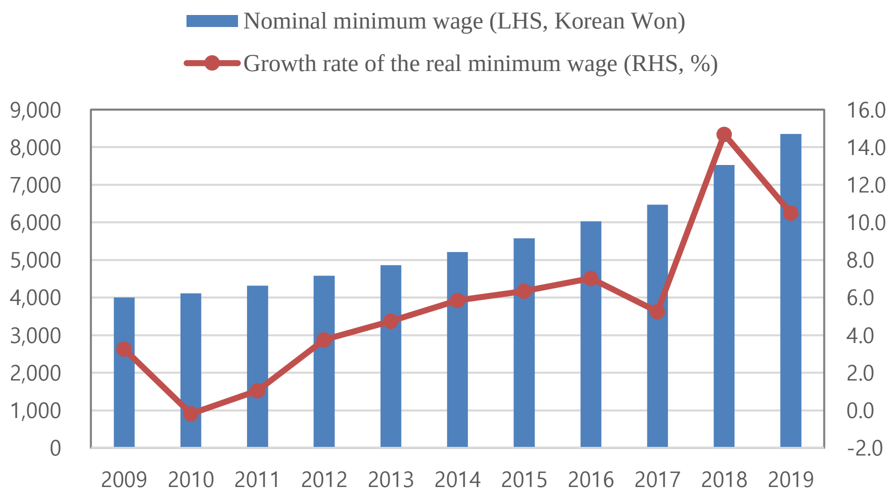
1. INTRODUCTION

In recent years, there has been a global hike in the minimum wage. For example, in 2016, the UK government adopted the "National Living Wage" policy, which is an obligatory minimum wage for workers aged over 25. This is the largest year-on-year increase of the minimum wage since 2001 from £6.7 to £7.2 an hour. Several US cities including Seattle, New York City, San Francisco, Los Angeles, Washington, D.C. have committed to increase the minimum wage to $15 by 2020. Australia, which already had the most generous minimum wage in the world, increased it by 3% to $19.49 effective on July 1, 2019. In Canada, the minimum wage has competitively been scaled up in several big provinces during the past few years. Particularly in 2018, Alberta raised its minimum wage from C$13.6 to C$15.0 and Ontario's minimum wage jumped from C$11.6 to C$14.0.

Figure 1 Trend of the Minimum Wage in Korea (2009-2019)



Note: Real minimum wages are minimum wages adjusted by the consumer price index (base year 2015)
Source: Survey on Labor Conditions by Employment Type, each year.

As shown in figure 1, the minimum wage in South Korea also followed the recent global trend. The Korea's minimum wage increases from 6,470 won in 2017 to 8,350 won (about US$7.16) in 2019, and over the period the annual growth rate of the real minimum wage reached 12.6% on average. In figure 2, the ratio of the minimum wage to the median wage was slightly in a down-trend until 2013, but it has surged from 40.5% in 2014 to 49.9% in 2018, because of rapid increases in the minimum wage and relatively sluggish rises in the median wage.

In particular, the recent hike of the minimum wage in Korea is related to the "income-led growth strategy", which has been an important economic policy of the Moon Jae-in administration since 2017. The "income-led growth" has its origin from Post-Keynesian/Kaleckian "wage-led growth" models. According to the models, a higher wage share could promote economic growth if the economy is a 'wage-led economic regime'.[1] Thus, if a country's regime is wage-led, pro-labor distributional policies are desirable for both higher economic growth and improvement of the income distribution. Most empirical studies on Korea's economic regime find that Korea has the characteristics of the wage-led regime.[2] Moreover, if a rise in the minimum wage compresses the wage distribution, the minimum wage may be an effective redistribute tool (Freeman, 1996) towards the low-wage workers with a higher propensity to consume, which would positively affect consumption and economic growth.

The increase in the minimum wage is expected to have two effects on the wage distribution. Low-wage workers entitled to the minimum wage will be directly affected by the hike of the minimum wage. Other workers far above the minimum wage are also influenced by the spill-over or ripple effects of the minimum wage, but the indirect effects will be diminished as wage percentiles go up. Both the direct and indirect effects will lead to compress the wage

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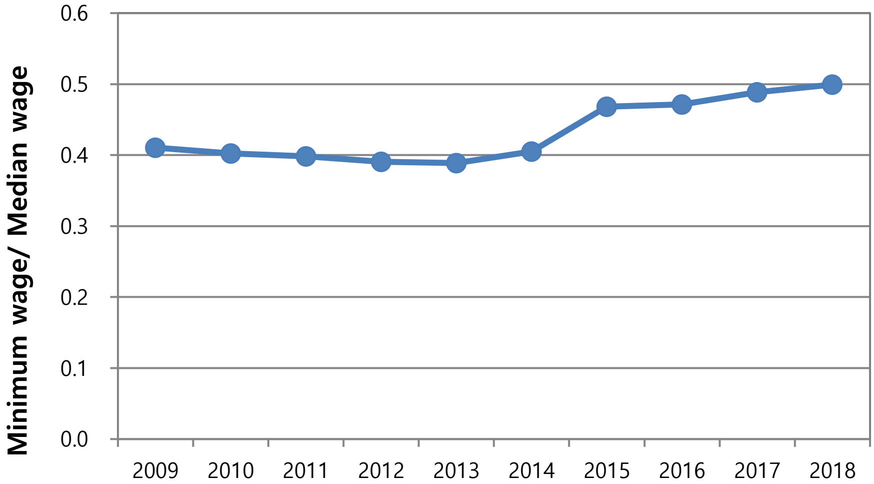
1) On the contrary, in a 'profit-led economic regime', a higher wage share falls the rate of economic growth. For details on the wage-led and the profit-led regimes, see Lavoie and Stockhammer (2013) and Stockhammer and Onaran (2013).

2) For example, Onaran and Galanis (2014), Hong (2014), and Jeon and Joo (2016).

Figure 2 Ratio of the Minimum Wage to the Median Wage in Korea (2009-2018)



Source: Survey on Labor Conditions by Employment Type, each year.

distribution. Thus, a rise in the minimum wage affects the entire distribution of wages. The impact will be the strongest particularly at the bottom of the distribution and thereafter, the impact is expected to fade out and become negligible beyond a certain point. In this regard, the extent to which the minimum wage lessens the wage gaps can be compelling evidence for the minimum wage to be an effective policy for the "wage-led growth."

In light of foregoing, this paper has two aims. One is to examine whether a rise of the minimum wage in Korea reduces the wage gaps of labor-specific groups, which is characterized by education and work experience, between the percentile wages and the median wage at both aggregate and industry level, that is, whether idiosyncratic features of industries lead to different effects of the minimum wage on the wage distribution within each industry.[3] The other aim is to see if there is a wage compression of the labor-specific groups at a given percentile across industries. The issue on the wage compression across

[3] In our survey, we find that most of previous studies except for Cengiz *et al*. (2019) explored the effects of the minimum wage on the wage gap only at the aggregate level.

industries has not been examined enough up until now. For the empirical tests, we apply a panel regression analysis for wage percentiles.

To preview, there are two main empirical findings. First, the wage compression is observed, namely, the marginal effects of the minimum wage on the wage gaps decline as the wage percentile moves up. In particular, as the minimum wage increases, the marginal effects tend to be higher in industries of which 10th percentile wage is closer to the minimum wage. Second, an increase in the minimum wage also leads to the wage compression across industries: that is to say that the wage gaps of the labor-specific groups are reduced across industries at both the 10th and 25th wage percentiles. These empirical findings reinforce the argument that the minimum wage contributes to compressing the wage distribution.

The rest of this paper proceeds as follows. In the next section, we review the previous studies on the related issues. Section 3 describes the data and method used for this research. In section 4, we present and discuss our empirical findings. The last section concludes our paper.

2. LITERATURE REVIEW

For the past four decades, the minimum wage has been a highly debated topic among economists. While the employment effect of the minimum wage is the most extensively studied issue (e.g., Brown *et al.*, 1982; Neumark and Wascher, 1992; Card and Krueger, 1994; Machin and Manning, 1994; Dube *et al.*, 2007, 2010; Allegretto *et al.*, 2017), an impact of the minimum wage on the wage distribution of workers has been relatively less studied.

The minimum wage influences the wage distribution in two ways. First, a rise in the minimum wage truncates or thins out the lower tail of wage distribution below the minimum wage. Therefore, the minimum wage creates a “spike” around its level (e.g., DiNardo *et al.*, 1996; Manning, 2003). Second, a spillover effect occurs if employers substitute away from the low-skilled workers and toward workers with somewhat higher skills in response to an increase in the minimum wage. Then wages of workers earning above the minimum wage can be pushed up by the increase in demand for the labor (Gramlich *et al.,* 1976; Grossman, 1983). This effect is stronger for firms paying wages closer to the minimum wage than for higher-wage firms (Manning, 2003). Therefore, the spillover effects should be concentrated on jobs paying just above the minimum wage. If a firm wants to maintain behavioral incentives for workers' effort in response to a rise in the minimum wage, the firm must mitigate the deterioration of the relative wage between workers by raising wages for higher-skilled workers (Grossman, 1983). However, employers faced with the increase in the wage cost for low-wage workers may seek to offset the cost increase by limiting pay increase for high-wage workers (Hirsch *et al.*, 2011; Schmitt, 2013). Consequently, due to these direct and indirect effects, the rise in the minimum wage compresses the wage distribution of all workers. Although the minimum wage is not mentioned explicitly, Latreille and Manning (2000)'s work is noteworthy related to the topic of this paper. They examined wage spillover between industrial groups of the UK at the 3-digit level of aggregation and showed that a change in an industry-specific variable has an effect not only on wage in the industry but also significantly spills over into other industries if the reservation utility of workers in an industry is a function of wages in other industry.

The studies on the wage distribution effect of the minimum wage began with the observation of a dramatic rise in the wage inequality of the US during the 1980s. Several studies attributed the deterioration of wage equality to a concurrent decline in the real minimum wage over the period. DiNardo *et al.* (1996) used the kernel density estimation of wage distributions to decompose changes in wage inequality between and within different groups of workers into the portions associated with changes in the minimum wage and other factors. They showed that a decline in the real minimum wage could substantially explain the rise of the wage inequality, particularly for women and for workers in the lower tail of the wage distribution even without the spillover effect. Lee (1999) utilized the cross-state variation in the relative level of the US federal minimum wage to identify the net impact of the minimum wage. He confirmed that a large part of the deterioration of equality in the lower tail of the distribution during the 1980s is attributable to the decline in the real minimum wage. Further, he showed that ignoring the effect of the declining minimum wage led to only a moderate increase in the wage inequality over the period. In a similar vein, Autor *et al.* (2016) reassessed the effect of the minimum wage on the US wage inequality by refining the model with a longer panel and an instrument to address potential biases of Lee's study. They confirmed the prior work but with a substantially smaller role of the minimum wage in the rise of the wage inequality of the US. While most previous studies used the regression analysis for the percentile differences of wage distribution, Teulings (2003) used a two-stage structural methodology and found an even larger spillover effect, which showed that the minimum wage can explain the whole increase in wage inequality in the lower half of the US wage distribution during the 1980s. Neumark *et al.* (2004) investigated the minimum wage effects on wages, employment, work hours and income throughout the wage distribution and found that the effects on wages were largest for low-wage workers but little for higher-wage workers. However, they also observed that the effect on net income were negative for the low-wage workers because of an adverse effect of the minimum wage increase on work-hours and employment.

Among studies for other countries, Dickens and Manning (2004) and Stewart (2012) examined the effect of the national minimum wage on the wage distribution in the UK and found no detectable effect. Nonetheless, the finding cannot be directly comparable to the empirical results on the US because the UK introduced the national minimum wage in April 1999, which was considerably later than the US. Moreover, the UK set the national minimum wage at a significantly low level such that only 6-7% of workers were directly affected by it (Dickens and Manning, 2004). Fortin and Lemieux (2015) examined the Canadian provincial data and showed that increases in the minimum wages since 2005 could be the main reason why wages at the very bottom grew more than in the middle of the distribution. By following Lee (1999)'s approach, Campolieti (2015) estimated the effects of the minimum wage on the wage distribution and the spillover effects from 1997 to 2010 and found a relatively modest spillover effect in Canada, which is smaller than in US but larger than in UK. In particular, he added that the minimum wage did not reduce inequality above the 10th percentile (i.e., 50/10 wage gap) of the wage distribution. Kambayashi *et al.* (2013) examined the Japanese minimum wage effect on the wage distribution of women for the period of 1994 to 2003 and observed that approximately one half of the reduction in 50/10 wage gap among women was due to the rise in the minimum wage. Most recently, Redmond *et al.* (2020) used distributional regression analysis to see the effect of 6% increase in the Irish minimum wage on the wage distribution and observed wage spillover effects up to 30th percentile of the wage distribution.

In Korea, most studies on the minimum wage have also focused on its employment effects so that its effects on the wage distribution have rarely been investigated. Among the few studies, Jeong *et al*. (2011) used a panel OLS with fixed effects for the period of 1998 to 2008 and found the spillover effects of the minimum wage up to the level of the median wage. Seong (2014) analyzed the effect of a rise in the minimum wage on the regional wage inequality for the period of 2008 to 2012. By adopting the methodology of Lee (1999) and Autor *et al.* (2016), he confirmed that the rise in the minimum wage reduced about 70 percent of the wage inequality in the lower tail. With a similar approach, Lee and Hwang (2018) also found that an increase in the minimum wage compressed the wage distribution, particularly in the lower tail, for the period of 2006 to 2016, but the size of the effect is small. Rather, they detected that the rise in the minimum wage even deteriorated the earnings inequality based on the total wage. They attributed the deterioration of the earnings equality to the decline in the work hours of lower wage workers. Baek and Park (2016) found that low-wage plants, paying below the minimum wage, revealed a larger increase in annual wage per worker than did high-wage plants with a limited effect on employment. Kang (2016) studied the effect on the wage compression within establishments. Using the cross-section data for the period of 2008 to 2015, he observed that as the proportion of workers earning the minimum wage is higher, the average wage of the establishment is lower and the relative wages of high wage groups to low wage groups become smaller. Aforementioned Korean studies all observed that an increase in the minimum wage compressed the wage distribution particularly in the lower tail. These findings reinforce Seo and Jeong (2014) who showed that a higher minimum wage contributed to reducing the probability of population falling under poverty line in Korea.

In reviewing the previous studies, we recognize that most studies on the wage distribution effects of the minimum wage focused on aggregate level without industry classifications. Focusing only on the aggregate level of wage distribution might not exclude a possibility that wage disparity could be widened 'within industry' or 'across industries' even if a higher minimum wage compresses the overall wage distribution. In this context, the main contribution of this paper is to expand the wage distribution effects to industry level. Further, this paper examines whether an increase in the minimum wage leads to the compression of the relative wages across industries.

3. DATA AND METHOD

3.1. Data

The data used for the empirical analysis in this paper are from the Wage Structure Survey of the 'Survey on Labor Conditions by Employment Type (SLCET)' which is performed by Ministry of Employment and Labor in Korea. The SLCET is a representative labor survey in Korea, which is an annual firm-based survey and covers about 800,000 individual-level observations each year, including work conditions such as wages and hours by various types of employment of workers.[4] The Wage Structure Survey covers "permanent

[4] Since the SLCET is collected from firms, it is considered to be more accurate than other data self-reported by an individual person.

employees in establishments with five or more permanent employees to ensure time-series consistency,"[5] and it includes industry codes of each observation at 2-digit level.[6] For experiments, we use data from 2009 to 2018, because the new classification of industry (the 9th Korean Standard Industrial Classification: KSIC) has been adopted since 2009 and there might be a structural change in the labor market due to the global financial crisis in 2008.

The SLCET contains three kinds of individual-labor wage data: Regular wages, overtime wages and discretionary payments before income taxes and other deductions. In this paper, the hourly wage of each worker is defined as 'regular' wages divided by 'regular' work hours per month. In Korea, there is no provincial minimum wage but one national-wide minimum wage set by the Minimum Wage Commission. Accordingly, we consider wage distributions only on the basis of worker types, instead of regional wage distributions which are often examined in the previous studies.

To analyze the effects of the minimum wage on the wage distribution at industry level, we classified manufacturing and services industries into eleven groups each. Table A1 provides a summary statistics of percentile wages, mean wage and ratio affected by the minimum wage for each classification as of 2018. Overall, industries with low hourly wages at the 10th percentile tend to have high ratio of workers affected directly by an increase in the minimum wage. The ratios have a range of 1.14-5.87% in manufacturing industries but

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[5] The definition of 'permanent employees' in the SLCET is different from that in surveys by the Statistics Korea. The former is defined as permanent workers except for workers in special employment types, workers at home, agency workers, subcontract workers, daily workers, part-time workers, fixed-term workers and contingent workers, while the latter is defined as permanent workers whose employment contract is more than one year or who is qualified for welfare benefits of firms such as bonuses and severance pay.

[6] Since the Wage Structure Survey covers only 'permanent employees in establishments with five or more permanent employees', there might be a problem of sample selection in our experiments because many labors affected by the minimum wage are working as non-regular workers in small businesses with less than five workers. In spite of this problem, we use this data to show the effects of the minimum wage across industries and within each industry because other surveys do not construct data at the 2-digit industrial classification so that the data is not suitable for our empirical experiments.

have a wider range of 0.69-21.95% in services industries, which reflects larger wage gaps in the latter.

3.2. Method

We use the approach suggested by Lee (1999) and Autor *et al.* (2016) to estimate the effects of the minimum wage on the wage distribution. Lee (1999) specified the latent wage distribution in the absence of the minimum wage, $w^*(F)$, which differs from the actual wage distribution, $w(F)$. Then, he distinguished the direct effect (a "spike effect" around a new minimum wage) and the indirect effect (a "spillover effect" above a new minimum wage). The latent wage distribution is characterized by the cumulative distribution function, $F_t((w-\mu_{jt})/\sigma_{jt})$, for each worker-type j (namely, labor-specific group in this paper) with different education, work experience, etc., at time t, where μ_{jt} is a centrality parameter and σ_{jt} is a scale parameter. If $F_t(\cdot)$ is constant across worker types, then the latent wage of percentile p can be depicted as $w_{jt}^{p*} = \mu_{jt} + \sigma_{jt} F_t^{-1}(p)$. Also, if μ_{jt} is independent of σ_{jt} and the actual median wage of worker-type j, w_{jt}^{50}, is an adequate approximate of μ_{jt} (that is, $F_t^{-1}(50) = 0$), covariance between $(w_{jt}^{p*} - w_{jt}^{50})$ and $(mw_t - w_{jt}^{50})$ becomes zero at time t such that

$$\mathrm{cov}[(w_{jt}^{p*} - w_{jt}^{50}), (mw_t - w_{jt}^{50})] = \mathrm{cov}[\sigma_{jt} F_t^{-1}(p), (mw_t - \mu_{jt})] = 0 ,$$

where mw_t is the minimum wage. Lee (1999) refers $(mw_t - w_{jt}^{50})$ as the effective minimum wage, the degree to which the minimum wage is binding in each worker-type j.

Therefore, if a positive or negative relationship between $(w_{jt}^{p*} - w_{jt}^{50})$ and $(mw_t - w_{jt}^{50})$ is found, it comes from the effects of the minimum wage on the observed pth percentile in the wage distribution, controlling other factors, because under the given assumptions, the non-zero covariance between $(w_{jt}^{p*} - w_{jt}^{50})$ and $(mw_t - w_{jt}^{50})$ is related to the minimum wage.[7)]

Since the exact form of the minimum wage effect on wage distribution is unknown, according to Lee (1999), the basic form of empirical specification can be written as

$$w_{jt}^{p} - w_{jt}^{50} = \beta_1^{p} \cdot (mw_t - w_{jt}^{50}) + \beta_2^{p} \cdot (mw_t - w_{jt}^{50})^2 + controls + \epsilon_{jt}{}^{p}, \qquad (1)$$

where β_1^p and β_2^p denotes the coefficients to be estimated and $\epsilon_{jt}{}^{p}$ is a conventional error term. Control variables reflect other factors, such as worker types and labor market conditions, which may affect the wage distribution. The square term on the right-hand side captures the level impact of the minimum wage.

As Autor *et al*. (2016) pointed out, however, the estimation of equation (1) might be biased because both the dependent variable and the explanatory variable depend on the median wage, w_j^{50}. Both variables are a function of the median wage with a negative sign, which may cause a positive correlation, so that there could be an upward bias in the estimates. To resolve this bias, we adopt an alternative method suggested by Campolieti (2015). First, the median wage is estimated from equation (2) below.

$$w_{jt}^{50} = \alpha_t + controls + u_{jt}, \qquad (2)$$

where α_t represents year effects and u_{jt} is a residual. Control variables denominate other factors that may affect the median wage. The estimated median wage, $\hat{w}_{jt}^{50}$, from equation (2) replaces the median wage in the right-hand side of equation (1). Then, equation (1) is rewritten as

7) Since all the wages used in this paper are the log wage, the difference between the wage at the *p*th percentile and the median wage is the relative wage to reveal the wage distribution.

$$w_{jt}^{p} - w_{jt}^{50} = \beta_{1}^{p} \cdot (mw_{t} - \hat{w}_{jt}^{50}) + \beta_{2}^{p} (mw_{t} - \hat{w}_{jt}^{50})^{2} + controls + \epsilon_{jt}^{p} . \qquad (1')$$

The marginal effect of a change in the minimum wage on the wage distribution in equation (1') is estimated by the equation (3)

$$\beta_{1}^{p} + 2\beta_{2}^{p} \cdot (mw_{jt} - \hat{w}_{jt}^{50}) . \qquad (3)$$

In this paper, equation (1') is estimated at both aggregate and industry level. However, even though the minimum wage compresses the wage distribution of the labor-specific groups (i.e., worker type j) characterized by education and work experience in a given industry, it does not necessarily imply wage compression across industries. It is because equation (1') estimates the effect of the minimum wage on the wage distribution within industry. To address the issue, we further investigate whether an increase in the minimum wage leads to the wage compression of the labor-specific groups at the pth percentile across industries. This additional practice is to find out the existence of the spillover effects of the minimum wage on the wage distribution across industries. To do it, the following empirical specification is examined:

$$w_{jt}^{p} - w_{Ft}^{50} = \gamma_{1}^{p} \cdot (mw_{t} - w_{Ft}^{50}) + \gamma_{2}{}^{p} \cdot (mw_{t} - w_{Ft}^{50}) + e_{jt}^{p} , \qquad (4)$$

where w_{Ft}^{p} and w_{Ft}^{50} are the pth percentile wage and the median wage in full sample, respectively. In equation (4), a dependent variable on the left-hand side represents a relative wage at the pth percentile. The coefficients measures effects of the minimum wage on the relative wage. Here, the marginal effect of the minimum wage at the pth percentile, $\hat{\gamma}_{1}^{p} + 2\hat{\gamma}_{2}^{p} \cdot (mw_{t} - w_{Ft}^{50})$, measures the wage compression across industries. The marginal effect is expected to be positive if the wage of a worker type j is lower than that of the full sample workers $(w_{jt}^{p} < w_{Ft}^{p})$ and negative if the former is larger than the latter $(w^p_{jt} > w^p_{Ft})$. Hence, if there is the wage compression at the pth percentile, we expect

$$\begin{cases} \hat{\gamma}^p_1 + 2\hat{\gamma}^p_2 \cdot (mw_t - w^{50}_{Ft}) > 0, & \text{if } w^p_{jt} < w^p_{Ft} \\ \hat{\gamma}^p_1 + 2\hat{\gamma}_2{}^p \cdot (mw_t - w^{50}_{Ft}) < 0, & \text{if } w^p_{jt} > w^p_{Ft}. \end{cases}$$

4. RESULTS AND DISCUSSION

We describe the types of workers as cells and use a data set extracted from the cells. The types of workers fall into groups with different education and work experience-year, which might be key factors to explain wage gaps among workers and have different effects of minimum wage.[8] The cells are classified by ten survey years (2009-2018), five categories of worker's education and seven categories of work experience-year.[9] Thus, the maximum number of cells are 350 (= $10 \times 5 \times 7$). To minimize the distortion that would be caused by small observations, cells only with 50 or more observations are used for empirical tests in this paper.

4.1. Wage Compression Within Industry

4.1.1. Aggregate level

First, we use the full sample to estimate effects of the minimum wage on wage distribution denoted by difference between the pth percentile wage and the median wage. Before examining equation (1'), we estimate the median

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[8] Lee and Hwang (2018) showed that the proportion of workers affected directly by an increase in the minimum wage was different as the level of education and work experience-year.

[9] The categories of education and work experience-year follow the questionnaires of the survey. Five categories in education are a middle school or less, a high school, a college, a university, and a graduate school or more. Seven categories in work experience-year are less than 1 year, 1-2 years, 2-3 years, 3-4 years, 4-5 years, 5-10 years, and more than 10 years.

wages by equation (2), which includes growth rates of employment, year dummies and cell-specific fixed effects as control variables. The estimated median wages are used for equation (1'), in which control variables are the growth rates of employment and the cell-specific fixed effects.

Table 1 Wage Compression within Industries (Aggregate Levels): All Workers and Gender Groups

		$w_j^{10}-w_j^{50}$	$w_j^{25}-w_j^{50}$	$w_j^{75}-w_j^{50}$	$w_j^{90}-w_j^{50}$
All Workers	Marginal effect for $(mw-\hat{w}_j^{50})$	0.322*** (0.051)	0.141*** (0.030)	−0.075*** (0.026)	−0.118** (0.047)
	F-test for joint significance	47.28 {0.000}	31.48 {0.000}	13.70 {0.000}	15.30 {0.000}
	Obs.	350	350	350	350
Men	Marginal effect for $(mw-\hat{w}_j^{50})$	0.369*** (0.065)	0.127*** (0.035)	−0.047 (0.029)	−0.055 (0.042)
	F-test for joint significance	26.25 {0.000}	22.87 {0.000}	13.62 {0.000}	14.23 {0.000}
	Obs.	350	350	350	350
Women	Marginal effect for $(mw-\hat{w}_j^{50})$	0.293*** (0.039)	0.170*** (0.021)	−0.163*** (0.029)	−0.295*** (0.070)
	F-test for joint significance	45.63 {0.000}	49.16 {0.000}	45.86 {0.000}	21.16 {0.000}
	Obs.	350	350	350	350

Notes: Each column represents the empirical results of equation (1'). The dependent variable is the wage percentile indicated in the first row (w_j^{10}, w_j^{25}, w_j^{75}, and w_j^{90}) minus the median wage (w_j^{50}). The marginal effects for $(mw-\hat{w}_j^{50})$ and $(mw-\hat{w}_j^{50})^2$ are calculated at the mean and those standard errors in brackets are computed by the delta method. The *p*-values for the *F*-distribution are shown in braces. Superscripts ***, ** and * denote the statistical significance at 1, 5 and 10 percent level, respectively.

Table 1 shows the estimated marginal effects of the minimum wage on the differences between the 10th, 25th, 75th and 90th percentile wages and the median wages of the labor-specific groups for all workers, men, and women. Here, the marginal effects are represented by equation (3) and the standard errors of the marginal effects are computed adopting the delta method to approximate the standard errors of the transformation of regression coefficients. Also, the null hypothesis that the linear and quadratic terms for the marginal effect of the minimum wage are jointly equal to zero is tested, following Campolieti (2015), and the F-test results for the joint significance are shown in table 1.

In consistent with the results of most previous studies, the signs of the marginal effects are positive for all workers below the median wage, but negative above the median wage at one percent level of significance. Table 1 also shows that the marginal effects are declined as the percentile on the wage distribution goes up. The marginal effect at the 10th percentile is 0.322, which implies that one percent increase in the minimum wage would reduce the ratio of the 10th percentile wage to the median wage by 0.322 percent, and it is more than twice as large as that at the 25th percentile. The marginal effect at the 90th percentile is −0.118, and it is much smaller than that at 75th percentile.

For men, the marginal effect at the 10th percentile is slightly higher than that for all workers, but at the 25th percentile it is a little lower than that for all workers. Furthermore, the marginal effects above the median wage are negative but statistically insignificant at both the 75th and the 90th percentiles. These results indicate that an increase in the minimum wage has much larger effect at lower percentile on the wage distribution for men, but it declines quickly or is ignorable as the percentile rises. For women, although the marginal effect at the 10th percentile is lower than that for men, it is larger for women than men at the other percentiles. Unlike men, the marginal effect of women is statistically significant (at one percent level) at percentiles even above the median wage, which implies that an increase in the minimum wage could contribute to reducing the wage gaps of women at a relatively wider range.

4.1.2. Industry level

Since each industry differs in its labor skills and productivity, the location of an industry's worker in the wage distribution can be different across industries even with same education, experience and job types. In addition, idiosyncratic features of industries such as the economy of scale, the union membership rate, the portion of the regular workers, etc., can lead to the different impact of the minimum wage on the wage distribution within each industry. Manufacturing and services industries are classified into eleven categories each. The model specification and variables for each industry are basically the same as in section 4.1.1.

Table 2 and table 3 report that most of the marginal effects of the minimum wage on wage distribution below the median wage are positive and statistically significant except for ‘Finance and Insurance’ at the 10th percentile, and ‘Computer and Electronic Products,’ ‘Finance and Insurance’ and ‘Professional, Scientific & Technical Services’ at the 25th percentile, of which industries show the highest wage level in each category of industry. Also, the marginal effects for all industries are larger at the 10th percentile than at the 25th percentile. These results at the industry level are compatible with the results at the aggregate level. Meanwhile, at the 75th and the 90th percentiles, each industry reveals negative or statistically insignificant marginal effects of the minimum wage, except only for ‘Information & Cultural Service.’ The negative and significant marginal effects at both the 75th and the 90th percentiles occur in two manufacturing industries and six services industries. This result indicates that the effects of the minimum wage on the wage distribution above the median wage are more visible in services industries, rather than in manufacturing industries.

Table 2 Wage Compression within Industries: Manufacturing Industries

		$w_j^{10}-w_j^{50}$	$w_j^{25}-w_j^{50}$	$w_j^{75}-w_j^{50}$	$w_j^{90}-w_j^{50}$
Food, Beverage and Tobacco	Marginal effect for $(mw-\hat{w}_j^{50})$	0.396*** (0.079)	0.149** (0.060)	−0.054 (0.076)	−0.106 (0.124)
	F-test for joint significance	13.72 {0.000}	5.54 {0.009}	0.61 {0.553}	3.02 {0.064}
	Obs.	292	292	292	292
Textile, Clothing, Leather and Allied	Marginal effect for $(mw-\hat{w}_j^{50})$	0.671*** (0.138)	0.334*** (0.053)	−0.051 (0.058)	−0.078 (0.078)

Product	F-test for joint significance	26.69 {0.000}	19.79 {0.000}	0.79 {0.465}	1.25 {0.303}
	Obs.	275	275	275	275
Wood, Paper, Printing	Marginal effect for $(mw-\hat{w}_j^{50})$	0.366*** (0.093)	0.145** (0.067)	0.053 (0.065)	0.042 (0.129)
	F-test for joint significance	33 {0.000}	7.96 {0.002}	10.36 {0.001}	10.48 {0.001}
	Obs.	227	227	227	227
Petroleum, Coal, Chemical, Plastics and Rubber	Marginal effect for $(mw-\hat{w}_j^{50})$	0.353*** (0.068)	0.191*** (0.044)	−0.218*** (0.045)	−0.206*** (0.074)
	F-test for joint significance	13.69 {0.000}	9.87 {0.000}	15.46 {0.000}	20.11 {0.000}
	Obs.	340	340	340	340
Metallic/Non-Metallic Mineral and Primary/Fabricated Metal	Marginal effect for $(mw-\hat{w}_j^{50})$	0.222** (0.107)	0.164*** (0.059)	−0.185*** (0.065)	−0.348*** (0.116)
	F-test for joint significance	4.01 {0.028}	6.93 {0.003}	4.24 {0.023}	5.73 {0.007}
	Obs.	306	306	306	306
Computer and Electronic	Marginal effect for $(mw-\hat{w}_j^{50})$	0.384*** (0.095)	0.056 (0.050)	−0.110 (0.083)	−0.285*** (0.102)
	F-test for joint significance	8.15 {0.001}	4.49 {0.019}	4.72 {0.016}	26.55 {0.000}
	Obs.	304	304	304	304
Medical Equipment, Precision Apparatus, Optical and Watch	Marginal effect for $(mw-\hat{w}_j^{50})$	0.345*** (0.075)	0.188*** (0.054)	−0.047 (0.074)	−0.096 (0.121)
	F-test for joint significance	13.70 {0.000}	6.10 {0.008}	0.91 {0.418}	0.98 {0.389}
	Obs.	221	221	221	221
Electrical Equipment	Marginal effect for $(mw-\hat{w}_j^{50})$	0.326*** (0.063)	0.141*** (0.047)	−0.051 (0.055)	−0.056 (0.085)
	F-test for joint significance	23.02 {0.000}	11.47 {0.000}	0.44 {0.646}	0.27 {0.764}
	Obs.	245	245	245	245
Other Machinery and Equipment	Marginal effect for $(mw-\hat{w}_j^{50})$	0.449*** (0.103)	0.170** (0.077)	−0.158*** (0.062)	−0.148 (0.097)
	F-test for joint significance	9.55 {0.001}	2.52 {0.096}	12.02 {0.000}	13.11 {0.000}
	Obs.	271	271	271	271
Transportation Equipment	Marginal effect for $(mw-\hat{w}_j^{50})$	0.249** (0.099)	0.109* (0.058)	0.031 (0.071)	0.046 (0.144)
	F-test for joint significance	4.63 {0.017}	3.80 {0.033}	0.13 {0.880}	0.23 {0.796}
	Obs.	308	308	308	308

Furniture and All Other Miscellaneous	Marginal effect for $(mw - \hat{w}_j^{50})$	0.782*** (0.123)	0.375*** (0.080)	−0.122 (0.082)	−0.121 (0.122)
	F-test for joint significance	25.93 {0.000}	12.07 {0.000}	1.34 {0.282}	0.54 {0.589}
	Obs.	187	187	187	187

Notes: Each column represents the empirical results of equation (1'). The dependent variable is the wage percentile indicated in the first row (w_j^{10}, w_j^{25}, w_j^{75}, and w_j^{90}) minus the median wage (w_j^{50}). The marginal effects for $(mw - \hat{w}_j^{50})$ and $(mw - \hat{w}_j^{50})^2$ are calculated at the mean and those standard errors in brackets are computed by the delta method. The *p*-values for the *F*-distribution are shown in braces. Superscripts ***, ** and * denote the statistical significance at 1, 5 and 10 percent level, respectively.

Table 3 Wage Compression within Industries: Services Industries

		$w_j^{10} - w_j^{50}$	$w_j^{25} - w_j^{50}$	$w_j^{75} - w_j^{50}$	$w_j^{90} - w_j^{50}$
Wholesale and Retail	Marginal effect for $(mw - \hat{w}_j^{50})$	0.329*** (0.098)	0.178*** (0.059)	−0.082 (0.062)	−0.123 (0.078)
	F-test for joint significance	16.94 {0.000}	12.53 {0.000}	3.84 {0.032}	2.44 {0.103}
	Obs.	350	350	350	350
Transport-ation	Marginal effect for $(mw - \hat{w}_j^{50})$	0.465*** (0.089)	0.188*** (0.048)	−0.251*** (0.083)	−0.357*** (0.102)
	F-test for joint significance	63.81 {0.000}	37.36 {0.000}	18.83 {0.000}	12.80 {0.000}
	Obs.	312	312	312	312
Accommod-ation and Food	Marginal effect for $(mw - \hat{w}_j^{50})$	0.451*** (0.112)	0.233** (0.091)	−0.429*** (0.081)	−0.652*** (0.123)
	F-test for joint significance	8.97 {0.001}	5.44 {0.010}	24.80 {0.000}	25.41 {0.000}
	Obs.	300	300	300	300
Information and Cultural	Marginal effect for $(mw - \hat{w}_j^{50})$	0.276*** (0.057)	0.119*** (0.037)	0.091** (0.041)	0.175*** (0.062)
	F-test for joint significance	11.81 {0.000}	5.27 {0.011}	2.80 {0.077}	5.91 {0.007}
	Obs.	290	290	290	290
Finance and Insurance	Marginal effect for $(mw - \hat{w}_j^{50})$	0.144 (0.108)	−0.007 (0.062)	0.015 (0.055)	0.067 (0.072)
	F-test for joint significance	1.16 {0.329}	6.13 {0.006}	1.63 {0.213}	1.62 {0.215}
	Obs.	289	289	289	289
Real Estate and Rental	Marginal effect for $(mw - \hat{w}_j^{50})$	1.013*** (0.120)	0.560*** (0.096)	−0.410*** (0.109)	−0.687*** (0.201)

	F-test for joint significance	37.91 {0.000}	20.23 {0.000}	7.1 {0.003}	7.07 {0.003}
	Obs.	305	305	305	305
Professional, Scientific, and Technical	Marginal effect for $(mw-\hat{w}_j^{50})$	0.142** (0.061)	−0.017 (0.038)	−0.130** (0.056)	−0.215*** (0.064)
	F-test for joint significance	16.56 {0.000}	13.22 {0.000}	3.23 {0.054}	5.79 {0.008}
	Obs.	295	295	295	295
Management of Companies and Enterprises	Marginal effect for $(mw-\hat{w}_j^{50})$	0.462*** (0.089)	0.222*** (0.064)	0.017 (0.070)	0.015 (0.102)
	F-test for joint significance	34.93 {0.000}	11.43 {0.000}	10.32 {0.000}	7.95 {0.002}
	Obs.	310	310	310	310
Education	Marginal effect for $(mw-\hat{w}_j^{50})$	0.340*** (0.068)	0.146*** (0.051)	−0.023 (0.065)	−0.211* (0.127)
	F-test for joint significance	27.71 {0.000}	21.96 {0.000}	5.02 {0.012}	6.59 {0.004}
	Obs.	350	350	350	350
Health Care and Social Assistance	Marginal effect for $(mw-\hat{w}_j^{50})$	0.329*** (0.085)	0.184*** (0.040)	−0.275*** (0.066)	−0.306*** (0.085)
	F-test for joint significance	34.5 {0.000}	24.34 {0.000}	23.38 {0.000}	7.21 {0.003}
	Obs.	350	350	350	350
Arts, Entertainment and Recreation	Marginal effect for $(mw-\hat{w}_j^{50})$	0.414*** (0.094)	0.247*** (0.057)	−0.153*** (0.059)	−0.238** (0.098)
	F-test for joint significance	13.23 {0.000}	14.3 {0.000}	16.86 {0.000}	9.99 {0.000}
	Obs.	322	322	322	322

Note: Each column represents the empirical results of equation (1'). The dependent variable is the wage percentile indicated in the first row (w_j^{10}, w_j^{25}, w_j^{75}, and w_j^{90}) minus the median wage (w_j^{50}). The marginal effects for $(mw-\hat{w}_j^{50})$ and $(mw-\hat{w}_j^{50})^2$ are calculated at the mean and those standard errors in brackets are computed by the delta method. The *p*-values for the *F*-distribution are shown in braces. Superscripts ***, ** and * denote the statistical significance at 1, 5 and 10 percent level, respectively.

Comprehensively at a given percentile, the marginal effects of the minimum wage seem to be related to the wage level of industry. As illustrated in figure A1, there is a plausible negative relationship between two variables. In fact, at the 10th percentile, the marginal effects are high for ‘Furniture and All Other Miscellaneous Products’ and ‘Textile, Clothing, Leather and Allied Products’ in manufacturing industries, and ‘Real Estate & Rental Services’ and

'Transportation Services' in services industries, of which industries are known to show relatively low wages at the percentile. We also find a similar negative relationship at the 25th percentile (see figure A2). These results imply that industries of which 10th and 25th percentile wages closer to the minimum wage tend to reveal a higher wage increase in response to a rise in the minimum wage, so that the impact of the minimum wage on the wage distribution in these industries is larger than in other industries.

4.2. Wage Compression across Industries

4.2.1. Aggregate level

We explore whether an increase in minimum wage leads to the compression of wages across industries at a given percentile. For the sake of parsimony, empirical tests are conducted only on the 10th and 25th percentile wages because the minimum wage would more likely affect the wage distribution below the median wage.

Table 4 presents the estimated marginal effects of the minimum wage on the wage gaps at both the 10th and 25th percentiles for all workers, men, and women. In all cases, as expected, the marginal effect is positive for $w_j^p < w_F^p$ and negative for $w_j^p > w_F^p$ at one percent level of significance. Given the results, we can say that at the aggregate level, the minimum wage contributes to reducing the wage gaps of the labor-specific groups at the 10th and 25th percentile. Nonetheless, the wage compression reveals unexpected magnitude: That is, the absolute size of the estimated marginal effects for $w_j^{10} < w_F^{10}$ is smaller than that for $w_j^{10} > w_F^{10}$ and $w_j^{25} < w_F^{25}$, particularly for the case of women.[10] These results appears to be due to that small gaps between w_j^{10} and w_F^p restrain the wage compression.[11] As the minimum

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[10] Since the effects of the minimum wage would decrease as wages are far from the minimum wage, all other things equal, the (absolute) magnitude of the wage compression effect is expected greater for $w_j^p < w_F^p$ at the 10^{th} percentile than other cases.

[11] The wage gap at the 10^{th} percentile is −0.228 for the full sample, −0.234 for men and −0.185 for women, which shows that the existing wage gaps are smaller for women than for the full sample and men.

wage rises, the magnitude of the wage compression will depend on the size of the marginal effects for the labor-specific group times the existing wage gaps. Hence, even though the marginal effect is greater at the 10th percentile of the wage distribution, the wage compression could be smaller (or disappeared) in case the wage gaps are significantly narrow.

Table 4 Wage Compression across Industries (Aggregate Levels): All Workers and Gender Groups

		$w_j^{10} < w_F^{10}$	$w_j^{10} > w_F^{10}$	$w_j^{25} < w_F^{25}$	$w_j^{25} > w_F^{25}$
All Workers	Marginal effect for $(mw - w_F^{50})$	0.163*** (0.038)	−0.384*** (0.041)	0.257*** (0.044)	−0.164*** (0.024)
	F-test for joint significance	9.40 {0.003}	44.30 {0.000}	20.17 {0.000}	72.48 {0.000}
	Obs.	148	202	166	184
Men	Marginal effect for $(mw - w_F^{50})$	0.272*** (0.081)	−0.309*** (0.046)	0.286*** (0.056)	−0.116*** (0.033)
	F-test for joint significance	6.10 {0.012}	44.90 {0.000}	16.93 {0.000}	70.42 {0.000}
	Obs.	140	210	148	202
Women	Marginal effect for $(mw - w_F^{50})$	0.073*** (0.028)	−0.401*** (0.048)	0.245*** (0.045)	−0.182*** (0.026)
	F-test for joint significance	3.60 {0.049}	35.69 {0.000}	23.86 {0.000}	63.35 {0.000}
	Obs.	171	179	201	149

Notes: Each column represents the empirical results of equation (4). The dependent variable is the log wage percentile of worker-type *j* indicated in the first row (w_j^{10} and w_j^{25}) minus the log percentile wage in full sample (w_F^{10} and w_F^{25}). The empirical tests are performed for two cases, $w_j < w_F$ and $w_j > w_F$, for each percentile. The marginal effects for $(mw - w_F^{50})$ and $(mw - w_F^{50})^2$ are calculated at the mean and those standard errors in brackets are computed by the delta method. The *p*-values for the *F*-distribution are shown in braces. Superscripts ***, ** and * denote the statistical significance at 1, 5 and 10 percent level, respectively.

4.2.2. Industry level

Now we examine whether an increase in the minimum wage contributes to compressing the labor-specific wages across industries at a given percentile. In Korea, workers whose hourly wage is close to the minimum wage are persons working in non-regular jobs or in small firms of which job security and working condition are inferior to regular jobs.[12] Thus the workers in the non-regular jobs or in small firms are hard to claim higher wages for relative wage fairness because most of them do not have a power to negotiate their wages through collective bargaining or they could be easily substituted by the other workers. In this circumstance, enforcing the minimum wage can have a larger positive effect on the low-wage workers who are more likely subject to the non-regular position. Consequently, the increase in the minimum wage contributes to fostering the compression of wages across industries as well as within each industry.

Table 5 Wage Compression across Industries: Manufacturing Industries

		$w_j^{10} < w_F^{10}$	$w_j^{10} > w_F^{10}$	$w_j^{25} < w_F^{25}$	$w_j^{25} > w_F^{25}$
Food, Beverage and Tobacco	Marginal effect for $(mw - w_F^{50})$	0.211***	−0.052	0.296***	0.292*
		(0.049)	(0.155)	(0.064)	(0.158)
	F-test for joint significance	9.18	14.70	19.80	2.24
		{0.001}	{0.000}	{0.000}	{0.143}
	Obs.	171	121	198	94
Textile, Clothing, Leather and Allied Product	Marginal effect for $(mw - w_F^{50})$	0.520***	−0.105	0.444***	−0.144*
		(0.093)	(0.169)	(0.076)	(0.072)
	F-test for joint significance	15.61	15.86	19.22	12.37
		{0.000}	{0.000}	{0.000}	{0.001}
	Obs.	152	123	167	108
Wood, Paper, Printing	Marginal effect for $(mw - w_F^{50})$	0.134*	−0.154	0.215***	−0.005
		(0.078)	(0.137)	(0.077)	(0.139)
	F-test for joint significance	2.41	13.59	13.73	7.68
		{0.120}	{0.000}	{0.000}	{0.005}
	Obs.	89	138	127	100
Petroleum, Coal, Chemical, Plastics and Rubber	Marginal effect for $(mw - w_F^{50})$	0.093	−0.230***	0.117**	−0.054
		(0.091)	(0.054)	(0.059)	(0.043)
	F-test for joint significance	11.06	15.47	25.62	6.02
		{0.001}	{0.000}	{0.000}	{0.008}
	Obs.	111	229	146	194

12) The non-regular employment in Korea remained at a stable portion (32%) since 2013, of which fraction is higher for women (41.5%) than men (26.3%) as of 2018 (Jung, 2018). Due to the different definition on the non-regular employment, it is hard to compare directly the portion across countries. Nevertheless, it is reasonable to conjecture that the fraction of the non-regular employment in Korea is higher than the average of other advanced countries.

Metallic/Non-Metallic Mineral and Primary/Fabricated Metal	Marginal effect for $(mw-w_F^{50})$	0.045 (0.077)	−0.177* (0.094)	0.158** (0.066)	0.095 (0.073)
	F-test for joint significance	0.81 {0.462}	7.28 {0.003}	20.45 {0.000}	6.26 {0.008}
	Obs.	116	190	154	152
Computer and Electronic	Marginal effect for $(mw-w_F^{50})$	0.102 (0.194)	−0.157** (0.071)	0.230** (0.099)	0.052 (0.078)
	F-test for joint significance	2.91 {0.090}	20.99 {0.000}	9.08 {0.003}	16.96 {0.000}
	Obs.	71	233	103	201
Medical Equipment, Precision Apparatus, Optical and Watch	Marginal effect for $(mw-w_F^{50})$	0.263* (0.154)	−0.365*** (0.111)	0.389*** (0.094)	−0.119 (0.096)
	F-test for joint significance	8.51 {0.006}	10.05 {0.001}	14.50 {0.001}	10.74 {0.001}
	Obs.	60	161	81	140
Electrical Equipment	Marginal effect for $(mw-w_F^{50})$	0.015 (0.181)	−0.444*** (0.071)	0.411*** (0.060)	−0.306*** (0.053)
	F-test for joint significance	3.29 {0.073}	24.85 {0.000}	23.74 {0.000}	23.71 {0.000}
	Obs.	79	166	98	147
Other Machinery and Equipment	Marginal effect for $(mw-w_F^{50})$	0.419 (0.356)	−0.192*** (0.066)	0.258* (0.132)	0.049 (0.065)
	F-test for joint significance	1.00 {0.395}	6.40 {0.005}	9.79 {0.002}	2.21 {0.132}
	Obs.	54	217	86	185
Transportation Equipment	Marginal effect for $(mw-w_F^{50})$	0.245* (0.146)	−0.285*** (0.090)	0.446*** (0.083)	−0.174** (0.079)
	F-test for joint significance	1.65 {0.223}	26.10 {0.000}	19.51 {0.000}	3.90 {0.036}
	Obs.	102	206	131	177
Furniture and All Other Miscellaneous	Marginal effect for $(mw-w_F^{50})$	0.412* (0.223)	0.018 (0.195)	0.410*** (0.064)	−0.093 (0.182)
	F-test for joint significance	17.90 {0.000}	7.46 {0.004}	23.23 {0.000}	3.30 {0.065}
	Obs.	76	111	98	89

Notes: Each column represents the empirical results of equation (4). The dependent variable is the log wage percentile of worker-type *j* indicated in the first row (w_j^{10} and w_j^{25}) minus the log percentile wage in full sample (w_F^{10} and w_F^{25}). The empirical tests are performed for two cases, $w_j < w_F$ and $w_j > w_F$, for each percentile. The marginal effects for $(mw-w_F^{50})$ and $(mw-w_F^{50})^2$ are calculated at the mean and those standard errors in brackets are computed by the delta method. The *p*-values for the *F*-distribution are shown in braces. Superscripts ***, ** and * denote the statistical significance at 1, 5 and 10 percent level, respectively.

Table 5 and table 6 present the estimated marginal effects of the minimum wage on the wage gaps at the 10th and 25th percentiles in each industry. Considering only the results with statistical significance at least at ten percent level, the marginal effects of the minimum wage have expected signs, except for ‘Health Care and Social Assistance’ at the 10th percentile and ‘Food, Beverage and Tobacco’ at the 25th percentile. In particular, at both the 10th and 25th percentiles, ‘Transportation Equipment’, ‘Wholesale and Retail’ and ‘Education’ show a statistically significant two-way wage compression (a positive marginal effect for $w_J^p < w_F^p$ and a negative marginal effect for $w_J^p > w_F^p$).

To visualize the wage compression effects across industries, we built scatterplots of a relationship between the wage level and the marginal effect. As illustrated in figure A3, if the 10th percentile wage of an industry is lower than the 10th percentile wage of the full sample, the industry tends more likely to have positive marginal effect. Otherwise, the industry tends more likely to have negative marginal effect. However, as shown in figure A4, this tendency seems less clear for the 25th percentile.

Table 6 Wage Compression across Industries: Services Industries

		$w_j^{10} < w_F^{10}$	$w_j^{10} > w_F^{10}$	$w_j^{25} < w_F^{25}$	$w_j^{25} > w_F^{25}$
Wholesale and Retail	Marginal effect for $(mw - w_F^{50})$	0.215*** (0.072)	−0.445*** (0.123)	0.392*** (0.090)	−0.228** (0.112)
	F-test for joint significance	4.46 {0.024}	18.82 {0.000}	10.13 {0.001}	33.07 {0.000}
	Obs.	149	201	168	182
Transportation	Marginal effect for $(mw - w_F^{50})$	−0.022 (0.068)	−0.465*** (0.119)	0.286*** (0.048)	−0.262*** (0.083)
	F-test for joint significance	24.03 {0.000}	10.30 {0.001}	46.92 {0.000}	6.44 {0.008}
	Obs.	202	110	195	117
Accommodation and Food	Marginal effect for $(mw - w_F^{50})$	0.078 (0.067)	0.133 (0.133)	0.266*** (0.064)	0.019 (0.068)
	F-test for joint significance	0.79 {0.465}	3.07 {0.081}	26.11 {0.000}	4.45 {0.050}
	Obs.	223	77	236	64
Information and Cultural	Marginal effect for $(mw - w_F^{50})$	0.125 (0.113)	−0.382*** (0.088)	−0.051 (0.156)	−0.269*** (0.073)

	F-test for joint significance	0.62 {0.571}	41.95 {0.000}	0.59 {0.581}	54.51 {0.000}
	Obs.	28	262	40	250
Finance and Insurance	Marginal effect for $(mw - w_F^{50})$	0.308 (0.390)	−0.483*** (0.088)	0.238** (0.104)	−0.359*** (0.087)
	F-test for joint significance	0.82 {0.475}	25.22 {0.000}	10.18 {0.006}	21.06 {0.000}
	Obs.	16	273	36	253
Real estate and Rental	Marginal effect for $(mw - w_F^{50})$	0.618*** (0.056)	−0.112 (0.127)	0.634*** (0.083)	−0.120 (0.087)
	F-test for joint significance	64.32 {0.000}	4.05 {0.037}	84.12 {0.000}	1.92 {0.180}
	Obs.	217	88	201	104
Professional, Scientific and Technical	Marginal effect for $(mw - w_F^{50})$	−0.562 (0.407)	−0.430*** (0.059)	−0.374 (0.284)	−0.184*** (0.048)
	F-test for joint significance	1.43 {0.295}	42.22 {0.000}	2.13 {0.169}	35.22 {0.000}
	Obs.	30	265	64	231
Management of Companies and Enterprises	Marginal effect for $(mw - w_F^{50})$	−0.082 (0.091)	−0.349*** (0.066)	0.075 (0.050)	−0.104 (0.068)
	F-test for joint significance	3.95 {0.040}	14.68 {0.000}	13.49 {0.000}	16.12 {0.000}
	Obs.	126	184	157	153
Education	Marginal effect for $(mw - w_F^{50})$	0.190*** (0.063)	−0.436*** (0.068)	0.314*** (0.066)	−0.327*** (0.060)
	F-test for joint significance	6.40 {0.008}	25.37 {0.000}	22.11 {0.000}	25.85 {0.000}
	Obs.	163	187	195	155
Health Care and Social Assistance	Marginal effect for $(mw - w_F^{50})$	−0.133*** (0.030)	−0.487*** (0.079)	−0.016 (0.037)	−0.267*** (0.073)
	F-test for joint significance	11.69 {0.000}	31.33 {0.000}	6.07 {0.007}	37.94 {0.000}
	Obs.	170	180	209	141
Arts, Entertainment and Recreation	Marginal effect for $(mw - w_F^{50})$	0.169*** (0.060)	−0.065 (0.140)	0.293*** (0.060)	−0.108 (0.111)
	F-test for joint significance	5.55 {0.012}	52.35 {0.000}	12.71 {0.000}	7.19 {0.005}
	Obs.	166	156	191	131

Notes: Each column represents the empirical results of equation (4). The dependent variable is the log wage percentile of worker-type j indicated in the first row (w_j^{10} and w_j^{25}) minus the log percentile wage in full sample (w_F^{10} and w_F^{25}). The empirical tests are performed for two cases, $w_j < w_F$ and $w_j > w_F$, for each percentile. The marginal effects for $(mw - w_F^{50})$ and $(mw - w_F^{50})^2$ are calculated at the mean and those standard errors in brackets are computed by the delta method. The p-values for the F-distribution are shown in braces. Superscripts ***, ** and * denote the statistical significance at 1, 5 and 10 percent level, respectively.

5. CONCLUDING REMARKS

In this paper, we examined the effect of the minimum wage on the wage distribution in Korea. By using 2009-2018 annual data (the Wage Structure Survey of SLCET), we obtained panel regression results supporting that an increase in the minimum wage contributes to compressing the wage distribution at both aggregate and industry level, especially for wage percentiles below the median wage. These empirical findings are consistent with the previous studies that reported the wage compression effects of the minimum wage. A new finding of this paper is that an increase in the minimum wage also contributed to reducing the wage gaps of the labor-specific groups across industries at a given percentile below the median wage.

Despite the findings, several caveats warrant caution in applying and interpreting the empirical results of this paper. First, the marginal effects obtained by our empirical tests may be underestimated because the SLCET data does not include workers at firms with less than five employees. Wages at very small firms are usually lower than those at larger firms. Thus, if the former is included in the sample, then the percentile wages (especially below the median wage) would be much lower and it could lead to higher marginal effects. Second, the data we used in this paper only include the employed workers. Thus, as pointed out by Manning (2003) and Neumark *et al*. (2004), the effects of the minimum wage on the wage equality do not necessarily mean the effect on income equality because the adverse employment effects caused by the minimum wage are not properly addressed in this paper.

Nevertheless, the wage compression effect within and across industries, which are observed in this paper, provides compelling evidence that the minimum wage could reduce the wage gap. Particularly, in Korea, low-wage workers whose wages are close to the minimum wage normally work in non-regular jobs, so that the claim to secure the fairness of relative wage is limited because most of them do not have a power to negotiate their wages through collective bargaining. In this circumstance, the enforcement of the minimum wage is expected to increase the non-regular workers' wages effectively and alleviate problems caused by the dual structure of the Korean labor market. In line with this perspective, policy-makers who design the minimum wage policy need to contemplate its favorable effect on the wage distribution along with its impacts on employment and inflation.

APPENDIX

Table A1 Summary Statistics (2018)

Classification		*p*10 wage	*p*25 wage	*p*50 wage	*p*75 wage	*p*90 wage	mean wage	% affected by minimum wage
Total		9.52	11.14	15.08	22.49	33.05	18.91	4.08
Men		9.93	12.39	17.29	25.66	36.75	21.12	3.58
Women		9.21	10.36	12.43	17.11	25.00	15.35	4.89
Manu-facturing	Food, Beverage & Tobacco	9.21	10.28	12.40	17.30	25.00	15.18	4.92
	Textile, Clothing, Leather & Allied Product	8.96	10.06	12.00	16.78	23.97	14.93	5.87
	Wood, Paper & Printing	9.34	10.53	13.41	17.76	23.44	15.43	5.45
	Petroleum, Coal, Chemical, Plastics & Rubber	9.87	11.51	15.43	21.48	29.35	18.27	2.61
	Metallic/Non-Metallic Mineral & Primary/ Fabricated Metal	9.83	11.20	14.43	19.47	26.20	16.91	2.98
	Computer & Electronic	10.27	12.74	18.61	26.50	36.99	21.44	1.14
	Medical Equipment, Precision Apparatus, Optical & Watch	10.39	12.50	16.28	22.92	31.14	19.27	1.39
	Electrical Equipment	9.68	11.10	14.47	20.58	29.05	17.49	3.80

	Other Machinery & Equipment	10.39	12.14	16.16	21.63	29.05	18.65	1.20
	Transportation Equipment	9.89	12.07	16.45	22.11	30.10	18.69	3.88
	Furniture & All Other Miscellaneous	9.43	10.54	13.16	18.75	24.99	15.77	2.05
Services	Wholesale & Retail	9.46	11.10	14.84	21.93	32.68	18.80	4.14
	Transportation	8.68	10.46	13.96	20.29	28.85	16.89	7.94
	Accommodation & food	8.00	9.02	10.49	12.63	16.48	11.77	16.83
	Information & cultural	11.84	15.13	21.88	31.16	40.32	24.53	0.69
	Finance & Insurance	12.33	16.67	25.12	34.64	44.41	27.30	0.25
	Real Estate & Rental	7.64	8.57	11.31	17.43	26.94	15.36	21.95
	Professional, Scientific & Technical	11.90	15.39	21.73	31.04	41.99	25.03	0.78
	Management of Companies & Enterprises	10.00	11.14	13.34	18.25	26.70	16.55	2.28
	Education	10.39	12.49	18.90	32.74	43.64	24.09	2.16
	Health Care & Social Assistance	9.26	10.35	11.95	16.55	24.66	16.07	4.39
	Arts, Entertainment & Recreation	9.03	10.63	13.51	19.61	27.63	16.59	5.13

Notes: The percentile wage and the mean wage are denominated in Korean 1000 won. The last column is the ratio of workers directly affected by the minimum wage of the next year.

Figure A1 Wage Compression within Industries: Hourly Wages vs. Marginal Effects in Equation (1') at the 10th Percentile

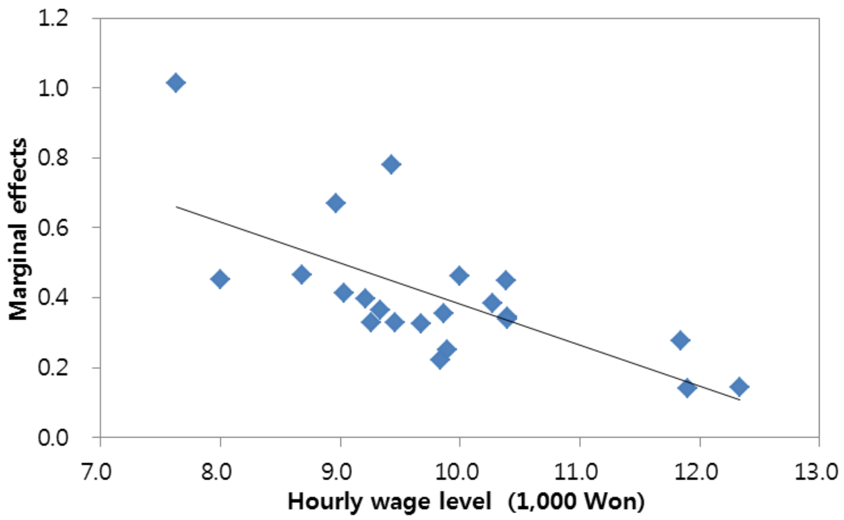


Figure A2 Wage Compression within Industries: Hourly Wages vs. Marginal Effects in Equation (1') at the 25th Percentile

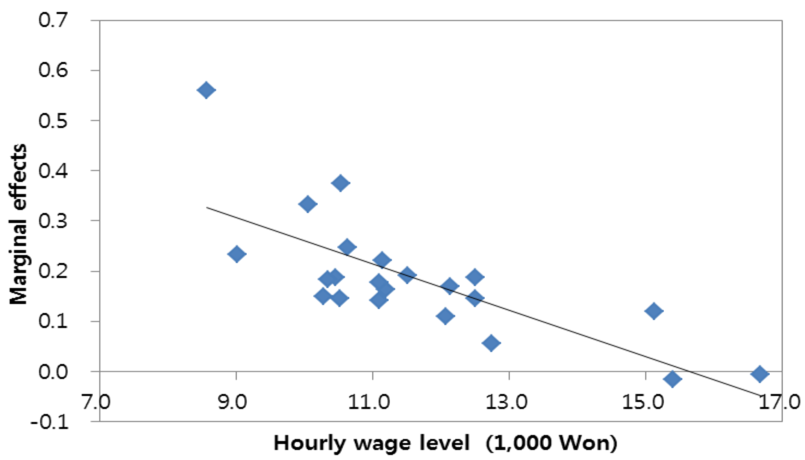
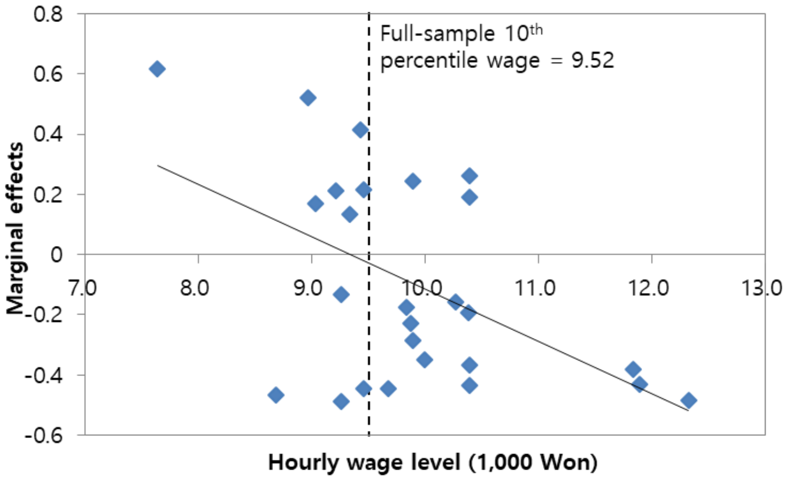
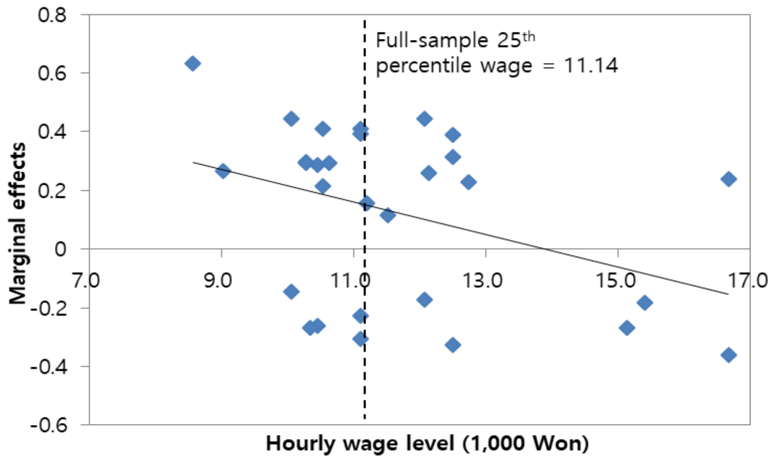


Figure A3 Wage Compression across Industries: Hourly Wages and Marginal Effects in Equation (4) at the 10th Percentile



Note: The figure includes only manufacturing and services industries with statistically significant marginal effects for both $(w_j^{10} < w_F^{10})$ and $(w_j^{10} > w_F^{10})$.

Figure A4 Wage Compression across Industries: Hourly Wages and Marginal Effects in Equation (4) at the 25th Percentile



Note: The figure includes only manufacturing and services industries with statistically significant marginal effects for both $(w_j^{25} < w_F^{25})$ and $(w_j^{25} > w_F^{25})$.

REFERENCES

Allegretto, S. A., A. Dube, M. Reich, and B. Zipperer, "Credible Research Designs for Minimum Wage Studies: A Response to Neumark, Salas, and Wascher," *Industrial and Labor Relations Review*, 70(3), 2017, 559-592.

Autor, D. H., A. Manning, and C.L. Smith, "The Contribution of the Minimum Wage to US Wage Inequality over Three Decades: A Reassessment," *American Economic Journal: Applied Economics*, 8(1), 2016, 58-99.

Baek, J. and W. Park, "Minimum Wage Introduction and Employment: Evidence from South Korea," *Economics Letters*, 139, 2016, 18-21.

Brown, C., C. Gilroy, and A. Kohen, "The Effect of the Minimum Wage on Employment and Unemployment," *Journal of Economic Literature*, 20(2), 1982, 487-528.

Campolieti, M., "Minimum Wages and Wage Spillovers in Canada," *Canadian Public Policy*, 41(1), 2015, 15-34.

Card, D. and A. B. Krueger, "Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania," *American Economic Review*, 84(4), 1994, 772-793.

Cengiz, D., A. Dube, A. Lindner, and B. Zipperer, "The Effect of Minimum Wages on Low-Wage Jobs," *Quarterly Journal of Economics*, 134(3), 2019, 1405-1454.

Dickens, R. and A. Manning, "Has the National Minimum Wage Reduced UK Wage Inequality?" *Journal of the Royal Statistical Society*, 167, 2004, 613-626.

DiNardo, J., N. M. Fortin, and T. Lemieux, "Labor Market Institutions and the Distribution of Wages, 1973-1992: A Semiparametric Approach," *Econometrica*, 64(5), 1996, 1001-1044.

Dube, A., S. Naidu, and M. Reich, "The Economic Effects of a Citywide Minimum Wage," *Industrial and Labor Relations Review*, 60(4), 2007, 522-543.

Dube, A., T. W. Lester, and M. Reich, "Minimum Wage Effects across State Borders: Estimates Using Contiguous Counties," *Review of Economics* *and Statistics*, 92(4), 2010, 945-964.

Fortin, N. and T. Lemieux, "Changes in Wage Inequality in Canada: An Interprovincial Perspective," *Canadian Journal of Economics*, 48(2), 2015, 682-713.

Freeman, R. B., "The Minimum Wage as a Redistributive Tool," *Economic Journal*, 106, 1996, 639-49.

Gramlich, E. M., "Impact of Minimum Wages on Other Wages, Employment, and Family Incomes," *Brookings Papers on Economic Activity*, 2, 1976, 409-451.

Grossman, J. B., "The Impact of the Minimum Wage on Other Wages," *Journal of Human Resources*, 18(3), 1983, 3-18.

Hirsch, B. T., B. Kaufman, and T. Zelenska, "Minimum Wage Channels of Adjustment," IZA Discussion Paper, No. 6132, Institute for the Study of Labor, 2011.

Hong, J., "Functional Income Distribution and Economic Growth in Korea: An Empirical Analysis of Demand Regime and Productivity Regime," *Journal of Korean Economic Development*, 20(2), 2014, 67-97. (in Korean)

Jeon, S. and S. Joo, "Functional Income Distribution and Aggregate Demand in Korea," *Review of Social & Economic Studies*, 10(4), 2016, 1-25. (in Korean)

Jeong, J., J. Nam, J. Kim, and Y. Chun, "Analysis of Minimum Wage Effect," *Korea Labor Institute*, Chapter 4, 2011, 54-76. (in Korean)

Jung, H., "On Non-Regular Employment. Korean Social Trends," *Statistics Korea*, 2018.

Kambayashi, R., D. Kawaguchi, and K. Yamada, "Minimum Wage in a Deflationary Economy: The Japanese Experience, 1994-2003," *Labour Economics*, 24, 2013, 264-276.

Kang, S., "Analysis of Wage Compression Effect of the Minimum Wage within Establishment," *Korean Journal of Labor Economics*, 39(4), 2016, 33-58. (in Korean)

Latreille, P. and N. Manning, "Inter-Industry and Inter-Occupational Wage

Spillovers in UK Manufacturing," *Oxford Bulletin of Economics and Statistics*, 62(1), 2000, 83-99.

Lavoie, M. and E. Stockhammer, "Wage-Led Growth: Concept, Theories and Policies," in M. Lavoie and E. Stockhammer, eds., *Wage-led Growth: An Equitable Strategy for Economic Recovery,* Palgrave Macmillan, 2013, 13-39.

Lee, D. S., "Wage Inequality in the United States during the 1980s: Rising Dispersion or Falling Minimum Wage," *Quarterly Journal of Economics*, 114(3), 1999, 977-1023.

Lee, J. and S. Hwang, "The Effects of the Minimum wage on Wage Distribution in Korea," *Journal of Korean Economic Analysis*, 24(2), 2018, 1-28. (in Korean)

Machin, S. and A. Manning, "The Effects of Minimum Wages on Wage Dispersion and Employment: Evidence from the UK Wages Councils," *Industrial and Labor Relations Review*, 47(2), 1994, 319-329.

Manning, A., *Monopsony in Motion: Imperfect Competition in Labor Markets*, Princeton University Press, 2003.

Neumark, D. and W. Wascher, "Employment Effects of Minimum and Subminimum Wages: Panel Data on State Minimum Wage Laws," *Industrial and Labor Relations Review*, 46(1), 1992, 55-81.

Neumark, D., M. Schweitzer, and W. Wascher, "Minimum Wage Effects throughout the Wage Distribution," *Journal of Human Resources*, 39(2), 2004, 425-450.

Onaran, Ö. and G. Galanis, "Income Distribution and Growth: A Global Model," *Environment and Planning A: Economy and Space*, 46(10), 2014, 2489-2513.

Redmond, P., K. Doorley and S. McGuinness, "The Impact of a Minimum Wage Change on the Distribution of Wages and Household Income," IZA Discussion Paper, no. 12914, Bonn: IZA, 2020.

Schmitt, J., "Why Does the Minimum Wage Have No Discernible Effect on Employment?" Center for Economic and Policy Research, 2013

Seo, J. and J. Jeong, "The Effect of the Minimum Wage on Poverty in Korea," *The Korean Journal of Economics*, 21(1), 2014, 81-101.

Seong, J., “Wage Inequality: Trends and Causes,” *Korea Labor Institute*, Chapter 5, 2014, 145-166. (in Korean)

Stewart, M., “Wage Inequality, Minimum Wage Effects, and Spillover,” *Oxford Economic Papers*, 64, 2012, 616-634.

Stockhammer, E. and Ö. Onaran, “Wage-Led Growth: Theory, Evidence, Policy,” *Review of Keynesian Economics*, 1, 2013, 61-78.

Teulings, C. N., “The Contribution of Minimum Wages to Increasing Wage Inequality,” *Economic Journal*, 113, 2003, 801-833.