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Glass Ceilings in Korea: A Quantile Decomposition Approach

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ABSTRACT

This paper investigates the existence of glass ceilings in white- and blue-collar jobs in Korea using the quantile decomposition method. We find that the glass ceiling widens towards the top of the wage distribution, with women facing barriers to further advancement. Our results also prove that glass ceilings may be more likely to exist in blue-collar than in white-collar jobs. Additionally, the empirical analysis is extended to included two realistic features in the Korean labor market—gender segregation in the workplace and the dual labor market according to firm size. Regarding the occupational gender composition, we find that glass ceilings in the Korean labor market are mostly found in blue-collar and female-dominated jobs. Moreover, allowing for interaction between the dual market structure by firm size and the glass ceiling effect, our results show that glass ceilings exist in relatively small firms regardless of whether the jobs are white or blue collar. These findings can provide the government with policy directions for alleviating the glass ceiling effect.

JEL Classification: J16, J31, J42, J71

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INTRODUCTION

At least over the past decade, Korea has had the largest gender wage gap among the Organisation for Economic Co-operation and Development (OECD) nations. According to an OECD report (2017), women working in Korea earn only 63% of what men do, and only 56.2% of Korean women are employed. Typically, these women leave work when they have children and return as temporary workers, who are not well paid and can benefit from regular employment. These career interruptions contribute to gender wage gaps. There are diverse reasons for gender wage gaps in labor markets, such as education and experience, occupation and industry segregation, family responsibilities and workers' careers, differences in negotiations, and discrimination in hiring, pay, and advancement (Council of Economic Advisers Issue Brief, 2015).

Labor economists have conducted numerous studies on the mean gender wage gap (e.g., Oaxaca, 1973; Blinder, 1973; Oaxaca and Ransom, 1994). However, attention has recently shifted to the degree to which the gender wage gap might vary across wage distributions (e.g., Machado and Mata, 2005; Melly, 2005; Firpo et al., 2009; Fortin et al., 2011). This approach is useful in verifying whether there exists a glass ceiling in the labor market. In the distributional approach, the glass ceiling widens toward the top of the wage distribution, with women facing more barriers to further advancement at certain levels. Xiu and Gunderson (2014) suggested multiple reasons for the existence of the glass ceiling: a scarcity of women in high-skilled white-collar occupations, career interruptions due to family duties and the lack of family-friendly policies, women's hesitation to negotiate for higher pay, and exclusionary aspects of old boy networks.

Focusing on discrimination in the Korean labor market, this study examines the glass ceiling through the quantile decomposition method. We first investigate whether a glass ceiling exists in white- and blue-collar jobs. Next, the empirical analysis is extended to include two realistic features of the Korean labor market: gender segregation in the workplace and the dual labor market according to firm size.[1]

In the 1990s, Korea experienced a continuous decline in its occupational gender segregation, but the gender difference in the occupational distribution is still large (Hwang and Polachek, 2004). According to De Ruijter et al. (2003), occupational gender wage-gap is caused by economic and sociological reasons, such as human capital, crowding hypothesis, and comparable worth or gender bias. By taking into account occupational segregation of women's restricted access to occupations, we divide occupations into male-dominated, female-dominated, and mixed occupations. Also, in Korea, the wage gap between large and small and medium-sized enterprises (SMEs) has continually increased since the 1997–1998 financial crisis. In 2016, the wage gap between large firms and SMEs was greater in Korea than in advanced countries, such as the USA, Japan, and France.[2] Therefore, it is meaningful to investigate how the dual structure by firm size affects the glass ceiling effect in Korea.

The remainder of this paper is organized as follows. The second section introduces empirical studies on the gender wage gaps in terms of wage distribution. We describe the empirical methodology in the third section and the data and descriptive statistics in the fourth. The next section presents the empirical results for white- and blue-collar jobs and the case of gender segregation in the workplace and for the dual labor market according to firm size. Finally, the last section draws conclusions and provides policy directions for alleviating the glass ceiling effect in the Korean labor market.

LITERATURE REVIEW AND METHODOLOGY

To examine the glass ceiling effect, many empirical studies have recently explored the gender wage gap in terms of the wage distribution. Albrecht et al. (2003) and Arulampalam et al. (2007) placed the glass ceiling effect under which the gender wage gap widen towards the top of the wage distribution. Using microdata from 1998, Albrecht et al. (2003) also showed that the gender wage gap in Sweden increased throughout the wage distribution and accelerated in the upper tail. Even after controlling for occupations, they found that the glass ceiling effect persists to a considerable extent. Arulampalam et al. (2007) examined the gender wage gaps in

[1] According to Cho and Cho (2011), most Korean female workers are employed in the peripheral sector with low-paying jobs, poor working conditions, and limited opportunity to the formal labor market. Furthermore, the severity of dualism might be different between men and women.

[2] Kim and Han (2012) revealed that Korea experienced two historical moments in which the size-wage gap surged; one in 1997, the year of the mass labor strikes spurred by the democratization movement, and the other in 2004, the year the Asian financial crisis began.

11 European countries and provided evidence of a glass ceiling effect for nine out of the 11 countries, suggesting that differences in childcare provision and wage setting institutions may partly account for the variation in the gender wage gap patterns by country and sector.

Many studies on developed economies such as the USA, Australia, and European countries showed that the evidence of a glass ceiling is stronger than that of a sticky floor (Kee, 2006 for Australia; Arulampalam et al., 2007 for European countries; De la Rica et al., 2008 for Spain; Albrecht, et al., 2009 for Netherlands; Chzhen and Mumford, 2009 for the UK; Miller, 2009 for the USA; Del Rio et al., 2011 for Spain). A sticky floor implies the gender wage gap widens towards the bottom of the wage distribution, with women facing more severe working conditions when they first enter the labor market. However, several studies on Asian countries pointed mainly to the existence of sticky floors (Fang and Sakellariou, 2011; Fang and Sakellariou, 2011 for Thailand; Xiu and Gunderson, 2014 for China; Duraisamy and Duraisamy, 2016 for India; Anh, 2019 for Vietnam). For the Japanese labor market, Hiromi (2016) showed that the gender wage gap is wider at the top and bottom of the wage distribution, indicating both the glass ceiling and sticky floor phenomena. Analyzing 12 Latin American countries, Carrillo et al. (2014) found that glass ceilings are more likely to occur in richer countries with lower income inequality, while poor countries with higher inequality are likelier to have sticky floors.

Most studies in Korea consider the gender wage gap at the mean level using the Oaxaca-Blinder decomposition (Oaxaca, 1973; Blinder, 1973). Only a few studies have examined the glass ceiling effect using the distributional approach.[3] For instance, using data from the 2018 Korean Labor and Income Panel Study, Jung and Lee (2011) found that there is a stronger glass ceiling effect in unionized firms than in non-unionized ones. Examining the multi-layered Korean labor market structure, Cho et al. (2014) proved the glass ceiling effect for irregular female workers with lower education levels in SMEs. By investigating the changing patterns of the glass ceiling effect in Korea over the past 30 years (1986–2016), Heo (2018) found that though was a serious issue in the past, it has been recently disappearing for full-time workers. From the sectoral and occupational views, glass ceilings are more likely to occur in the manufacturing sector and blue-collar jobs, which may be traditionally male-dominated. In particular, using data from the five waves of the Wage Structure Survey (WSS, 2011–2015), Heo and Yoon (2018) showed strong evidence of a glass ceiling for arts and culture professionals in Korea, supporting the recent assertion of UNESCO (2014) that culture is not immune to gender inequalities and discrimination.

Empirical methodology

We employ the unconditional quantile regression (UQR) method of Firpo et al. (2009) and Fortin et al. (2011) to investigate how the gender wage gap varies across the wage distribution. Since the UQR includes a regression on the transformation of the unconditional quantile of the wage variable on the explanatory variables, it provides an estimate of the standard partial equilibrium effect of the explanatory variable and can be used to generate the traditional Oaxaca-Blinder decomposition over the wage distribution.

The general model is as follows (see Heo and Yoon, 2018). First, we estimate a re-centered influence function (hereafter *RIF*) for each individual:

$$RIF = q(\tau) + [1(Y \geq q(\tau)) - (1-\tau)] / \ f(q(\tau)) \tag{1}$$

where $q(\tau)$ is the τth percentile of the pooled male-female sample ($1 \leq \tau \leq 100$); 1(.) is a binary variable taking the value of 1 if the wage variable (Y) is greater than or equal to $q(\tau)$ for each individual, and 0 otherwise; and $f(q(\tau))$ is the density of the wage at the τth percentile, which can be estimated by the kernel density. In the UQR, the RIF of Y, and not Y itself, is used as the dependent variable. Subsequently, the RIF is regressed on the explanatory variables using ordinary least squares (OLS). Their quantile decomposition allows us to provide robust estimates for each quantile and generalize the traditional Oaxaca-Blinder decomposition across wage distributions.

Next, applying the standard Oaxaca-Blinder decomposition over the entire wage distribution, we obtain equation (2), that is, the gender wage gap at the τth percentile:

[3] Relevant studies on the Korean labor market did prove the sticky floor effect, although they identified it for certain periods and sectors. Thus, we focus on only the glass ceiling effect.

$$WG(\tau) = q_M(\tau) - q_F(\tau), \tag{2}$$

where $q_M(\tau)$ and $q_F(\tau)$ are the τth percentiles for the male and female distributions, respectively. $WG(\tau)$ can be decomposed into two parts: an explained part due to the differences in characteristics (or endowments)—$\Delta X(\tau)$—and an unexplained part due to the differences in coefficients—$\Delta\beta(\tau)$:

$$WG(\tau) = [q_M(\tau) - q_C(\tau)] + [q_M(\tau) - q_C(\tau)] = \Delta X(\tau), \Delta\beta(\tau), \tag{3}$$

where $q_C(\tau)$ is the counterfactual wage at the τth percentile. Fortin et al. (2011) showed that when the linearity and zero conditional mean assumption of the Oaxaca-Blinder decomposition are satisfied, their decomposition is identical to the Oaxaca-Blinder decomposition. However, to remove the index number problem in the traditional Oaxaca-Blinder decomposition, we use the non-discriminatory structure proposed by Oaxaca and Ransom (1994), which allows the unexplained part to be further disaggregated into male advantage and female disadvantage. Therefore, the unexplained part in equation (3) is the sum of male advantage and female disadvantage.[4]

The glass ceiling can be measured based on the total wage gap or the unexplained part. Here, we use the unexplained part to measure it, because the total wage gap does not distinguish between characteristics and coefficient components. The gender wage gap by the unexplained part indicates an adjusted wage gap—a wage discrimination that prevails after controlling for the effect of gender differences in their characteristics. According to Arulampalam et al. (2007), we define the glass ceiling as existing if the 90th percentile wage gap is higher than the reference wage gap (e.g., 50th or 75th percentiles) by at least two percentage points. If a glass ceiling exists in the labor market, the unexplained part, such as part A in Figure 1, is increasing towards the right-hand side of the wage distribution. Note that part B describes a sticky floor, showing that the line of the unexplained part is increasing towards the left-hand side of the wage distribution. Sticky floors are broadly defined as declining earning gaps as one moves from lower to higher quantiles of the earnings.

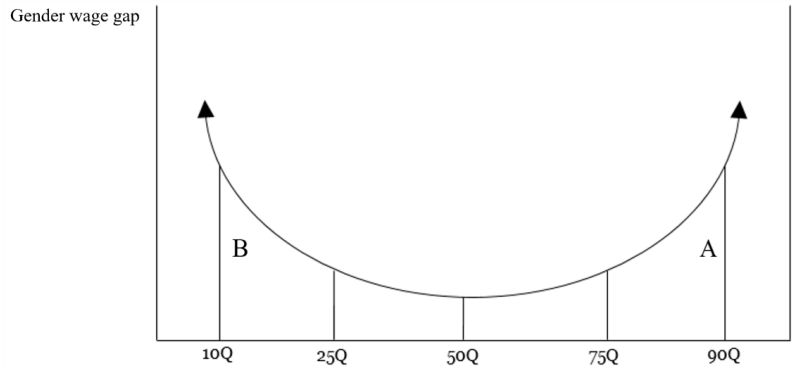

Figure 1 Glass ceiling

Data and descriptive statistics

The data come from the WSS, extracted from the Survey on Labor Conditions by Type of Employment, administered by the Ministry of Employment and Labor. The WSS dataset is useful in analyzing specific occupations because it allows coding at the two-digit level. To increase the sample size and thus, the accuracy, of the estimated distribution, we pool the seven waves of the WSS data currently available (2010–2016).[5] Our sample is restricted to Korean individuals aged 18–65 years, excluding employers, self-employed workers, students, and persons with missing values on the observed characteristics. The final sample consists of 4,842,078 workers: 3,149,993 white-collar workers and 1,692,085 blue-collar workers.

[4] In practice, there are a few alternative approaches for the quantile decompositions, such as Machado and Mata (2005), Melly (2005), and DiNardo et al. (1996). According to Carrillo et al. (2014), the UQR has the advantage of allowing to identify the role of each covariate in the decomposition, and the resulting decomposition is path independent. Furthermore, UQR decomposition is easily computed by simply running a logit or probit model, and estimate distributional statistics of interest using sampling weights.

[5] Additionally, Baron and Cobb-Clark (2010) mentioned that pooling data across waves is potentially useful in reducing sample selection bias because it allows observing a larger fraction of the population.

Table 1 shows that women working in white-collar jobs receive higher wages, but face a slightly larger gender wage gap than women in blue-collar jobs, and the percentage of women working in white-collar jobs (41.4%) is higher than that working in blue-collar jobs (22.2%). Compared to all workers, white-collar women have higher education levels and longer work experience, while blue-collar women are older and less educated and work for relatively smaller businesses.[6] Firm size and the rate of joining unions for white-collar jobs are higher than those for blue-collar jobs. There is a significant difference in the rate of joining unions between men and women in blue-collar jobs.

Table 1 Summary statistics for main variables

	All workers			White-collar workers			Blue-collar workers		
	All	Men	Women	All	Men	Women	All	Men	Women
Log gross hourly wage	2.71 (0.64)	2.84 (0.64)	2.46 (0.54)	2.84 (0.62)	3.05 (0.59)	2.54 (0.54)	2.46 (0.59)	2.54 (0.60)	2.17 (0.43)
Age	39.75 (10.82)	41.12 (10.29)	37.20 (11.31)	37.72 (9.98)	39.59 (9.46)	35.07 (10.11)	43.77 (11.28)	43.40 (11.03)	45.06 (12.00)
Tenure	7.15 (7.72)	8.34 (8.32)	4.94 (5.83)	7.04 (7.56)	8.48 (8.20)	5.00 (6.00)	7.37 (8.01)	8.12 (8.50)	4.71 (5.19)
Education									
Primary / middle school	0.05 (0.21)	0.04 (0.20)	0.06 (0.23)	0.01 (0.11)	0.01 (0.09)	0.02 (0.13)	0.12 (0.32)	0.10 (0.29)	0.20 (0.40)
High school	0.35 (0.48)	0.35 (0.48)	0.35 (0.48)	0.20 (0.40)	0.15 (0.36)	0.26 (0.44)	0.66 (0.47)	0.65 (0.48)	0.70 (0.46)
Two-year college	0.18 (0.38)	0.15 (0.36)	0.22 (0.42)	0.20 (0.40)	0.15 (0.36)	0.27 (0.44)	0.13 (0.34)	0.15 (0.36)	0.06 (0.24)
University	0.35 (0.48)	0.37 (0.48)	0.31 (0.46)	0.48 (0.50)	0.55 (0.50)	0.39 (0.49)	0.09 (0.28)	0.10 (0.30)	0.03 (0.18)
Graduate school	0.07 (0.26)	0.09 (0.28)	0.05 (0.23)	0.11 (0.31)	0.14 (0.35)	0.07 (0.25)	0.00 (0.06)	0.00 (0.07)	0.00 (0.04)
Experience	4.79 (2.25)	5.12 (2.17)	4.18 (2.25)	4.79 (2.24)	5.22 (2.12)	4.18 (2.26)	4.80 (2.26)	4.97 (2.24)	4.20 (2.22)
Firm size	3.70 (1.24)	3.75 (1.22)	3.62 (1.27)	3.73 (1.26)	3.81 (1.24)	3.61 (1.30)	3.66 (1.20)	3.65 (1.20)	3.66 (1.19)
Union	0.23 (0.42)	0.28 (0.45)	0.14 (0.35)	0.16 (0.37)	0.18 (0.38)	0.14 (0.34)	0.36 (0.48)	0.42 (0.49)	0.16 (0.37)
N	4,842,078	3,149,993	1,692,085	3,214,456	1,883,794	1,330,662	1,627,622	1,266,199	361,423

Notes: SDs are given between parentheses. According to KSCO, all workers include white-collar workers (1. Managers, 2. Professionals and related workers 3. Clerks, 4. Service workers, 5. Sales workers) and blue-collar workers (6. Skilled agricultural, forestry, and fishery workers; 7. Craft and related trades workers; 8. Equipment, machine operating and assembling workers; and 9. Elementary workers excluding armed forces).

The dependent variable is the logarithm of gross hourly wage in real terms, which is deflated by the consumer price index (base year = 2005). The explanatory variables used in the empirical analysis are age, tenure, education level with five categories (elementary or middle school, high school, two-year college, university, and graduate school), experience level with five categories (less than 1 year, 1 to less than 3 years, 3 to less than 5 years, 5 to less than 10 years, and 10 years or more), and firm size (based on number of employees) with five categories (5-9, 10-29, 30-99, 100-299, and ≥ 300 employees). Additionally, we include 18 dummies for industry, two dummy variables for working full time and union membership, and seven dummies for year.

EMPIRICAL RESULTS

White- and Blue-Collar Jobs

Table 2 presents the results from the RIF quantile decomposition for five quantiles (10^{th}, 25^{th}, 50^{th}, 75^{th}, and 90^{th}) and Figure 1 plots the decomposition results for the three groups at each of the 10 different quantiles. As mentioned above, the total gender wage gap is divided into the explained part (differences in characteristics) and an unexplained part (differences in coefficients). The latter component is regarded as discrimination in the

[6] In fact, among blue-collar jobs, the occupation "Elementary Workers (9)" has the highest rate of women employment (49.3%).

labor market. For the entire sample and for blue-collar workers, Table 2 shows that the total gender wage gap is almost equally attributed to the explained and unexplained parts, while the unexplained part is relatively higher for white-collar workers than the explained part for every quantile.

Table 2 Quantile decomposition results

	OLS	10Q	25Q	50Q	75Q	90Q
Whole sample						
Total difference	0.381 (0.001)	0.150 (0.001)	0.333 (0.001)	0.488 (0.001)	0.504 (0.001)	0.423 (0.001)
Difference in characteristics	0.184 (0.000)	0.075 (0.001)	0.171 (0.001)	0.233 (0.001)	0.246 (0.001)	0.204 (0.001)
Difference in coefficients	0.197 (0.000)	0.075 (0.001)	0.162 (0.001)	0.254 (0.001)	0.259 (0.001)	0.219 (0.001)
White collar						
Total difference	0.506 (0.001)	0.346 (0.001)	0.503 (0.001)	0.607 (0.001)	0.567 (0.001)	0.477 (0.001)
Difference in characteristics	0.300 (0.001)	0.256 (0.001)	0.319 (0.001)	0.341 (0.001)	0.329 (0.001)	0.269 (0.001)
Difference in coefficients	0.206 (0.001)	0.091 (0.001)	0.183 (0.001)	0.266 (0.001)	0.238 (0.001)	0.208 (0.001)
Blue collar						
Total difference	0.369 (0.001)	0.078 (0.001)	0.233 (0.001)	0.448 (0.001)	0.580 (0.001)	0.558 (0.002)
Difference in characteristics	0.171 (0.001)	0.018 (0.001)	0.111 (0.001)	0.214 (0.001)	0.278 (0.001)	0.270 (0.001)
Difference in coefficients	0.198 (0.001)	0.061 (0.001)	0.122 (0.001)	0.234 (0.001)	0.302 (0.001)	0.288 (0.002)

Notes: Bootstrap SEs with 100 replications are given in parentheses. All coefficients are significant at 1%.

Since the glass ceiling effect implies that the gender wage gap due to the unexplained part widens toward the top of the wage distribution, it has an increasing shape, showing that the unexplained part of the total wage gap is increasing at the right-hand side of the wage distribution. In Figure 1 (a) and (b), the unexplained gaps for all workers and white-collar workers have an inverse U-shaped pattern, indicating no evidence of a glass ceiling for these groups. However, for blue-collar workers, in Figure 1 (c), although the evidence of a glass ceiling is weaker at the top quantile, the unexplained gap has a mainly increasing shape, showing a strong glass ceiling. This suggests that glass ceilings in Korea may be more likely to occur in blue-collar jobs than in white-collar ones.

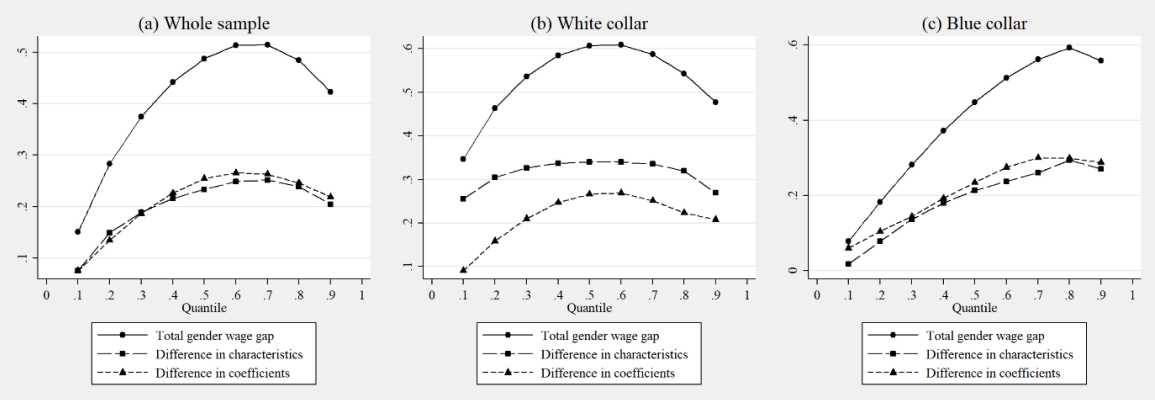

Figure 2 Decomposition of the gender wage gap across distributions

Reflecting on Occupational Gender-Composition and the Dual Market Structure by Firm Size

In the Korean labor market, the occupational gender segregation against women seems to prevail. Therefore, to reflect the occupational gender segregation in the workplace, we divide occupations into male-dominated, female-dominated, and mixed occupations. We follow De Ruijter et al.'s (2003) rule for group classification. That is, a female (male)-dominated occupation is when the women's ratio in a certain occupation is above (below) 15% of the average women's employment rate for all occupations. Applying this classification rule,

51 two-digit-coded occupations are grouped into three types of occupations.[7]

In Figure 2 (a), the unexplained gap has a mainly increasing shape in female-dominated white-collar occupations. The remaining occupations display inverse U-shaped patterns. Therefore, we can conclude that glass ceilings are found in female-dominated occupations, even for white-collar jobs. As shown in Figure 3, the unexplained gaps for all three types of occupations mainly show increasing trends. This result implies that glass ceilings exist in blue-collar jobs regardless of occupational gender composition. Therefore, from the occupational viewpoint, our results suggest that glass ceilings, as a phenomenon, occur in blue-collar and female-dominated occupations in the Korean labor market.

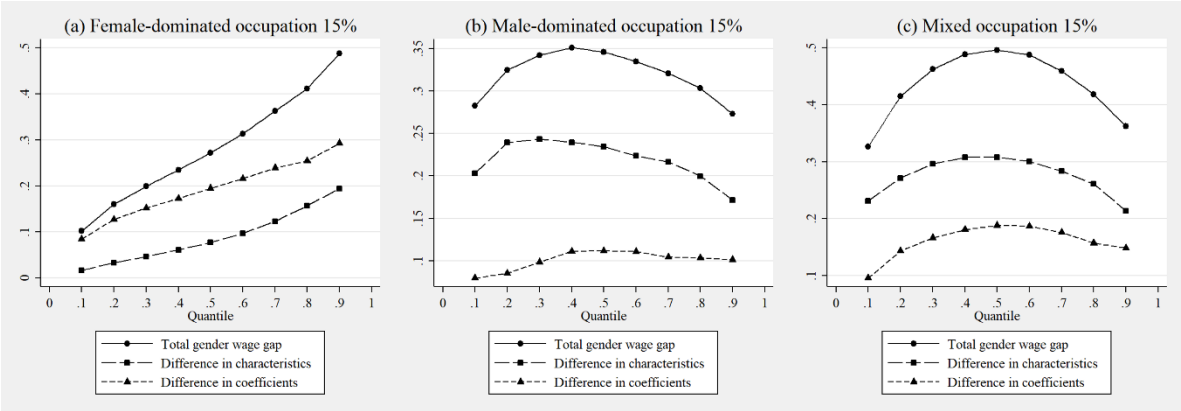

Figure 3 Three types of occupations in white-collar jobs

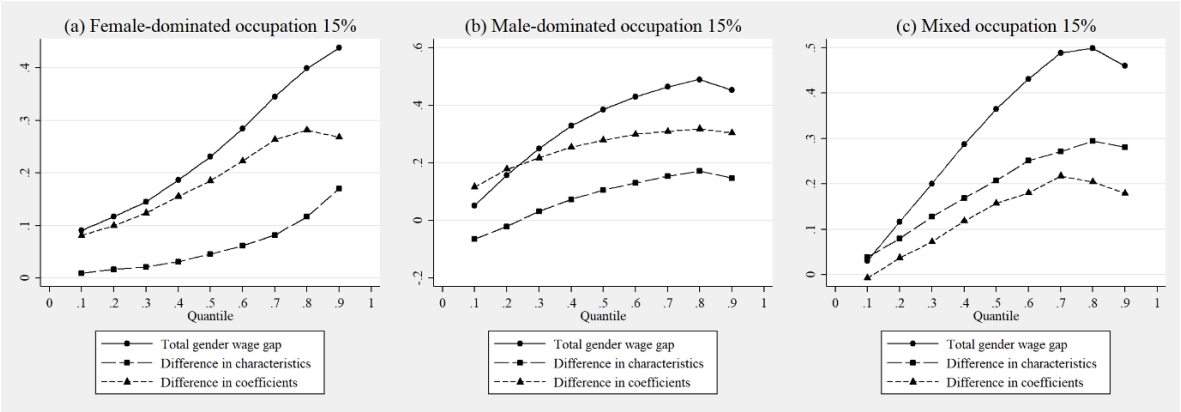

Figure 4 Three types of occupations in blue-collar jobs

In Korea, the dual labor market according to firm size is serious. Indeed, the wage gap between large firms and SMEs in 2016 was than for Korea than for the advanced countries and most female workers are employed in the peripheral sector by relatively small firms, with low-paying jobs, poor working conditions, and limited opportunities for career advancement. Therefore, we consider the interaction between firm size and the glass ceiling effect in the Korean labor market. In Figures 3 (a) and 4 (a), the unexplained gaps have mainly increasing trends in firms with less than 300 employees, while they display an inverse decreasing relationship and U-shaped patterns in firms with more than 300 employees in Figures 3 and 4 (b). The results suggest that glass ceilings exist in SMEs for both white- and blue-collar occupations. That is, considering the dual labor structure, our findings suggest that gender discrimination in relatively small firms increases as the wage quantile shifts from lower to higher levels.

[7] See the three types of occupations from 51 two-digit code occupations in the appendix. Our results remain robust even for the narrow band (e.g., ±20%, ±25%) and the broad band (e.g., ±10%, ±5%).

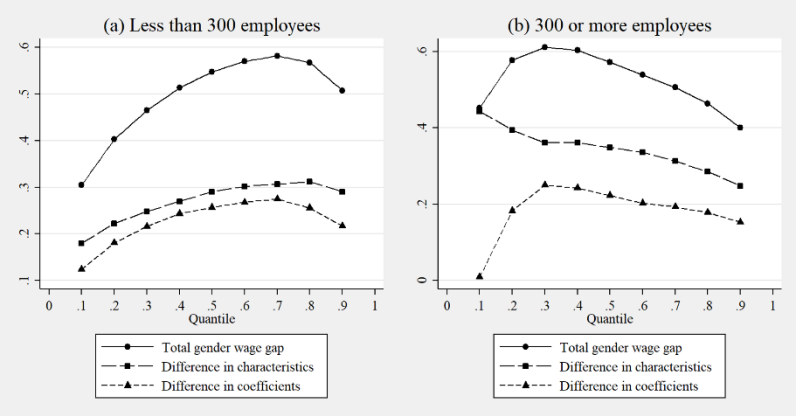

Figure 5 Two types of firm size in white-collar jobs

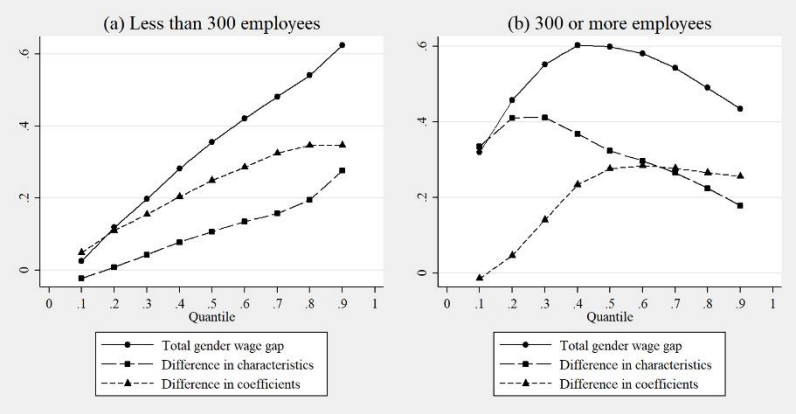

Figure 1 Two types of firm size in blue-collar jobs

CONCLUSIONS

Using the quantile decomposition method of Firpo et al. (2009) and Fortin et al. (2011), this study investigated the evidence of glass ceiling in the Korean labor market. We focused on the glass ceiling effect of white- and blue-collar jobs, as well as that of including realistic features in the Korean labor market, that is, gender segregation in the workplace and dual labor markets according to firm size. First, our results show that glass ceilings may be more likely to occur in blue-collar jobs. In addition, considering occupational gender composition, we found that glass ceilings in the Korean labor market are due to blue-collar jobs and female-dominated phenomena. In case of allowing the interaction between the dual structure by firm size and the glass ceiling effect, our results showed that glass ceilings exist in small and medium- size firms for both white- and blue-collar occupations.

Second, despite the anti-discrimination acts of 2007 and 2014, our evidence indicates that Korean female workers are still discriminated in female-dominated and relatively small working places, as well as in blue-collar jobs with an androcentric culture. Therefore, to alleviate glass ceilings in the Korean labor market, the government should consider diverse gender inequality policies such as the improvement of affirmative actions in peripheral sectors, gender balance at senior leadership levels, and campaigns against gender stereotypes and discrimination. Moreover, similar to Cho and Cho's (2011) assertion, since the dual structure of the Korean labor market can aggravate the gender wage gap, the government's policy direction should simultaneously consider gender discrimination and the dual structure of the labor market.

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