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A Comparative Study of Gender Inequality: Occupational segregation in Japan and Korea*

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Abstract

Gender occupational segregation, or the concentration of women in low-wage occupations, is known as one of the most important sources of gender inequality in the labor market. However, it has rarely been closely examined in both Japan and Korea. We analyze gender occupational segregation and its effects on the wage gap in Japan and Korea. The main data set for Japan is the Social Stratification and Social Mobility Survey of 2005 (SSM 2005) and we use the Korean Labor & Income Panel Study (KLIPS) from year 2009 to 2017 for the analyses of Korea. By using two types of counter-factual decomposition methods (Yamaguchi 2017), we reveal that most of the gender occupational segregation cannot be explained through gender disparities in human capital. In fact, gender occupational segregation increases as human capital is equalized across gender in both countries: this is known as occupational segregation paradox. Women are doubly disadvantaged in both countries, through intra-occupational wage gaps and inter-occupational wage gaps. However, the relative magnitude of the two disadvantages is different in the two countries. In general, Korea shows greater intra-occupational gaps than Japan, which means that women with the same qualifications are paid less than men within the same occupation. However, inter-occupational gaps, meaning women's under-representation in high-wage occupations, are larger in Japan.

JEL classification: J24, J31, J71

Keywords: occupational segregation, gender wage gap, counterfactual analysis, Japan, Korea

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Introduction

Gender occupational segregation, one of the major sources of gender wage gap, is examined in this study[†]. Gender occupational segregation, the concentration of women in relatively low-wage occupation, has hardly been studied both in Japan and Korea. Previous studies on the U.S. confirmed that there exists little gender wage gap within the same occupation once controlling for human capital in the United States (Peterson and Morgan 1995) and thus, numerous researches on gender inequality at work place in the United States has focused on the gender occupational segregation, the disparity in the occupational types held by men and women (Reskin 1993). With contrast to the United States, both Japan and Korea have shown a strong and systematic gender wage gap even after controlling for human capital within each occupation: intra-occupational gender wage gap. We believe, for this reason, gender occupational segregation, has scarcely examined in Japan and Korea. If there exists strong gender occupational segregation in Japan and Korea, however, a simple principle of equal pay for same work cannot be a solution for gender inequality.

We have three major goals in this study. First, the patterns and degrees of occupational segregation are examined and compared. Especially, the index of dissimilarity is employed to measure the extent of the segregation. Second, once the patterns and degrees of gender occupational segregation are identified, we examine how they are associated with gender wage gap by using multivariate linear regressions. Finally, we analyze the data to find whether the gender segregation, and thus, gender wage gap would disappear if we assume that men and women have the same human capital by using two types of counter-factual decomposition methods: an extension of DiNardo-Fortin-Lemieux method (hereafter DFL) and the Matching method (hereafter Matching method) developed by Yamaguchi (2017). DFL method assumes that the demand-side of the labor market changes as the human capital of the women

[†] This research is a direct extension of Yamaguchi's book on gender inequality at workplace in Japan (2019). All statistics for Japan and the U.S. are based on the book.

becomes the same as one of the men under the counter-factual assumption. Thus, for example, if the proportion of women with college graduation is assumed to increase to become identical to the one of men, then the proportion of professional occupations that have large proportions of college graduates will also rise in the population. Unlike the DFL method, the Matching method, however, assumes no change in the proportion of professional occupations under the assumption of increase of women with college graduation. Since the DFL method assumes that the marginal occupational distribution is determined solely by labor supply-side factors, and the Matching method assumes that it is determined solely by labor demand-side factors.

Since occupational distribution depends on both labor supply-side and demand-side factors, we believe that the actual results will fall in a range between the predicted outcomes of these two methods. If both methods reveal that gender occupational segregation (and also, gender wage gap) remain practically the same even after counter-factual treatment, it could be a robust evidence implying that the current serious gender occupational segregation and wage gap can be improved not by enhancing women's qualification such as educational attainment but by enforcing guidelines and regulations of gender equality at workplace.

Data

For Japan, the Social Stratification and Social Mobility Survey for year 2005 is mainly used in the analysis. SSM 2005 is a random sampling survey targeting men and women aged 20–69 years nationwide. We limit the analysis to a sample of the 2,449 employees aged 23–60 years in order to reduce the sample selection bias caused by gender differences in college attendance and retirement age. For Korea, in the beginning, we considered two data sets for the analysis. The first one was the Occupational Wage Survey (OWS) that is an annual business establishment survey conducted since 1970 by South Korea's Ministry of Labor. The

dataset contains detailed information on individual workers' earnings, hours worked, educational attainment, actual labor market experience, occupation, industry, and region. The surveyed establishments must employ at least ten workers and were selected by a stratified random sampling method. The second Korean data considered is the Korean Labor & Income Panel Study (KLIPS) collected by Korea Labor Institute that is a longitudinal data of a representative sample of Korean households and individuals living in urban areas. It annually tracks the characteristics of households as well as the economic activities, labor movement, income, expenditure, education, job training, and social activities of individuals. It started from wave 1 in 1998 and most recent available wave is for year 2017. We chose the KLIPS over OWS because OWS does not provide detailed occupation code, which is discussed in more detail below. For the analyses of both countries, we excluded the respondents who were self-employed.

Unlike their Western counterparts, the proportion of women employed in specific types of well-paid professions is very low in both countries. Thus, in order to examine the extent to which labor supply-side factors of gender differences in human capital explain the lagging female participation in the male-dominated, extremely well-paid professional occupations such as medical doctors in Japan and Korea, we decided to divide the professional occupation, which has usually been treated as a single occupation category in previous studies, into two. Type 2 professionals refer to all human service professionals other than three groups with high-socioeconomic status, namely, college professors, medical doctors, and dentists. And type 1 professionals include all non-human service professions, and college professors, medical doctors, and dentists. As a result, the distinction of eight categories of occupations is used in the analysis: “type 1 professional”, “type 2 professional”, “managerial”, “clerical”, “sales”, “manual non-service”, “manual service”, and “other”. The control variables used in the analysis of gender occupational segregation consisted of the following four variables for both countries:

"educational attainment," "age," "years of service," and "the distinction of regular and non-regular employment."

We decided to use KLIPS rather than OWS for the analysis of Korea because OWS does not provide 3-digit occupational code for professional occupation that is necessary to distinguish between type 1 professional and type 2 professional. Also, Korea has constantly updated its occupational code to accommodate ever-changing dynamics of occupations. The most recent update of occupational code has been done in year 2009: the 6th revision, which is quite compatible to the ones in SSM 2005. For this reason, our analyses are limited to nine years of KLIPS from year 2009 to 2017. The comparison, however, become not based on exact year-match: Japanese SSM is based on year 2005 while Korean KLIPS covers from year 2009 to 2017. Both KLIPS and SSM contained the sampling weight variables and we used them for the analyses unless mentioned otherwise.

Analytic methods

The extent of gender occupational segregation is measured by the dissimilarity index as following.

$$D = \frac{1}{2}\sum_{i}^{8}\left|P_i^M - P_i^W\right|$$

In the above equation, P_i^M represents the proportion of men who take job *i* among all employed men, while P_i^W represents the proportion of women who take job *i* among all employed women. This index refers to the minimum proportion of women (men) who must change their job such that the job distribution for women (men) become equal to that for men (women). This index ranges from zero to one. For example, let's assume there are only two occupational categories for the illustration purpose. In one extreme case where no separation

exists at all and thus, $P_i^M = P_i^W$, the dissimilarity index becomes zero: no need for anybody changes their job to achieve equal job distribution across gender. In the opposite extreme case, let's assume that all men would take one occupation while all women would take another occupation. Then, the dissimilarity index becomes one: all women (men) must change their job to the other job to realize equal job distribution across gender.

Once the structure and extent of the gender occupational segregation are identified from the above analysis, we employ multivariate regressions to examine their relationship with gender wage gap. The analysis of the relationship among gender, occupation, and wages for Japan uses 2005 SSM survey data. SSM 2005 did not collect actual amount of income, but it characterizes income by 30 categories of income range. For each category, the middle value of the income range was scaled by assuming 1 unit per each 1 million yen, with one exception. Because the 30th category was greater than 20.5 million with an unknown middle value, it was assigned a value of 21 for convenience given that this category included only one sample, and therefore, the bias of this assignment can be ignored. The natural logarithmic value of this income scale was then taken as the dependent variable given the well-known skewness of income distribution. Weighting by the sampling weight is not used in the regression analysis. The control variables included in the analysis are educational attainment, employment status, age, years of service, and average weekly working hours. Because the regression models control for working hours, we are virtually observing the effects of other variables on wages. We regress the logarithm of income where control variables, occupations, gender, and the interaction effects of gender and occupation are included as explanatory variables. KLIPS data for Korea is analyzed in an almost identical way except we do not need to transform wage data since it contains actual monthly wage information.

Finally, we decompose gender occupational segregation into "explained degree of segregation" and "unexplained degree of segregation". The decomposition is achieved by the

following two methods. The first is an extension of the DiNardo-Fortin-Lemieux method (DiNardo et al. 1996; Yamaguchi 2017). This method allows us to assume a counterfactual situation in which statistical independence is achieved between gender and other control variables such as age, educational level, and years of employment: for example, there is no statistically significant association between gender and educational level. This is possible by using the “inverse probability of treatment weighting” (IPTW) from the propensity scores. The degree of segregation that remains even in this counterfactual situation is the “unexplained degree of segregation.”

One characteristic of the DFL method is that when counterfactual independence between gender and human capital variables is obtained, the labor demand-side factors are not considered. For example, it assumes that if the proportion of female college graduates becomes the same as that of male college graduates, with which the proportion of college graduates in the aggregate population of men and women should increase, then the proportion of professional occupations that have large proportions of college graduates will accordingly also increase in the population. However, this assumption may not hold because the percentage of people who become employed for each occupation will be affected not only by labor supply-side factors but also by labor demand-side factors. Thus, the Matching method developed by Yamaguchi (2017) shares all the assumptions with DFL method except one: the Matching method keeps the observed marginal distribution of occupations in the total of men and women unaffected even when labor supply-side distribution changes. Thus, for example, when the proportion of female college graduates becomes identical to that of men, the number of female professionals increases, whereas the number of male professionals should decrease. In short, the DFL method assumes that the marginal occupational distribution is determined solely by labor supply-side factors, and the Matching method assumes that it is determined solely by labor demand-side factors. Occupational distribution depends on both

labor supply-side and demand-side factors and thus, the actual results will fall in a range between the predicted outcomes of these two methods.

Results

Results are also offered and interpreted in three parts. First, the degree of gender occupational segregation in Japan, the U.S., and Korea is presented and compared. Next, we interpret the wage gap by gender and occupation in Japan and compare it to Korea's case. This would give us a crucial insight on how and how much gender occupational segregation plays a part in producing gender wage gap in each country. Finally, two kinds of decomposition methods on gender occupational segregation show the degree of unexplained part of the segregation and reveal its association with gender wage gap.

- Inter-occupational segregation: strongest in Japan

Table 1 summarizes the patterns and degrees of gender occupational segregation in three countries. A preliminary analysis showed that gender occupational segregation in Korea seemed to be constant without any significant changes over the last nine years and thus, we decided to present statistics only for year 2009 and 2017: the dissimilarity index in Korea from the whole nine years ranged from 0.33 to 0.37. Although our Japanese data is for year 1995 and 2005 and thus, cannot be directly comparable to Korean data, Japanese seems to show strongest gender occupational segregation among three countries. The extent of the Korean gender occupational segregation is much closer to the one in the United States.

[table 1 about here]

Also, unlike the USA, both Japan and Korea showed very strong gender occupational segregation between type 1 professional and type 2 professional, which is confirmed by high

odds-ratios in the table. And if we limit our analysis to year 2005 in Japan, Japanese gender occupational segregation between type 1 professional and type 2 professional is extremely strong. The biggest difference among three countries comes from the proportion of type 1 professional jobs among women. 12.7% of US women took type 1 professional job while it dropped about half (6.2%) in Korea and shrank to mere 1.8% in Japan. Based on these results, we can conclude that on average, inter-occupational segregation is strongest in Japan among three countries, followed by Korea, and the USA, in that order. This is confirmed by the dissimilarity index and odds-ratios in table 1. In this sense, the devaluation theory (England 1992; England et al. 1994) that states that the labor market undervalues skills required for occupations in "nurturant work" where women are over-represented is valid to some extent in both countries.

Additional differences in general occupation structure would be worth mentioning. Unlike Japan and the USA, Korea shows very small proportion of managerial occupation both in men and women. Also, compared to Japan and the USA, Korea shows large proportion of 'manual, non-service' occupation both in men and women.

- Structure of wage gap: intra/inter occupation gender gap

The results for Japan, the odds of relative wages—with male clerical occupation as the base of comparison set at value 1 —by occupation and gender, are presented in figure 1.

[figure 1 about here]

As indicted above, the disparity between men and women is the smallest among type 1 professions, followed by managerial occupations. Although not statistically significant, the average wage of women in these two categories exceeds that of male clerical occupations.

However, the gender disparities are large for all other occupations. Particularly surprising is the fact that women's average wage in female-dominated type 2 professions is lower despite being professional occupations than men's average wage, not only of clerical occupations but also of for all categories, including blue-collar occupations.

The result reveals that Japanese women face a dual handicap regarding wages as a result of occupational segregation. First, the proportion of women is extremely low in occupations with highest wages and low intra-occupational gender wage disparities (type 1 professions and managerial occupations). Second, intra-occupational gender wage disparities are extremely high in white-collar occupations with a higher concentration of women (type 2 professions and clerical occupations). Thus, the predicted likelihood that further gender equalization of educational attainment results in a shrinking gender wage gap is very low, assuming other conditions remain unchanged.

Almost identical analysis is done by using Korean KLIPS and the figure 2 summarizes the results for four years. Two findings about the trend in figure 2 are worth mentioning. Over nine years, the wage gap among men in different occupations has shrunk sharply. Wage gap, however, among women seems to remain still. Thus, we can conclude that Korea has improved wage inequality over nine years, but the enhancement was made only among men across different occupations. There has been little improvement in gender wage gap over the period. Also, in year 2017, even female 'managerial' workers received lower wage than male 'manual, non-service' workers after controlling for human capital. This is based on very low wage for female managers in the occupation of 'health and social service related' in year 2017. This extraordinary low income for managerial women occurred only in year 2017 and thus, we need further data and analyses on this subject to obtain a robust conclusion.

[figure 2 about here]

Now, for easier comparison between Japan and Korea, figure 3 summarizes only year 2017 by using the same format as figure 1. Unlike Japan, type 2 professional, the occupation where Korean women are severely overrepresented, has lower wage even than male 'manual, non-service' workers. Regarding intra-occupation gender wage gap, in general, Korea shows much bigger amount of gap compared to Japan: strong intra-occupation gender gap.

[figure 3 about here]

Especially, intra-occupation gender wage gap within type 1 professional and managerial occupation is strikingly different between two countries. In Japan, intra-occupation gender wage gaps in these two occupations are smallest among all occupations while they are almost largest in Korea. This is interesting difference since these two occupations, on average, tend to pay best among all occupations. Because of largest gender wage gap within each occupation, Korean women even in these two very well-paid occupations end up with lower wage than almost any other male workers. Japanese women in both occupations, however, enjoy better wage than most male workers. The smallest intra-occupation gender wage gap in Korea occurs in type 2 professional but it doesn't help to increase Korean women's wage since unlike Japan, wage in type 2 professional is not high even for men.

Although both countries show strong gender wage gap, there exist a substantial difference between them. As summarized in dissimilarity index and odds-ratio in table 1, Japanese women are suffering from serious inter-occupation gender gap. Although Korean women are also suffering from inter-occupation gender gap, their bigger problem lies in intra-occupation gap. From multivariate regression models used for figure 1, figure 2, and figure 3, we can confirm that after controlling for human capital and also, occupation types, Korean women, on average, earned only 68% of men's wage while Japanese women received 76% of Japanese men's wage (results are not show).

- Occupational segregation paradox: counterfactual decomposition results

Table 2 presents the main outcomes of changes in the degree of gender occupational segregation based on the counterfactual situation in which the distributions of covariates – age, educational level, years of service, and employment status - for women become identical to those for men. As introduced early, the DFL method allows the marginal occupational distribution changes in response to changes in labor supply while in the Matching method, the marginal distribution remains constant. Statistical independence using the inverse-probability of treatment (IPT) weighted data between each variable and gender were also verified. It also presents the occupation distributions by gender as predicted by their respective counterfactual situations and the values of their segregation index. The occupation distributions for men in the sample are the same for the DFL method because, if the covariate distributions for women become equal to those of men by keeping men's covariate distributions unchanged, the occupation distribution changes only for women and remains unchanged for men for the supply-side driven DFL method.

[table 2 about here]

The most striking result is that if job qualification for women becomes identical to that for men and thereby gender equalization of educational attainment, age, employment status, and years of service is realized, the degree of occupational segregation between men and women increases even further in both countries: gender segregation paradox. For Japan, we predict that the equalizations will further increase female dominated type 2 professions by 13.8 percentage point change and further decrease female-underrepresented nonservice manual occupations among women by 5.4 percentage point change, and thereby generate an increase in gender occupational segregation. Meanwhile, according to the Matching method

results in which the occupational distribution summed over gender categories is held constant, increases in the proportion of women in type 2 professions are suppressed given restrictions in the further decline in the proportion of men in the already male-underrepresented type 2 professions in Japan: only 2.5 percentage point change. As a result, the increased degree of occupational segregation under the Matching method in Japan becomes smaller than that under the DFL method.

Korea also shows similar results from two counter-factual decomposition methods. Under the DFL method, number of people who take jobs in type 2 professionals and clerical, in which women were already over-represented, increases among women by respectively, 4.1 percentage point and 5.7 percentage point, and thus makes the occupational segregation worse (please refer to supplement table 1, S1 for percentage point change in occupational distribution). This change raises the dissimilarity index from 0.35 to 0.39. The Matching method produced a similar result with a bit higher dissimilarity index.

In order to measure the effect of changed occupational distribution on the wage, we calculated expected wage for men and women, respectively, under the assumption of wage gap by gender and occupation for each country in figure 1 and figure 3. The expected gender wage ratio is the women's average wage as the portion of men's average wage and presented in table 2. For example, we can expect that in Japan, women's average wage is only 78% of the men's wage when we assume the following two: first, the occupational distribution for each gender is the same as the actual sample in year 2005 and second, the wage distribution by gender and occupation follows the pattern in figure 1. Table 2 reveals that even under the assumption of newly changed occupational distribution, their wage will be only about 80% of the men's wage, which is not substantially different from the current ratio, 78%. This little improvement is due to strong inter-occupation gender gap in Japan: women with college

degree would take type 2 professional jobs where women's wage significantly lower than men's wage and thus, this kind of changes could not improve gender wag gap.

Korea also cannot expect any significant improvement from changed occupational distribution for a different reason. Table 2 shows that the current gender wage ratio (0.72) rises to 0.74 under DFL method and to 0.75 under the Matching method. Unlike Japan, this little improvement is driven by intra-occupation gender gap rather than inter-occupation gender gap. As figure 3 shows, Korean women's wage is markedly lower than men's wage even among type 1 professionals or managerial positions. Their wage is even lower than men in non-service manual occupation. Thus, moving to different occupation does not help to bring any meaningful increase in Korean women's wage.

Conclusion

Regarding gender occupation segregation, both similarities and dissimilarities between Japan and Korea are observed. Both countries are suffering from serious gender segregation of occupations with compared to the USA. However, Japan showed the strongest gender occupation segregation out of three countries. For example, 12.7% of US women took type 1 professional job while the proportion fell about half (6.2%) in Korea and withered to 1.8% in Japan. Both dissimilarity index and odds-ratios in table 1 confirmed that gender occupation segregation is strongest in Japan followed by Korea, and the USA, in that order. Also, counter-factual decomposition methods reveal that this strong gender segregation of occupation gets worse when women's qualification improves: occupational segregation paradox. Because this paradox is the result from the counter-factual analyses that assumes the equality of women's qualification with men's one, we believe the current strong gender occupation segregation has little to do with supply-side of labor. We believe demand-side of labor such as statistical

discrimination against women by employers (Beilby an Baron 1986; Phelps 1972) are mainly responsible for the segregation.

The difference between Japan and Korea becomes obvious when we take wage gap by gender and occupation into account, revealed in figure 1 and figure 3. Japanese women are under strong inter-occupation gender gap, meaning that, for example, Japanese women with college degree are highly over-represented in type 2 professional in which average wage is relatively low while they are extremely under-represented in type 1 professional occupation. This kind of inter-occupation gender gap is much weaker in Korea. About 8% of Korean women (with compared to mere 2% of Japanese women) are type 1 professionals, for example. However, Korean women are suffering from different gender gap: intra-occupation gender gap. Their wage is substantially lower than male counterparts within each occupation. Their wage is so low that even type 1 professional women get lower wage than non-service manual men. Thus, although women in both countries are suffering from two types of disadvantages, inter-occupation and intra-occupation gender gap, relative severity of two disadvantages are different. Inter-occupation gender gap is a bigger obstacle for Japanese women while Korean women are suffering from intra-occupation gender gap more.

Because of this double disadvantage, even if women's qualification such as educational attainment and employment duration improves so that it is identical to men's one, change of women's wage would be a little, if there is any. Japanese women, for example, with college degree, would take a type 2 professional job where they can't expect great wage gain. Also, Korean women would not gain any meaningful wage increase since whichever occupation they move to, there will be strong intra-occupational gender wage gap. Thus, in order to improve gender inequality of wage in both countries, we believe that changes in demand-side such as enforcing governmental guidelines or regulations on firms are essential. In Korea,

regulations on each work place to reduce intra-occupation gender wage gap would be more effective while government guidelines or laws covering across occupations such as refraining from making employment or placement decisions based on gender would be more effective in Japan.

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	Japan 1995		Japan 2005		USA 2005		Korea 2009		Korea 2017	
	men	women	men	women	men	women	men	women	men	women
type 1 professional	0.094	0.019	0.116	0.018	0.156	0.127	0.167	0.062	0.175	0.075
type 2 professional	0.048	0.142	0.041	0.196	0.043	0.208	0.042	0.209	0.039	0.214
managerial	0.101	0.012	0.1	0.007	0.108	0.075	0.017	0.003	0.020	0.007
clerical	0.218	0.345	0.167	0.33	0.07	0.219	0.182	0.221	0.190	0.226
sales	0.093	0.113	0.131	0.104	0.106	0.12	0.066	0.102	0.065	0.101
manual, non-service	0.294	0.197	0.305	0.159	0.255	0.047	0.458	0.265	0.437	0.228
manual, service	0.031	0.132	0.026	0.136	0.106	0.155	0.025	0.129	0.036	0.139
other	0.121	0.04	0.114	0.05	0.156	0.05	0.043	0.009	0.038	0.010
index of dissimilarity	0.342		0.428		0.3765		0.346		0.350	
odds-ratio*	14.6		30.8		5.9		13.4		12.8	

Table 1. Gender segregation of occupations: Japan, USA, and South Korea

* This is the odds-ratio of male vs. female with compared to type 1 professional vs. type 2 professional. For example, 14.6 for year 1995 in Japan means that Japanese men are 14.6 times more likely to have a type 1 professional job rather than type 2 professional job with compared to Japanese women in year 1995. The higher the odds, the bigger gender segregation between two professional occupations.

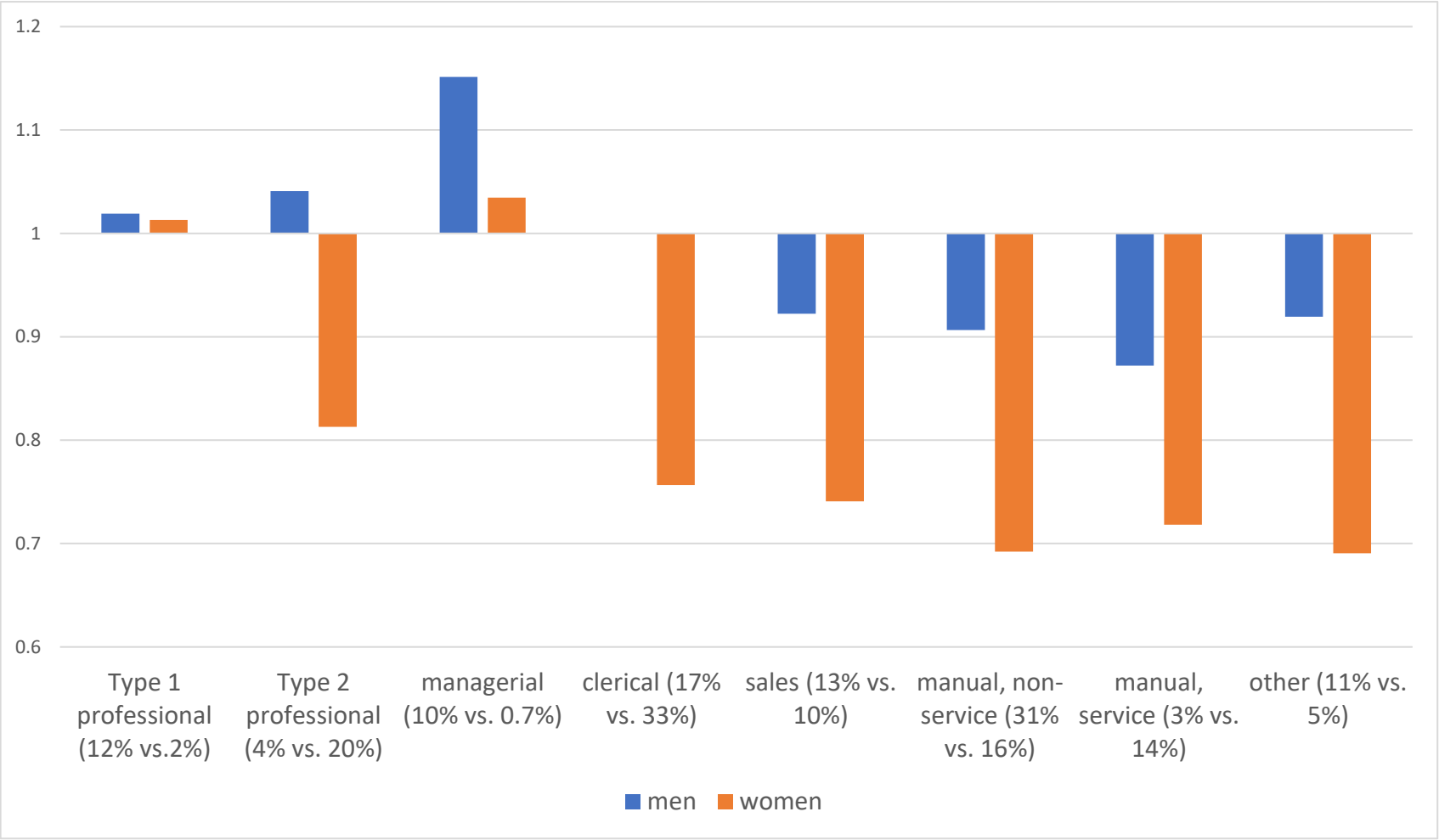

Figure 1. Relative wage by gender and occupation in Japan ("men, manual, non-service" = 0) (adapted from Yamaguchi, 2019, page 97)

* Percentages in parentheses showed that proportion of people in the respective occupation for each gender. For example, 12% of men took type 1 professional job while only 2% of women did.

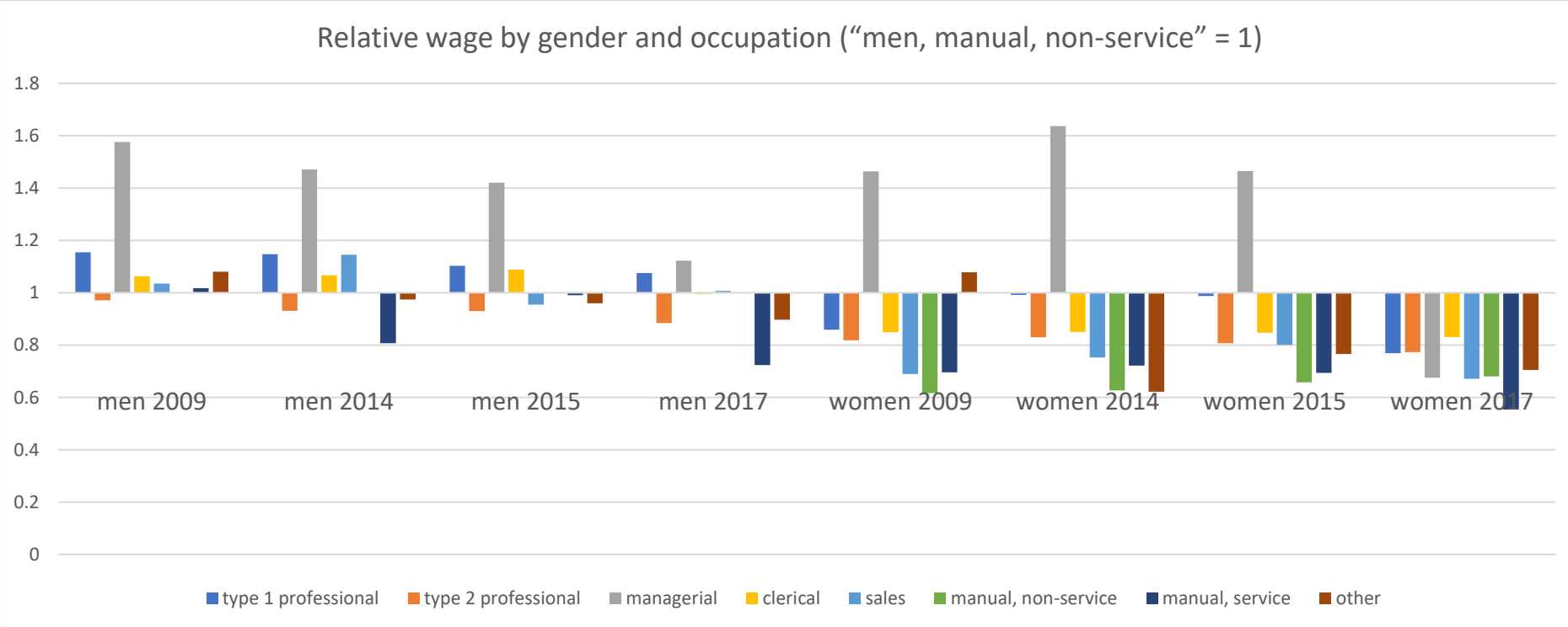

Figure 2. Trends of relative wage by gender and occupation in Korea (“men, manual, non-service” = 1)

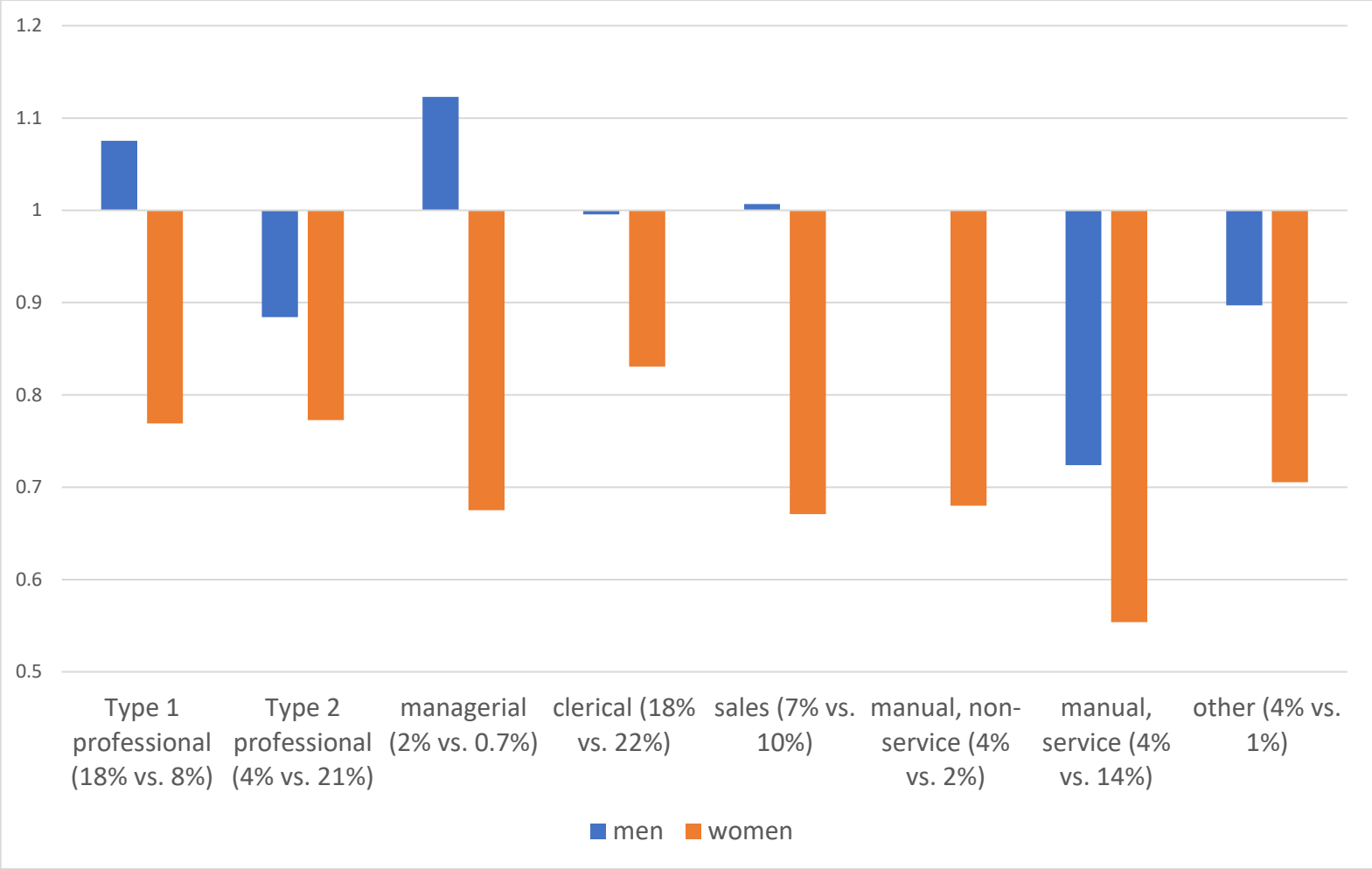

Figure 3. Relative wage by gender and occupation in 2017 Korea ("men, manual, non-service" = 1)

* Percentages in parentheses showed that proportion of people in the respective occupation for each gender. For example, 18% of men took type 1 professional job while only 8% of women did.

	Japan 2005						Korea 2017					
	sample		DFL		Matching		sample		DFL		Matching	
	men	women	men	women	men	women	men	women	men	women	men	women
type 1 professional	0.116	0.018	0.116	0.038	0.093	0.042	0.175	0.075	0.175	0.084	0.166	0.089
type 2 professional	0.041	0.196	0.041	0.334	0.018	0.221	0.039	0.214	0.039	0.255	0.03	0.227
managerial	0.1	0.007	0.1	0.015	0.093	0.015	0.02	0.007	0.02	0.012	0.017	0.011
clerical	0.167	0.33	0.167	0.299	0.165	0.332	0.19	0.226	0.19	0.283	0.159	0.269
sales	0.131	0.104	0.131	0.084	0.136	0.098	0.065	0.101	0.065	0.084	0.072	0.094
manual, non-service	0.305	0.159	0.305	0.105	0.332	0.13	0.437	0.228	0.437	0.168	0.474	0.181
manual, service	0.026	0.136	0.026	0.104	0.029	0.132	0.036	0.139	0.036	0.103	0.044	0.128
other	0.114	0.05	0.114	0.022	0.135	0.028	0.038	0.01	0.038	0.012	0.036	0.013
index of dissimilarity	0.43		0.50		0.47		0.35		0.39		0.41	
expected gender wage ratio*	0.78		0.80		0.80		0.72		0.74		0.75	

Table 2. Occupational distributions: based on sample, DFL, and Matching model

* Under the assumption of wage gap by gender and occupation in figure 2 and figure 3, we calculate the women's average wage as the ratio of men's average wage. From the counter-factual treatment, we only changed the occupational distribution. We did not consider the effect on the wage based on the changed job qualification such as educational attainment or employment duration.

[Supplement]

	Japan 2005			Korea 2017		
	DFL	Matching		DFL	Matching	
	women	men	women	women	men	women
type 1 professional	2	-2.3	2.4	0.9	-0.9	1.4
type 2 professional	13.8	-2.3	2.5	4.1	-0.9	1.3
managerial	0.8	-0.7	0.8	0.5	-0.3	0.4
clerical	-3.1	-0.2	0.2	5.7	-3.1	4.3
sales	-2	0.5	-0.6	-1.7	0.7	-0.7
manual, non-service	-5.4	2.7	-2.9	-6	3.7	-4.7
manual, service	-3.2	0.3	-0.4	-3.6	0.8	-1.1
other	-2.8	2.1	-2.2	0.2	-0.2	0.3

Table S1. Percentage point change of occupational distributions under DFL method and Matching model

* This is calculated based on table 2. For example, Under the assumption of the DFL, the proportion of type 1 professional workers among women increase by 2 percentage point (from 1.8% to 3.8%). Since, under the assumption of the DFL, the proportion would not change for male workers, we did not include men's percentage point change in the table.