The Effect of Gender Differences in Fields of Study on Precarious Youth Employment:

Comparing University-Educated Non-Regular Employees in Japan and South Korea

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1 Introduction

Even though gender disparities in higher education have substantially narrowed in Japan and South Korea (henceforth, Korea) (Ishida 2007; Park 2007), these countries still grapple with substantial gender disparities in several areas, such as earnings, economic participation, and political empowerment (OECD 2023; World Economic Forum 2023). Moreover, gender disparities in Japan and Korea even extend to employment types. Already in early career stages, the number of individuals engaging in non-regular employment has been gradually increasing (太郎丸 2009). Among young non-regular workers, particularly females are overrepresented in these countries (Hwang and Baek 2008; 小杉 2010; Yoo et al. 2014), facing disadvantages not only in terms of remuneration but also job security and training opportunities (OECD 2014). Females in Japan and Korea also face greater challenges when they transition from non-regular to regular employment than their male counterparts (小杉 2010; Cho 2015).

Social scientists have emphasized considering qualitative differences in higher education, such as fields of study, to understand why the gender gap in the labor market is widespread and persistent despite females' increased access to higher education (Gerber and Cheung 2008). Despite the growing scholarly attention focused on fields of study, our knowledge of gender disparities in East Asian societies remains limited. Only a limited number of studies focus on gender pay gaps in Japan and Korea, paying attention to gender segregation in field choices (山本・安井 2016; Koo and Yoon 2021; Shin and Kim 2021; 武内 2021). Research addressing gender disparities

in employment associated with field choices primarily compares European societies (e.g., Smyth 2005; Giesecke and Schindler 2008; Smyth and Steinmetz 2008; Reimer and Steinmetz 2009), limiting our understanding of whether the same findings also apply in non-European contexts.

To fill this void, this study explores whether East Asian graduates experience gender disparities in their first jobs' employment types due to their gender-differentiated field specialization by comparing Japan and Korea. Given the gender differences in field choices in Japan and Korea, which garner their particular importance in comprehending persistent gender disparities in these societies [1] (Yamaguchi 2019; Shin and Kim 2021), the current study is expected to contribute to our understanding of field choices among Japanese and Korean graduates and their effects on shaping gender disparities in early careers. The next section develops a theoretical framework for investigating fields of study to explain labor market disparities among graduates. After extending the framework from a gender perspective, I introduce an analytical approach and establish models for Japanese and Korean graduates. Based on the analysis results, this study concludes with practical suggestions for achieving gender parity in Japan and Korea.

2 Theoretical Framework and Previous Research on Fields of Study and Disparities in Labor Market Outcomes

Education serves as an investment in human capital that can increase individuals' productivity through the acquisition of knowledge and skills, leading to higher earnings (Mincer 1974; Becker 1993). Fields of study serve as specialized human capital investments that may offer specific occupational knowledge and skills (Kalmijn and van der Lippe 1997; van de Werfhorst 2002; Shauman 2006). Therefore, when occupations and fields match in terms of skills, earnings levels increase (van de Werfhorst 2002). However, as their degrees do not provide occupational skills, but generic skills, humanities graduates encounter challenges in securing matching

[1] Females' underrepresentation in STEM fields is considered to cause gender disparities in holding professional positions and high-paying jobs in Japan and Korea (Yamaguchi 2019; Koo and Yoon 2021; Shin and Kim 2021).

occupations (Wolbers 2003; 金 2008). Moreover, even when they have matching occupations, humanities degree holders do not experience earnings increases because of the general skills their fields offer (van de Werfhorst 2002; Ortiz and Rodriguez-Menés 2016).

Empirical studies substantiate these theoretical premises, particularly in terms of how the humanities exacerbate their holders' job opportunities. In both Korea and Japan, degree holders in medical-related fields (e.g., medical science, nursing, dentistry, and pharmacy), social sciences (e.g., law, economics, and business), and engineering fare better than humanities degree holders in securing high-paying jobs and regular employment (Lee 2004; Hwang and Baek 2008; Kil and Choi 2014; Yoo et al. 2014; Jung 2015; Koo and Yoon 2021; 武内 2021; 髙松 2008, 2022a).

3 Factors Causing Gender Differences in Field Choices

Given that fields of study are closely linked to labor market disparities, we need to pay particular attention to students' gender, since gender may play a key role in shaping students' field choices. Students make field choices by considering their future occupational plans (Daymont and Andrisani 1984; Mann and DiPrete 2013; Morgan et al. 2013; Finger et al. 2020; 髙松 2022b; 増井 2023[2]). Sociologists and social psychologists have established theories emphasizing that cultural factors shape gender differences in occupational preferences. A host of studies have documented that gender stereotypes shape students' tastes and self-perceptions through socialization based on their parents' and teachers' expectations (e.g., Baker and Entwisle 1987; Konrad et al. 2000; Charles and Bradley 2002, 2009; Cech 2013). Gender stereotypes are transferred to students, with masculine stereotypes characterized by analytical and physical abilities, and feminine stereotypes associated with altruistic and social-interactive characteristics (Konrad et al. 2000; Barone 2011). Gender roles are also pivotal factors that contribute to gendered preferences. The different roles of males as breadwinners and females as caregivers and homemakers lead to male preferences for high-paying

[2] Along with students' occupational orientation, 増井 (2023) argues that family orientation influences Japanese females' field choices. Japanese females with weak family orientation opt for medical and social work fields to achieve economic independence (増井 2023).

jobs in contrast to female preferences for jobs that allow reconciling work and family responsibilities (Polachek 1978; Konrad et al. 2000; Hakim 2002).

Although social scientists focus on the internalization of gender norms, there is also the possibility that these norms function as social constraints in which students are sanctioned by their friends and parents when they do not follow them (Ochsenfeld 2016). Additionally, traditional gender norms are extremely resilient even in modern societies where individual choices are highly valued, since the norms do not necessarily conflict with gender equality and are regarded as voluntary choices (Charles and Bradley 2002; Cech 2013; Levanon and Grusky 2016). As a result, influenced by gender roles and gender stereotypes, females are overrepresented in fields associated with low-paying occupations, such as the humanities, social work, and teaching, while males primarily specialize in science and engineering, whose pecuniary returns are expected to be substantial in the labor market (Davies and Guppy 1997; Kalmijn and Lippe 1997; Cech 2013; Ochsenfeld 2016; Finger et al. 2020).

The discussion thus far emphasizes the two-step mechanism underlying gender differences in field choices and labor market outcomes. First, humanities degree holders do not experience favorable labor market outcomes because of their lack of occupational competencies. Second, females have preferences for the humanities since the field aligns with their gender roles and gender stereotypes. Based on these mechanisms, we hypothesize that *females are more likely to hold non-regular employment contracts than their male counterparts because of their concentration in the humanities.*

4 Data and Methods

Data

The analyses in this comparative study are based on two comparable national survey data sets. First, for Japan, I use nationwide cross-sectional survey data on Social Stratification and Social Mobility (SSM). The SSM survey has been conducted every ten years since 1955. For the analyses, I utilize data from 2005 and 2015. The SSM survey contains a survey item on respondents' first jobs. Given its primary interest in qualitative differences in higher education, the current study limits the population of

interest to four-year university graduates to provide insight into how horizontal segregation, rather than vertical segregation, brings about gender disparities (3).

Second, for Korea, I use data from the Korean Labor and Income Panel Study (KLIPS), collected by the Korea Labor Institute since 1998. The KLIPS is a longitudinal survey with a representative sample of Korean households and individuals. New samples were added to the KLIPS in 2009 (12th wave) and 2018 (21st wave). The latest available dataset covers 2021 (4). The KLIPS offers data in which individuals' retrospective information on work history is traceable along with their educational background. As for the SSM, I only include data from four-year university graduates. These two data sets were in use when comparing non-regular employment and the gender pay gap in Japan and Korea (Lee and Shin 2017; Youm and Yamaguchi 2019).

Variables

The dependent variable is a dummy variable representing the employment type of graduates' first job, distinguishing between regular employment (reference group) and non-regular employment. For the SSM, regular employees are defined as individuals holding non-fixed-term contracts. After excluding non-wage workers, such as employers, self-employed workers, family workers, and side-job workers, I created a category for non-regular employees, including temporary and part-time workers, dispatch workers, and contract workers. For the KLIPS, I define regular employees as those with non-fixed-term contracts. Non-regular employees are defined as those who work on a temporary or daily basis. Similar to the SSM approach, I exclude non-wage workers from the analyses. Unfortunately, I cannot use the same definition for non-regular employees because the SSM and KLIPS use different survey items in their questionnaires. Although part-time workers do not have fixed-term contracts,

(3) Horizontal segregation refers to distributional differences in fields of study, while vertical segregation refers to level differences (e.g., two-year colleges versus four-year universities) (Charles and Bradley 2002, 2009).

(4) Note that SSM and KLIPS data sets do not exactly match in terms of survey years. The SSM covers the years 2005 and 2015, while the KLIPS covers the years between 1998 and 2021. I included the recent data from the KLIPS to retrieve as much information as possible. In the KLIPS, work history is surveyed for the first-wave respondents and new cohorts that were added in 2009 and 2018. If respondents graduate from a school and obtain a job, their employment status is additionally surveyed. For instance, those who graduated in 2020 and obtained a job in 2021 are newly surveyed on their employment status.

temporary and part-time workers are not mutually exclusive (Osawa et al. 2013). Temporary and part-time workers frequently lack enrollment in social insurance programs, which impedes their eligibility for unemployment benefits, thereby rendering them as precarious workers (Osawa et al. 2013).

The main independent variables comprise fields of study, university type/location, and job start cohorts. The fields of study used in the analyses are as follows: humanities (reference group), social sciences, STEM [5], medicine, education, and entertainment and physical education. To ensure comparability, I recoded fields of study using SSM data, excluding miscellaneous, home economics, and merchant marines. I dropped home economics and merchant marine fields because comparable categories were not found in the KLIPS. Physical education, originally included in the education category in the SSM data, was separated and combined with music and arts into "entertainment and physical education". Due to the limited number of Japanese females in natural sciences and engineering, I combined them, creating the "STEM" category. Regarding the remaining fields, I prioritized using broad and not detailed classifications. The KLIPS offers information on individuals' fields of study, including the humanities, social sciences, natural sciences, engineering, medicine, education, music, arts, physical education, and miscellaneous. From these categories, I integrated music, arts, and physical education into "entertainment and physical education" and dropped the miscellaneous category while merging natural sciences and engineering into the "STEM" category.

To reflect differences between "prestigious institutions" and "non-prestigious institutions", I distinguished universities by national-funded and non-national-funded institutions (public and private universities) for the SSM (e.g., 武内 2021; 高松 2022a). For the KLIPS, the location of universities is controlled, which consists of Seoul (the capital city of Korea) and regional areas (e.g., Lee 2004; Hwang and Baek 2008). Finally, job start years are coded for both Japan and Korea, ranging from 1950 to 2020. I additionally coded a square term of job start years to capture non-linear effects.

Table 1 shows the descriptive statistics for Japanese and Korean university graduates in the data used in the analyses. Over 90% of males in both countries begin

[5] STEM stands for sciences, technology, engineering, and mathematics.

their first job as regular employees. A relatively small percentage of them commence their careers as non-regular employees, constituting approximately 9~10% of the entire male population. On the other hand, females in Japan and Korea show a much higher rate of non-regular employment for their first jobs relative to their male counterparts: approximately 19~22% of females hold non-regular employment contracts for their first jobs.

Table 1 Descriptive Statistics

	Japan		Korea	
	male (N=935)	female (N=482)	male (N=1438)	female (N=980)
Job Start Year				
Mean(SD)	1990 (16.6)	1990 (13.8)	2000 (12.9)	2010 (10.4)
Fields of Study				
Humanities	55 (5.9%)	165 (34.2%)	383 (26.6%)	406 (41.4%)
Social Sciences	467 (49.9%)	128 (26.6%)	212 (14.7%)	136 (13.9%)
STEM	302 (32.3%)	38 (7.9%)	728 (50.6%)	229 (23.4%)
Medicine	37 (4.0%)	36 (7.5%)	27 (1.9%)	67 (6.8%)
Education	42 (4.5%)	67 (13.9%)	27 (1.9%)	56 (5.7%)
Entertainment and Physical Education	32 (3.4%)	48 (10.0%)	61 (4.2%)	86 (8.8%)
University Type/ Location				
National/ Seoul	198 (21.2%)	95 (19.7%)	387 (26.9%)	245 (25.0%)
Non-National/ Region	737 (78.8%)	387 (80.3%)	1051 (73.1%)	735 (75.0%)
Employment Type				
Regular	844 (90.3%)	390 (80.9%)	1310 (91.1%)	767 (78.3%)
Non-Regular	91 (9.7%)	92 (19.1%)	128 (8.9%)	213 (21.7%)

Data: Social Stratification and Social Mobility Survey (SSM, Japan) 2005, 2015 and Korean Labor and Income Panel Study (KLIPS, Korea) 1998~2021.

Methods

To analyze the impact of gender differences in fields of study on the likelihood of entering non-regular employment as one's first employment relationship, I use linear probability models. Linear probability models are simple OLS regressions used with binary dependent variables that yield results in terms of probability changes (Mood

2010: 78; Karlson et al. 2012: 299). I report robust standard errors to overcome the violation of the homoscedasticity assumption. After building linear probability models for each country, I conduct a mediation analysis using multigroup structural equation modeling to examine the differences in academic fields' mediating effects on the relationship between gender and non-regular employment rates across countries. Linear probability models are used to build a structural equation model.

For the analyses, I use R software with version 4.3.1. Robust standard errors are computed with packages "lmtest" by Zeileis and Hothorn (2002) and "sandwich" by Zeileis (2004) and Zeileis et al. (2020). For structural equation modeling, I use the "lavaan" package by Rosseel (2012). Bootstrapping is used to compute the standard errors in structural equation modeling.

5 Results

Figure 1 shows the female ratio for each field of study. In the bar graphs, the black columns on the left side represent the ratio of Japanese females and the right white columns represent that of Korean females. Only a small proportion of females specialize in STEM in both countries. Among those majoring in STEM, approximately 11% of the Japanese and 24% of the Koreans are female. Females also appear to be less majoring in social sciences, although Korean females tend to specialize more in this field than their Japanese counterparts. In Japan, 22% of social sciences degree holders are female. In Korea, females account for almost 40% of all social sciences holders. As far as the humanities and medicine are concerned, we observe clear differences between the two countries. In Japan, females account for 75% of humanities degree holders, whereas humanities degree holders in Korea are evenly distributed between males and females. In the case of medicine, Korean females are concentrated in this field, accounting for approximately 70% of Korean medicine graduates, whereas Japanese graduates are evenly distributed across genders.

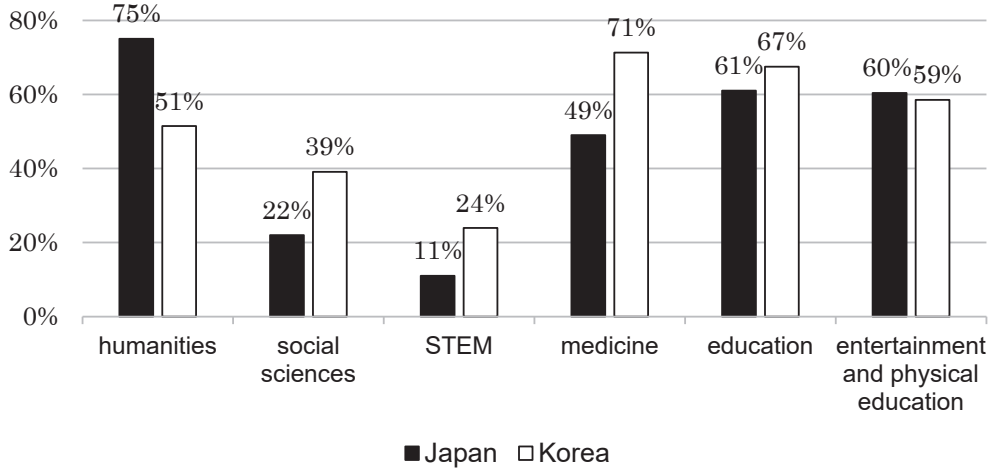

Figure 1 Ratio of Females in Each Field of Study in Japan and Korea

Figure 2 (Japan) and Figure 3 (Korea) demonstrate the distribution of employment types in each field of study. In both countries, the humanities have the second highest rate of non-regular employment, with 20.0% in Japan and 16.9% in Korea, followed by entertainment and physical education. Interestingly, the occurrence of non-regular employment varies by academic fields and is more pronounced in Japan than in Korea. For instance, when we compare the share of non-regular employees in the humanities and STEM fields, the difference amounts to 12.1 percent points in Japan and 5.9 percent points in Korea. The differences between the humanities and social sciences in terms of non-regular employment rates are 9.7 percent points and 3.1 percent points in Japan and Korea, respectively. I built a log-linear model to figure out whether the differences between Japan and Korea are statistically significant in terms of gender distribution in fields and non-regular employment rates. The model returns a result of $p<0.001$, supporting the differences between the two countries (results not presented here). In summary, our preliminary tests indicate that the Japanese female population, but not the Korean female population, is concentrated in the humanities. Non-regular employment rates vary across fields in Japan, and this tendency is much less pronounced in Korea.

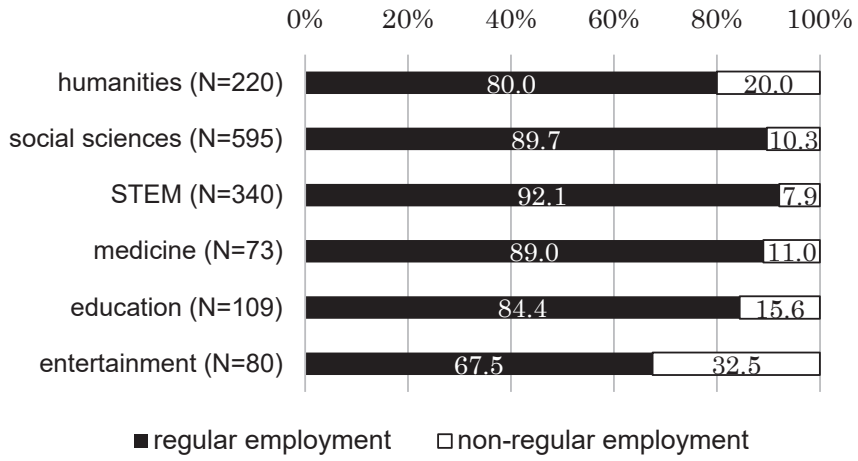

Figure 2 Distribution of Employment Types in Each Field (Japan)
Note: Row percentage. $\chi^2(d.f.)= 49.279(5)$. $Pr < 0.001$. $N = 1417$.

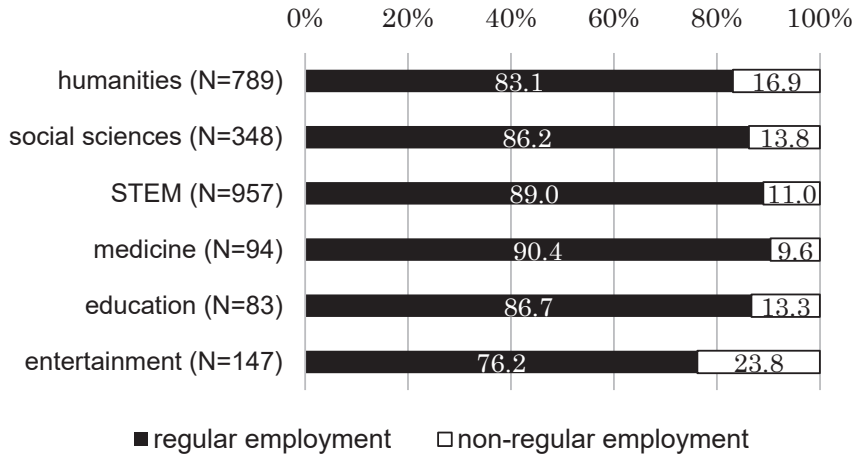

Figure 3 Distribution of Employment Types in Each Field (Korea)
Note: Row percentage. $\chi^2(d.f.)= 25.786\ (5)$. $Pr < 0.001$. $N = 2418$.

The results from the multivariate analyses reveal whether fields of study explain gender differences in the risks of non-regular employment for graduates' first jobs (Table 2). In the baseline model (Model 1), I controlled for job start years, job start years squared, university type/location, and gender. In Model 2, I added fields of study variables to Model 1, with the humanities as the reference group. In the baseline model, female graduates in both Japan and Korea are more likely to hold their first job

as non-regular employees than males. University prestige does not seem to be a key factor in explaining youth precarious employment in either country.

Table 2 Linear Probability Model Results for Non-Regular Employment

Dependent Variable: Non-Regular Employment (ref. Regular Employment)								
	Japan (N = 1417)				Korea (N = 2418)			
	Model 1		Model 2		Model 1		Model 2	
	Coef.	*s.e*	*Coef.*	*s.e*	*Coef.*	*s.e*	*Coef.*	*s.e*
Intercept	380.556**	120.593	377.947**	121.545	94.868	103.703	88.619	105.077
Job start year	-0.387**	0.122	-0.384**	0.123	-0.098	0.104	-0.092	0.106
Job start year squared	0.000**	0.000	0.000**	0.000	0.000	0.000	0.000	0.000
Non-national/ Regional	0.029	0.020	0.023	0.023	0.009	0.015	0.014	0.015
Female	0.060**	0.021	0.017	0.024	0.116***	0.015	0.111***	0.016
Social sciences			-0.081*	0.032			-0.018	0.022
STEM			-0.094**	0.034			-0.032†	0.017
Medicine			-0.090*	0.046			-0.105**	0.034
Education			-0.026	0.047			-0.036	0.041
Entertainment and physical education			0.108†	0.058			0.056	0.037
Adjusted R^2	0.055		0.075		0.043		0.049	
Note:	† p<0.10; * p<0.05; ** p<0.01; *** p<0.001 The reference groups of university type/location, gender, and fields of study variables are national/Seoul, male, and the humanities, respectively. Robust standard errors are reported. Coefficients and standard errors are rounded to three decimal places.							

The extent to which field choices explain the gender-differentiated risks of non-regular employment differs considerably between the two societies. In Korea, fields of study do not significantly influence gender differences in risks. Even after controlling for fields of study in Model 2, we do not observe considerable changes in females' high risks of non-regular employment. However, we observe that gender differences in Japanese graduates' risks depend on their field choices. Among Japanese graduates, the gender effect disappears in Model 2 when field choices are reflected in the model.

In terms of the fields' influence on non-regular employment risks, the two countries exhibit slightly different tendencies (Model 2). Compared to humanities degree holders, those who majored in STEM and medicine have lower risks in both countries. Obtaining a degree in education does not show any differences compared to the humanities in either country. Meanwhile, social sciences, entertainment and physical education degrees affect only Japanese graduates' employment types. In Japan, individuals with degrees in entertainment and physical education are more likely to work as non-regular employees than those with humanities degrees, while those with degrees in social sciences are unlikely to do so.

As a final step, we now compare fields' mediating effects on the relationship between gender and non-regular employment rates between Japan and Korea (Table 3). Based on Model 2 in Table 2, I built a multigroup structural equation model using the same variables. The fields' mediating effects are shown as the "Indirect Effect" in Table 3. In Japan, fields of study demonstrate statistically significant mediating effects, while gender has no direct effect on non-regular employment rates. By contrast, Korea exhibits discernible patterns in that fields of study do not mediate the relationship between gender and non-regular employment rates. Instead, gender has a direct effect, even when other variables are controlled. To confirm whether fields' mediating effects are significantly different between Japan and Korea, I performed a statistical test using bootstrapping. The null hypothesis posits that there are no differences in the mediating effects between these countries. Notably, the test reveals significant country differences in the mediating effects, supported by a p-value of 0.494 and a 95% confidence interval of 0.001–0.051. Thus, we corroborate the hypothesis that *females are more likely to hold non-regular employment contracts than their male counterparts because of their concentration in the humanities* only in Japan.

Table 3 Mediation Analysis with Multigroup Structural Equation Modeling

Dependent Variable: Non-Regular Employment (ref. Regular Employment)				
	Fields of Study		Gender	Total Effect
	Direct Effect	Indirect Effect	Direct Effect	
Japan	-0.017(0.007)*	0.032(0.012)*	0.029(0.025)	0.060(0.022)**
Korea	-0.005(0.004)	0.006(0.005)	0.110(0.016)**	0.116(0.016)**
Note:	cfi = 1.000, tli = 1.000, RMSEA = 0.000. *p<0.05; **p<0.01. The following variables are controlled in the model but unshown in this table: job start year, job start year squared, and university type/location. The total effect includes not only the effect of fields of study and gender but also that of unshown variables. Numbers in parentheses are standard errors. Coefficients and standard errors are rounded to three decimal places.			

6 Conclusion

This study investigated how gender differences in field choices influence non-regular employment risks among university graduates in Japan and Korea using two nationally representative samples of the SSM and KLIPS. Given the few prior studies in East Asia on this topic, our goal was to ascertain whether gender segregation in field choices leads to females' high propensities for precarious employment. The findings show clear differences between Japan and Korea. While Japanese females' high non-regular employment rates stem from their overrepresentation in the humanities, we do not find any evidence that Korean females' concentration in the humanities leads to a high risk of precarious employment. Below, I discuss the implications of the findings.

The findings of this study point toward apparent differences between Japan and Korea regarding study fields' mediating effects. Why do field choices explain gender disparities in employment in Japan but not in Korea? Demographic challenges and labor shortages in Japan not only promote youth employment (Song 2020), but large Japanese firms also prefer young generations when hiring new regular employees for human resource development (太田 2010). Moreover, not all Japanese industrial sectors favor non-regular employment over regular employment. Rather, non-regular employment is commonly found in sales, trade, and service industries (Osawa et al.

2013). Meanwhile, youth non-regular employment has become Korean firms' human resource strategy to safeguard their core workforce from economic uncertainty driven by high trade dependency and from the pressure of technological innovation that replaces the human workforce (Song 2020). Therefore, given that Korean firms voluntarily opt for youth precarious employment, individuals' human capital, such as fields of study, may not effectively support them in securing regular positions.

This study also offers insight into the differences in knowledge and skills among highly educated East Asian women. As 髙松 (2022a) points out that gendered academic tracks indirectly lead to gender gaps in employment types in Japan, it would be helpful to reduce Japanese females' overrepresentation in the humanities for the sake of realizing gender parity. This can be accomplished by providing proper guidance to students in choosing academic fields. Japanese female high school students underestimate their mathematical and scientific abilities and subjective probability of successfully completing STEM coursework (古田 2016; 田邊 2022). Additionally, gender beliefs, such as males' superiority in numerical tasks and females' superiority in interactive and care work, are widespread among Japanese high school students (田邊 2022). Gender beliefs result in females' underestimation of their competencies in STEM fields, especially when they are educated in co-educational schools, as they acquire these beliefs through interactions with male students (古田 2016). This indicates that female Japanese students may refrain from specializing in science and engineering fields that offer favorable job opportunities, even when they have potential. Therefore, guidance from schools and parents should be offered to Japanese female students so that they appropriately understand their aptitudes.

Unlike in Japan, field choices do not explain females' high exposure to precarious employment in Korea. This indicates that gender differences in human capital may not be the primary cause of gender disparities in the labor market. Kim and Oh (2019) demonstrate that even after controlling for human resource variables (college selectivity, fields of study, GPA, and certificates), occupations, and industries, Korean females earn 17.4% less than their male counterparts in early career stages, and thus Korean females are disadvantaged even before career disruption. Therefore, reducing gender segregation in field choices may not be a solution to gender disparities in the Korean labor market. Rather, given our finding that medical fields lead to favorable

employment opportunities, Korean females' overrepresentation in these fields may contribute to reducing gender gaps. A more effective approach may be to reduce females' disadvantages in the labor market. Youm and Yamaguchi (2019) note that in Korea, females are paid less than males in the same occupation, even with the same qualifications. However, the public and education sectors seem to contribute to gender equality, as the gender pay gaps in these sectors are remarkably reduce to 2.6% (Kim and Oh 2019). Consequently, implementing legal regulations and affirmative actions may be a valid approach to achieving gender parity in Korea.

This study has several noteworthy limitations. First, in this study, I restricted the job start years from 1950 to 2020. The sampling restriction may potentially impact the generalizability of the findings since field choices are not immune to changes (Uchikoshi et al. 2020; Shin and Kim 2021). Second, although I used broad field categories in the analyses, the use of broad categories may cause biases because less segregation is captured compared to detailed categories (Reskin 1993: 243). Further studies are encouraged to expand on this article and overcome these drawbacks.

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