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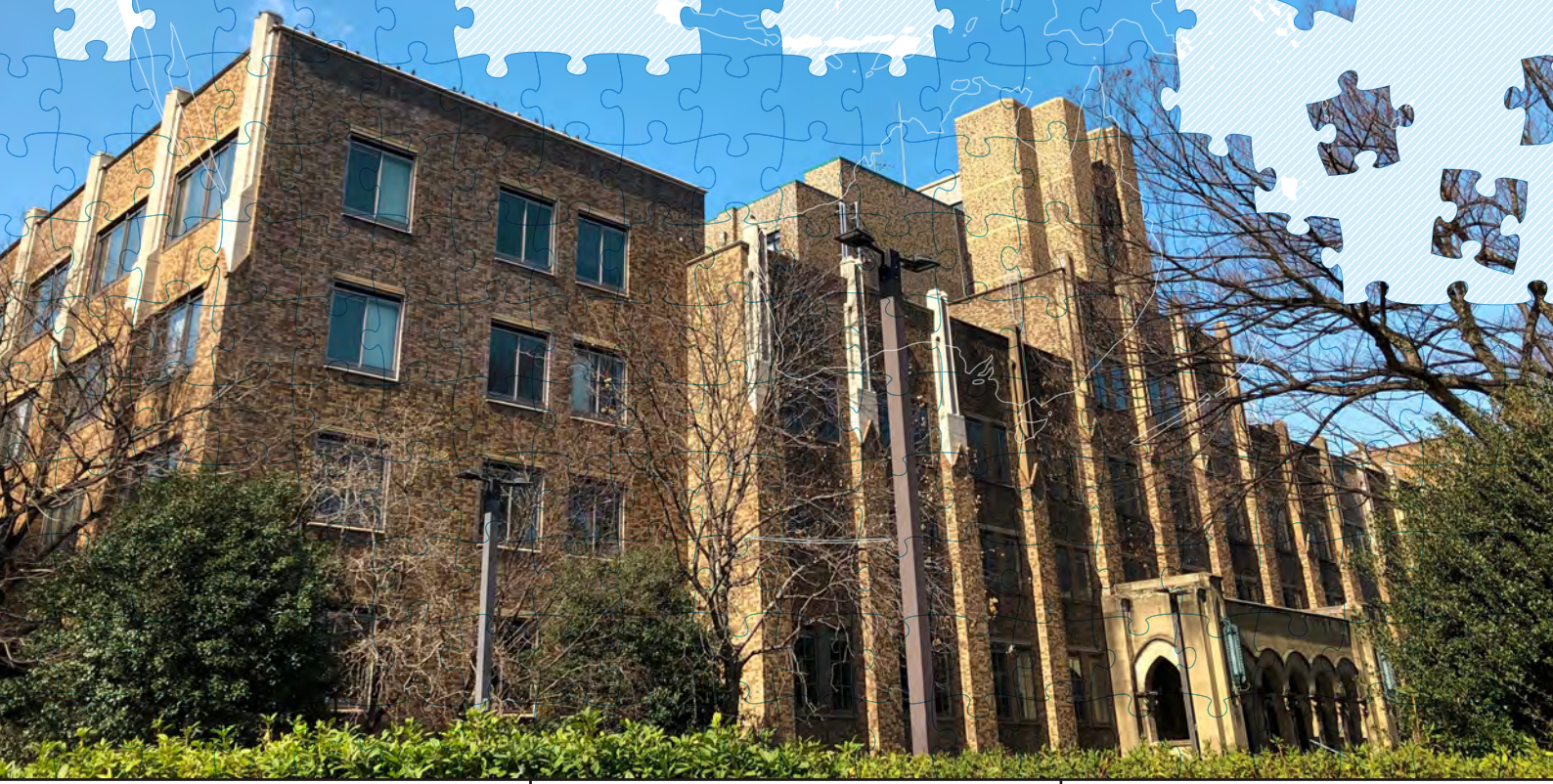
Consequences of Diversified College Expansion for Gender Segregation and Inequality: The Case of Vocationally Oriented Programs in Japan



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Consequences of Diversified College Expansion for Gender Segregation and Inequality:
The Case of Vocationally Oriented Programs in Japan

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Abstract
In this paper, we integrate three bodies of literature on higher education—horizontal stratification, diversified college expansion, and gender segregation—to generate new insights into the consequences of diversified higher education for gender segregation and inequality. We specifically examine the case of Japan, where college expansion and women's increasing enrollment in four-year universities have been driven by the proliferation of nonselective private sectors. Two sets of analyses using administrative and survey data reveal the following findings. First, the relative increase in female enrollments in private institutions is driven by the growth of vocationally oriented programs, which typically offer publicly certified licenses for female-dominant occupations. If there was no such increase, then gender segregation in terms of fields of study would have decreased more than observed. Second, we find that those from low socioeconomic background are more likely to be enrolled in vocational fields such as nursing, education and home economics. These results suggest that women's increased college attendance in Japan contributes to the growth of *double gender* segregation in terms of fields of study and institutional selectivity by incorporating less privileged women into these sectors.

Keywords: gender, higher education, horizontal stratification, vocational education, Japan

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Introduction

As access to higher education has expanded in many countries, social stratification scholars have increasingly paid attention to the role of horizontal stratification—qualitative differences within the same education level—in the process of social stratification (see, e.g., Gerber and Cheung 2008; Hamilton et al. 2024). Specifically, college expansion is often accompanied by institutional differentiation with respect to curricular programs (Charles and Bradley 2009). Studies have shown that diversified college expansion is linked to gender segregation via an increase in curricular programs that translate gendered self-expressive values into gender-differentiated educational trajectories (Charles and Bradley 2009).

In this paper, we integrate these three bodies of literature on higher education—horizontal stratification, college expansion, and gender segregation—to better understand the consequences of what we call "diversified college expansion" for gender segregation and inequality.[1] Women's levels of higher education attendance and completion have surpassed those of men in many economically affluent societies (Buchmann et al. in press; DiPrete and Buchmann 2013; van Bavel 2012), whereas educational trajectories are still segregated for men and women *within* higher education, especially in terms of fields of study (Barone 2011; England and Li 2006; van de Werfhorst 2017). Since gender segregation in higher education has stalled in many countries (Barone 2011; England and Li 2006) and is linked to gender inequality in the labor market (Barone 2011; Charles and Bradley 2009; England and Li 2006; Gerber and Cheung 2008) via occupational gender segregation (Zheng and Weeden 2023), we can expect that the differentiation of higher education may have implications for the reproduction of both gender segregation in higher education and gender inequality in the labor market.

[1] In this paper, we define diversity in terms of proportional distribution of fields of study.

In this study, we examine these questions by focusing on the case of Japan. There is good reason to believe that higher education in Japan provides important contextual insights into the gender consequences of diversified college expansion. Specifically, both college expansion and women's increasing enrollment in four-year universities have been driven by the growth of (relatively less selective) private universities in Japan. Anecdotal evidence also suggests that these expanded private sectors have established new curricular programs, which typically offer vocational education for female-dominated occupations (e.g., nursing or childcare).[2] If this is the case, then the relative improvement in women's access to four-year universities, as Charles and Bradley (2009) suggest, may maintain gender segregation among college graduates. However, as the diversification of curricular programs has been initiated by newly established private sectors in different higher education contexts (e.g., Cottom 2017), Charles and Bradley (2009) did not pay close attention to the selectivity stratification of higher education institutions. Additionally, although it has been less focused in previous studies on gender and higher education, the horizontal stratification perspective suggests that there is differential access to selective fields by socioeconomic status despite college expansion (Lucas 2001). The increase in vocationally oriented programs in the context of Japanese college expansion suggests that these newly established fields may target socioeconomically less advantaged students, which may result in maintaining socioeconomic segregation within higher education.

Therefore, our goal in this paper is to examine the extent to which the increase in vocational education curricular programs initiated by the private sector shapes gender

[2] For example, Obunsha (2014), a publisher specializing in college admission, reports that due to an increase in the establishment of nursing departments, as of 2014, one in 3.3 universities in Japan had a nursing department. Obunsha further explored why universities establish nursing departments, speculating that the high demand for nursing and the relatively large number of (mostly female) applicants are lucrative to private universities, approximately 40% of which suffer from the shortage of applicants.

segregation in higher education. We also advance our understanding of the role of vocational education programs in higher education in terms of gender inequality by examining the socioeconomic correlates of choosing such fields of study. We believe that this specific case study has important implications for our broader understanding of the role of higher education in the process of gender stratification. Specifically, by documenting the role of diversified college expansion in shaping segregation and inequality, our results suggest that newly established private sectors may maintain or even exacerbate gender segregation and inequality in higher education by targeting the historically marginalized population in higher education, which consists of less privileged women in the Japanese context.

Importantly, insights from our findings can be applied to other contexts. For example, the American higher education expansion that occurred from the early 1990s until the early 2010s was partly driven by an increase in for-profit attendance (National Center for Education Statistics 2019), which targeted marginalized students (Cottom 2017; Deming et al. 2013). Scholars have found that students attending for-profit colleges suffer from a considerable amount of student loans (Deming et al. 2012) and enjoy almost no economic returns (Cellini and Turner 2019).

In the next section, we review several key implications of diversified college expansion for social inequality by focusing on its gender consequences. We also briefly overview the gendered landscape of the Japanese labor market and higher education. We then introduce our data and methods. After the results based on these data sources are shown, we summarize our results and discuss their theoretical implications.

1. Background

2.1 Diversified college expansion and social stratification

In many countries where higher education is characterized by market-oriented systems, including those in North America, Latin America, and East Asia (Buckner 2017), higher education is increasingly *diversified* and *stratified*. Specifically, higher education expansion has been characterized by an increase in diversity in terms of curricular programs (Charles and Bradley 2009) and the growth of institutional differentiation with respect to selectivity (Arum et al. 2007; Hoxby 2009; Roksa et al. 2007; Ishida 2007). For example, at the lower end of the distribution, expansion has been driven by an increase in for-profit universities in the United States (Cottom 2017; National Center for Education Statistics 2019) or newly established private institutions in Japan (Ishida 2007), which provide economically less lucrative educational programs. At the upper end of the distribution, institutional heterogeneity has grown because of the increasing selectivity of elite institutions (Hoxby 2009; Roksa et al. 2007).

Social stratification studies have long sought to understand whether these structural changes in higher education maintain inequality in educational attainment. For example, the effectively maintained inequality (EMI) hypothesis (Lucas 2001) posits that although vertical educational inequality diminishes, horizontal stratification either remains or increases because privileged groups seek out qualitative differences to secure their advantages. Similarly, rational choice-based theory (Breen and Goldthorpe 1997) suggests that inequality is maintained because socioeconomically disadvantaged individuals choose more risk-averse options.

In the context of higher education, many studies have shown evidence consistent with these theories, where socioeconomically advantaged parents invest more in their children's education to help them achieve advantaged status within higher education, in terms of college majors or selectivity, compared to their less privileged counterparts (Haveman and Smeeding 2006; Jerrim et al. 2015; Lovenheim and Smith 2022; Roksa et al. 2007). This results in more

students from privileged backgrounds being enrolled in selective and prestigious colleges than those who are less privileged (Davies and Guppy 1997; Thomsen 2015). Most studies also agree that, despite some country differences, privileged students are more likely to study in fields such as science, technology, engineering and mathematics (STEM), medical sciences, and law (Davies and Guppy 1997; Reimer and Pollak 2010) or liberal arts (Mullen 2014; Thomsen 2015). Moreover, less privileged students are more likely to pursue non-STEM vocational-oriented fields, such as business, education, and nursing (Quadlin 2017), which tend to require less on-the-job training and have greater immediate employability in their initial careers (Forster and Bol 2018; Tobback et al. 2023).

2.2 Gender consequences for diversified college expansion

In addition to socioeconomic differences, gender plays an important role in one's college choices and consequences. Despite the so-called "gender gap reversal in higher education" (DiPrete and Buchmann 2013; van Bavel 2012), women are underrepresented in higher-rewarding fields such as STEM but overrepresented in less economically lucrative vocational fields, such as education and health-related fields (Barone 2011; Buchmann et al. in press; Charles and Bradley 2002, 2009).

In this context, studies have suggested that college expansion and diversification are linked to gender segregation. According to Charles and Bradley (2009: 927), the diversification of higher education can contribute to creating "gender-specific curricular niches," which means that differentiation in tertiary educational programs promotes students' gender-differentiated expressive interests.[3] By encouraging such gender-specific educational and career orientations,

[3] Their findings are consistent with the evidence provided by psychological studies, which find that gender differences in preferences are larger in countries characterized by a more gender-egalitarian regime (Falk and

they argue that curriculum diversification can maintain gender segregation in higher education in terms of fields of study. Charles and Bradley (2009: 932) also argue that an increase in vocationally oriented programs has contributed to the increase in female-affinity fields (e.g., physical education, human development, or teacher education), thereby accommodating women's enrollment in female-dominant fields. Moreover, the fact that the diversification of fields of study has been led by less selective institutions discussed earlier suggests that the growth of female-affinity fields is accompanied by an increase in female enrollment in these less selective institutions, which has not been closely examined in previous studies.

2.3 Japanese context

As evidenced by previous studies (e.g., van de Werfhorst 2004), the relative importance of horizontal stratification in higher education differs across educational systems. In this section, therefore, we briefly review what horizontal stratification in higher education means in Japan and how men and women are allocated into different segments of higher education in terms of fields of study and selectivity under the gender-segregated regime. By doing so, we provide critical contextual insights that help us understand the complex relationships between diversified college expansion and gender segregation and inequality.

2.3.1 Role of horizontal stratification in higher education in Japan

The Japanese educational system has been characterized as a comprehensive system with vertical stratification and weak vocational specificity (Ogawa 2023; Shavit and Müller 1998;

Hermle 2018; Mac Giolla and Kajonius 2019). Similar to Charles and Bradley (2009), the authors argue that "a more egalitarian distribution of material and social resources enables women and men to independently express gender-specific preferences" (Falk and Hermle 2018: 5).

Dore and Sako 1989). While educational credentials are closely associated with occupational outcomes in the labor market, the substantive content of education has been scarcely linked to specific professions (Hamaguchi 2011). This is because the Japanese labor market has been characterized by its distinctive human capital development system in which firm-specific skills gained through on-the-job training, as opposed to general or industry-specific skills, are emphasized (Estévez-Abe et al. 2001). Because those skills attained through on-the-job training are only recognizable in specific firms, employers are heavily involved in the training of workers with the mutual expectation that workers will stay in the firm for a long period (Busemeyer 2009; Mun and Jung 2018).

In such labor market contexts, employers often view college selectivity as an important signal for trainability and future productivity in the labor market to maximize the efficiency of on-the-job training (Ishida et al. 1997; Thurow 1975).[4] On average, private universities, which account for approximately 80% of all four-year university enrollment (MEXT 2023), are often regarded as less prestigious (and less selective) than national or public universities are (Ishida 1998; Ono 2008).[5] There is also selectivity stratification within national/public or private universities. For example, seven schools that were imperial universities before World War II are now considered the most prestigious and selective national universities in Japan.[6]

With respect to the salient role of selectivity across universities, robust evidence suggests that returns to college selectivity are significant (Li et al. 2023; Ono 2008) and have widened in response to the rapid college expansion in the late 20th century due to an increase in newly

[4] Selectivity is often made explicit by the standardized rank score (*Hensachi*) provided by testing services, while it is highly correlated with institutional prestige, a measure based on the year of establishment.
[5] National universities were established by the government, while public universities were established by prefectures or municipal entities. Despite the different origins, both types of universities are often grouped into the same category because of their institutional similarity regarding funding sources and admission.
[6] These seven institutions are Tokyo, Kyoto, Tohoku, Kyushu, Hokkaido, Nagoya, and Osaka, which are collectively called the former imperial universities.

established private universities (Amano 1997; Toyonaga 2022). Moreover, previous studies have assumed that fields of study play a limited role; a few recent empirical studies have provided evidence, although mixed, regarding returns to fields of study, with some showing statistically significant differences across fields of study (Toyonaga 2018), whereas others find no such evidence (Yamamoto et al. 2015).

2.3.2 Gendered labor market contexts

Gendered norms and the structure of the labor market in Japan play critical roles in shaping women's career and educational plans. The traditional Japanese labor market used to operate on the basis of the assumption that men were expected to be breadwinners and dedicated to the company rather than to the family, whereas women were expected to engage in unpaid labor and remain dedicated to their family and children (Osawa 1993). The gender-based division of domestic labor remains strong, including married men's longer work hours (Ishii-Kuntz 2013) and little time spent on domestic work (Kan et al. 2022) or parenting (Brinton and Oh 2019). The persistent gender division of labor is also reflected in relatively strong gender essentialist norms in Japan compared with other economically affluent countries (Brinton and Lee 2016). These persistent gendered norms are likely to lead women to anticipate facing work–family conflict after marriage and childbirth.

Despite the rigid labor market structure and societal gender essentialist norms that constrain married women's full-time work, recent cohorts of Japanese women have increasingly been expected to have career trajectories similar to those of men (NIPSSR 2022). This is especially the case for highly educated women, who increasingly maintain stable employment even after marriage or childbearing (Mugiyama 2024).

The growing career aspirations among women also seem to impact women's improved access to higher education in Japan. The majority of women in previous generations who aimed for higher education tended to be enrolled in junior colleges. For example, women accounted for almost 90% of the students enrolled in junior colleges through the 1980s (MEXT 2023). This gendered pattern changed around the 1990s, when a series of gender equality laws were implemented, which increased women's opportunities to enter occupational careers (Edwards and Pasquale 2003). Although women's university attendance rate does not equal or surpasses that of men, the gender gap in four-year institution attendance is almost negligible, as Panel A of Figure 1 shows.

2.3.3 Gender segregation within higher education

Despite the convergence of the gender gap in four-year university attendance, women and men are allocated into different segments of higher education. As in Western societies, women are marginally integrated into STEM fields. For example, the share of women in STEM fields among tertiary graduates in Japan has been considerably lower than that in other economically affluent countries (OECD 2017). Reflecting this trend, previous studies have argued that gender desegregation in terms of fields of study has stalled in recent years (Nakao 2022; Uchikoshi et al. 2020). These studies have also suggested that the stalled trend is partially driven by the increase in enrollment in health fields during the same period, which includes vocationally oriented programs (e.g., nursing).[7] This trend is evidenced in Panel B of Figure 1, which presents the composition of major occupation-relevant programs over the last two decades. In the early

[7] This is because the Japanese government has relaxed regulations regarding the establishment of new occupation-relevant departments such as nursing, social work, and pharmacy in response to the rapid population aging.

2000s, such programs accounted for 9.4% of the total capacity of four-year institutions,[8] whereas in recent years, such programs have increased, contributing to 18.4% of the total capacity. This increase has been driven by specific departments, including nursing or daycare teacher programs. Regarding the consequences of the increase in such vocationally oriented programs, we do not yet know systematically the extent to which the increase in vocational fields shapes gender segregation.

Additionally, the increase in women's share in four-year institutions looks different when we distinguish these institutions by selectivity. Panel C of Figure 1 presents the share of female students in four-year university enrollment by institution type and selectivity. For the selectivity measure, we rely upon the classification scheme proposed by Kaneko (1996) and Toyonaga (2022), where universities are grouped into five categories: "selective national and public," "other national and public," "selective private," "moderately selective private," and "nonselective private." A detailed description of these classifications can be found in the Supplementary Materials. Considering the female share, we can see that the gender gap in overall attendance has been decreasing. We can also see that this decrease is driven by the increase in female attendance in private institutions. However, women still account for only 43% of the enrollment in national and public universities, which are generally considered more selective and prestigious than private universities are (Ishida 1998; Ono 2008). Meanwhile, private universities achieve near parity, where women account for 47% of enrollment. Furthermore, the female share is even lower for more selective national and public universities,

[8] In Japan, student enrollment is strictly regulated by the Ministry of Education, Culture, Sports, Science and Technology (MEXT). For example, if private universities enroll more (or less) students than the capacity approved by MEXT, they may receive less funding from the MEXT.

with only 36% of enrolled students being women.[9] We can also see that these patterns have persisted for almost two decades.

Descriptively, the relative increase in female-dominated vocationally oriented programs and the contribution of less selective private institutions to the increase in women's college attendance seem to have occurred simultaneously; these private institutions play an active role in providing vocationally oriented programs. Anecdotal evidence indeed suggests that these new occupation-relevant programs have been established by less selective private institutions,[10] which tend to struggle with recruiting students because of their lack of prestige.[11] Instead, these universities typically target those who did not attend four-year institutions, i.e., socioeconomically less privileged women in the Japanese context, by promoting the marketable value of these vocational programs. This speculation is evidenced by Panel D of Figure 1, which indicates that the increase student enrollment in vocational programs has been led mainly by private, especially less selective, sectors.

[Figure 1 about here]

2. Research questions

[9] Understandably, the underrepresentation of women in these selective institutions is distinctive compared to other economically affluent countries (Lau 2020; Schubert and Marinica 2018).

[10] For example, 18 universities established nursing departments in 2014, which was an historically high number (Obunsha 2014). A total of 16 out of the 18 universities are private, and most of them are less prestigious and smaller institutions. It is speculated that there is a great incentive for these less selective and small private institutions to establish health-related departments including nursing, because these departments typically have more applications than other departments (Nihon Keizai Shimbun 2012).

[11] In Japan, the size of undergraduate enrollment is positively correlated with selectivity (particularly for private universities), meaning that larger institutions tend to be more competitive, selective, and prestigious. Indeed, application rates tend to be lower for smaller institutions than larger institutions (Promotion of Mutual Aid Corporation for Private Schools of Japan 2023: 6-7).

The uneven diversification of curricular programs across selectivity gradients provides important theoretical insights into persistent gender segregation not only in Japan but also across societies. Specifically, by documenting the process through which vocationally oriented programs incorporate less privileged women into higher education, the current study helps us understand the consequences of the ongoing transformation of higher education in market-oriented systems. Our results suggest that newly established institutions in such contexts may be key agents in maintaining gender segregation in higher education.

In this study, we specifically examine two research questions. First, we examine the extent to which women's improved access to four-year institutions driven by the increase in less selective private institutions is associated with gender segregation in higher education in terms of fields of study. Since these less selective institutions tend to offer more occupation-relevant programs than traditional and more selective universities do, we expect that increased women's college attendance does not necessarily reduce gender segregation. To answer this question, we use administrative data on field-specific male and female enrollment across institutions. Second, using nationally representative survey datasets, we examine the socioeconomic correlates of attending these vocational higher education programs. This is an important question since robust studies have shown that socioeconomically disadvantaged individuals are more likely to choose these fields. If women with less privileged backgrounds are found to be disproportionately enrolled in these vocational programs, then this finding will echo implications from the EMI perspective in the sense that inequality in educational opportunity remains despite college expansion, as high socioeconomic groups maintain their privilege by sending their offspring to more advantaged programs. In turn, any differential selection into fields of study by socioeconomic status will provide important insights when we examine returns to fields of study.

3. Data and methods

In this study, we use two sources of data to answer these questions. First, we use School Basic Study (SBS)-restricted data to examine trends in gender segregation across fields of study. This survey, which is one of the surveys for Fundamental Statistics stipulated by the Statistics Act in Japan and conducted annually by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), is an annual census of all formal education institutions in Japan. The SBS collects various types of information about school characteristics, including the share of student enrollment or placement by gender, age, or the region of high school that students graduated from. For higher education institutions, the data provide information about these characteristics in each field on the basis of departments or programs, from which we speculate on students' fields of study. Specifically, we use microdata on field-specific male and female annual new enrollment across institutions from the survey provided under Article 33 of the Statistics Act of Japan. We use data from all available years from 2003 to 2021.

Second, we use all available years covered by three nationally representative comparable cross-sectional surveys, namely, the 1995, 2005, and 2015 Japanese Social Stratification and Mobility Survey (SSM), the 2013 Survey of Education, Social Stratification, and Social Mobility in Japan (ESSM), and the Japanese Life-Course Panel Survey (JLPS).[12] These surveys collect information about respondents' birth year, educational attainment, field of study, name of college respondents, and parental socioeconomic status. The targeted respondents in these surveys vary in age range, which allows us to account for cohort differences among those who are enrolled in

[12] Note that although the JLPS is a panel survey, all information we use for analysis is collected from the first and second wave in each sample. It is therefore safe to assume that the attrition from the survey does not produce biased estimates.

college.[13] The surveys are also highly comparable in both design and implementation. In terms of the sampling strategy, they employ the same standard stratified two-stage sampling, with the first stage being based on broader regional clusters and the second stage involving the random sampling of approximately 10–20 individuals in each census area. We therefore combine these datasets to increase the sample size. We use these data to examine how attending a vocationally oriented program differs by socioeconomic origin. The descriptive statistics are shown in Appendix Table 1.[14]

For measures of fields of study, we aim to make the classification between the two analyses as comparable as possible. Since the SBS is a census for all programs,[15] we use a more detailed definition. This definition is based on the initial 83 classifications created by the SBS. We merge similar fields of smaller sizes (e.g., housing studies and food studies are integrated into "home economics"). We also remove residual fields labeled "other" assigned to each broader field. In the case of humanities, for example, these "other" categories include 200 (mostly interdisciplinary) programs. Since these other categories are heterogeneous and hard to reclassify, we remove them to provide a clear interpretation. After reclassification and pruning, 46 fields remain, which are listed in Appendix Table 2. For the second set of analyses, we use respondents' self-reported fields of study to produce 5 groups: humanities (literature, history, philosophy, and language), social sciences (economics, law, political sciences, psychology and sociology), STEM (science, technology, engineering, and mathematics), medicine (medicine, dentistry, and pharmacy), and vocational fields (nursing, education, and home economics). For

[13] Respondent age range is 20–69 in the 1995 and 2005 SSM, 20–79 in the 2015 SSM, and 30–64 in the ESSM at the time of each survey. The JLPS includes samples aged 20–40 in 2007 and 20–31 in 2019.
[14] For measures of college selectivity, we employ multiple imputations by iterative chained equations (MICE) to create 10 imputed datasets to address the missing data.
[15] Programs are the minimum unit of entity in the SBS; they are equivalent to departments or courses.

college selectivity, we use the conventional five groupings from Kaneko (1996) and Toyonaga (2022), namely, selective national/public, other national/public, selective private, moderate private, and nonselective private.

To show trends in gender segregation in the field of study, we use Duncan's dissimilarity index (Duncan and Duncan 1955), following previous studies (e.g., England and Li 2006). This index refers to the share of women (or men) that need to be moved to another field to make the gender distributions equal. For example, a value of 50 indicates that 50% of women (or men) need to be moved to other fields to make the distribution of fields of study between men and women the same. To produce this index, we first calculate the number of female (male) annual new enrollments in the field of study j at time t, which is defined as F_{jt} (M_{jt}). We then sum the absolute differences between the share of female enrollment in a given field (F_{jt}/F_t) and that of male enrollment (M_{jt}/M_t). which can be expressed as follows:

$$D_t = \sum_j \left[100 \times \frac{1}{2} \times \left| \frac{F_{jt}}{F_t} - \frac{M_{jt}}{M_t} \right| \right] = \sum_j D_{jt}$$

A series of descriptive findings regarding trends in gender segregation in the field of study is a product of compositional shifts in certain fields and changes in segregation within the field. To distinguish between those two contributors, we apply a decomposition method (Blau and Hendricks 1979; Fuchs 1975). This method allows us to evaluate contributions to overall segregation separately by (1) compositional shifts in fields of study (*college major mix effect*) and (2) changes in segregation within fields (*gender composition effect*). Specifically, we can decompose changes in gender segregation between $t = 2$ and $t = 1$ as follows:

$$D_2 - D_1 = \sum_j \left[D_{j2} - 100 \times \frac{1}{2} \times \left| \frac{\frac{F_{j2}}{T_{j2}} \times T_{j1}}{\frac{F_2}{T_2} \times T_1} - \frac{\frac{M_{j2}}{T_{j2}} \times T_{j1}}{\frac{M_2}{T_2} \times T_1} \right| \right]$$

$$+ \sum_j \left[100 \times \frac{1}{2} \times \left| \frac{\frac{F_{j2}}{T_{j2}} \times T_{j1}}{\frac{F_2}{T_2} \times T_1} - \frac{\frac{M_{j2}}{T_{j2}} \times T_{j1}}{\frac{M_2}{T_2} \times T_1} \right| - D_{j1} \right]$$

where T_{jt} refers to the total number of male and female students in field j at time t ($T_{jt} = M_{jt} + F_{jt}$). The first term (*college major mix effect*) indicates the extent to which the D index would be changed by shifting the share of each field net of the gender composition in each field. The second term (*gender composition effect*) indicates the extent to which the D index would be changed by changing the gender composition in each field of study net of the share of field.

For the second part of the analysis, we use multinomial logistic regression to examine who is selected into which field of study. Our key independent variable is the parental socioeconomic index (SEI). We specifically use the Japanese Socio-Economic Index (Fujihara 2020), which is assigned based on the occupation of the respondent's father when the respondent was aged 15.[16] We use their mother's occupation if the father's occupation is missing. Our models also include cohorts based on respondents' birth year and college selectivity. The respondents' birth years are categorized into three birth cohort dummy variables (1927–1951, 1952–1975, and 1976–1998), which are used as control variables to adjust for differences in college attendance across different birth cohorts. We also use cohort variables to test implications from the EMI perspective to examine whether socioeconomic gradients in attending specific fields of study have changed over time in response to college expansion. We further include dummy variables that indicate each survey.

[16] This index is made by calculating occupation-specific age-adjusted weighted average years of schooling and logged earnings of working individuals separately by gender (Fujihara 2020: 552). We use father's (or mother's if father's occupation is missing) occupation when respondents were age 15, which was asked to each respondent retrospectively at the time of the survey.

For the second set of analyses, we examine three models. Model 1 is a baseline model predicting respondents' fields of study by parental SEI with control variables. The equation can be described as follows:

$$In\left[\frac{P_{ij}}{P_{i1}}\right] = B_{0j} + B_{1j}Parental\ SEI_i + B_{2j}Birth\ cohort_i + B_{3j}Survey\ types_i \quad \text{(Model 1)}$$

$In\left[\frac{P_{ij}}{P_{i1}}\right]$ represents the log of the ratio of probabilities of choosing each college (j=2 for social sciences, j=3 for STEM, j=4 for medicine, j=5 for vocational fields) relative to the probabilities of choosing the reference category, humanities (j=1). B_{0j} refers to the intercept for outcome *j*. $B_{2j}Birth\ cohort_i$ and $B_{3j}Survey\ types_i$ represent respondents' birth cohorts and survey types, respectively.

In Model 2, we add an interaction term of parental SEI and cohorts measured by respondents' birth cohorts to examine whether the relationship between socioeconomic backgrounds and fields of study choices has changed along with college expansion. Finally, Model 3 includes college selectivity to examine whether particular fields of study are associated with institution types.

$$In\left[\frac{P_{ij}}{P_{i1}}\right] = B_{0j} + B_{1j}Parental\ SEI_i \times Cohort_i + B_{2j}Survey\ types_i \quad \text{(Model 2)}$$

$$In\left[\frac{P_{ij}}{P_{i1}}\right] = B_{0j} + B_{1j}Parental\ SEI_i \times Cohort_i + B_{2j}College\ selectivity_i + B_{3j}Survey\ types_i \quad \text{(Model 3)}$$

4. Results

5.1 Expansion of vocationally oriented programs and gender segregation

Figure 2 presents trends in gender segregation measured by Duncan's index over the course of eighteen years. As of 1975, the segregation index was 43.7, meaning that we would need to move approximately 44% of men or women to make the distribution of fields of study

equal. There has been a consistent decline in gender segregation in fields of study over the observational period. The declining trend is especially true over the last ten years. In 2021, the segregation index was 40.1, indicating that segregation has decreased by approximately 8% over the past 20 years.

To what extent do each of the fields of study contribute to the overall segregation pattern? Table 1 presents the top fifteen fields of study that contribute to the overall segregation index at two points in time (2003 and 2021). According to Table 1, one-fifth (19.7%) of the segregation is contributed by "commerce and economics." This is followed by both female-dominated and male-dominated fields, including "literature" (7.12, 16.2%), "telecommunication engineering" (4.72. 10.8%), or "home economics" (3.88, 8.9%). In 2021, these fields of study still contributed to the segregation pattern, while the size of the contribution decreased. For example, the top contributor to segregation is still "commerce and economics," but its size has decreased from 8.70 to 7.24.

Moreover, we also see fields of study that show the opposite trend from the overall trend. Specifically, the nursing field of study plays a more critical role in contributing to segregation, where the magnitude of contribution has increased from 1.51 to 5.09. The 3.58-point increase is equivalent to the overall size of the decrease (43.7-40.1=3.6). We also see that the "pedagogy" field of study increased its contribution (0.83 to 1.12). These two fields of study are characterized by occupation-specific education that provides opportunities for certified licensing.

We also show the proportion of occupation-relevant programs and nonselective private universities for each field in Table 2. The former indicates that most students in several fields are enrolled in these occupation-focused programs (e.g., nursing or pedagogy), whereas those in other fields are not enrolled in such programs at all (e.g., commerce and economics).

Interestingly, the first group of fields of study has increased the proportion of occupation-relevant programs over time. Looking at specific fields, for example, the pedagogy field includes programs where students can obtain a daycare teacher license. The home economics field includes programs for childcare workers or dietitians. The nursing field has increased its share over the past two decades, as we showed earlier, which suggests that the increase in occupation-relevant curricular programs in the abovementioned fields has contributed to greater gender segregation.

We can also see that the fields with a large share of vocational programs are offered by nonselective private universities. On average, approximately 36–38% of students were enrolled in these universities during the observation period. Compared with the baseline number, these occupation-relevant fields tend to have a larger share of nonselective universities (50.6% for home economics, 42.7% for pharmacy, and 40.8% for nursing). With respect to changes over time, these fields are increasingly offered by nonselective private universities. For example, more than two-thirds of the students in nursing fields are studying at these universities. Similar increases can be found for other occupation-relevant fields, including home economics, pedagogy, and pharmacy. This is consistent with the results shown earlier in Figure 1.

To better understand what drives the overall trend in segregation, Figure 3 presents decomposition results for changes in gender segregation between 2003 and 2021, where each field is mapped on two sources of segregation. The x-axis shows the gender composition effect, which refers to changes in gender distribution within a specific field, whereas the y-axis shows the major college mix effect, which refers to changes in the distribution of fields of study that contribute to the segregation trend. The sum of the two sources corresponds to the overall contribution of each field.

The results indicate that most fields play a modest role in either increasing or decreasing segregation for both gender composition and major college mix effects. There are, however, several fields that play a more important role in explaining the change. For the gender composition effect, three female-dominated fields, namely, literature, sociology, and home economics, have decreased their contribution, meaning that these fields have contributed to less segregation over time. We also find that commerce and economics, which is a male-dominated field, has decreased its contribution. Moreover, two STEM fields, namely, mechanical engineering and telecommunication engineering, have contributed to more segregation in recent years. With respect to the college major mix effect, the nursing field contributes the most. Although its gender composition effect decreases its contribution, the numerical increase in the nursing field contributes to an increase in overall gender segregation. Similarly, the other two occupation-relevant fields, namely, home economics and pedagogy, have also increased in size, which has contributed to more gender segregation.

These results suggest that the increase in the female share of four-year university students is driven by nonselective private universities, which increasingly offer occupation-relevant programs. While such offerings contribute to the declining gender gap in four-year university attendance, they also contribute to maintaining gender segregation in terms of fields of study.

[Figure 2 about here]

[Table 2 about here]

[Figure 3 about here]

5.2 Who chooses vocational fields of study?

Second, we examine how parental socioeconomic status is correlated with the choice of fields of study to understand who is incorporated into the growing vocational sectors in higher education. Tables 3 and 4 present the multinomial regression results for men and women. Note that the parental SEI is standardized for the male and female samples separately.

For men, parental SEI is not strongly associated with most fields of study, including vocational fields. According to Model 1, parental SEI is not significantly related to the choice of each field of study. The exceptions are those who choose medicine, whose parental SEI is significantly greater than that of those who enroll in humanities ($p<0.001$). To examine whether the relationship between parental SEI and the choice of major has changed across cohorts, we add interaction terms between parental SEI and respondents' birth cohorts in Model 2. This model indicates that parental SEI is more strongly associated with choosing vocational fields among those who are born in the most recent cohort. This result is not inconsistent with the EMI hypothesis, which states that the association between one's socioeconomic status and educational attainment remains or even increases despite college expansion. However, the overall results suggest that parental socioeconomic status does not matter for fields of study choice among men.

In contrast, parental SEI seems to play a more critical role in fields of study among women. Model 1 in Table 4 shows that those with low parental SEI are significantly more likely to choose vocational fields (compared with humanities, the reference category) at $p<0.05$. Model 2, which considers interactions between parental SEIs and women's birth cohorts, reveals that those with lower parental SEIs are more likely to study vocational fields than humanities; however, the size of the association becomes small in the second cohort (those who are born in 1952–1975), as the coefficient for the interaction term is statistically significant at $p<0.1$ (compared with those who are born in 1927–1951, which is the reference category). However,

the interaction term is not significantly related in the most recent cohort, indicating that the association between parental SEI and vocational fields has not changed dramatically across respondents' birth cohorts.

Although these results provide evidence for the negative association between parental SEI and vocational fields among women and that these fields are established by less selective private sectors, the observed relationship is partially accounted for by considering college selectivity. To examine this, Model 3 includes college selectivity in the model. Tables 3 and 4 show that attending a selective institution (e.g., selective private or moderately selective private) is negatively associated with choosing vocational fields for both men and women. Importantly, considering college selectivity does not alter our earlier findings based on Models 1 and 2.

Figure 4 presents the predicted probabilities of choosing each field of study by parental SEI. Since the relationship between parental SEI and respondents' major choices is mostly consistent across birth cohorts, we show predicted probabilities on the basis of the baseline model (Model 1). We show the predicted probability of each field across standardized SEIs ranging between -1.5 and +1.5 standard deviations. For men, similar to what we have observed in Table 3, parental SEI is not strongly responsive to fields of study choice except for medicine. For example, men's probability of entering vocational fields at +1.5 SD is 5.8%, whereas it marginally increases to 6.2% at -1.5 SD. For women, parental SEI is responsive to all fields except for STEM. We see positive socioeconomic gradients for humanities and medicine, whereas we see negative gradients for social sciences and vocational fields. Specifically, for the latter, the probability of attending vocational fields significantly increases from 21.9% at +1.5 SD to 29.5% at -1.5 SD.

[Table 3 about here]

[Table 4 about here]

[Figure 4 about here]

5. Discussion

In this paper, we leverage the Japanese higher education context to update our understanding of the consequences of diversified college expansion for gender segregation and inequality. We find that gender segregation in terms of fields of study among university-enrolled students has declined, especially over the last decade. Looking closely at what contributes to this trend, we find an overall decline in segregation within specific fields. Moreover, we also find that the numerical increase in occupation-relevant fields (nursing, home economics, and pedagogy) contributes to greater gender segregation. If there were no increase in these fields, then the distribution of fields of study between men and women would be more equal than we observed. Importantly, these fields often provide vocational training education, and the increase has been driven by less selective private institutions. As such, while these sectors contribute to women's improved college attendance, they also play a role in maintaining gender segregation in terms of both fields of study and college selectivity. Moreover, while women with less privileged backgrounds are more likely to choose these vocational fields, we do not find evidence that socioeconomic gradients in choosing fields of study have been mitigated in the recent college expansion cohort. These results are consistent with expectations from the EMI hypothesis. In summary, our results indicate that women's increased college attendance in Japan contributes to the growth of *double gender* segregation in terms of fields of study and selectivity by incorporating less privileged women into these sectors.

The relative increase in vocationally oriented programs is an important finding that helps us think more about the implications of diversified college expansion for gender segregation and inequality. Although this paper does not discuss the potential mechanisms of the recent increase, college application is a matching process, meaning that there are demand-side and supply-side factors. On the one hand, there has been a growing demand for healthcare workers due to population aging. As a result of the Japanese government's regulation reform to mitigate the negative consequences of population aging, tertiary education institutions have established vocational programs, including nursing. Since demands for the healthcare sector will continue to increase in the future, we can expect that future trends in the gender integration of fields of study may stall. On the other hand, studies have suggested that more women than men are likely to prefer skills that are portable across organizations, which tend to be less affected by career interruptions, than less portable skills, such as firm-specific skills (Busemeyer 2009; Estévez-Abe 2005). This is because these skills are typically developed through educational institutions independently of employers' potential gender-based differential treatment (Estévez-Abe 2005). These studies have suggested that the expansion of curricular programs focused on specific skill training may lead to greater gender segregation (Buchmann and Charles 1995; Charles et al. 2001; Estévez-Abe 2005, 2011). Since the Japanese labor market is characterized by a segmentalist skill regime that emphasizes firm-specific skill investment through on-the-job training as a main source of human capital formation, the segmented labor market context may maintain women's preference for portable skills, resulting in sustained gender segregation across fields of study.

Several limitations in this study should be mentioned. First, we did not explore the consequences of diversified college expansion for gender inequality beyond education. As

discussed earlier, college expansion and women's increasing enrollment in four-year universities have been driven by the growth of relatively less selective private universities in Japan, which have disproportionately established new curricular programs focused on vocational skill training. Our findings suggest that while the increase in less selective, vocationally oriented programs may maintain gender segregation in higher education, it could perhaps contribute to greater gender equality by contributing to the accumulation of human capital for women. This is likely because these vocationally oriented programs can help increase women's labor force attachment by providing licensed education. To answer these questions, future studies should shift the focus from the difference between men and women to differences among women to address women's occupational trajectories, with a focus on how the levels of education, as well as fields of study, can explain the variation.

Second, further elaboration on our classification for vocational fields of study is also needed for future analysis. While this study defines vocational fields as those that are linked to obtaining occupational licenses, we still need to examine whether those who are enrolled in vocational fields actually acquire occupational licenses via college education. In addition, a recent discussion emphasized the role of other higher and postsecondary education, including junior college and polytechnic colleges, in vocational training for Japanese women (Taki 2024). This suggests that we should also incorporate other institutions to deepen our understanding of how the expansion of higher and postsecondary education and their changing roles either mitigate or exacerbate gender inequality in the labor market.

Despite these limitations, we believe that the empirical implications of these findings are critical. Specifically, the results highlight the importance of jointly considering two sources of horizontal stratification, i.e., college selectivity and fields of study. As we discuss in the

literature review, previous studies that have focused on the importance of distributional shifts in fields of study for gender segregation have not paid enough attention to how the selectivity of institutions plays a role. To paraphrase, these studies have implicitly assumed that the degree of change does not differ across institutions. Our findings, however, suggest that the growth of vocationally oriented programs, which is one driver of such distributional change, has been established by less selective private sectors. Since institutional differentiation has been a key feature of higher education expansion in market-oriented systems (Buckner 2017), our results potentially speak to other institutional contexts characterized by the relative importance of private sectors in the supply of higher education. For example, our findings can be compared with those of for-profit colleges in the United States, a number of which target socioeconomically less advantaged students by offering occupational training (Cottom 2017). Indeed, the proliferation of for-profit colleges benefits more women than men in terms of college attendance (Buchmann et al. in press). Although there are recognizable differences between nonselective private universities in Japan and for-profit colleges in the U.S. (e.g., whether colleges are profit-seeking institutions), future studies would benefit from understanding the consequences of diversified college expansion through a comparative lens.

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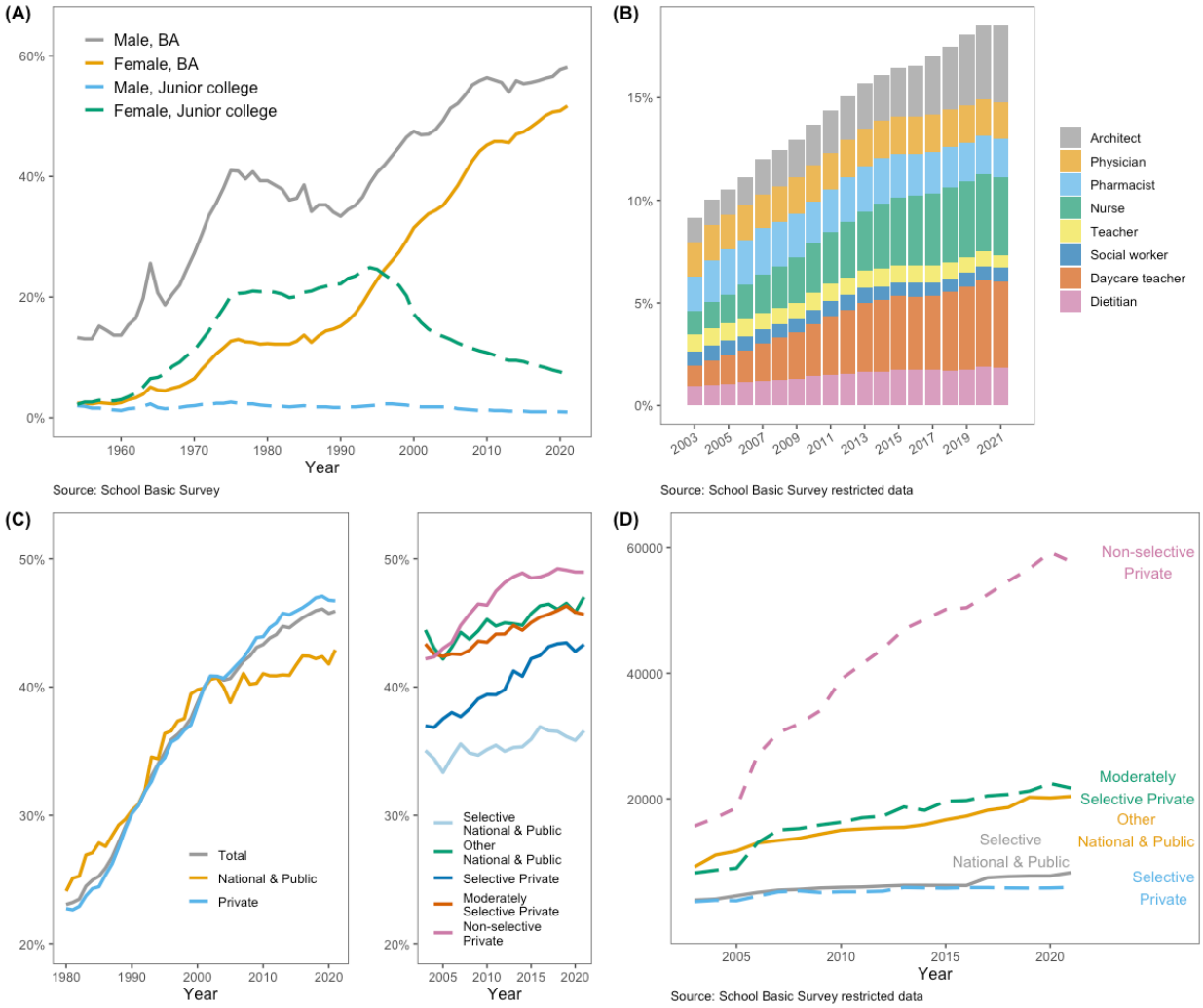


Figure 1 Trends in gender-specific attendance rates (Panel A), the composition of occupation-relevant programs (Panel B), the female share by institution type and selectivity (Panel C), and the number of students enrolled in vocationally oriented programs by selectivity (Panel D)

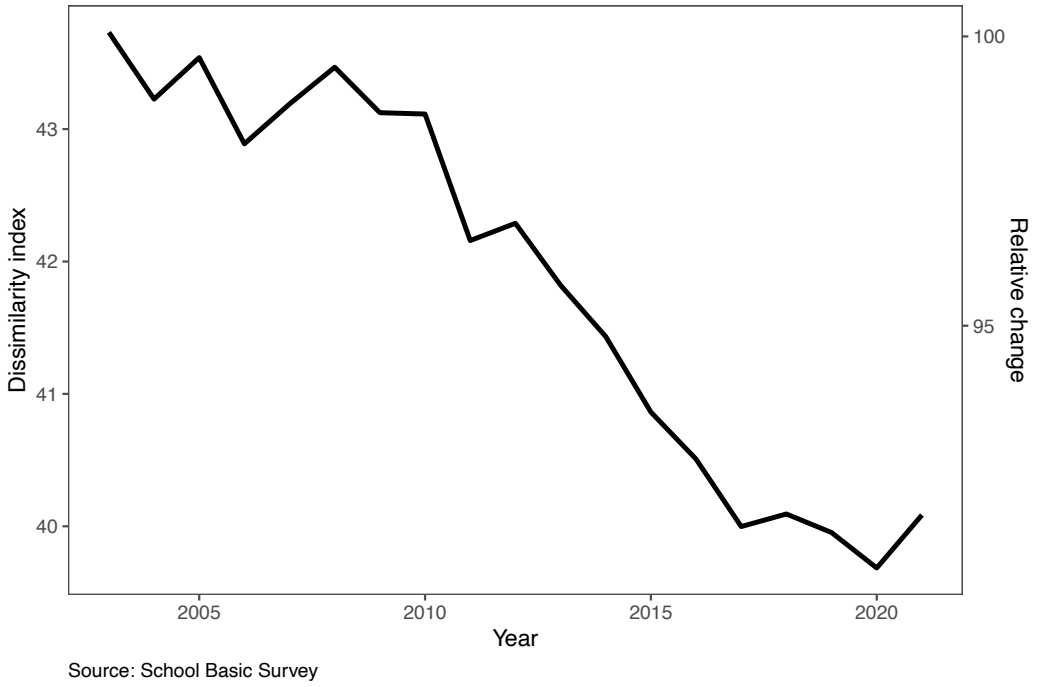


Figure 2 Dissimilarity index (left: absolute; right: relative)

Table 1 Contributions of the top fifteen fields, % occupational programs, and % nonselective private universities

2003				
		D	% occ. programs	% nonselective private
1	Commerce and economics	8.61	0.0%	40.5%
2	Literature	7.12	0.0%	39.8%
3	Telecommunications engineering	4.72	0.0%	33.6%
4	Home economics	3.88	43.3%	50.6%
5	Sociology	3.12	16.2%	51.5%
6	Mechanical engineering	2.87	0.0%	29.2%
7	Civil engineering	1.75	23.0%	28.3%
8	Nursing	1.51	95.0%	40.8%
9	Law and politics	1.23	0.0%	26.2%
10	Music	1.12	0.0%	52.1%
11	Pharmacy	0.94	0.0%	42.7%
12	Philosophy	0.93	2.0%	40.2%
13	Applied chemistry	0.83	0.0%	10.9%
14	Pedagogy	0.83	10.9%	37.7%
15	Design	0.53	2.6%	73.6%

2021				
		D	% occ. programs	% nonselective private
1	Commerce and economics	7.24	0.1%	38.6%
2	Nursing	5.09	97.0%	67.3%
3	Telecommunications engineering	3.84	1.0%	30.7%
4	Literature	3.81	0.0%	34.4%
5	Home economics	3.56	69.2%	53.7%
6	Mechanical engineering	2.38	0.0%	24.9%
7	Sociology	1.72	21.0%	44.0%
8	Law and politics	1.43	0.0%	20.9%
9	Civil engineering	1.31	65.9%	26.5%
10	Pedagogy	1.12	63.0%	61.4%
11	Philosophy	0.99	1.5%	48.9%
12	Pharmacy	0.92	90.3%	50.7%
13	Applied chemistry	0.57	0.0%	8.4%
14	Music	0.54	0.0%	56.8%
15	Design	0.51	4.9%	61.4%

Note: The percentages of occupational programs and nonselective private universities are weighted by the number of enrolled students.

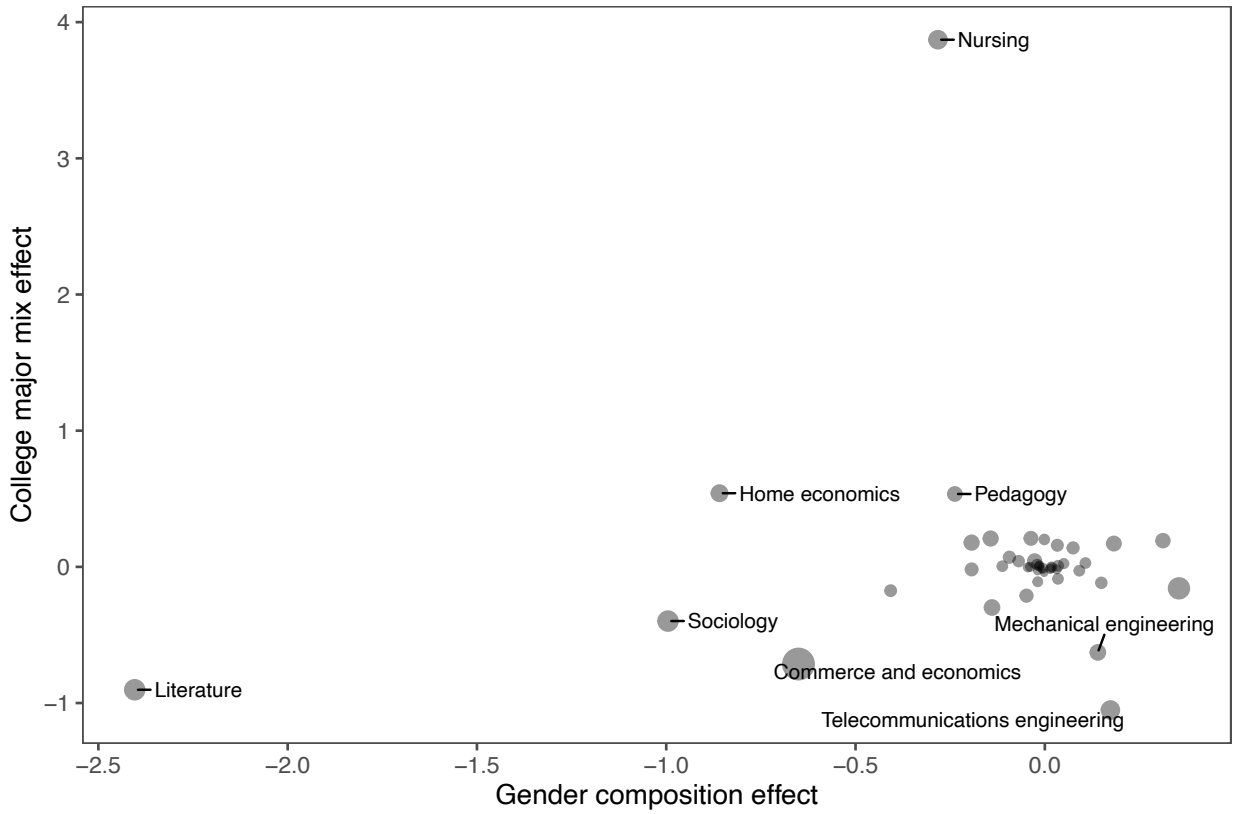


Figure 3 Distribution of decomposition results

Table 3
Multinomial regression results estimating the likelihood of attending different fields of study (male)

Ref. Humanities	Model 1		Model 2		Model 3 (MI)	
Social sciences						
Parental SEI (standardized)	-0.03	(0.06)	-0.08	(0.12)	-0.08	(0.12)
Birth cohorts (ref.1927–1951)						
Birth cohort 1952–1975	0.34*	(0.17)	0.34*	(0.17)	0.32+	(0.17)
Birth cohort 1976–1998	0.09	(0.20)	0.10	(0.20)	0.08	(0.20)
Parental SEI (standardized)						
# Birth cohort 1952–1975			0.04	(0.15)	0.04	(0.15)
# Birth cohort 1976–1998			0.10	(0.16)	0.09	(0.17)
College selectivity (ref. Nonselective private)						
Selective national & public					-0.51*	(0.24)
Other national & public					-0.58*	(0.25)
Selective private					-0.03	(0.19)
Moderately selective private					-0.13	(0.17)
Constant	1.37***	(0.23)	1.37***	(0.23)	1.52***	(0.28)
STEM						
Parental SEI (standardized)	0.00	(0.06)	-0.06	(0.13)	-0.08	(0.13)
Birth cohorts (ref.1927–1951)						
Birth cohort 1952–1975	0.23	(0.17)	0.23	(0.17)	0.25	(0.18)
Birth cohort 1976–1998	0.24	(0.20)	0.24	(0.20)	0.23	(0.21)
Parental SEI (standardized)						
# Birth cohort 1952–1975			0.04	(0.16)	0.05	(0.16)
# Birth cohort 1976–1998			0.13	(0.17)	0.16	(0.17)
College selectivity (ref. Nonselective private)						
Selective national & public					0.79***	(0.23)
Other national & public					0.96***	(0.23)
Selective private					-0.23	(0.20)
Moderately selective private					0.04	(0.17)
Constant	0.76***	(0.25)	0.76***	(0.25)	0.60*	(0.30)
Medicine						
Parental SEI (standardized)	0.58***	(0.11)	0.74*	(0.30)	0.70*	(0.30)
Birth cohorts (ref.1927–1951)						
Birth cohort 1952–1975	0.68*	(0.34)	0.86*	(0.42)	0.87*	(0.42)
Birth cohort 1976–1998	0.67+	(0.39)	0.85+	(0.46)	0.82+	(0.46)
Parental SEI (standardized)						
# Birth cohort 1952–1975			-0.21	(0.34)	-0.19	(0.34)
# Birth cohort 1976–1998			-0.14	(0.36)	-0.11	(0.36)

College selectivity (ref. Nonselective private)						
Selective national & public					1.02**	(0.37)
Other national & public					0.88*	(0.38)
Selective private					-0.56	(0.41)
Moderately selective private					-0.41	(0.35)
Constant	-1.90***	(0.47)	-2.05***	(0.52)	-2.01***	(0.60)
Vocational fields						
Parental SEI (standardized)	-0.02	(0.09)	-0.41+	(0.21)	-0.44*	(0.21)
Birth cohorts (ref.1927–1951)						
Birth cohort 1952–1975	0.15	(0.26)	0.24	(0.27)	0.17	(0.29)
Birth cohort 1976–1998	0.36	(0.30)	0.44	(0.31)	0.23	(0.32)
Parental SEI (standardized)						
# Birth cohort 1952–1975			0.36	(0.25)	0.40	(0.25)
# Birth cohort 1976–1998			0.60*	(0.26)	0.72**	(0.26)
College selectivity (ref. Nonselective private)						
Selective national & public					0.38	(0.32)
Other national & public					1.73***	(0.28)
Selective private					-1.29***	(0.38)
Moderately selective private					-1.46***	(0.33)
Constant	-0.98*	(0.39)	-1.04***	(0.40)	-0.72	(0.47)
Observations	3,588		3,588		3,588	
Log likelihood	-4352.61		-4349		NA	

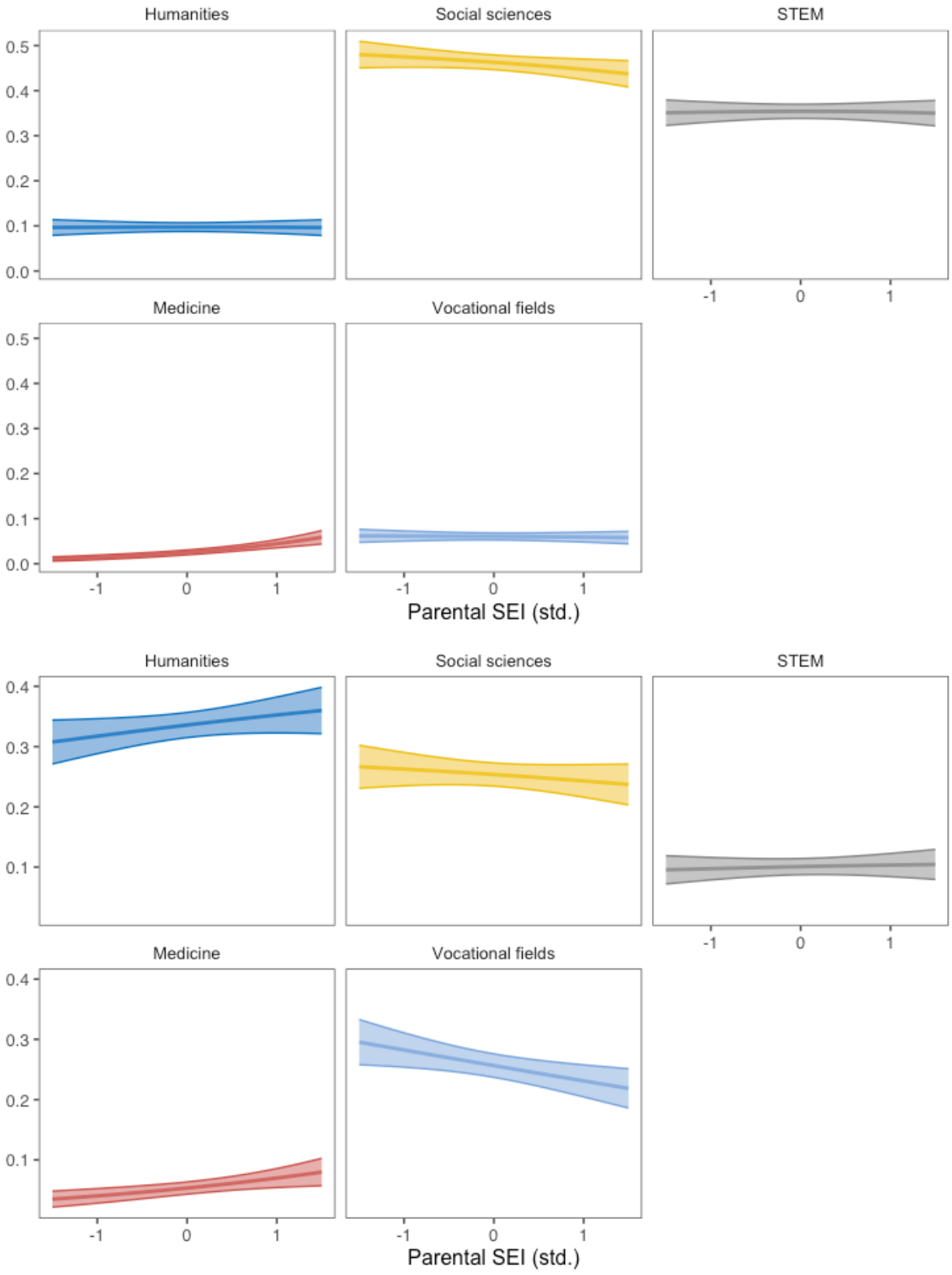
Standard errors in parentheses, + p<0.1 * p<0.05 ** p<0.01 *** p<0.001. Survey types are controlled.

Table 4
Multinomial regression results estimating the likelihood of attending different fields of study (female)

Ref. Humanities	Model 1		Model 2		Model 3 (MI)	
Social sciences						
Parental SEI (standardized)	-0.09	(0.06)	-0.12	(0.30)	-0.14	(0.31)
Birth cohorts (ref.1927–1951)						
Birth cohort 1952–1975	0.90*	(0.36)	0.87*	(0.37)	0.99**	(0.37)
Birth cohort 1976–1998	1.39***	(0.37)	1.36***	(0.37)	1.53***	(0.38)
Parental SEI (standardized)						
# Birth cohort 1952–1975			0.17	(0.31)	0.17	(0.32)
# Birth cohort 1976–1998			-0.07	(0.31)	-0.11	(0.32)
College selectivity (ref. Nonselective private)						
Selective national & public					0.53*	(0.26)
Other national & public					0.93***	(0.25)
Selective private					0.99***	(0.19)
Moderately selective private					0.58***	(0.16)
Constant	-2.04***	(0.47)	-2.04***	(0.47)	-2.74***	(0.49)
STEM						
Parental SEI (standardized)	-0.03	(0.08)	-0.95+	(0.49)	-0.93+	(0.48)
Birth cohorts (ref.1927–1951)						
Birth cohort 1952–1975	0.43	(0.46)	0.79	(0.62)	0.72	(0.62)
Birth cohort 1976–1998	1.04*	(0.47)	1.42*	(0.62)	1.41*	(0.62)
Parental SEI (standardized)						
# Birth cohort 1952–1975			1.15*	(0.51)	1.11*	(0.50)
# Birth cohort 1976–1998			0.84+	(0.50)	0.78	(0.49)
College selectivity (ref. Nonselective private)						
Selective national & public					1.77***	(0.30)
Other national & public					2.17***	(0.28)
Selective private					0.45	(0.32)
Moderately selective private					0.21	(0.25)
Constant	-2.44***	(0.61)	-2.81***	(0.74)	-3.65***	(0.77)
Medicine						
Parental SEI (standardized)	0.22*	(0.10)	-0.12	(0.33)	-0.15	(0.33)
Birth cohorts (ref.1927–1951)						
Birth cohort 1952–1975	-0.06	(0.42)	-0.13	(0.42)	-0.13	(0.43)
Birth cohort 1976–1998	0.25	(0.44)	0.19	(0.44)	0.23	(0.45)
Parental SEI (standardized)						
# Birth cohort 1952–1975			0.46	(0.36)	0.47	(0.37)

# Birth cohort 1976–1998			0.31	(0.36)	0.29	(0.36)
College selectivity (ref. Nonselective private)						
Selective national & public					1.32***	(0.36)
Other national & public					1.30***	(0.36)
Selective private					0.16	(0.38)
Moderately selective private					0.14	(0.30)
Constant	-1.99***	(0.55)	-1.93***	(0.55)	-2.41***	(0.61)
Vocational fields						
Parental SEI (standardized)	-0.15*	(0.06)	-0.38+	(0.20)	-0.36+	(0.22)
Birth cohorts (ref.1927–1951)						
Birth cohort 1952–1975	-0.14	(0.25)	-0.14	(0.25)	-0.45	(0.28)
Birth cohort 1976–1998	0.10	(0.26)	0.09	(0.27)	-0.23	(0.29)
Parental SEI (standardized)						
# Birth cohort 1952–1975			0.41+	(0.22)	0.41+	(0.24)
# Birth cohort 1976–1998			0.11	(0.22)	0.14	(0.24)
College selectivity (ref. Nonselective private)						
Selective national & public					0.17	(0.24)
Other national & public					1.60***	(0.20)
Selective private					-1.66***	(0.34)
Moderately selective private					-0.68***	(0.16)
Constant	-0.52	(0.33)	-0.54	(0.33)	-0.35	(0.38)
Observations	1,941		1,941		1,941	
Log likelihood	-2777.60		-2770.72			

Standard errors in parentheses, + p<0.1 * p<0.05 ** p<0.01 *** p<0.001. Survey types are controlled.



Source: SSM 1995, 2005, 2015, ESSM 2013, JLPS. Note: Error bars indicate 95% confidence intervals.

Figure 4 Predicted probabilities of fields of study for men and women

Appendix Table A1 Descriptive statistics

	Men			Women		
	Mean	SD	Valid cases	Mean	SD	Valid cases
Fields of study						
Humanities	0.10	0.30	3,588	0.33	0.47	1,941
Social sciences	0.46	0.50	3,588	0.25	0.43	1,941
STEM	0.35	0.48	3,588	0.10	0.30	1,941
Medicine	0.03	0.17	3,588	0.06	0.23	1,941
Vocational fields	0.06	0.24	3,588	0.26	0.44	1,941
Parental SEI	52.85	10.28	3,588	54.20	10.21	1,941
Birth cohorts						
1927–1951	0.17	0.37	3,588	0.05	0.23	1,941
1952–1975	0.48	0.50	3,588	0.39	0.49	1,941
1976–1998	0.36	0.48	3,588	0.56	0.50	1,941
College selectivity						
Selective national & Public	0.12	0.33	3,447	0.09	0.29	1,866
Other national & public	0.15	0.35	3,447	0.18	0.38	1,866
Selective private	0.18	0.39	3,447	0.12	0.33	1,866
Moderately selective private	0.33	0.47	3,447	0.32	0.47	1,866
Nonselective private	0.22	0.41	3,447	0.28	0.45	1,866
Survey types						
SSM 1995	0.07	0.25	3,588	0.04	0.20	1,941
SSM 2005	0.19	0.39	3,588	0.13	0.33	1,941
SSM 2015	0.30	0.46	3,588	0.28	0.45	1,941
ESSM	0.12	0.32	3,588	0.10	0.30	1,941
JLPS	0.34	0.47	3,588	0.45	0.50	1,941

Appendix Table A2 List of fields of study

1	Literature	24	Agricultural chemistry
2	History	25	Agricultural engineering
3	Philosophy	26	Agricultural economics
4	Others	27	Forestry
5	Law and politics	28	Veterinary medicine
6	Commerce and economics	29	Fisheries science
7	Sociology	30	Medicine
8	Mathematics	31	Dentistry
9	Physics	32	Pharmacy
10	Chemistry	33	Nursing
11	Biology	34	Home economics
12	Geography	35	Pedagogy
13	Mechanical engineering	36	Elementary school education
14	Telecommunications engineering	37	Junior high school education
15	Civil engineering	38	Special school education
16	Applied chemistry	39	Physical education
17	Applied science	40	Fine arts
18	Material engineering	41	Design
19	Marine engineering	42	Music
20	Aeronautical engineering	43	Liberal arts
21	Engineering management	44	Arts and social sciences
22	Crafts	45	International studies
23	Agricultural sciences	46	Human sciences

Supplementary materials

Definition of college selectivity

In this study, we categorize universities on the basis of selectivity in the following way. First, a group of 29 selective national and public four-year universities is categorized as "selective national and public." Although a majority (22 out of 29) of these schools are national universities (e.g., former imperial universities), we also include seven selective public universities. These 29 schools are Tokyo, Kyoto, Tohoku, Kyushu, Hokkaido, Osaka, Nagoya, Tokyo Institute of Technology, Tokyo Medical and Dental University, Hitotsubashi, Chiba, Tokyo University of Foreign Studies, Tsukuba, Ochanomizu, Yokohama National, Niigata, Kanazawa, Okayama, Hiroshima, Nagasaki, and Kumamoto (national universities), Tokyo Metropolitan, Yokohama City, Nagoya City, Kyoto Prefectural, Osaka City, Osaka Prefectural, and Kobe City University of Foreign Studies (public universities). Other national and public universities are categorized as "other national and public."

Similarly, we also create a group of selective private universities. First, we rely on the threshold used in previous studies (Kaneko 1996; Toyonaga 2022) to distinguish between selective and nonselective private universities. The threshold is whether the institution was established before 1960, which is characterized by the first stage of college expansion. The rationale here is that elite private institutions were established before the period of expansion; thus, the threshold is a useful proxy of selectivity and prestige. In addition to this definition, we distinguish selective private institutions on the basis of their prestige. As a result, we categorize a group of 29 selective private universities as "selective private." These schools include Keio, Waseda, Sophia, Tokyo University of Science, International Christian University, Meiji, Aoyama Gakuin, Rikkyo, Chuo, Hosei, Gakushuin, Kwansei-Gakuin, Kansai, Doshisha,

Ritsumeikan, and other medical school-based universities. Note that this is a small fraction of the approximately 790 private universities in Japan. Next, we categorize a group of 70 private universities as “moderately selective private.” These universities were established before 1960 but are considered to be not as selective as the first group. This group includes universities such as Senshu University, Tsuda College, Nihon University, Chukyo University, Kindai University, and Seinan Gakuin University. Other private universitas are categorized as “nonselective private.”