The effect of attending college on one's first job

With a focus on effect heterogeneity *

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Abstract

The increasing access to college in Japan underscores the importance of better understanding variation in the effects of college attendance according to students' social backgrounds. This study used the propensity score method to estimate the causal effect of college attendance on one's first job. Particular focus was placed on individuals who attended college despite a low likelihood of doing so due to their socioeconomic backgrounds. Using 2005 and 2015 Social Stratification and Social Mobility (SSM) Survey data, the study applied the stratification-multilevel method to estimate the effect of college attendance on one's first job in a professional role. The results of the analysis showed that for both males and females, individuals who had a low likelihood of attending college but who ultimately did so were more likely to enter a professional role in their first job, once selectivity of college attendance was accounted for. Possible mechanisms for this finding suggests that those who attend college against the odds tend to have a stronger motivation for learning and that, for this group, college is the only route to attain a professional job status unlike for those from advantageous family backgrounds who may attain professional status regardless of whether or not they attend university. In terms of theory, this study adds to the literature on the heterogeneous effects of college attendance from a Japanese perspective, particularly supporting the negative selection hypothesis where its outcome is a first job being in a professional role. In terms of practice, the heterogeneity revealed in this study may lend support to policy interventions that assist highly motivated individuals from disadvantaged backgrounds to attend college, when this group may otherwise not be able to attend college without financial and institutional supports.

Keywords: access to college, heterogeneous effects, propensity score, Japan

1. Introduction

Over the past several decades, college enrollment rates have increased in Japan for both

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males and females. From the 1960s to the mid-1970s in particular, enrollment in four-year universities and junior colleges rapidly increased, reaching over 40% for males and over 30% for females. In more recent years, the figure has reached over 50% for both genders. Such educational expansion has led to greater diversity in the social backgrounds of students who attend college, including those from less advantageous backgrounds who have traditionally had more difficulty accessing college. In this context of increased diversity, it has become more important to assess the extent to which colleges are actually effective in enhancing career outcomes for students of different social backgrounds.

Recent studies, particularly in the United States, have focused on heterogeneity in the effects of attending college on various social and economic outcomes (Brand, Pfeffer, & Goldrick-Rab, 2014; Brand & Xie, 2010; Hout, 2012; Musick, Brand, & Davis, 2012). These studies are based on the idea that the effects of college as a treatment may not be the same for all groups when we consider selection bias, or preexisting student characteristics. Some of these studies have explored aspects such as the negative selection hypothesis, which posits that the lower a person's likelihood of advancing to college, the higher their returns from attending college will be.

Building on this line of inquiry, this study examines the effect of attending college on one's first job – a direct causal outcome of college attendance in the Japanese context – with a focus on effect heterogeneity. Using the Social Stratification and Social Mobility (SSM) Surveys, the study applies stratification-multilevel method based on propensity scores (Xie, Brand, & Jann, 2012) to assess how the treatment effects may vary systematically according to one's likelihood of attending college. The results show that for both males and females, the likelihood of a first job being in a professional role is greater for individuals who have attended college despite a low likelihood of their doing so. The study then proposes several auxiliary analyses to elaborate why such relationships were observed, and the findings are further discussed on this basis.

2. Background and effects of attending college

Although access to college has expanded in Japan, there remains inequality in who has easier access to college education. A host of studies both within and outside of Japan have revealed that students from a more advantageous background, including parental socioeconomic status and cultural resources, are more likely to attend college (e.g., Ishida, 2007; Lareau, 2011; Ono, 2001; Sewell, Haller, & Portes, 1969). Studies have also shown that the opportunity to receive college education varies by gender and area of residence

(Buchmann & DiPrete, 2006; Byun, Irvin & Meece, 2015; Tsai & Xie, 2011).

Regarding the effects of attending college, researchers have examined various positive effects on social and economic outcomes, including occupation, income, marriage, and health (e.g., Hout, 2012). In Japan, a major finding from analyses of the Social Stratification and Social Mobility Surveys is that the relationship between education and occupational attainment in postwar Japan has been stable over time (Hara & Seiyama, 1999; Ishida & Miwa, 2011; Naoi & Fujita, 2008). Furthermore, recent investigations into the effects of college attendance on first job and present occupation have shown that the institutional ranking of universities also matters in such scenarios (e.g., Hirasawa, 2011; Nakanishi, 2000). Rather than economic indices such as income that are commonly used in the field of economics, Japanese scholars in social stratification research have often focused on occupation as a major outcome, an indicator that carries important social implications.

This study uses first job as a dependent variable. Due to its most direct causal link to college attendance, first job is considered the most appropriate candidate for inferring the effects of attending college in the Japanese context. In Japan, there is strong tendency that new college graduates are recruited all at once. Moreover, in contrast to income and current occupation, which are often missing for females who are not working because of marriage, it is relatively easy to observe both genders in their first job after graduation. From the human capital viewpoint, which is one of the theoretical perspectives that explain the link between education and occupation, whether a person's first job is in a professional role is an appropriate method of investigating the effects of college attendance (Becker, 1975; Bills, 2003). In general, professional jobs are attained after intense educational training to obtain knowledge and skills in and out of college.

3. Heterogeneous effects of college attendance

As previously noted, access to university remains unequal despite the recent expansion in higher education in Japan. If we consider this situation, there may be a variation in the gains from advancing to college, depending on one's social background. Relative risk aversion theory, as proposed by Breen and Goldthorpe (1997), suggests that socially advantaged parents and their children expect to pursue education so that their children can avoid downward mobility. Similarly, Kikkawa (2006) suggests that college-graduated parents hope that their children will also proceed to college so that they can "at least avoid" experiencing downward educational mobility. As these theories suggest, students from advantageous social and educational backgrounds who are more likely to attend college may do so based

on a rather passive motivation, which is to avoid downward social mobility, so that they can retain at least the same level of educational and occupational status as their parents.

On the other hand, when students from less advantageous backgrounds who are less likely to attend college, actually do end up attending, it may be inferred that they have a stronger motivation and objectives that would prompt them to pursue college attendance "against the odds." Compared to high school graduates who start working immediately after high school, going to college requires significant financial and opportunity costs, which would make it a crucial decision for those at the marginal likelihood of attending college. Therefore, if such people do proceed to college, the benefits they obtain from attending college may increase, compared to those of similar backgrounds who do not proceed to college. In other words, once selection bias due to preexisting characteristics is considered, those with a higher propensity to attend college may attain some level of socioeconomic status in any case, even when they do not proceed to college; for those from more advantaged backgrounds, going to college may not be the sole ticket to success, while those with a lower propensity to attend college who actually do end up attending may try to make the most out of their degrees, compared to those who do not attend college in the same situation.

4. Method

4.1 Analytic strategy

This study uses propensity scores to estimate the causal effect of college attendance on one's first job. By using this approach, it is possible to estimate the average treatment effect by using a combination of actual outcomes and "potential outcomes" that are defined as counterfactuals of the observed variables (Guo & Fraser, 2009; Hoshino, 2009; Morgan & Winship, 2007; Rosenbaum & Rubin, 1983). The propensity scores are defined as a conditional probability of assignment to treatment given the observed covariates. They are a type of balancing score that are predicted with covariates and summarized into a single-dimensional scale. This study uses logistic regression to generate these propensity scores. When using this approach to estimate causal effects, the selection of covariates becomes important. It is important to select covariates that influence both the assignment into treatment (in this case, college attendance) and the outcome (first job being in a professional role). By removing the effects of these covariates, it becomes possible to estimate the causal effects of the treatment on the outcome variable.

Based on this approach, this study takes the further step of investigating the

heterogeneity of the effect. In this case, the stratification-multilevel method proposed by Xie and his colleagues is applicable (Xie, Brand, & Jann, 2012). This method utilizes propensity score strata divided at fixed intervals, which enables a more systematic investigation of heterogeneity. In the first step, propensity scores for attending university were created using observed data. Next, strata were created so that the covariates were equal across the treatment group (college attendees) and the control group (non-attendees) within each stratum. This step was supported by the "pscore" command in Stata. The final number of strata was confirmed after testing that there were no significant differences in the mean values of the covariates within each stratum to the point where significant differences for all intra-stratum covariates were eliminated (Becker & Ichino, 2002).

Next, the propensity score strata were used to estimate the treatment effect for each stratum. This can be done by comparing the outcome variables of the treatment and control groups, or by fitting a regression model to each stratum and correcting any imbalances in the remaining covariates (Xie et al., 2012). The analysis in this study followed the latter method, whereby a logistic regression analysis of the outcome variable (a dummy variable for whether the first job was in a professional role) was performed for each stratum. Because the covariates were well balanced within each stratum when the initial propensity scores were created, the only independent variable included in the regression model was the treatment variable (college attendance). This process was therefore equivalent to comparing the outcome variable for the treatment and control groups.

Finally, the treatment effects estimated for each stratum were modeled at "level two" of a multilevel model and a conclusion was reached as to whether any systematic trends were discernible in terms of the heterogeneity of effect. In particular, the examination of whether there was a positive or negative relationship between the results and the size of the propensity score for each stratum based on fitting the results to a linear model has both theoretical and empirical significance (Brand & Xie, 2010). The above stratification-multilevel method, including the creation of graphs to illustrate the relationship between propensity scores for each stratum, was supported by the "hte" user command in Stata (Jann, Brand, & Xie, 2010).

4.2 Data and measures

This study analyzed the 2005 and 2015 cycles of the Social Stratification and Social Mobility (SSM) Surveys in Japan. The sample was restricted to respondents born on or after 1960, so that they were 18 years old after the mid-1970s when college enrollment had

experienced a rapid increase. Because mechanisms for advancing to college and gaining employment may differ according to gender, the analysis was performed separately for males and females. The academic background for study subjects was set at "high school graduate or higher." Subjects whose highest level of education was "junior high school" and those with "no record" or an "unclear record" were excluded. For males, individuals who graduated from a four-year university were defined as college attendees, and effects were estimated by comparing these subjects with high school graduates. In addition, because the relationship of "specialized vocational high school" and "junior college graduates" to university and high school graduates was unclear for males, these individuals were removed from the analysis for males. Considering that a certain number of males advanced to graduate school, only males older than 25 were considered in the analysis. In light of the fact that the enrollment rate in four-year universities for females expanded later than for males, females who attended either a two-year (junior college) or four-year university were treated as college attendees. Females older than 23 were included in the analysis.

After reviewing the related literature, the following covariates were selected.

- Attended College: For males, Highest level of education "University" or "Graduate School"=1, Otherwise=0. For females, Highest level of education "Junior College/Two-year University," "University," or "Graduate School"=1, Otherwise=0.
- Professional First Job: First job was in a professional role=1, Other=0[1].
- Female: Male=0, Female=1.
- Birth Year: Birth year of respondent (60–94).
- Number of Siblings at Age 15: Number of siblings (including self) at age 15 (1-13).
- Economic Status at Age 15: Family circumstances at age 15 (1=Poor to 5=Wealthy).
- Family Possessions at Age 15: Sum of the following 18 items: owns house, bath, children's room(s), study desk, lounge suite, piano, television, radio, video player, refrigerator, microwave oven, telephone, camera, literature/encyclopedia set, computer/word processor, car, work of art/antique (0-18).
- Number of Books at Age 15: The mid-point of the category for the number of books at age 15, divided by 10 (e.g., 11–25 books = 18 books = 1.8). To preserve the sample size, the missing values (approximately 10%) were uniformly recorded as 1.2 after considering their correlation with other variables (0.5-85).
- National or Private Junior High School: Junior high school was a national or private school=1, public school=0.

[1] First job being in a managerial role was dropped due to missing cases during the analysis.

- Academic Achievement at Year 3 of Junior High School: Self-rated level of academic achievement at year 3 of junior high school (1=Bottom to 5=Top).
- Parents' Education: Number of years of education for mother or father, whichever is higher (6–18).
- Father's Job – Professional/Management: Father employed in a professional/technical or management role when respondent was aged 15.
- Father's Job – Non-Manual: Father employed in an office administration, sales, service, or security job when respondent was aged 15=1, Other=0.
- Father's Job – Manual: Father employed in a manual job when respondent was aged 15=1, Other=0.
- Father's Job – Other: Father employed in any other type of job when respondent was aged 15=1, Other=0.
- Single-Parent Family at Age 15: If at least one parent was absent or not alive when respondent was aged 15=1, Other=0. In creating the categories, information on father's/mother's occupation, and age of death of father/mother was used (Inaba, 2011).
- Vocational Track at High School: Subjects offered at respondent's school were other than regular courses, science and mathematics courses, languages courses, or arts courses=1, Other=1.
- High School Rank: Proportion of respondent's peers at the same high school who advanced to study at university or junior college/two-year university (1=Almost None to 5=Almost All).
- Large City at Age 15: At age 15, respondent lived in any part of Tokyo or Osaka, a government designated city, or the urban areas of Saitama, Chiba, Kanagawa, Aichi, Kyoto, Hyogo, or Okayama=1, Other=0 (Aramaki, 2011).

5. Results

Table 1 presents the pre-matching mean values for the covariates using the propensity scores for college attendees and non-attendees by gender. A statistically significant difference (t-test) between the treatment group (college attendees) and control group (non-attendees) was observed for all variables. Both male and female college attendees exhibited the characteristics of being slightly younger, having fewer siblings, and having a wealthier home environment at age 15. A higher proportion of college attendees had attended national or private junior high schools. They also demonstrated better academic performance in the third year of junior high school, and had parents with longer years of education and

higher occupational status. A lower percentage of college attendees lived in single-parent families, and there was a strong trend for them to attend high schools with high university matriculation rates. Furthermore, a high proportion of students who went on to college studied regular subjects in high schools as opposed to vocational ones, and lived in a major city at age 15.

Table 1. Means of precollege covariates

	Male			Female		
Variables	No College	College		No College	College	
Birth Year	71.58	72.62	**	71.91	73.55	***
Number of Siblings at Age 15	2.48	2.37	**	2.50	2.34	***
Economic Status at Age 15	3.05	3.33	***	3.08	3.40	***
Family Possessions at Age 15	12.36	13.72	***	12.61	14.50	***
Number of Books at Age 15	6.83	15.28	***	7.02	14.88	***
National or Private Junior High School	0.03	0.08	***	0.03	0.10	***
Academic Achievement at Year 3 of Junior High School	2.73	3.75	***	2.94	3.66	***
Parent Education	11.60	13.49	***	11.73	13.50	***
Father's Job - Professional/Management	0.05	0.25	***	0.07	0.24	***
Father's Job - Non-Manual	0.25	0.34	***	0.23	0.33	***
Father's Job - Manual	0.56	0.29	***	0.56	0.30	***
Father's Job - Other	0.14	0.12		0.13	0.13	
Single-Parent Family at Age 15	0.08	0.04	***	0.09	0.04	***
Vocational Track at High School	0.51	0.06	***	0.38	0.09	***
High School Rank	2.28	4.04	***	2.69	4.10	***
Large City at Age 15	0.36	0.51	***	0.39	0.50	***
N	1079	898		1545	1237	

***p<.001, **p<.01, *p<.05

Table 2 presents the results of the logistic regression analysis, which was conducted in the process of creating the propensity scores. Generally, the results are in line with those reported in the existing literature. This paper does not interpret each coefficient presented in this table in detail. The important point is that these propensity scores were created as a unidimensional measurement that includes all of the possible covariate information.

In addition, Appendices A and B present the mean values for the covariates for each propensity score strata by gender. Test results are not included, but show no differences between college attendees and non-attendees for all covariates in all strata at the .01

significance level, with only two minor exceptions[2]. As a result, eight strata were formed for both males and females. The figures present the mean value of the propensity score and the number of cases included for each stratum. According to Xie et al. (2012), a minimum of 20 cases for the treatment and control groups in each stratum is desirable. The relevant estimates of the likelihood of attending university yielded the unsurprising result that strata with lower propensity scores had more non-attendees and strata with higher propensity scores had more attendees.

Table 2. Logit models predicting college attendance for the generation of estimated propensity scores

	Male		Female	
Variables	Coef.	S.E.	Coef.	S.E.
Birth Year	-0.007	(0.009)	-0.010	(0.007)
Number of Siblings at Age 15	-0.142 †	(0.079)	-0.112 †	(0.063)
Economic Status at Age 15	0.047	(0.088)	0.072	(0.070)
Family Possessions at Age 15	0.088 ***	(0.027)	0.144 ***	(0.023)
Number of Books at Age 15	0.003	(0.004)	0.004	(0.003)
National or Private Junior High School	0.389	(0.304)	0.538 *	(0.227)
Academic Achievement at Year 3 of Junior High School	0.644 ***	(0.072)	0.512 ***	(0.061)
Parent Education	0.131 ***	(0.032)	0.136 ***	(0.024)
Father's Job - Professional/Management	1.050 ***	(0.229)	0.471 **	(0.168)
Father's Job - Non-Manual	0.407 **	(0.151)	0.263 *	(0.120)
Father's Job - Manual (Reference)				
Father's Job - Other	0.268	(0.220)	0.439 *	(0.175)
Single-Parent Family at Age 15	-0.578 †	(0.307)	-0.466 †	(0.239)
Vocational Track at High School	-1.210 ***	(0.182)	-0.650 ***	(0.138)
High School Rank	0.645 ***	(0.061)	0.685 ***	(0.050)
Large City at Age 15	0.082	(0.130)	-0.046	(0.101)
Constant	-6.441 ***	(0.735)	-7.244 *	(0.582)
Likelihood Ratio X^2	1136.380		1253.230	
$p>X^2$	0.000		0.000	
Pseudo (McFadden's) R^2	0.417		0.328	
N	1977		2782	

***p<.001, **p<.01, *<.05, †<.10

Table 3 presents the results, by gender and for each propensity score stratum, of the

[2] Number of books at age 15 did not balance in block 1 for males, and vocational track for high school did not balance in block 4 for females. However, even after including these covariates again into the model after matching, the results remained very similar from what is presented in the current paper.

logistic regression analysis of the dummy variable that represented whether attending college resulted in a first job that was in a professional role. For both males and females, logit regression coefficients were higher in the lower propensity groups. As propensity scores increased, the value of the coefficients tended to decrease, although the trend was moderate for males compared to females. Figures 1 and 2 present the relationship between strata expressed as Level 2 slopes by plotting the values of the coefficients. The slope was -0.193 for males and -0.298 for females, both fitting a downward sloping line.

Table 3. Heterogeneous effects of college attendance on first job being in a professional role

	Male			Female		
	Coef.		S.E.	Coef.		S.E.
Level-1 Slopes						
P-score Stratum 1 [0.0-0.1]	2.957	***	(0.531)	1.383	**	(0.453)
P-score Stratum 2 [0.1-0.2]	1.487	**	(0.576)	0.979	**	(0.338)
P-score Stratum 3 [0.2-0.4]	1.379	***	(0.401)	0.662	**	(0.227)
P-score Stratum 4 [0.4-0.6]	1.290	**	(0.407)	0.422	†	(0.237)
P-score Stratum 5 [0.6-0.7]	1.707	**	(0.640)	0.690	*	(0.328)
P-score Stratum 6 [0.7-0.8]	0.428		(0.537)	-0.423		(0.294)
P-score Stratum 7 [0.8-0.9]	1.666	**	(0.552)	-0.535		(0.350)
P-score Stratum 8 [0.9-1.0]	0.854		(0.597)	-0.615		(0.659)
Level-2 Slope	-0.193	*	(0.085)	-0.298	***	(0.062)

***p<.001, **p<.01, *<.05, †<.10

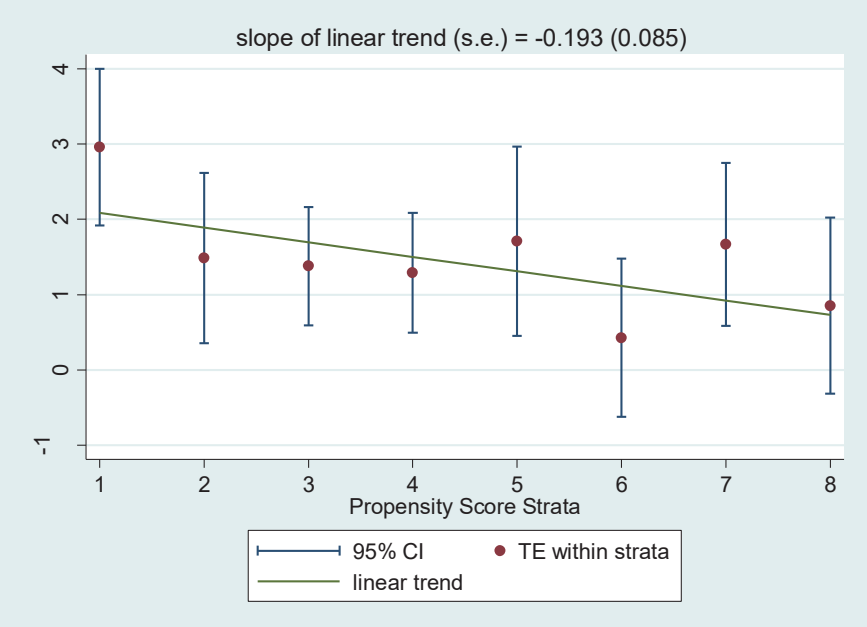

Figure 1. Heterogeneous effects of college attendance on first job being in a professional role (male)

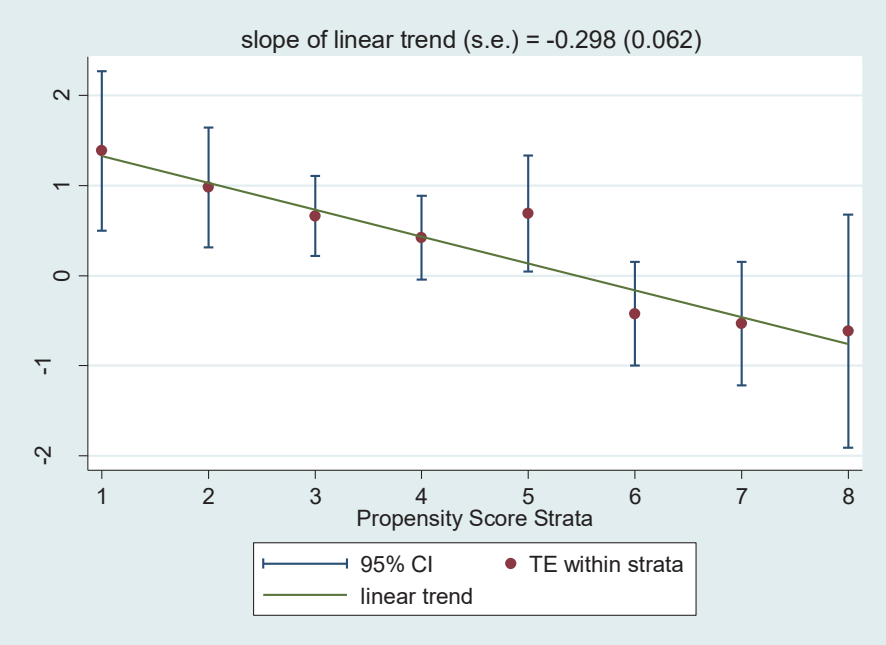

Figure 2. Heterogeneous effects of college attendance on first job being in a professional role (female)

Tables 4 and 5 present the mean values for the actual percentages of males and females whose first job was of a professional nature for each propensity score stratum. Of the 1006 males that did not attend college, only 6% entered a professional role in their first job. Of the 888 males that did attend college, 35% entered some type of professional role in their first job. Similarly, of the 1449 females that did not attend college, 17% entered a professional role in their first job, and 33% of the 1218 females that attended college entered a professional role in their first job. For both males and females, if they attended college, the likelihood of entering a professional job was approximately 30% regardless of the propensity score stratum. On the other hand, if they did not attend college, their likelihood of entering a professional job became higher as their propensity to attend college increased.

Table 4. Proportion for the first job being in a professional role, by propensity score strata (male)

	No College		College		
	Proportion	N	Proportion	N	Odds Ratio
Stratum 1	0.03	(416)	0.36	(22)	19.24
Stratum 2	0.04	(179)	0.17	(35)	4.42
Stratum 3	0.07	(174)	0.24	(70)	3.97
Stratum 4	0.09	(116)	0.26	(94)	3.63
Stratum 5	0.07	(42)	0.30	(94)	5.52
Stratum 6	0.17	(30)	0.23	(115)	1.53
Stratum 7	0.12	(34)	0.41	(191)	5.29
Stratum 8	0.27	(15)	0.46	(267)	2.35
Total	0.06	(1006)	0.35	(888)	8.69

Table 5. Proportion for the first job being in a professional role, by propensity score strata (female)

	No College		College		
	Proportion	N	Proportion	N	Odds Ratio
Stratum 1	0.09	(390)	0.28	(29)	3.99
Stratum 2	0.12	(326)	0.27	(59)	2.66
Stratum 3	0.20	(336)	0.32	(140)	1.94
Stratum 4	0.20	(199)	0.28	(202)	1.52
Stratum 5	0.23	(80)	0.37	(120)	1.99
Stratum 6	0.41	(69)	0.31	(178)	0.65
Stratum 7	0.44	(39)	0.31	(260)	0.59
Stratum 8	0.60	(10)	0.45	(230)	0.54
Total	0.17	(1449)	0.33	(1218)	2.43

Additionally, Tables 4 and 5 show the odds ratios on each percentage. The odds ratio indicates the degree of difference between the number of male or female college attendees who gained professional employment versus the number of male or female non-attendees who gained professional employment. The odds ratio for males is 8.69, which is higher than the 2.43 for females. This suggests that, on average, the proportion of male college attendees entering a professional job in comparison to male non-college attendees is higher for males than for females. It is also noteworthy that for females, the proportion entering a professional job is higher for non-college attendees than for college attendees in the higher strata (stratum 6-8), which is also apparent from the odds ratios that are smaller than 1. We need to examine further why it can be the case that females who did not attend college showed a higher

percentage of entering a professional job if they had a higher likelihood of attending college.

6. Auxiliary analyses

In this section, we will further examine the mechanisms of how and why the heterogeneity observed for both genders in the previous section occurred. The auxiliary analyses proceed as follows. First, the details of the professional job are described. Second, as part of possible explanations for the heterogeneous trend, one's college major, values placed on attending college, and proportion attending technical schools are examined by strata and gender.

Examining the specific details of professions based on the strata generated by the analysis, many male professionals had entered the fields of engineering, research, and teaching. A large number of female professionals were nurses, early childhood educators, or teachers. However, even among professionals, there was a tendency for doctors, dentists, and pharmacists to come from strata with high propensity scores for both genders. Among females in the low propensity strata, nurses were a major profession for non-college attendees, whereas early childhood educators and teachers (kindergarten to high school) were major professions for college attendees. For females, individuals who did not attend university despite a high propensity to do so were able to enter a professional job at the same or even a higher rate as college graduates. This may be because some females in the subject group, such as nurses or other health workers and nursery school teachers, were able to find work in a professional role by attending a technical schools or other lectures and seminars, thereby independently gaining qualifications without attending college.

In addition to examining the details of professions, the distribution of the first job for both professional and non-professional jobs by college-attendance status and propensity strata for both genders are summarized in Appendices C and D.

As for the possible mechanisms why those with a lower propensity are more likely to enter a professional role in their first job, two scenarios are proposed. The first is that for individuals who attend college despite a low likelihood of so doing, they may have a stronger motivation and objectives in attending college considering that they do so "against the odds." We will examine this scenario through two indicators: one is college major and the other is values on attending college. The second scenario is that among those with a lower propensity to attend college, whether or not they attend college tends to make a sole and crucial difference to whether or not they obtain a professional job. However, among those with a higher propensity to attend college, they may obtain a professional job through

other means such as having other training opportunities elsewhere, even when they do not attend college. Technical schools are one such example that will be examined below.

Table 6 shows the distribution of college majors by propensity score strata among college attendees for both genders. Lower propensity males are slightly more likely to major in social science. Within the social science category, the further details (table not shown here) reveal that there are approximately 40% business and economics majors among the lower strata (strata 1-2) compared to approximately 20% among the higher strata (strata 7-8), suggesting that lower propensity males may tend to seek more practical expertise when attending college. We also see more agricultural majors among the lower propensity than the higher propensity males. Although medicine and health is also an applied and practical field, no male in the lower strata majored in these subjects, possibly because it is a costly field in which to study. For females, there are more home economics and education majors, which are applied and practical fields, among the lower strata. In the higher strata, there are more humanities majors (particularly literature), which could be regarded as an example of a non-applied field.

Table 6. Distribution of college majors by propensity score strata (%, college attendees only)

College Major	Male		Female	
	Stratum 1-2 (N=54)	Stratum 7-8 (N=451)	Stratum 1-2 (N=87)	Stratum 7-8 (N=488)
Humanities	5.6	6.0	13.8	27.7
Social Sciences	55.6	39.5	17.2	17.8
Natural Sciences	0.0	3.6	0.0	1.0
Engineering	22.2	31.0	3.5	3.7
Agriculture	11.1	3.6	1.2	1.6
Medicine and Health	0.0	6.2	3.5	8.4
Home Economics	0.0	0.0	24.1	12.7
Education	3.7	7.1	28.7	16.0
Art	0.0	1.3	5.8	8.0
Other	1.9	1.8	2.3	3.1
Total	100.0	100.0	100.0	100.0

Table 7 shows the mean values for objectives of attending college, in response to the questionnaire item: “Those without clear objectives should not go to college.” On average, non-college attendees have higher values than college attendees in both genders. By strata among non-college attendees, those in the lower strata of both genders are more likely to agree with such an idea. However, among college attendees, this trend is observed only

among females.

Table 7. Mean “college objectives” by propensity score strata

	Male				Female			
	No College		College		No College		College	
	Mean	N	Mean	N	Mean	N	Mean	N
Stratum 1	2.90	(248)	2.54	(13)	2.91	(213)	2.40	(15)
Stratum 2	3.03	(114)	2.30	(27)	2.75	(190)	2.88	(32)
Stratum 3	2.88	(125)	2.51	(43)	2.75	(188)	2.44	(89)
Stratum 4	2.56	(79)	2.34	(64)	2.74	(136)	2.47	(116)
Stratum 5	2.71	(28)	2.13	(53)	2.62	(47)	2.59	(78)
Stratum 6	2.64	(22)	2.56	(75)	2.78	(50)	2.42	(121)
Stratum 7	2.94	(18)	2.28	(128)	2.35	(26)	2.31	(173)
Stratum 8	2.36	(11)	2.22	(172)	2.57	(7)	2.16	(166)
Total	2.85	(645)	2.32	(575)	2.77	(857)	2.39	(790)

Note: The values are means of responses to the item: "Those without clear objectives should not go to college" (Strongly Agree=4, Agree=3, Disagree=2, Strongly Disagree=1)."The item is only available in 2015 SSM, not in 2005 SSM.

Table 8 shows the proportion of technical school attendance by propensity score strata. For both male and female non-college attendees, on average, approximately 30% attended technical schools across all strata. Among male and female college attendees, approximately 5% attended technical schools in addition to four-year or two-year universities. In the non-attendees groups, the proportion of technical school attendees increased as the propensity to attend college increased for both genders. These facts suggest that technical schools may provide an alternative route to a professional job other than through four-year or two-year universities, especially for females.

Table 8. Proportions of technical school attendance by propensity score strata

	Male				Female			
	No College		College		No College		College	
	Proportion	N	Proportion	N	Proportion	N	Proportion	N
Stratum 1	0.14	(418)	0.09	(22)	0.19	(393)	0.07	(29)
Stratum 2	0.24	(180)	0.06	(35)	0.26	(329)	0.03	(60)
Stratum 3	0.45	(175)	0.04	(70)	0.40	(340)	0.03	(140)
Stratum 4	0.48	(116)	0.05	(96)	0.52	(200)	0.05	(203)
Stratum 5	0.50	(42)	0.08	(96)	0.54	(82)	0.05	(122)
Stratum 6	0.58	(31)	0.07	(117)	0.71	(69)	0.06	(181)
Stratum 7	0.41	(34)	0.07	(193)	0.70	(40)	0.03	(267)
Stratum 8	0.60	(15)	0.02	(269)	0.73	(11)	0.07	(235)
Total	0.29	(1011)	0.05	(898)	0.36	(1464)	0.05	(1237)

7. Discussion

This study used propensity scores to estimate the causal effect of university attendance on one's first job. Particular focus was placed on individuals who attended university despite a low likelihood of so doing. The results of the analysis showed that for both males and females, individuals who had a low likelihood of attending university, but who did ultimately do so, were more likely to enter a professional role in their first job, once selectivity of college attendance was taken care of. The trend was more straightforward for females than for males.

This study attempted to further elaborate on the reasons for such findings, and found that those with a lower likelihood of attending college but who ultimately did so were slightly more likely to major in more applied and practical fields than their higher propensity counterparts. These low propensity groups also had slightly stricter views on college attendance, and considered that those without clear objectives should not attend college. This may suggest that individuals who attend college against the odds tend to have clearer learning objectives in college. Due to a stronger motivation to gain skills and expertise through their college career, they may have more opportunity to enter a professional job than would have been the case if they had not attended college. The study also found that among these "against the odds" groups, the proportion of technical school attendance increased as the propensity to attend college increased. This suggests that individuals with a higher propensity have alternative routes to enter a professional job, one of which is possibly by attending technical schools. For those with a lower propensity to attend college, however, college tends to be the only route to success, which may be another reason why those with a

lower propensity to attend college were more likely to enter a professional job compared to their non-college attendee counterparts.

Although there have been few attempts to examine the heterogeneous effects of college attendance according to students' social backgrounds in Japan, Ishida (2017) has done so by using propensity score matching to examine the effect of higher education on occupational outcomes. In particular, the study found that for both males and females, cumulative advantage and disadvantage continue to exist after one's educational attainment; the benefits of higher education on one's first job are the same regardless of one's likelihood of attending higher education. Ishida's findings contradict with the present study's findings with regards to whether the effect heterogeneity exists in college attendance in Japan, which is a crucial difference in findings that needs to be investigated further. Although the two studies used similar approaches to examine the effect of attending college on one's first job, possible difference in the estimated effects may be due to various factors such as the datasets used, treatment variable, covariates, and the use of propensity scores[3]. Future study is needed to scrutinize such difference in findings to in order to continue the discussion on the effect heterogeneity of higher education in the Japanese context.

The present study has both theoretical and practical implications. In terms of theory, it adds to the literature on the heterogeneous effects of college attendance from a Japanese perspective, particularly supporting the negative selection hypothesis where its outcome is a first job being in a professional role. In terms of practice, the heterogeneity revealed in this study may lend support to policy interventions that assist highly motivated individuals from disadvantaged backgrounds to attend college, when this group may otherwise not be able to attend college without financial and institutional supports. Such an intervention based on the effect heterogeneity may help to achieve both greater efficiency and equality in the opportunity to access college.

One limitation of this research includes the possible influence of unobserved variables. Although it is a common challenge in any regression-based analyses, propensity score methods in particular depend on the strongly ignorable treatment assumption, meaning that the assignment for a treatment condition does not depend on the outcome of interest. Thus, inclusion of variables that influence both college attendance and the first job is crucial for

[3] Ishida (2017) used Japanese Life Course Panel Surveys (JLPS) for young and middle-aged cohorts that were conducted between 2008 and 2015. The outcome variable was whether one's first job was in a professional/ managerial role. Ishida's treatment variable was higher education (two-year junior college, four-year university, and graduate school), whereas the current study dropped junior college for males. Possible causes of difference may also include the process of estimating propensity scores as well as the making of strata based on propensity scores.

obtaining the unbiased college effect estimates in this study. Therefore, if, for example, there is a difference in ability between college attendees and non-attendees such that the former has a higher level of ability, then the effect of attending college could be overestimated. Although this study attempted to address motivation, which may in part be an example of non-cognitive ability, as a relevant factor in explaining the heterogeneous effects of college attendance, further study is needed to consider such possible factors that are currently unobserved in the existing surveys.

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Appendix A. Mean covariate values by propensity score strata (male)

Variables	Stratum 1 [.0-.1]		Stratum 2 [.1-.2]		Stratum 3 [.2-.4]		Stratum 4 [.4-.6]		Stratum 5 [.6-.7]		Stratum 6 [.7-.8]		Stratum 7 [.8-.9]		Stratum 8 [.9-1.0]	
	No College	College	No College	College	No College	College	No College	College	No College	College	No College	College	No College	College	No College	College
Birth Year	70.54	71.41	72.71	74.31	72.33	72.13	72.92	73.07	73.14	71.75	73.42	72.82	72.29	72.46	74.20	72.81
Number of Siblings at Age 15	2.57	2.32	2.39	2.51	2.39	2.27	2.32	2.46	2.38	2.65	2.23	2.25	2.65	2.32	2.33	2.32
Economic Status at Age 15	2.92	3.18	3.14	3.00	3.14	3.10	3.09	3.27	3.38	3.17	3.19	3.21	3.32	3.34	3.73	3.55
Family Possessions at Age 15	11.83	12.64	12.79	12.86	12.54	12.93	13.20	12.76	13.93	13.13	12.81	13.52	14.44	13.85	14.00	14.68
Number of Books at Age 15	3.97	9.72	6.63	8.81	7.23	9.56	8.28	9.97	10.33	8.59	9.18	11.91	22.33	15.07	35.31	23.96
National or Private Junior High	0.02	0.00	0.03	0.00	0.05	0.04	0.03	0.01	0.05	0.07	0.06	0.03	0.06	0.12	0.07	0.14
Academic Achievement at Year 3 of Junior High School	2.44	2.41	2.69	2.83	2.95	2.86	3.18	3.27	3.33	3.48	3.45	3.61	4.12	3.88	4.53	4.46
Parent Education	10.85	11.23	11.92	12.09	12.07	11.91	12.59	12.44	12.57	12.31	12.81	13.10	13.26	13.71	15.20	15.06
Father's Job - Professional/Management	0.01	0.05	0.04	0.00	0.09	0.06	0.11	0.10	0.07	0.09	0.10	0.14	0.21	0.21	0.33	0.54
Father's Job - Non-Manual	0.17	0.27	0.28	0.29	0.26	0.30	0.39	0.39	0.48	0.47	0.42	0.38	0.38	0.35	0.47	0.28
Father's Job - Manual	0.68	0.59	0.53	0.63	0.51	0.49	0.41	0.40	0.29	0.29	0.29	0.33	0.32	0.31	0.07	0.09
Father's Job - Other	0.14	0.09	0.14	0.09	0.14	0.16	0.09	0.11	0.17	0.15	0.19	0.15	0.09	0.13	0.13	0.09
Single-Parent Family at Age 15	0.10	0.05	0.09	0.00	0.06	0.07	0.04	0.07	0.05	0.06	0.03	0.05	0.00	0.02	0.07	0.02
Vocational Track at High School	0.80	0.95	0.52	0.49	0.25	0.17	0.06	0.05	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
High School Rank	1.56	1.50	2.16	2.03	2.63	2.61	3.16	3.23	3.71	3.81	4.35	4.12	4.35	4.54	4.67	4.84
Large City at Age 15	0.26	0.23	0.38	0.37	0.45	0.47	0.53	0.43	0.50	0.46	0.48	0.61	0.38	0.54	0.67	0.55
Propensity Score	**.05**	**.05**	**.15**	**.15**	**.29**	**.30**	**.50**	**.51**	**.65**	**.66**	**.75**	**.76**	**.85**	**.86**	**.93**	**.95**
N	418	22	180	35	175	70	116	96	42	96	31	117	34	193	15	269
N (Total for Each Stratum)		440		215		245		212		138		148		227		284

Appendix B. Mean covariate values by propensity score strata (female)

Variables	Stratum 1 [.0-.1]		Stratum 2 [.1-.2]		Stratum 3 [.2-.4]		Stratum 4 [.4-.6]		Stratum 5 [.6-.7]		Stratum 6 [.7-.8]		Stratum 7 [.8-.9]		Stratum 8 [.9-1.0]	
	No College	College	No College	College	No College	College	No College	College	No College	College	No College	College	No College	College	No College	College
Birth Year	70.65	73.38	71.36	71.32	72.34	73.04	72.93	73.18	73.83	71.82	75.23	73.94	73.13	73.79	73.27	75.10
Number of Siblings at Age 15	2.58	2.41	2.52	2.50	2.47	2.47	2.36	2.35	2.45	2.44	2.38	2.25	2.18	2.33	1.73	2.23
Economic Status at Age 15	2.88	3.00	3.07	3.10	3.16	3.12	3.19	3.29	3.39	3.25	3.48	3.33	3.28	3.47	3.91	3.83
Family Possessions at Age 15	11.30	11.72	12.47	12.73	13.26	13.11	13.77	13.88	14.32	14.25	14.77	14.51	14.68	15.12	16.00	16.08
Number of Books at Age 15	4.25	4.93	5.48	4.87	6.67	7.56	8.74	10.96	11.32	11.76	14.15	11.89	19.93	16.58	37.96	28.39
National or Private Junior High	0.02	0.00	0.02	0.00	0.01	0.02	0.06	0.03	0.06	0.06	0.10	0.06	0.05	0.16	0.18	0.25
Academic Achievement at Year 3 of Junior High School	2.57	2.55	2.82	2.85	3.05	3.09	3.23	3.26	3.51	3.59	3.71	3.64	4.03	3.93	4.36	4.46
Parent Education	10.70	10.28	11.54	11.86	11.87	12.25	12.85	12.65	12.99	12.66	13.70	13.46	13.74	14.19	15.50	15.48
Father's Job - Professional/Management	0.02	0.07	0.03	0.07	0.08	0.05	0.15	0.15	0.11	0.18	0.22	0.20	0.28	0.25	0.64	0.54
Father's Job - Non-Manual	0.15	0.17	0.20	0.15	0.24	0.30	0.35	0.33	0.37	0.33	0.42	0.40	0.40	0.40	0.18	0.28
Father's Job - Manual	0.69	0.72	0.64	0.63	0.56	0.54	0.39	0.40	0.41	0.38	0.28	0.27	0.15	0.19	0.18	0.06
Father's Job - Other	0.14	0.03	0.14	0.15	0.13	0.11	0.13	0.12	0.11	0.11	0.09	0.14	0.18	0.15	0.00	0.12
Single-Parent Family at Age 15	0.14	0.10	0.08	0.03	0.07	0.06	0.03	0.06	0.04	0.06	0.06	0.03	0.03	0.04	0.00	0.01
Vocational Track at High School	0.70	0.59	0.43	0.55	0.22	0.22	0.14	0.05	0.02	0.02	0.06	0.04	0.00	0.02	0.00	0.00
High School Rank	1.78	1.86	2.33	2.33	2.94	2.99	3.59	3.61	4.07	4.10	4.28	4.48	4.78	4.73	4.91	4.93
Large City at Age 15	0.32	0.28	0.37	0.27	0.39	0.41	0.44	0.44	0.52	0.49	0.45	0.49	0.38	0.58	0.82	0.60
Propensity Score	**.06**	**.07**	**.15**	**.15**	**.29**	**.30**	**.50**	**.51**	**.65**	**.66**	**.74**	**.75**	**.84**	**.85**	**.93**	**.93**
N	393	29	329	60	340	140	200	203	82	122	69	181	40	267	11	235
N (Total for Each Stratum)		422		389		480		403		204		250		307		246

Appendix C. Distribution of first job by propensity score strata (male, %)

First Job	Lower Propensity (Stratum 1-2)		Higher Propensity (Stratum 7-8)	
	No College (N=595)	College (N=57)	No College (N=458)	College (N=49)
Professional/Technical	3.4	24.6	16.3	44.1
Clerical	9.8	22.8	20.4	23.6
Sales	11.9	22.8	16.3	19.4
Service	4.9	7.0	14.3	2.6
Police/Security	3.9	0.0	6.1	1.1
Manual work	65.7	22.8	26.5	9.2
Other	0.5	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0

Appendix D. Distribution of first job by propensity score strata (female, %)

First Job	Lower Propensity (Stratum 1-2)		Higher Propensity (Stratum 7-8)	
	No College (N=716)	College (N=88)	No College (N=49)	College (N=490)
Professional/Technical	10.3	27.3	46.9	37.6
Clerical	39.3	44.3	34.7	43.3
Sales	17.6	12.5	4.1	10.8
Service	13.4	9.1	12.2	4.5
Manual work	19.4	6.8	2.0	3.7
Other	0.0	0.0	0.0	0.2
Total	100.0	100.0	100.0	100.0