Over-education and its opportunity cost in Japan

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Abstract

In this paper, we investigate the determinants of over-education in Japan and evaluate its opportunity costs for university graduates. To this end, we use the REFLEX data. Results reveal that over-education level in Japan is high and it brings an important wage penalty for Japanese workers. Large firm and high occupations point towards a significant reduction in the likelihood of over-education. Results for wage regressions for over-education indicate that Japanese workers who achieve jobs in large organizations will experience 20% increase in their wage due to the firm size and if over-educated their increase in wage will remain still positive.

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1. Introduction

This paper analyzes over-education in Japan and evaluates its opportunity costs for university graduates. Using a very contextually rich survey, we firstly determine which factors contribute to over-education in Japan among university graduates. In the following step, we estimate stylized Mincer equations measuring the opportunity cost of being over-educated in Japan. To our best knowledge, this is the first study of over-education in Japan. [2]

Our research aims at providing new evidence for Japan (Ono 2010), taking into account the fact that Japanese society shows a very low degree of job mobility leaving space for potential strong persistence of over-education (Genda and Kurosawa 2001) and hence, large economic costs of this phenomenon. It becomes particularly important for Japan, as it has undergone a deep economic crisis during nineties and the new millennium (Jung and Cheon 2006; Yu 2010).

There is a large body of literature on over-education in economics and sociology (Verhaest and Van der Velden 2012). It has been demonstrated that over-education is a rather long-lasting phenomenon at both micro and macro levels (AlbaRamirez 1993; Battu et al. 1999; Dolton and Vignoles 2000; Frei and Sousa-Poza 2011; Frenette 2004; Rubb 2003). Furthermore, over-education is shown to bring negative consequences for workers, such as decreased wages (Hung 2008; Korpi and Tahlin 2009; Nordin et al. 2010) and lower job satisfaction (Allen and van der Velden 2001; Belfield and Harris 2002; Garcia-Aracil et al. 2004). Yet worse, persisting in over-education has been demonstrated to have a detrimental influence on workers' cognitive skills (de Grip et al. 2008). These results have attracted institutional attention of OECD calling for labor market reforms combatting wide spread mismatch phenomenon (Quintini 2011).

Over-education has an important negative wage effect understood as opportunity cost of mismatch. This cost varies by country and is estimated between 7 and 18% (Groot and Massen van den Brink 2000). This brings a significant potential loss of productivity in a macro scale, even if over-education was just a temporary phenomenon in workers' lives. However, as Scherer (2004) and Lindley and McIntosh (2010) show, over-education in the first jobs may potentially leave a scarring effect on workers' wages further in their careers.

[2] The only paper which addresses match quality in Japan that we are aware of is that of Esteban-Pretel and Fujimoto (2012) where a theoretical model of match quality specific to Japanese labor market is developed. Esteban-Pretel and Fujimoto do not preset, however, any empirical evidence for neither quantity nor its opportunity costs of over-education. Esteban-Pretel, J., and Fujimoto, J. (2012). "Life-cycle search, match quality and Japan's labor market." *Journal of the Japanese and International Economies*, 26(3), 326-350.

Finally, over-education decreases job satisfaction (Allen and Velden 2001; Belfield 2010) and causes over-educated workers to be more prone to quits (Buchel and Mertens 2004; Groot and Massen van den Brink 2003; Hersch 1991; Robst 1995a). The paper is organized as follows. In next section, we present the theoretical argument standing behind our hypothesis that entrepreneurial skills may serve as an instrument in the battle against over-education. In section 3, we describe the REFLEX survey used in this paper (Allen and Van der Velden 2007) and the econometric methods applied to data analysis. We provide the results in section 4 and conclude in section 5, forming some policy recommendations.

2. Theoretical background

Over-education has received much attention in the economic literature (Chevalier 2003; Groot and Massen van den Brink 2000; McGuinness 2006). However, to date there is no direct evidence on Japan. This paper aims at filling this gap and provides an insight into determinants of over-education and its opportunity costs. Japan constitutes a very interesting case for the career mobility theory (Sicherman 1991; Sicherman and Galor 1990) and its predictions for over-education. The theory posits that young workers (in our case young university graduates) enter initially over-educated positions and while learning on-the-job acquire the necessary skills to ascend to matching positions (Sicherman 1991, p.108). Japanese workers have been described as those who enjoy smooth school-to-work transitions (Genda and Kurosawa 2001; Ryan 2001). However, as Genda and Kurosawa (2001) further demonstrate, Japanese workers who decide to change employers "lower significantly their chances for a matching job". This is of the chief importance for our study as the Japanese workers remain with the same employer for significantly longer tenures than do any other workers in advanced economies (Blinder and Krueger 1996; Hashimoto 1979; Kambayashi and Kato 2011; Kato 2001; Ono 2010; Shimizutani and Yokoyama 2009). The opposite has been observed in Europe where, workers who persist with the same employer receive on average lower wages and less training than those hired through the external promotions (Groeneveld and Hartog 2004). In this sense, Japanese workers who remain within their initial jobs should have greater chances to achieve better matches through internal promotions and not, as is the case of American workers, through job change (Hersch 1995; Robst 1995a).

Hypothesis 1: Japanese workers should be able to achieve better matches through internal promotions and not through job changes.

Given the job stability of Japanese workers we control for the size of the establishment since larger firms enjoy better possibilities for workers promotions

(Cheng and Kalleberg 1996). Shimitzutani and Yokoyama (2009) demonstrate that larger companies provide their workers with better retention rates and higher promotion possibilities. Furthermore, as noted in Ohkusa et al. (1997) occupational and internal labor markets in Japan should be clearly separated. Drawing on this conclusion, we include in our analysis measures on occupations in attempt to control for labor mobility across firms within the same occupation.

Hypothesis 2: Working in a large firm in Japan should decrease the likelihood of over-education even after controlling for occupation-specific factors.

Over-education, apart from the labor market conditions, is also thought to be influenced by the educational credentials and their relative quality (McGuinness 2003; Robst 1995b; Robst 2008). The evidence for Europe demonstrates that graduates from better quality colleges and graduates whose university programs were more skills oriented have lower chances for becoming over-educated (Garcia-Aracil and Van der Velden 2008). Drawing on these findings, we can expect that similar effects should be present in Japan, especially so, because Japanese firms are known hire university graduates when they are still studying. Fields of study appear particularly important in this context. As Rebick (2000) shows, particular faculties enjoy a much greater level of hires due to special networks between them and the employers, as well as their male/female composition, being those male-dominated the preferred types of studies. Such close education-industry links are also known in Europe and the U.S. leading to better matches of graduates already at the entry level (Van de Werfhorst 2004; Werfhorst 2002). This coupled with specific program characteristics such as vocational orientation of the program or its prestige lead us to form the following two hypotheses.

Hypothesis 3: Graduates from more widely recognized fields such as engineering and health should enjoy lower over-education probabilities than do graduates from social sciences.

Hypothesis 4: Prestigious, highly demanding and vocationally oriented programs are thought to diminish over-education likelihood.

Finally, there are marked differences observed between genders and their school-to-work transitions (Genda and Kurosawa 2001). These entry differences translate further into wage differences leaving women significantly worse off in the Japanese labor market (Miyoshi 2008). Gender differences in over-education may serve here as one of the mechanisms of transmission of inequality in the labor market. Knowing that over-education leaves a scarring effect on workers' wages (Lindley and McIntosh 2010) and joining it with the observed persistent gender wage differences in the Japanese labor market one should expect higher probability of over-education among women than men.

Hypothesis 5: Women are expected to have higher probability of over-education than men in Japan.

In the second part of the paper, we aim to measure the opportunity cost of over-education in Japan. It has been well documented in the literature on over-education, that it leads to lower wages than if the worker would be adequately matched (Chevalier 2003; Groot and Massen van den Brink 2000; Hartog 2000; Lindley and McIntosh 2010; McGuinness 2006). The opportunity cost of over-education is measured through introduction of a dummy variable of over-education into the otherwise quite standard Mincer-style wage equation (Kiker et al. 1997; Verdugo and Verdugo 1989). Based on the previous hypotheses on the incidence of over-education we should expect to observe a wage penalty associated with over-education.

Hypothesis 6: Over-educated workers in Japan earn less than if they were matched.

With the lifetime employment in Japan in mind, we should also expect to observe higher internal promotions possibilities in large companies which in turn conduct to higher wages (Shimizutani and Yokoyama 2009). Thus, we will compare the rewards associated with working in the large firm with the penalty to over-education.

Hypothesis 7: Working in a large firm in Japan has stronger effect on the wage than over-education.

The next section describes the data and econometric methods employed in the analysis.

3. Data and Methods

To analyze over-education and its opportunity costs in Japan, we use the REFLEX data. This survey consists of information on individuals who graduated in 2000 and were interviewed five years later, in 2005. We have detailed information on their university studies, their present job and their personal background. All this information is available for 1091 individuals in Japan (Allen and Van der Velden 2007). We restrict the sample to those individuals below 45 years old, who are not self-employed and work full time.

The dependent variable, over-education based on a self-reported measure defined as a response to a question “Which is the most appropriate level of education for your current work”. Workers who responded that lower level than their currently attained or lower than tertiary education level is required were classified as over-educated. Those who responded that their current level or a higher level would be best for their current job form the reference category for over-education dummy

and are regarded as matched in this paper. On the right-hand side of the equations, we employ a large battery of explanatory variable in this paper.

[Table 1 about here]

Table 1 presents definitions of all explanatory variables used in our analysis. In the first phase, we analyze the determinants of over-education in Japan. This part of analysis involves a standard probit model with over-education dependent variable defined as before and a series of explanatory variables introduced in a sequential way in a model-building strategy.
The most complete model in this part is defined as follows:

$$\Pr\left(y=1|x\right)=\Phi\left(\mathbf{X}\beta_1+\mathbf{F}\beta_2+\mathbf{I}\beta_3+\mathbf{E}\beta_4\right)$$

where:
X is the matrix of basic controls;
F is the vector of dummies controlling for fields of study;
I is the vector of dummies controlling for occupations;
E is the vector of dummies controlling for university program characteristics.
Φ is the cummulative normal density function.

We start with estimation of a basic model of over-education including only the **X** matrix of regressors. The explanatory variables included in the matrix **X** are the following: gender, average grade in the secondary school, long vs. short university program, labor market experience (in months since graduation), public sector dummy, number of jobs since graduation, dummy controlling for internal promotions practice inside the firm, and two controls for the size of the company (medium firms 50-250 employees and large firms with more than 250 employees). Results for this estimation are represented in Table 4 in column “Model 1”. Model 2 expands the first estimation with inclusion dummies for fields of study (vector **F**). We have seven fields observed in Japan. These are education, humanities, social sciences (reference category in this paper), sciences and mathematics, engineering, agriculture and vet, and health.
In the next step, in Model 3, we introduce four dummies for aggregated occupations (vector **I**). As a base category we use lower than clerks, occupations and we control further for professionals and senior managers.
In the next three models we introduce seven university program attributes (vector **E**). These are responses to a question whether the university program of the worker was demanding in academic terms, if employers were familiar with it, if it was broadly oriented or vocationally focused, if students had freedom to choose their

study path and whether the program was academically prestigious and if it could be considered as entrepreneurial. These program attributes are introduced interchangeably with, first, fields of study (Models 4 and 5) and with time spent on job search before attaining first job (Models 4 and 6).

The respondent was asked to attach a degree to which he or she considered that the program could be labeled with each of the seven attributes (in a Likert scale from 1 to 5 scale). Since the reported level of the program attributes could be considered endogenous,[3] we construct a measure based on empirical Bayes predictions. We take into account that the attribute of a program depends, basically, on three items: the length of the program (short vs. long), the field of study and the university where the program was attended. Therefore, we compute seven measures one for each program attribute characterized by combination of the length, field of study (21 categories) and the university. This implies 152 types of programs (clusters). To do so we estimate a random-intercept model with an ordinal dependent variable (prestige with 3 categories) and then compute via empirical Bayes predictions the probability to study a program with certain attribute (attribute>2) for each cluster (Skrondal and Rabe-Hesketh 2012, p. 594-595, 602-605). This variable should avoid the endogeneity problem of the self-reported measure of program attributes.

Our sample consists of 1091 individuals who graduated from universities in the year 2000 and have been interviewed in 2005. Over-education distribution by field of study and by firm size are displayed in Tables 2 and 3. As regards fields of study, we can readily observe that there is much larger incidence of over-education in so called “hard sciences” such as engineering or pure sciences (34 and 36%, respectively). There is surprisingly little over-education among education and humanities graduates (19 and 22%, respectively). This is a radically different picture from Europe or the U.S. (Frenette 2004; Garcia-Aracil 2008; Robst 2007; Verhaest and Van der Velden 2013).

[Table 2 about here]

A much more predictable view is presented in Table 3. The distribution of over-education across firms in Japan is very similar to that known from other parts of the world. Larger firms offer better promotion possibilities and therefore experience a much lower over-education incidence.

[3] The reported level of characteristic of the program could be affected by the labor market outcomes of the respondent, for instance, as it is a subjective measure. Then, if parental background also affects labor market outcomes, a spurious correlation between parental background and prestige of the program could arise.

[Table 3 about here]

Finally, Table 4 depicts the basic descriptive statistics for all explanatory variables.

[Table 4 about here]

In the next step we estimate the opportunity cost of over-education. In order to measure the opportunity cost we introduce a dummy for over-education into an otherwise fairly standard Mincer-style equation (Heckman et al. 2003; Mincer and Higuchi 1988). The most complete model is defined as follows:

$$\ln(ghwage) = \varphi_1 + \mathbf{X}\varphi_2 + \mathbf{F}\varphi_3 + \mathbf{I}\varphi_4 + \varsigma$$

where:

X is the matrix of basic controls;

F is the vector of dummies controlling for fields of study;

I is the vector of dummies controlling for occupations;

φ_i are vectors of linear regression coefficients;

ς is a random error term.

Worker's wage is measured through a gross hourly wage variable and the rest of the variables are defined exactly as before.
In the following section we discuss the results from both exercises.

4. Results

Over-education determinants

Overall over-education level in Japan is surprisingly high. With roughly 27% of all graduates in our sample over-educated five years after graduation Japan might seem like having some serious problems with accommodating highly skilled labor at the beginning of their careers. However, such an alarmist view would be very misleading given the high stability of jobs in Japan (Kambayashi and Kato 2011; Ono 2010; Shimizutani and Yokoyama 2009). Job entry in Japan is relatively easy for a majority of graduates from well-recognized universities. Once in the company, however, workers begin their careers at very low levels being over-educated. As Genda and Kurosawa (2001) show, changing employers at that stage is most likely going to lead to a worse matching position. This is also the view that our results suggest. Firstly, we observe that the larger the firm the lower the probability of over-education. This coupled with the fact that changing jobs increases the

likelihood of over-education confirms our hypothesis 1 (**H1**). In the next step we hypothesized that working in a large firm should lower the likelihood of over-education even after controlling for the occupation. Model 3 in Table 5 shows precisely that. The coefficients for both, large firm and high occupations point towards a significant reduction in the likelihood of over-education. Large firm reduces this probability by about 11% while high occupations (where over-education is virtually absent) reduces is further by about 22%. Given the high stratification of jobs by age in Japan, and relatively young sample in our study (below 46 year of age), it is of no surprise that the "best occupation" for our graduates is Professionals instead of Senior Managers. The explanation here is that individuals in our sample are too young to become senior managers.

In the following step we test the third hypothesis regarding the fields of study in Japan. From Model 2 (Table 5) we can readily observe that the best fields in terms of over-education (those that reduce the most the likelihood of it) are precisely engineering, health but also humanities, education, and agriculture (as compared to the social science). Notwithstanding, once we control for occupations in Model 3 to 6, the importance of fields wanes. It is clear that occupations capture better the variability in our data than fields. The most plausible argument here is that engineers and health graduates all become professionals and, hence the field itself loses its importance for the occupation.

In the last step, we introduce controls for university program attributes. We test in Models 4 to 6 whether having studied in a program an academically demanding, vocationally oriented, prestigious, known to employers, broad, entrepreneurial or in a program that allowed students to design their own path through the studies affects over-education likelihood. Models 4 to 6 in Table 5 demonstrate the results for the program attributes on over-education. It is clear that none of the attributes affects the likelihood of over-education in Japan. Therefore, our fourth hypothesis (**H4**) does not find any confirmation in our analysis.

Finally yet importantly, we do not confirm the relatively disadvantaged position of women in the Japanese labor market for university graduates. There is no significant relationship between female gender and over-education in our sample (**H5** rejected). A rather surprising result comes from the variable measuring the time of search for the first job. One would expect that in a labor market like Japanese, characterized by very high stability of employment, workers who take longer to find jobs should be more likely to be over-educated due to their lower quality signaling power. It turns out, however, that for our sample there is no significant effect for having search for the first job longer. This result should be further explored with use of panel data.

Next, we proceed to analyze the opportunity cost of over-education.

Opportunity cost of over-education

Results for wage regressions for over-education are presented in Table 6. Models are labeled as ModelW1, ModelW2, and ModelW3 indicating our model building strategy of gradually adding more controls into the right-hand side of the equation. The first model contains only the **X** controls defined above. We that over-education brings an important wage penalty in Japan. ModelW1 shows a wage penalty of approximately 20% for university graduates while controlling for the standard factors affecting wage.[4] From Table 6 it is also immediately clear that, larger firms, as well as the long study programs (those that allow attending Ph.D. studies) bring on average 20% increase in wage each of them. Models 2 and 3 include gradually fields of study and occupations controls, respectively. There is no evidence as to any significant impact of fields of study once we control for occupational position. Other variables remain remarkably stable across all three models contributing to the robustness of our results.

The last hypothesis asked whether working for a large company may offset the negative effect of over-education. In model 2 and 3 we demonstrate that this is indeed the case. Japanese workers who achieve jobs in large organizations will experience 20% increase in their wage due to the firm size and if over-educated their increase in wage will still remain positive, though much lower, at only 3%. This positive effect may, in turn be offset, if we consider women. Although they are not more prone than men to be over-educated in Japan, they earn on average 18% less wage than their male peers.

Therefore, we can conclude that over-education even though high in Japan is not very harmful for workers in large firms, as their opportunity loss associated with it, is effectively offset by the firm size effect for men. The same does not hold for women as they suffer independently of their match status a wage loss associated with their gender.

5. Conclusions

In this paper we study the determinants and opportunity cost of over-education in Japan. Our study is based on a very contextually rich cross-section survey called REFLEX. This data allows us to observe both over-education and wage of graduates

[4] Note that differently from a standard Mincer equation we do not include (experience)^2 which is normally meant to model the U-shaped distribution of earnings across age and experience. We do so, because our sample is homogeneous in terms of age and entails mostly young individuals for whom there is no the U-shape of wage yet.

who finished their studies in the year 2000 and have been interviewed in 2005. The data contains rich information on workers education and present job. In the first step, we investigate what factors foster and what mitigate the likelihood of over-education in the Japanese university graduates' labor market. It turns out that working for a large organization and within a high occupation are the key factors, which diminish the likelihood of educational mismatch. Furthermore, we note that fields of study such as engineering or health cease to contribute negatively to over-education in Japan once we control for occupational status. This finding goes in line with what Ohkusa et al. (1997) suggest as internal and occupational labor markets. We find a substantive evidence pointing towards the existence of both. Internal labor markets exist within large Japanese companies and they are chiefly responsible for the negative effect of a big organization on over-education in our results. In other words, workers who are over-educated in a large firm have much better chances for leaving their mismatch (on average 12% better chances than workers in small firms). Yet better, if they are employed within a good occupation. Their likelihood of leaving over-education improves by further 22%. This suggests existence of a strong negative relationship between occupations and mismatch.

Contrary to our expectations and to the existing findings claiming a much worse labor situation of women in Japan, we do not find evidence on higher likelihood of over-education for women. However, once we regress gender control on wage, we do find an important wage penalty for women. This result should however, be taken with caution and studied further since we do not control for self-selection of women into our sample neither for their unobserved characteristics, which could possibly bias our results. We find, in line with the existing evidence elsewhere, that over-education in Japan is associated with a 20% opportunity cost. This cost may get even more aggravated if one takes into account that Japan has experienced one of the longest crisis across industrialized world (Yu 2010).

This paper contributes to the existing literature by demonstrating the existence of a rather high mismatch level in Japan and by measuring its wage penalty, which amounts to about a fifth of workers' wages. We manage also to bring a suggestive evidence for previously described internal and occupational labor markets in Japan.

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Table 1: Variable definitions.

Variable	Definition
Female	Female
Grade secondary education	Quintile of GPA in high school
Long program	Highest level of education currently attained
Experience	Number of months employed since graduation
Public sector	Public sector current job
Number of jobs	Number of employers since graduation
Internal promotions	Internal promotion
Medium firm	Firm size (50-250 employees)
Large firm	Firm size (above 250 employees)
Education	Field of studies: Education
Humanities	Field of studies: Humanities and arts
Social Sciences	Field of studies: Social sciences, business and law
Science & Maths	Field of studies: Sciences and mathematics and computing
Engineering	Field of studies: Engineering, manufacturing and construction
Agriculture & Vet	Field of studies: Agriculture and veterinary
Health	Field of studies: Health and welfare
Senior Managers	Legislators, senior officials and managers
Professionals	Technicians and associate professional
Clerks	Clerks and administrative workers
Lower occupations	Skilled manual and non-skilled workers
Search time 1st job	Time to find the first job
Prestigious program	Probability to have attained a high prestige program
Demanding	Probability to have attained a highly demanding program
Employers familiar with it	Probability to have attained a program well known to employers
Vocationally oriented	Probability to have attained a highly vocational program
Broadly oriented	Probability to have attained a very broad program
Free to choose path	Probability to have attained a program with high component of path choice by student
Entrepreneurial	Probability to have attained a highly entrepreneurial program

Table 2: Incidence of over-education by field of study in Japan.

Field of study	Over-education (percentages by field)	
	0	1
Education	80,3	19,7
Humanities	77,93	22,07
Social sciences	71,86	28,14
Science & maths	63,79	36,21
Engineering	66,04	33,96
Agriculture and vet	76,84	23,16
Health	85,59	14,41
Total	72,87	27,13

Table 3: Incidence of over-education by firm size in Japan.

Number of employees	Over-education by firm size (percentages)	
	0	1
Below 50	67,06	32,94
50-250	70,45	29,55
Above 250	75,04	24,96
Total	72,87	27,13

Table 4: Descriptive statistics for the working sample

Variable	Mean	Std. Dev.	Min	Max
Female	0,474	0,500	0	1
Grade secondary education	4,321	1,148	1	5
Long program	0,224	0,417	0	1
Experience	56,237	12,481	0	82
Public sector	0,256	0,436	0	1
Number of jobs	1,556	0,957	0	8
Internal promotions	0,604	0,489	0	1
Medium firm	0,202	0,401	0	1
Large firm	0,643	0,479	0	1
Education	0,060	0,239	0	1
Humanities	0,133	0,340	0	1
Social sciences				
Science & Maths	0,053	0,224	0	1
Engineering	0,294	0,456	0	1
Agriculture & Vet	0,087	0,282	0	1
Health	0,102	0,302	0	1
Senior Managers	0,041	0,199	0	1
Professionals	0,389	0,488	0	1
Clerks	0,123	0,328	0	1
Lower occupations	0,447	0,497	0	1
Search time 1st job	1,192	4,001	0	48
Prestigious program	0,292	0,081	0,111	0,505
Demanding	0,309	0,118	0,118	0,561
Employers familiar with it	0,166	0,043	0,094	0,287
Vocationally oriented	0,244	0,172	0,035	0,759
Broadly oriented	0,325	0,056	0,231	0,519
Free to choose path	0,392	0,152	0,067	0,668
Entrepreneurial	0,117	0,027	0,064	0,188

Table 5: Determinants of over-education in Japan (marginal effects from probit models).

	Model1	Model2	Model3	Model4	Model5	Model6
Female (d)	-0.000	0.020	0.017	-0.003	0.018	0.017
	(0.030)	(0.034)	(0.034)	(0.031)	(0.034)	(0.034)
Grade secondary education	-0.018	-0.015	-0.013	-0.006	-0.006	-0.006
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Long program (d)	0.333***	0.370***	0.430***	0.456***	0.456***	0.454***
	(0.040)	(0.045)	(0.047)	(0.044)	(0.048)	(0.048)
Experience	-0.002	-0.001	-0.002*	-0.002	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Public sector (d)	-0.049	-0.052*	-0.054*	-0.053*	-0.051	-0.046
	(0.031)	(0.031)	(0.031)	(0.031)	(0.032)	(0.033)
Number of jobs	0.044***	0.040***	0.035**	0.035**	0.034**	0.034**
	(0.014)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Internal promotions (d)	-0.019	-0.022	-0.029	-0.022	-0.025	-0.024
	(0.028)	(0.028)	(0.028)	(0.029)	(0.029)	(0.029)
Medium firm (d)	-0.019	-0.021	-0.029	-0.031	-0.032	-0.031
	(0.043)	(0.044)	(0.043)	(0.043)	(0.043)	(0.043)
Large firm (d)	-0.086**	-0.092**	-0.119***	-0.113***	-0.119***	-0.119***
	(0.040)	(0.041)	(0.042)	(0.042)	(0.042)	(0.042)
Education (d)		-0.121**	-0.068		-0.133**	-0.131**
		(0.048)	(0.057)		(0.056)	(0.057)
Humanities (d)		-0.084**	-0.074*		-0.055	-0.055
		(0.040)	(0.040)		(0.047)	(0.047)
Science&Maths (d)		-0.002	0.070		0.041	0.042
		(0.062)	(0.071)		(0.074)	(0.074)
Engineering (d)		-0.099**	-0.013		-0.036	-0.036
		(0.039)	(0.045)		(0.051)	(0.051)
Agriculture&Vet (d)		-0.112***	-0.087*		-0.108**	-0.109**
		(0.042)	(0.045)		(0.050)	(0.050)
Health (d)		-0.144***	-0.071		-0.101	-0.099
		(0.039)	(0.051)		(0.070)	(0.071)
Senior Managers (d)			-0.103*	-0.095	-0.093	-0.094
			(0.056)	(0.058)	(0.058)	(0.058)
Professionals (d)			-0.224***	-0.216***	-0.217***	-0.219***
			(0.031)	(0.030)	(0.031)	(0.031)
Clerks (d)			-0.094**	-0.090**	-0.091**	-0.090**
			(0.037)	(0.037)	(0.037)	(0.037)
Search time 1st job				-0.002		-0.002
				(0.004)		(0.004)
Prestigious program				-0.478	-0.316	-0.310
				(0.301)	(0.317)	(0.317)
Demanding				-0.091	-0.201	-0.207
				(0.226)	(0.244)	(0.244)
Employers familiar with it				-0.267	0.010	0.020

				(0.512)	(0.532)	(0.532)
Vocationally oriented				0.085	0.205	0.199
				(0.129)	(0.159)	(0.160)
Broadly oriented				0.282	0.214	0.210
				(0.309)	(0.317)	(0.317)
Free to choose path				-0.114	-0.170	-0.164
				(0.130)	(0.138)	(0.138)
Entrepreneurial				0.147	-0.483	-0.455
				(0.624)	(0.708)	(0.709)
Observations	1091	1091	1091	1091	1091	1091
Pseudo R^2	0.087	0.101	0.137	0.140	0.146	0.146
AIC	1183.9	1179.0	1139.3	1139.0	1141.7	1143.3
BIC	1233.9	1259.0	1234.2	1243.9	1271.6	1278.2

Marginal effects
(d) for discrete change of dummy variable from 0 to 1
* p<0.10, ** p<0.05, *** p<0.01

Table 6: Wage regressions measuring the opportunity cost of over-education in Japan.

	Wage1	Wage2	Wage3
Over-education	-0.200***	-0.196***	-0.178***
	(0.034)	(0.034)	(0.035)
Female	-0.218***	-0.181***	-0.173***
	(0.030)	(0.035)	(0.035)
Grade secondary education	0.051***	0.049***	0.048***
	(0.013)	(0.013)	(0.013)
Long program	0.240***	0.188***	0.170***
	(0.039)	(0.044)	(0.045)
Experience	0.002*	0.002	0.002*
	(0.001)	(0.001)	(0.001)
Public sector	-0.097***	-0.087**	-0.084**
	(0.033)	(0.034)	(0.034)
Internal promotions	0.003	0.010	0.010
	(0.030)	(0.030)	(0.030)
Medium firm	0.135***	0.126***	0.129***
	(0.048)	(0.048)	(0.048)
Large firm	0.209***	0.198***	0.208***
	(0.041)	(0.041)	(0.042)
Education		0.034	0.006
		(0.068)	(0.069)
Humanities		-0.074	-0.080
		(0.049)	(0.049)
Science&Maths		0.033	0.006
		(0.068)	(0.069)
Engineering		0.100**	0.063
		(0.045)	(0.047)
Agriculture&Vet		-0.039	-0.044
		(0.056)	(0.056)
Health		0.023	-0.017
		(0.056)	(0.058)
Senior Managers			0.032
			(0.074)
Professionals			0.092**
			(0.037)
Clerks			-0.031
			(0.049)
Constant	2.029***	2.019***	1.980***
	(0.099)	(0.101)	(0.103)

Observations	1039	1039	1039
AIC	1337.1	1336.6	1333.3
BIC	1386.5	1415.7	1427.2

* p<0.10, ** p<0.05, *** p<0.01