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Evaluating the Effects of Career-oriented Education on Academic Performance and Employment Outcome - A statistical analysis based on students' data -†

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The Centre of Research and Development for Cooperative Education at Kyoto Sangyo University (KSU) has gathered the data of all 5473 students who graduated in 2008 and 2009, through which we can trace how well he/she performed academically, whether he/she took career-oriented education programme, and how he/she managed the job hunting.

This paper is an attempt to verify the causal relationships among these factors by using a statistical analysis on the KSU students' data and thus to suggest to academics and practitioners concerned one way to assess the career-oriented education programme.

Based on this huge and detailed set of data on individual students, we performed a regression analysis to test following three hypotheses; Hypothesis 1: "Career-oriented education helps to obtain a good job," Hypothesis 2: "Career-oriented education raises academic performance," and Hypothesis 3: "Good students do well at university, anyway." Our data showed a set of statistical results in favour of all of the three hypotheses.

Keywords: Academic performance, Employment outcome, Career-oriented education, Statistical analysis

1. Introduction

The concept of Career-oriented Education (better known as Career Education in Japan) started drawing attention of educators and industrialists approximately 10 years ago, when the Ministry of Education, Culture, Sports, Science, and Technology introduced it in the Report of Central Educational Council in 1999. Its popularity grew steadily helped by two recent socioeconomic trends in Japan, despite being somewhat behind the rest of the industrial nations. One was the lack of financial resource to train employees by companies. Japanese companies typically offered a lifetime employment to newly recruited employees and train them at their own expense. But the companies became increasingly cautious to use their financial resource for such investment for the uncertain future, as a result of the long economic downturn after the collapse of bubble economy during 1990's. So there was a need for someone to train the potential employees. The other trend was the lowering ability standard of university graduates. The Ministry of Economy, Trade, and Industry has been pointing out in the same period that university graduates tend to lack "Basic social skills," the term equivalent to generic or soft skills. This is not unrelated to the rising enrolment rates of universities and colleges, which exceeded 50% by 2005, and to the fact that many universities and colleges find it necessary to offer remedial programmes in recent years. It is probably safe to say that after the 10 years both career education and basic social skills are becoming integral parts of higher education as well as of workplace in Japan. And yet there is no hard fact to verify the

effectiveness of such programmes.

At Kyoto Sangyo University (KSU) we have started to gather individual data on each student since 2009, in which student's attributes such as the pre-entry background, the academic performance during the university career, as well as the employment outcome after graduation are collected. These data if properly used can help construct an academic programme at KSU that responds to the need of Japanese society today.

The present paper makes use of some of the data in order to specifically verify the effectiveness of career education programme at KSU.

2. Kyoto Sangyo University and its career education programme

Kyoto Sangyo University is a private university, which was established in 1965 with Faculties of Economics and Science, and by 2011 there are 9 faculties in all --- Economics, Science, Business Administration, Law, Foreign languages, Cultural Studies, Engineering, Computer Science and Engineering, and Life Science. We have 393 full-time academic staff, 399 full-time administrative staff and 12961 undergraduate and 251 post-graduate students as of may 2011. Undergraduate courses are for 4 years and the academic year starts in April and end in March of the following year in Japan. .

Since 1999, KSU has been offering to its students a range of career education courses based on domestic internships. But the significant step was taken when the government approved and funded our new project on career education in 2004, with a help of which the Center of Research and Development for Cooperative Education was set up. Since then, the programme expanded and as of 2009 there are 20 courses. Of the 20 courses, 11 are Work-integrated Learning WIL) courses, e.g. Internships 1~5, in which students have direct contacts with industries, while 9 are induction courses, e.g. University life and career choice, Business Challenges of 21st century, to prepare students towards working life.

3. Basic data

The data has been collected from all 5473 undergraduate students who graduated in March of 2008 and 2009, --- 2739 and 2734 respectively. Of the total 5473, 3781 were male and 1692 were female from 7 faculties i.e. Economics, Business, Law, Foreign Languages, Cultural Studies, Science, and Engineering. From the original panel data of each student, we use annual GPAs, whether he/she has taken career education courses, and the employment outcome. Here is the brief description.

(i) Annual GPAs over 4 years: The average annual GPAs for the 4 years of undergraduate courses are 1.90, 1.74, 1.90, and 1.53. The 1st year's GPA may be used to represent the student's academic ability before coming to university. This is because we cannot trace detailed data on students' pre-university academic performance --- we do not have a national examination to include in the data every high school leaver such as A levels and O levels in UK, and we assume that the 1st year GPA depends heavily on the pre-university achievement. The 3rd year's GPA is used to identify the academic progress during the undergraduate years. The 3rd instead of the 4th year is used, due to a rather peculiar Japanese situation where many students manage to attain the necessary units to graduate by the end of 3rd year to spend almost an entire 4th year for job hunt, so that their 4th year's GPAs do not reflect their academic ability.

(ii) Career education: the total number of registrations for these courses is 5132, with 1190 in WIL courses, which offer direct contacts with companies through internships, and 3942 in inductive courses, which introduce to students various aspects of working life. In terms of student number, 1789 took one career education course and 1275 took two or more, while 2409 took none.

(iii) Employment outcome: We look at this from two different angles. First, the students were asked upon graduation whether they have obtained full-time (or permanent) employment or, part-time (or temporary) employment or otherwise. Because of Japan's life-time employment tradition students tend to prefer the full-time to part-time employment. Out of 5473 students, 4432 were in full-time employment, 462 were in part-time employment, 170 went to graduate school, and 409 with neither of these. Second, the companies were categorized as Listed and Unlisted, where the former tend to be with more prominent companies and be preferred by students. 1423 students went to listed companies and 2778 went to unlisted ones, while we could not specify 1272 cases. Although it has no direct significance to our analysis, the main industries in the

breakdown of 4432 students' placements by industry are; Finance and Insurance 949, Wholesale and Retail 922, Manufacturing 782, Information 359, Services 339. It needs to be mentioned that although these figures solely refer to the students at KSU, it is not very far from the general outlook of the Japanese students as a whole.

4. Hypotheses

The main theme of this paper is to determine the effects of career education on students' academic performance during undergraduate years as well as on their employment outcome upon graduation. Therefore our main hypotheses would be;

Hypothesis 1: "Career education helps to obtain a good job."

Hypothesis 2: "Career education raises academic performance."

The first is a necessary requirement for the career education to exist. Even if it holds, however, some may feel that it does not help academic performance. For example, an emphasis on career education is sometimes not met by full support of academics in Japan because some feel that it does not bring about a positive and direct effect on academic performance. So it is crucial for the advocates of career education to prove it is not the case, i.e. to verify the hypothesis 2, to earn more support of their colleagues.

In order to prove an effectiveness of career education programme, there is one other hypothesis to check;

Hypothesis 3: "Good students do well at university, anyway."

If this were true, all our effort to improve the students' outcome would be meaningless, let alone the career education programme. So it is important to clarify that our effort is worthwhile by somehow negating this hypothesis.

In fact, this line of argument is all very familiar to labour economists by the concepts of "human capital investment" and "signalling" in labour economics. Human capital investment is a concept to explain one's decision to pay for education in the expectation that his/her productivity and wage will rise in future, just as in monetary investment. For example, one decides to go to university as long as his/her wage differential with a high school leaver is greater than the cost of university education he/she has to pay.

Some argue, however, that education is a credential rather than capital formation (or productivity raising) and consider it as signalling. The idea is that people are different and we do not have perfect information about the difference among them, so that a job seeker needs an educational credential to "signal" his/her productive ability, or equivalently a recruiting firm needs to "screen" the applicant's productive ability. There is a large volume of theoretical as well as empirical research in labour economics in this issue. (For example, see Becker 1964 or Mincer 1974)for the original work on human capital theory, Spence (1973) for an intuitive and clear introduction of signalling, and Borjas (2008) for introductory treatment of the both.)

Empirically, however, it is difficult to differentiate the human capital effect and signalling effect of education, since the both raise one's employment outcome, i.e. one could get a good job based on receiving education because he/she becomes productive through human capital formation and/or because the prospective employer recognizes his/her innate productivity.

We therefore construct 3 hypotheses based on the concepts of human capital and signalling as follows;

Hypothesis 1: "Career education helps to obtain a good job."

Career education helps to obtain a good job, through forming practical human capital skills and/or signalling the prospective employer his/her innate practical skills.

Hypothesis 2: "Career education raises academic performance."

Career education helps to obtain high academic performance rather than the former preventing the latter.

Hypothesis 3: "Good students do well at university, anyway."

If this holds, higher education acts a signal rather than human capital. Thus universities do not nurture students.

5. Variables

For estimation, we use following variables.

5.1. Dependent variables

(i) Employment outcome: measured by a binary choice dummy variable in terms of a job status with 1 if full-time and 0 if otherwise, or a company status with 1 if the company is listed and 0 if otherwise.

(ii) Academic performance: measured by average GPA in

the 3rd year instead of the 4th and final year. This is because many students obtain the required number of units for graduation by the end of the 3rd year, so that they can concentrate on job hunting in the final year.

5.2. Independent variables

(i) Faculty: a dummy variable for each faculty except for Engineering Faculty

One would naturally expect employment outcome to differ among students of different faculties due to the supply and demand interactions for labour markets with the special skills, although it is not easy to predict which faculty does better, i.e. the signs of the coefficients. There may be also faculty based variation due to difference among the ability distributions of students by faculty.

(ii) Sex: a dummy variable with 1 if male and 0 if female

Despite the Japan's official declaration of equal opportunity for male and female in employment since 1985 and with its several amendments, female graduates still face employment discrimination in a form of what is known as 'statistical discrimination' in the labour economics literature. This is based on two idiosyncratic aspects of female labour force in Japan. First, many female employees quit the job for marriage, expecting a baby or nurturing a small child, and come back to labour market afterwards, which generates Japan's peculiar "M-shaped" labour participation curve only shared presently by few countries such as Korea. Second, this induces employers to give the priority to male applicants especially if any training at work is offered, since the female's discontinuity at work could greatly reduce the effectiveness of such on-the-job training. So we would expect it to be positively significant. As for academic performance, there should not be an obvious reason to distinguish by sex.

(iii) Year of graduation: a dummy variable with 1 if 2009 and 0 if 2008

Employment prospects and outcomes are heavily influenced by the economic fluctuations. Particularly, one should be careful about the effect of the recent US subprime problem. Or we might see some subtle difference in an ability distribution of students from year to year.

(iv) Academic performance at the 1st year (GPA1) and the 3rd year (GPA3): GPA1 is used as a proxy to measure student's academic level before entering university while GPA3 is used to measure student's academic level he/she has achieved at university. Generally, we expect they have positive effects on the dependent variables.

(v) Career education

This is the main theme of this research and we look at this from three angles because of the way we organize Career Education programme at KSU. First, we see if the number of courses a student takes matter. We expect that the more courses a student takes the better they perform academically and at job hunt. Second, we single out WIL courses to see if taking any is effective by using a dummy variable. Thirdly, the effect of inductive courses is examined with a dummy variable. As we work with career education programmes, we hope the effects on academic performance and employment outcome to be positive and significant.

6. Estimation and the results

Out of the total of 5473 students, we left out those without GPA results for 4 years in a row due to reasons such as study abroad or illness, to have 5160 samples. Regressions were estimated with employment status (i.e. Full-time or not), company status (i.e. listed or not), or GPA in the 3rd year as a dependent variable. The employment status regression has 4616 samples by leaving out 544 students who have opted for other activities such as going to graduate school, while company status regression has 3965 samples by leaving out 1195 students who have opted for other activities such as working for public sectors.

The causal relationship between dependent and independent variables were estimated using "Ordinary Least Square" method with a statistical package "EView." The estimated equations were "Linear Probability Model" for employment outcome i.e. Job status and company status, and "Linear Model" for academic performance i.e. GPA3. The results appear in Table I, II, and III respectively.

When the dependent variable is a binary choice as in our employment outcome, the model contains heteroskedasticity. In such a case, usual t-values need to be replaced by heteroskedasticity-robust t-values. The existence of homo-skedasticity was rejected in all equations in Table I and II using Breusch-Pagan-Godfrey test, and therefore the t-values were replaced by heteroskedasticity-robust t-values, although these t-values were very closed to the usual t-values, as it is often pointed out. (See Wooldridge (2006) for the problem of and solution to heteroskedasticity)

Table I shows the estimation results with employment status as dependent variable and a set of independent variables appear along the first column, with 4 equations to allow a variation in the definition of career education, i.e. career education, WIL, and/or inductive courses. Several observations are worth noting. First, adjusted R square values to check the fitness of the model to data is around 3%, which is not particularly high --- textbook examples tend to give values between 60~90% for time series. However, it is not rare for a cross-section analysis with a sample of this large size to have this value. In any case, F-value below supports the validity of the estimation. Turning to the coefficients, most of them show t-values to imply significance at 5%, apart from the faculty difference for Economics, Business, and Law. The year of graduation seems to matter --- in equation 1, for example, if you graduate in 2009, your probability of obtaining a full-time employment is 1.9% below those in 2008. The faculty difference seems to exist between engineering students and others with engineering students performing better than all others, as the coefficients are all negative. But the results are significant only for Languages, Culture, or Science students. Sex seems to affect the employment prospect with being male student significantly raising the probability by 2.2~2.5% in equations 1~4. This result was expected, although not notably high, with the existence of statistical discrimination in the graduate labour market in Japan.

Now turning to the variables of main interest, GPA's seem to be significant factors for employment outcome. Academically competent students with higher GPA1 and /or GPA3 do well for job hunt and GPA1 seems to have slightly bigger impact than GPA3, e.g. 0.039 and 0.035 in Equation 1. It seems to suggest that both the pre-university achievement and university achievement raise the full –time employment probability. As far as career education is concerned, their effects are all positive and significant --- for example, one more career education course seems to raise the employment prospect by 1.9%. And WIL course is about twice as effective as inductive course, i.e. 7.6% and 3.7%. This last set of results confirms Hypothesis 1: "career education helps to obtain a good job."

Table II is just the same as Table I except for the dependent variable. It is a company status rather than employment status. General results are similar but somewhat weaker.

Table III shows the estimation results of regressing GPA3 on GPA1 and career education as well as students' other traits. The coefficients and t-values for the variables are quite similar over the 5 equations. The discrepancy in GPA3 due to graduation year may be caused by the marking inconsistency between 2008 and 2009, or by 2009 students being less academically competent than 2008 students --- this is a plausible hypothesis as the general academic level seems to continue falling. The faculty difference is a more worrying result. For example, the gap between students in Faculties of Culture and Economics in Equation 1 is 0.229 - (-0.104) = 0.333, which is a considerable size for GPA. Again this is either or both because of a difference in marking standard and students' academic standard. It is an important issue but also outside of the scope of this paper. Male students seem to perform worse academically as the coefficients are all negative and significant --- a clear contrast to the employment cases of Tables I & II.

The estimate for GPA1 is very important for our purpose. It says higher GPA1 implies higher GPA3 and the relationship is significant. More specifically, 1 point rise in GPA1 generates just below 0.6 point rise in GPA3. This supports Hypothesis 3: "Good students do well as university anyway," not to full but to some extent, leaving some room for hard work during university years.

Finally, career education coefficients show different results --- career education as a whole has no notable effect on GPA3, WIL is positive and significant, and Induction courses are negatively related to GPA3. The later may be due to that fact that induction courses are sometimes taken as remedial courses by students with low GPA. More importantly, positive and significant coefficients on WIL in equations 3 and 5 support the Hypothesis 2: "Career education raises academic performance."

Table I: Determining Factors of Employment Outcome by Employment Status

Linear Probalility Model estimated by Ordinary Least Square method

Equation	1		2		3		4	
Dependent Variable: Full-time employment (Sample size 4616)								
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Constant	0.784	28.955	0.797	29.514	0.786	28.480	0.780	28.336
Grad in 09	-0.019	-2.220	-0.023	-2.698	-0.021	-2.404	-0.019	-2.263
Econoomics	-0.025	-1.195	-0.021	-1.012	-0.021	-1.004	-0.025	-1.186
Business	-0.039	-1.875	-0.033	-1.564	-0.030	-1.449	0.039	-1.879
Law	-0.030	-1.400	-0.029	-1.333	-0.026	-1.189	-0.030	-1.382
Languages	-0.076	-3.183	-0.067	-2.815	-0.067	-2.804	-0.073	-3.083
Culture	-0.075	-2.923	-0.080	-3.073	-0.072	-2.793	-0.078	-3.023
Science	-0.072	-2.491	-0.076	-2.638	-0.071	-2.465	-0.070	-2.500
Male/Femal	0.025	2.351	0.023	2.199	0.020	1.878	0.025	2.390
GPA1	0.039	4.421	0.040	4.528	0.041	4.710	0.038	4.328
GPA3	0.035	4.078	0.033	3.804	0.036	4.202	0.033	3.819
Career	0.019	5.816						
WIL			0.056	6.389			0.076	7.190
Induction					0.018	2.085	0.037	3.877
Adjusted R^2	0.033		0.031		0.028		0.035	
F-value	15.099		14.613		13.097		14.811	

Table II: Determining Factors of Employment Outcome by Company Status

Linear Probalility Model estimated by Ordinary Least Square method

Equation	1		2		3		4	
Dependent Variable: Listed Company (Sample size 3965)								
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Constant	0.247	4.882	0.260	5.139	0.258	5.028	0.254	4.959
Grad in 09	-0.010	-0.650	-0.014	-0.954	-0.014	-0.911	-0.013	-0.856
Econoomics	-0.001	-0.021	0.003	0.076	0.041	0.096	0.002	0.050
Business	0.030	0.696	0.038	0.894	0.041	0.957	0.036	0.844
Law	-0.022	-0.518	-0.019	-0.445	-0.017	-0.401	-0.020	-0.456
Languages	-0.106	-2.375	-0.096	-2.142	-0.094	-2.104	-0.098	-2.187
Culture	-0.065	-1.385	-0.068	-1.431	-0.064	-1.351	-0.067	-1.418
Science	0.004	0.067	-0.001	-0.220	0.000	0.007	0.001	0.016
Male/Femal	0.027	1.472	0.024	1.291	0.021	1.169	0.024	1.328
GPA1	0.009	0.597	0.010	0.730	0.012	0.810	0.010	0.684
GPA3	0.031	2.167	0.030	2.084	0.032	2.214	0.030	2.085
Career	0.019	2.829						
WIL			0.033	1.504			0.041	1.709
Induction					0.002	0.131	0.014	0.816
Adjusted R^2	0.011		0.010		0.009		0.010	
F-value	5.081		4.536		4.321		4.212	

(Note) Significant at 5%
Significant at 10%
t-values: Heteroskedasticity-robust t-values

Table III: Determining Factors of Acdemic Performance

Linear Model estimated by Ordinary Least Square method

Equation	1		2		3		4		5	
Dependent Variable: GPA3 (Sample size 5160)										
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Constant	0.860	18.004	0.856	17.851	0.858	18.018	0.878	18.232	0.865	17.974
Grad in 09	-0.047	-3.162	-0.046	-3.093	-0.048	-3.242	-0.051	-3.415	-0.050	-3.323
Econoomics	-0.104	-2.586	-0.105	-2.624	-0.106	-2.641	-0.099	-2.472	-0.104	-2.591
Business	-0.124	-0.308	-0.016	-0.395	-0.021	-0.524	-0.006	-0.147	-0.018	-0.446
Law	0.038	0.935	0.037	-0.905	0.032	0.796	0.038	0.939	0.033	0.808
Languages	0.130	2.989	0.126	0.885	0.124	2.854	0.136	3.135	0.127	2.914
Culture	0.229	4.960	0.229	4.953	0.217	4.713	0.226	4.895	0.217	4.706
Science	-0.586	-1.190	-0.058	-1.174	-0.063	-1.278	-0.065	-1.320	-0.065	-1.320
Male/Femal	-0.110	-5.971	-0.108	-5.838	-0.101	-5.470	-0.111	-6.005	-0.102	-5.511
GPA1	0.593	51.645	0.592	51.328	0.585	50.725	0.593	51.687	0.586	50.711
Career			0.007	0.975						
WIL					0.117	5.259			0.109	4.544
Induction							-0.043	-2.828	-0.017	-1.006
Adjusted R^2	0.397		0.398		0.400		0.398		0.400	
F-value	377.911		340.212		344.647		341.381		313.408	

(Note) Significant at 5%
Significant at 10%

7. Conclusion

Let us conclude the paper by using the empirical results to verify the three hypotheses.

Hypothesis 1: "Career education helps to obtain a good job." (Accept)

Career education, no matter how defined, showed a positive and significant effect on employment status. (Table I) However, once we use company status as an dependent variable the results were somewhat weaker. (Table II) As mentioned earlier it is not possible to conclude here that career education acts as human capital forming or signalling. But in either way it helps and therefore we accept Hypothesis 1.

Hypothesis 2: "Career education raises academic performance." (Accept)

The estimation results for WIL in Table III support this hypothesis. Therefore, career education courses and more academic courses are not conflicting but can be complementary.

Hypothesis 3: "Good students do well at university." (Accept)

Table III's results support this view. Ideally, we would like education to offer equal opportunity to invest in human capital, in which case that GPA 1's coefficient should not be significant --- how a student came to university (i.e. GPA1) does not influence how he/she leaves university (i.e. GPA3) Yet the reality is a positive and significant GPA 1, which supports Hypothesis 3. However, as the coefficient is clearly below 1, a signalling in education is complemented by human capital element.

So are we doing the right thing with career education? The answer seems to be affirmative with a slight suspicion that we are gathering already able students to simply give them signature of approval.

In concluding the paper, it is important to mention that the data used for this estimation is of KSU students only, which may have certain selection bias. It would be advisable not to take the results for granted but to apply a similar approach to one's own data by adjusting to its specific environment. As for our future research, we have two further issues --- one is to merge these objective data with more subjective data such as those in Matsutaka, Tanaka, and Churton (2009), and the other is to compare the effectiveness of career education in different countries (see, for example, Tanaka and Carlson (2011))

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和文抄録

京都産業大学キャリア教育研究開発センターは2008年3月と2009年3月に卒業した全学生5473名に関する学業成績、キャリア教育科目履修の有無、内定先のデータを集計した。本論文の目的はこれらのデータを使ってキャリア教育が学業成績と就職状況に与える影響を検証することである。具体的には、キャリア教育が就職に有利に働くこと、キャリア教育が学業成績を向上させること、良い成績で入学した学生は在学中の成績も良いことが示された。

キーワード:キャリア教育、学業成績、就職状況、統計分析

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†田中寧: キャリア教育が学業成績と就職状況に与える影響の評価 ー卒業生データに基づく統計分析ー
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