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STUDENT EARNINGS ESTIMATES OF NEW GRAD PAY

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ABSTRACT

Gary Becker, in his early work on human capital formation argued that "the typical investor in human capital is more impetuous and thus more likely to err than the typical investor in tangible capital" (1962, p.10). A subsequent stream of research has focused on the manner in which individuals attempt to correct this. One branch of this examination concerns the ability of students to accurately assess the relative value of training in different fields of study. Although a number of American investigators addressed this issue during the 1990's, the most current work has been conducted by European authors. Alchian (1969) argued that the cost of acquiring information imposes a constraint on the ability of individuals to make the "best" decisions. The internet provides a bounty of inexpensive information with respect to market pricing. This paper examines American student estimates of starting and future wages in 1991, 1999, 2006 and 2014, a period during which internet usage grew from non-existent to fairly common to universal. It was found that the accuracy of their estimates, for certain majors, had increased over this time. A separate test was run, in 2008, using students from a Korean university. Although the accuracy of that group's estimates was lower, the great importance of job security in Korea may cloud comparisons. Additionally, a significant gender effect existed in both the Korean and American students' accuracy of estimation.

INTRODUCTION

Table 1

Factors Affecting Accuracy of Student Prediction

Demographic
- Gender
- Age
- Parent's education
- Race
- Parent's income
- Same major discipline
- Grades/marks
- Employed while at school
- Positive outlook on job prospects

Field of study
- Law
- Soc. Sciences
- Medicine
- Engr. & I.T.
- Other

Info source
- Career center
- Friends & colleagues
- Print media
- University publications
- Salary reports

Methodology

The sample of 989 American students used in study is from a midwestern state university with an enrollment of about 15,000. About 1/3 are drawn from each of the sample years (1991, 1999,2006, 2014). The Korean sample included 133 students from a university about 120 km from Seoul. These individuals were all juniors in a Business school and the accuracy of their estimates within and outside their field will be considered. The enrollment and wage trends are calculated at the university level, although these trends do not differ from what one sees nationwide.

One distinctive characteristic of this study is that students were asked to rank the relative pay of different new graduates and experienced professionals, as opposed to generating actual pay forecasts. This is consistent with the point made by Betts.

"Economic theory predicts that occupational choice should depend on relative salaries, rather than on the absolute level of salaries in any one occupation. Thus, it may be that a large degree of variation in beliefs about salaries in a given field or for a given level of education may mask quite uniform beliefs about relative

salaries, in that some students consistently overestimate or underestimate salaries in all fields or for all levels of education (1996, p.34)."

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(1) $Error_{it} = \beta_0 + \beta_1 \text{ Internet usage}_t + \beta_2 \text{ Gender}_t + \varepsilon_{it}$

where:

$Error_{it}$ = the absolute value of the difference between the student's ranking of major "I" and the relevant market ranking in year "t"

$Internet_t$ = whether had gathered information from the internet, regarding expected starting salaries in year "t

$Gender_t$ = the respondent's gender, 0 for female, 1 for male

ε_{it} = the stochastic error

Even though these variables represent a very modest attempt at explanation, the available body of research does little to provide clear, alternative directions. How these affect the precision of one's estimate of the relative earnings in one's own field of study will be considered alongside the effects seen when dealing with other occupational areas.

RESULTS

The first question addressed concerns the accuracy of overall student wage rankings. Figure 1 shows the results when American student errors in ranking (the absolute value of the difference between student and actual rank) are shown declining during a time when internet usage grew dramatically (from 0% to 99%). The decline in the total was significant only at the .10 level, which is typically not viewed as sufficient.

A decomposition of the total error yields some more illustrative findings. Table 2 shows the results for equation 1, where student errors in ranking (as described before) are regressed on gender and internet usage. As can be seen, internet usage tended to be more important when students considered pay outside of their major area. This variable was not relevant for the Korean sample, because there was no substantial variance in usage. The gender of the evaluator seemed to matter, when dealing with occupations outside of one's major. With regard to total estimation error, there was a significant gender effect for both Korean and American students. Gender coefficients tended to be positive for both American and Korean students, consistent with the findings that females tended to have lower mean error values (the gender dummy variable was coded 0=female, 1=male). The use of the internet was a relevant factor for American students when considering areas outside of one's major, but not for the aggregate error. Examining the coefficients leads one to conclude that internet usage reduced estimate errors in some majors, but increased it in others. The net result appears to be that there is little effect on the combined measure.

Table 2
Factors Affecting Student Accuracy of Estimates in Business and Other Majors

Major	Business		Engineering		Nursing		Education		Liberal Arts		Composite Score	
	KR	US	KR	US	KR	US	KR	US	KR	US	KR	US
Constant	.66[a]	.86[c]	-.04	.12[b]	.13	1.05[c]	1.1[c]	.78[c]	.38	.66[c]	2.23[a]	3.47[c]
Internet Usage	.67	.03	.71	.26[c]	.62	-.16[b]	.04	.20[c]	.28	-.05	.21	-.12

Gender	-.15	.01	.60[c]	.03	.16	.07	.24[a]	.12[a]	.05	.10	.42[a]	.33[a]
r^2	.024	.001	.090	.034	.016	.012	.010	.021	.012	.004	.023	.006

	Sum of Squares	df	Mean Square	F	Sig.
Regression	2.843	2	1.422	2.624	.076
Residual	70.985	131	.542		
Total	73.828	133			

[a]=significant at the .05 level
[b]=significant at the .01 level
[c]=significant at the .001 level
(KR = Korean sample US = American sample)

ANOVA tables for Equation 1

KR Business

KR Engineering

	Sum of Squares	df	Mean Square	F	Sig.
Regression	15.030	2	7.515	7.596	.001
Residual	129.604	131	.989		
Total	144.634	133			

KR Education

	Sum of Squares	df	Mean Square	F	Sig.
Regression	1.927	2	.963	1.401	.250
Residual	90.044	131	.687		
Total	91.970	133			

KR Nursing

	Sum of Squares	df	Mean Square	F	Sig.
Regression	2.809	2	1.404	2.102	.126
Residual	87.527	131	.668		
Total	90.336	133			

KR Liberal Arts

	Sum of Squares	df	Mean Square	F	Sig.
Regression	.488	2	.244	.215	.807
Residual	148.714	131	1.135		
Total	149.201	133			

KR Composite

	Sum of Squares	df	Mean Square	F	Sig.
Regression	33.049	2	16.524	2.553	.082
Residual	847.787	131	6.472		
Total	880.836	133			

US Business

	Sum of Squares	df	Mean Square	F	Sig.
Regression	.166	2	.083	.223	.800(a)
Residual	265.548	716	.371		
Total	265.713	718			

US Engineering

	Sum of Squares	df	Mean Square	F	Sig.
Regression	11.820	2	5.910	12.550	.000
Residual	337.160	716	.471		
Total	348.979	718			

US Nursing

	Sum of Squares	df	Mean Square	F	Sig.
Regression	4.951	2	2.476	4.398	.013
Residual	403.049	716	.563		
Total	408.000	718			

US Education

	Sum of Squares	df	Mean Square	F	Sig.
Regression	8.270	2	4.135	7.583	.001
Residual	390.458	716	.545		
Total	398.729	718			

US Liberal Arts

	Sum of Squares	df	Mean Square	F	Sig.
Regression	2.105	2	1.052	2.472	.085
Residual	304.858	716	.426		
Total	306.962	718			

US Composite

	Sum of Squares	df	Mean Square	F	Sig.
Regression	20.256	2	10.128	2.150	.117
Residual	3372.233	716	4.710		
Total	3392.490	718			

Table 3 reveals an intriguing pattern for estimation errors. American students had the second lowest level of miscalculation within their own area of study, while for Korean students, it was the highest. For both groups the standard deviation of error was lowest in their chosen field, suggesting a consensus of opinion within the samples. It did seem, however, that the Korean students were more likely to overestimate the return for business training.

Table 3
Accuracy of Estimates Within and Outside of Business

	American Students		Korean Students	
Area	Mean Error	Standard Deviation	Mean Error	Standard Deviation
Business	.0550	0.664	1.231	0.745
Education	0.668	0.753	1.014	0.832
Engineering	0.390	0.798	0.948	1.044
Liberal Arts	0.599	0.860	0.679	1.059
Nursing	1.114	0.825	0.813	0.824

Two factors which might possibly complicate a direct appraisal of the Korean estimates. The first is the importance of job security in the Korean culture, as opposed to placing a more central focus on salary. This characteristic reduces the power of an instrument targeted specifically at earnings and not making some adjustment for more intangible qualities. The second issue is the gender pay differences within occupations. A large portion of the gender pay gap in the U.S. labor market is often attributed in occupational choice, while within occupation differentials are smaller (Blau & Kahn, 2006). In the Korean market, within occupation pay differentials are not unusual (Kim, 1992; Monk-Turner, 1994; Palley, 1994). Table 4 provides an example of situation. Pay data was drawn from ilo.org and the Digest of Educational Statistics. Tables 5 and Table 6 show some comparative results on this issue. American students of both genders produce very similar responses, while Korean students differ substantially in their assessments, depending upon their gender. A difference in sensitivity to possible discriminatory practices might not be considered inconceivable.

Table 4
Gender Differences in Teacher Pay

	United States	Korea
Male	$45,600	KRW 42550368
Female	$44,100	KRW 24400920
Female/Male ratio	0.9671	0.573

Table 5
Ratings of American students

gender		Business	Engineering	Education	Nursing	Liberal Arts
male	Mean	2.8365	3.7421	.7799	2.1069	.5535
	N	318	318	318	318	318
	Std. Deviation	.67281	.63756	.72927	.82616	.75894
female	Mean	2.7855	3.6908	.8603	2.0698	.6085
	N	401	401	401	401	401
	Std. Deviation	.72380	.74104	.83991	.88040	.85664

Difference		0.0510	0.0513	0.0831	0.0371	0.0550

Table 6
Ratings of Korean students

gender		Business	Engineering	Education	Nursing	Liberal Arts
male	Mean	2.6667	3.3636	2.0455	1.2727	.6515
	N	66	66	66	66	66
	Std. Deviation	1.33973	.73665	1.02929	1.01596	.99988
female	Mean	2.5147	2.7500	2.5441	1.4853	.7059
	N	68	68	68	68	68
	Std. Deviation	1.29859	1.20168	1.13865	1.16533	1.12049
Difference		0.0774	0.6136[c]	0.4986[b]	0.2126	0.0544

[a]=significant at the .05 level
[b]=significant at the .01 level
[c]=significant at the .001 level

A second question to be considered is the extent to which student perceptions are reflected in the popularity of various majors. Human capital models typically make the implicit (or explicit) assumption that high relative returns draw people to an area. The selection of a field of study is also mitigated by tastes, preferences and abilities. The business majors responding to the survey acknowledge that engineering majors have higher starting pay; however, they believe that this advantage will disappear over time. The rigorous nature of technical training may present a barrier to entry for some individuals and a reasonable psychological defense for one's choice might be that there was little long run gain to be garnered in the unattainable area.

A simple regression was run on the change in majors and student estimation of earnings. The results shown in Table 7 suggest that students might be considering the value of training over a longer period of time. Expected earnings for an occupation, after five years on the job, is more strongly associated with the selection of a major than starting pay. It is also intriguing that individuals seem to place such great value on their potential earnings, 10 years hence. This finding is consistent with the assumptions normally made concerning an individual's decision to invest in human capital.

Table 7
Linkage between Choice of Major and Salary

	Starting Salary	Salary After 5 Years	Salary After 10 Years
Constant	-.330	-.767	-.447
Coefficient	1.25[a]	1.688[b]	1.362[a]
r^2	.252	.330	.242
F	5.711[b]	7.910[c]	5.473[b]

[a]=significant at the .05 level
[b]=significant at the .01 level
[c]=significant at the .001 level

Salary after 10 Years

	Sum of Squares	df	Mean Square	F	Sig.
Regression	.157	1	.157	5.473	.036
Residual	.373	13	.029		
Total	.530	14			

CONCLUSIONS

University students make a major investment in education and they have a great incentive to seek a reasonable return. Knowledge of market wage rates for different occupations can be viewed as an essential element in this process. The results of this study suggest that the widespread usage of the internet has allowed students to form more accurate opinions of pay in areas outside their field of study. While no gender effect was exhibited in the ratings of American students, Korean students did show such differences. It also appears that students behave rationally, in that they migrate toward areas where higher returns might be forthcoming. It appears that students behave fairly conscientiously, in that they place a significant weight on longer term investment returns. A more detailed assessment of exactly which internet based resources provide the most robust and useful information is a viable area of future research, as is the disparate sources that may be chosen by various demographic groups.

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