Determinants of Student Salaries in Professional Training Year

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Motivation

- Key changes in the UK higher education: increase in tuition fees and student debt.
- Against this backdrop, the industrial placement year is an important feature of several UK universities because:
  - industrial placements are often **remunerated**.
  - companies **offer graduate jobs** to placement students.
- This study focuses on placements offered to students of economics in a UK university, the University of Surrey.
- Aim: **identify key determinants of placement salaries utilising different sources of information.**
  - The sample's significant variation in placement salaries is an early promising indication of interesting outcomes.

What's next?

- Related literature
- Methodology
- Data
- Results
- Discussion
- Concluding remarks

Related literature

- Previous studies have found:
  1. Positive effects of placement experience on employability outcomes (e.g. Knouse and Fontenot, 2008; Nunley et al., 2016; Silva et al., 2018) and skills (e.g. Knight and Yorke, 2004; Reddy and Moores, 2012).
  2. Positive effects of degree performance on labour market outcomes (e.g. Di Pietro, 2017; Feng and Graetz, 2017).
- Wang and Crawford (2018) → academic performance is the *only* significant factor in securing a highly-paid placement.
  - Our study differs in focus, data, sample and methodology.
  - We present new and additional evidence on this topic.

Methodology

- Our model hypothesises the following natural log of salary (y) function for individual i

$$\ln(y_i) = \beta_0 + \mathbf{x_i'}\boldsymbol{\beta} + \epsilon_i, \tag{1}$$

where $\mathbf{x_i'}$ is a set of individual demographic, academic, professional and labour characteristics and ϵ_i is an individual-level error term.

- We first estimate (1) by OLS. Next we employ a quantile regression model similar to (1), where quantile τ is given by

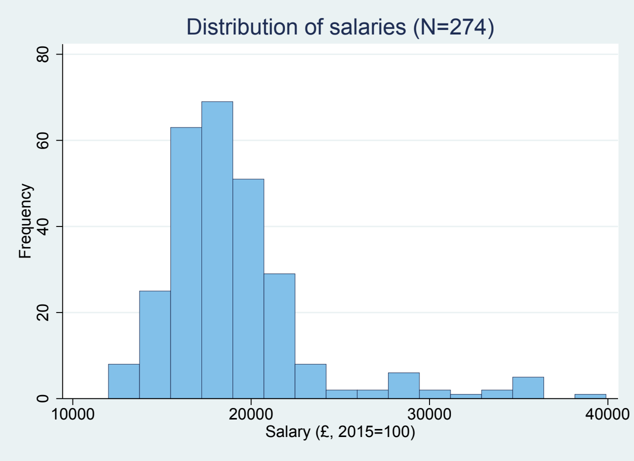
$$\tau = \Pr(y_i < q_i(\tau) | \mathbf{x_i'}). \tag{2}$$

- $q_i(\tau)$ is the model-based quantile.

Data: Sampling

- Three cohorts of placement students: 15/16; 16/17; 17/18.
  - 15/16: 104; 16/17: 119; 17/18: 64 $\rightarrow$ total of 287 students.
- University records: demographic characteristics; academic and job information.
- CV data: job experience, accomplishments, language.
- Due to some missing information (e.g. missing CVs or salaries) our final sample includes **274** placement students.

Data: Response variable (annual real salary)



Data: Explanatory variables

- Average first-year mark;
- Job experience: number of different jobs before placement;
- Job location (London = 1);
- Gender (= 1 if male), age;
- Fee status (= 1 if UK, = 0 if EU or overseas);
- Ethnicity (dummies for ‘Asian’ and ‘Other’);
- Programme (Business Economics BSc, Economics and Finance BSc and Economics and Mathematics BSc);
- Accomplishments (= 1 if made ‘notable’ achievement);
- Language (= 1 if more than one language is spoken);
- Industry type (dummies for ‘Economic’ and ‘Technology’ sectors).

Data: Descriptive statistics

Table 1: Sample descriptive statistics.

	Full sample				Quantiles (mean values)		
Variable	Mean	S.D.	Min.	Max.	<Q10	Q25-Q75	>Q90
Salary (real)	19,027	4,222	12,000	39,894	14,315	18,927	29,165
First-year mark	70.58	7.25	51	88	66.51	70.97	73.01
Age	18.29	0.81	17	27	18.29	18.32	18.48
Gender (male)	0.69	0.46	0	1	0.61	0.73	0.7
Fee status (UK)	0.86	0.35	0	1	0.79	0.86	0.85
Ethnicity							
Asian	0.22	0.42	0	1	0.32	0.24	0.26
Other	0.15	0.36	0	1	0.18	0.13	0.19
Programme							
Business Economics BSc	0.1	0.3	0	1	0.25	0.07	0.11
Economics and Finance BSc	0.41	0.49	0	1	0.39	0.43	0.59
Economics and Mathematics BSc	0.05	0.21	0	1	0.04	0.05	0
Job location (London)	0.58	0.5	0	1	0.32	0.59	1
Job experience	2.78	1.36	0	8	2.71	2.82	3.37
Accomplishments	0.3	0.46	0	1	0.32	0.33	0.26
Language	0.39	0.49	0	1	0.21	0.46	0.41
Industry							
Economic sector	0.35	0.48	0	1	0.07	0.38	0.7
Technology sector	0.17	0.38	0	1	0.5	0.16	0.04
Observations		$N = 274$			28	141	27

Results: OLS

- We first estimate our model (1) by OLS.
- We start with the following basic model (M1):

$$\ln(y_i) = \beta_0 + \beta_1\, year1mark + \beta_2\, jobexperience + \epsilon_i.$$

- Then, we gradually add the rest of the control variables.
- Let's see the results…

Table 2: Model comparison of M1 to M12. Dependent variable: ln(salary)

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
First-year mark	0.0068***	0.0052***	0.0052***	0.0053***	0.0053***	0.0053***	0.0058***	0.0059***	0.0047***	0.0046***	0.0064***	0.0123***
	(0.0017)	(0.0016)	(0.0016)	(0.0016)	(0.0016)	(0.0016)	(0.0017)	(0.0017)	(0.0017)	(0.0017)	(0.0018)	(0.0039)
Job experience	0.0248***	0.0159*	0.0161*	0.0161*	0.0162*	0.0161*	0.0140	0.0144	0.0147*	0.0153*	0.0151*	0.1683**
	(0.0091)	(0.0085)	(0.0086)	(0.0086)	(0.0087)	(0.0088)	(0.0088)	(0.0088)	(0.0085)	(0.0086)	(0.0085)	(0.0845)
Job location (London)		0.1498***	0.1498***	0.1496***	0.1496***	0.1495***	0.1441***	0.1421***	0.1124***	0.1073***	0.1067***	0.1051***
		(0.0191)	(0.0192)	(0.0192)	(0.0192)	(0.0193)	(0.0191)	(0.0190)	(0.0186)	(0.0194)	(0.0194)	(0.0190)
Gender (Male)			0.0037	0.0035	0.0035	0.0044	-0.0022	0.0048	-0.0009	0.0016	-0.0018	-0.0058
			(0.0220)	(0.0220)	(0.0220)	(0.0222)	(0.0234)	(0.0232)	(0.0226)	(0.0227)	(0.0221)	(0.0220)
Age				0.0128	0.0127	0.0126	0.0142	0.0133	0.0137	0.0135	0.0153	0.0177*
				(0.0128)	(0.0128)	(0.0130)	(0.0119)	(0.0125)	(0.0111)	(0.0111)	(0.0104)	(0.0103)
Fee status (UK)					-0.0012	0.0020	0.0131	0.0320	0.0324	0.0328	0.0306	0.0307
					(0.0351)	(0.0379)	(0.0370)	(0.0381)	(0.0371)	(0.0370)	(0.0372)	(0.0369)
Ethnicity (Asian)						0.0032	-0.0069	-0.0215	-0.0151	-0.0131	-0.0144	-0.0158
						(0.0273)	(0.0283)	(0.0300)	(0.0290)	(0.0292)	(0.0290)	(0.0288)
Programme (BE)							-0.0105	-0.0134	-0.0052	-0.0031	-0.0065	-0.0074
							(0.0452)	(0.0457)	(0.0436)	(0.0436)	(0.0425)	(0.0428)
Programme (EF)							0.0428*	0.0426*	0.0456*	0.0460*	0.0426*	0.0414*
							(0.0240)	(0.0244)	(0.0242)	(0.0243)	(0.0239)	(0.0235)
Programme (EM)							-0.0372	-0.0354	-0.0273	-0.0256	-0.0280	-0.0299
							(0.0304)	(0.0321)	(0.0335)	(0.0326)	(0.0329)	(0.0322)
Accomplishments								-0.0023	-0.0113	-0.0125	0.3848*	0.3264
								(0.0218)	(0.0211)	(0.0212)	(0.2311)	(0.2214)
Language								0.0454	0.0443*	0.0455*	0.0420	0.0442*
								(0.0276)	(0.0262)	(0.0261)	(0.0256)	(0.0253)
Industry (Econ)									0.0864***	0.0828***	0.0794***	0.0755***
									(0.0259)	(0.0262)	(0.0256)	(0.0251)
Industry (Tech)										-0.0252	-0.0291	-0.0364
										(0.0229)	(0.0232)	(0.0231)
Mark × accomplish											-0.0057*	-0.0049
											(0.0033)	(0.0031)
Mark × job exp.												-0.0022*
												(0.0012)
Constant	9.2852***	9.3385***	9.3347***	9.0945***	9.0963***	9.0889***	9.0160***	8.9959***	9.0629***	9.0786***	8.9231***	8.4647***
	(0.1208)	(0.1114)	(0.1128)	(0.2575)	(0.2596)	(0.2636)	(0.2452)	(0.2582)	(0.2261)	(0.2269)	(0.2224)	(0.3529)
N	274	274	274	274	274	274	274	274	274	274	274	274
F	12.3196	28.0873	21.2460	17.1984	14.5737	10.9212	8.6000	7.2367	7.0613	6.8042	6.6114	6.5357
p	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R^2	0.0892	0.2287	0.2288	0.2316	0.2316	0.2318	0.2463	0.2556	0.2908	0.2927	0.3022	0.3120

Standard errors in parentheses
$^{*}\ p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

- Consistent and positive relationship between salaries and first-year academic performance.
- Likewise for job location (the ‘London effect’).
- Placement students in the ‘economic’ sector earn more.
- Weaker results include enrolment in the Econ. and Finance programme, job experience and language.
- No evidence of gender wage gap.
- Very weak or non-existent associations with: accomplishments, age, nationality and ethnicity.
- Lastly, interactions exhibit limited statistical significance.

Results: Quantile regression

- The next step of our analysis is based on Model 12.
- Quantile regression, using estimator of the covariance matrix suggested by Machado and Santos Silva (2013).

  [Standard errors and t-statistics are asymptotically valid under heteroskedasticity and misspecification of the quantile regression function.]
- Our analysis will focus on:
  1. comparison between mean versus median regression.
  2. effect of covariates across quantiles of salaries distribution.
- Let's see the results…

Table 3: Model comparison of M12 OLS vs QR. Dependent variable: ln(salary)

	OLS	Q(0.1)	Q(0.25)	Q(0.5)	Q(0.75)	Q(0.9)
First-year mark	0.0123***	0.0109	0.0073*	0.0072**	0.0078	0.0131**
	(0.0039)	(0.0078)	(0.0040)	(0.0035)	(0.0061)	(0.0063)
Job experience	0.1683**	0.1934	0.0957	0.1107	0.0414	0.1517
	(0.0845)	(0.1564)	(0.0908)	(0.0737)	(0.1442)	(0.1250)
Job location (London)	0.1051***	0.0699*	0.0654***	0.0993***	0.1400***	0.1807***
	(0.0190)	(0.0366)	(0.0234)	(0.0214)	(0.0252)	(0.0300)
Gender (Male)	-0.0058	-0.0068	-0.0129	-0.0106	0.0264	0.0485
	(0.0220)	(0.0410)	(0.0240)	(0.0225)	(0.0341)	(0.0368)
Age	0.0177*	0.0199	0.0211	0.0145	0.0130*	0.0076
	(0.0103)	(0.0287)	(0.0166)	(0.0224)	(0.0078)	(0.0190)
Fee status (UK)	0.0307	0.1068	0.0175	0.0202	0.0354	-0.0780*
	(0.0369)	(0.1131)	(0.0325)	(0.0276)	(0.0452)	(0.0430)
Ethnicity (Asian)	-0.0158	-0.0600	-0.0213	-0.0128	0.0137	0.0192
	(0.0288)	(0.0640)	(0.0274)	(0.0267)	(0.0527)	(0.0378)
Programme (BE)	-0.0074	-0.0230	-0.0332	-0.0470	-0.0542	-0.0666
	(0.0428)	(0.0448)	(0.0406)	(0.0347)	(0.0481)	(0.0520)
Programme (EF)	0.0414*	0.0526	0.0554**	0.0330	0.0261	0.0541
	(0.0235)	(0.0351)	(0.0270)	(0.0238)	(0.0393)	(0.0385)
Programme (EM)	-0.0299	0.0329	0.0031	-0.0249	-0.0705*	-0.0589*
	(0.0322)	(0.0485)	(0.0344)	(0.0425)	(0.0404)	(0.0340)
Accomplishments	0.3264	-0.0379	0.1339	0.0898	0.5793	0.6161**
	(0.2214)	(0.3428)	(0.2351)	(0.1934)	(0.4026)	(0.2885)
Language	0.0442*	0.0579	0.0584**	0.0355	0.0004	0.0516
	(0.0253)	(0.0422)	(0.0284)	(0.0236)	(0.0295)	(0.0441)
Industry (Econ)	0.0755***	0.0611*	0.0326	0.0332	0.0621	0.2090***
	(0.0251)	(0.0330)	(0.0254)	(0.0242)	(0.0575)	(0.0691)
Industry (Tech)	-0.0364	0.0168	-0.0378	-0.0543**	-0.0218	-0.0686**
	(0.0231)	(0.0455)	(0.0329)	(0.0270)	(0.0345)	(0.0339)
Mark × accomplish	-0.0049	0.0006	-0.0019	-0.0016	-0.0085	-0.0097**
	(0.0031)	(0.0047)	(0.0034)	(0.0028)	(0.0058)	(0.0041)
Mark × job exp.	-0.0022*	-0.0026	-0.0012	-0.0015	-0.0002	-0.0017
	(0.0012)	(0.0021)	(0.0012)	(0.0010)	(0.0021)	(0.0018)
Constant	8.4647***	8.3182***	8.7171***	8.9297***	8.9009***	8.7631***
	(0.3529)	(0.9297)	(0.4140)	(0.4248)	(0.4621)	(0.5875)
N	274	274	274	274	274	274
F	6.5357					
p	0.0000					
R^2	0.3120	0.2349	0.2736	0.2878	0.2763	0.2767

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

- OLS tends to overestimate the effect of the covariates in comparison with Q(0.5).
- The effects of first-year academic performance and job location are the highest at the top quantile.
- Strong association of economic sector and placement earnings at the top quantile.
- The accomplishments' coefficient is large and statistically significant at the top quantile.
- Enrolments in different programmes show non-existent or weak associations with placement earnings.
- Language is significant once and only one interaction is significant at the top quantile.
- Similar results to OLS for gender, age, nationality and ethnicity; job experience is never statistically significant.

Discussion

- **Academic performance, job location and industry type** being robust predictors of placement salaries.
- Academic performance not only increases the chances of securing a placement (Arsenis and Flores, 2019), but also its returns.
- The positive effects of London and the economic sector on earnings are intuitive and are in line with official statistics (ONS, 2018).
- Job experience is not a strong predictor of earnings; employers offer training and several have rigorous hiring processes.

- Interesting results at the top quantile, Q(0.9):

  Almost twice the size of the first-year mark coefficient than at the median.

  - Indeed, 78% of students with top salaries achieved a first-class mark in the first year of their studies.
  - An intuitive result: top employers recruit the most academically competent students.

  Also, accomplishments appear to matter at this part of the distribution.

  - Employers scrutinise candidates assessing not only academic skills but extracurricular competencies too.

  Accomplishments matter, but possibly not as much as academic performance.

  - The coeff. of interaction term is *negative*: students with accomplishments had significantly lower average grades.

- **We find no evidence of earnings differences between genders.**
  - This is consistent with findings on entry to the labour market (Manning and Swaffield, 2008).
  - But later on discrepancies emerge in favour of men (e.g. Chevalier, 2011; Albrecht et al., 2018).
- **This outcome is true even at the top of the earnings distribution.**
  - In contrast to previous studies, we find no earnings gender gap at the highest-paid jobs.
  - We find similar earnings differentials both at the bottom (10th perc.) and top (90th perc.) of the distribution.
  - Also, the proportion of males/females are similar at the distribution extremes; females at about 35%.

Concluding remarks

- This study is a one of the first attempts to explore *placement* labour market outcomes.

Key empirical findings:

1. The average first-year mark is a strong predictor of placement earnings.
2. In addition, job location and type of industry are important determinants of placement salaries.
3. Highly-paid placements are also associated with candidates' accomplishments.
4. Other demographic factors (e.g. gender and nationality) and past job experience do not have much (or any) explanatory power.

Implications

- Clearly, early degree performance is important, but, typically, no weight is attached to it.
- There is a discussion on the 'value' offered by UK universities and students' expectations increase.
- This study adds one more argument to this discourse suggesting reforms in higher education.
- Counting first-year performance will encourage students to increase their efforts improving academic results.
- Employers will also be better informed of the graduates' abilities utilising a more effective indicator of academic performance.