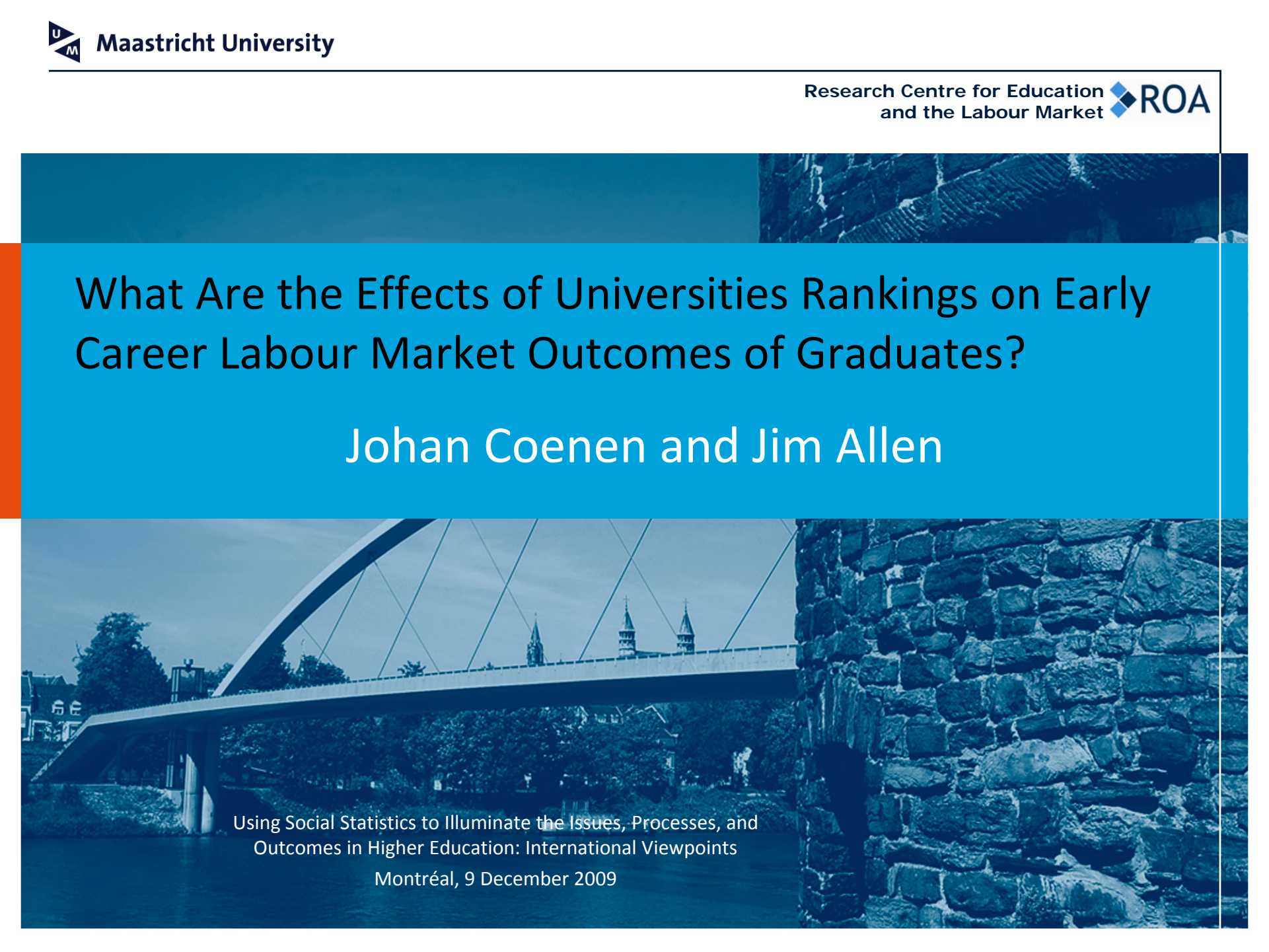# What Are the Effects of Universities Rankings on Early Career Labour Market Outcomes of Graduates?

Johan Coenen and Jim Allen

Using Social Statistics to Illuminate the Issues, Processes, and Outcomes in Higher Education: International Viewpoints

Montréal, 9 December 2009

Introduction

- Effect of university ranking on selected labour market outcomes of graduates
- Differences in outcomes may reflect differences in quality and/or a premium for university reputation
- Focus on effects of rankings based on research quality
- Does attending universities in Europe and Japan with high research ranking result in higher graduate wages and/or transition to jobs with higher occupational prestige?

Maastricht University

Background: equality or excellence?

- Interest in this topic fuelled, at least in the Netherlands, by concerns that mass higher education places pressure on quality

- Higher education in the Netherlands so far mainly based on equal chances for all students, based on minimum entry requirements

- Enrolment based on a flat tuition rate

- Consequently, to date few differences between Dutch HE institutes, apart from distinction academic universities vs universities of applied sciences

- Increasing discussion about selectivity and financial differentation: should universities be allowed more room to select on entry, require higher tuition rates, etc.?

Earlier studies (1)

- Most research on effects of university quality has been done using US data (i.e. Brewer, Eide and Ehrenberg, 1999; Dale and Krueger, 2002; Hoxby, 2004; Long, 2008)
- Hussain, McNally and Telhaj (2009) did a study using UK data

Earlier studies (2)

- Most studies find evidence that a wage premium exists for graduates from high-quality universities
- US graduates earn back their high investments in tuition several times during their career (Hoxby, 2004)
- Hussain, McNally and Telhaj (2009) suggest an average earnings differential of 6 percent for one SD rise in university quality.

What is university quality?

What is university quality?

- In early (US) studies typically measured by average SAT-scores of first-year students
- Other indicators include student/staff ratio, % of staff who hold a doctorate,
- Some studies use combined indicators based on e.g. selection at entry + staff salaries + library size + … (e.g. Dale and Krueger, 2002; Long, 2008)
- Rankings increasingly popular (Shanghai, Times, national rankings)

Some international ranking systems

Some popular university world ranking systems

- – 'Shanghai rankings': Academic world ranking of universities (top 500)
- – Times Higher Education (THE)
    - + Both well-known, clear criteria
    - - Few institutes ranked, and large proportion US/other non-Europe
    - - Well suited for comparison of elite universities
- – Webometrics top 4000 of universities on the web
    - + More institutes ranked
    - - Less well-known, one-sided perspective (web-based publications)
    - - Well suited for comparision of broad range of institutes

Webometrics

- Webometrics: Web-based ranking based on total volume, visibility and type of web-based publications per HE institute
- Large data base allows comparison of a large number of institutes, not only elite
- Link with education quality mainly indirect: universities with academically superior professors may provide better learning opportunities, but to some extent there may be a trade-off between education and research
- Additional reputation effect may or may not be linked to quality

Hypotheses

- *Graduates from more highly ranked higher education institutes have a higher hourly wage 5 years after graduation*

- *Graduates from more highly ranked higher education institutes are more likely to work in more prestigious occupations 5 years after graduation*

Data (1): **Reflex**⚡

The Flexible Professional in the Knowledge Society

http://www.reflexproject.org

- An international survey among higher education graduates from 14 European countries and Japan

- People who graduated in 1999/2000 surveyed ca. five years later, in 2005.

- The REFLEX-data features a.o. information about the university and study programme respondents attended, their transition to the labour market, first job after graduation and current job five years in their career

Data (2): Webometrics

Figure 1: Comparison between Webometrics and Shanghai rankings

CRITERIA	WR (webometrics)		ARWU (Shanghai)	
Univ's Analyzed	15000		3000	
Univ's Ranked	5000+		500	
Quality of Education			Alumni Nobel&Field	10%
Internazionalization				
Size	Web Size	20%	Size of Institution	10%
Research Output	Rich Files	15%	Nature & Science	20%
	(Google) Scholar	15%	SCI & SSCI	20%
Impact	(Link) Visibility	50%	Highly Cited Res'ers	20%
Prestige			Staff Nobel&Field	20%

Top 5 of both rankings

Webometrics		ARWU	
1	Massachusetts Inst Tech (MIT)	1	Harvard Univ
2	Harvard University	2	Stanford Univ
3	Stanford University	3	Univ California - Berkeley
4	University of California Berkeley	4	Univ Cambridge
5	Pennsylvania State University	5	Massachusetts Inst Tech (MIT)

Data (3): REFLEX data linked to ranking

- We linked the webometrics top 4000 to the REFLEX dataset based on HE institute

- German and Swiss data excluded: identity of HE institutions kept confidential in REFLEX data

Multilevel /random intercept Model (1)

4 levels:

- Individual graduates, nested in
- HE institutes, nested in
- Broad fields of study, nested in
- Countries

# Multilevel /random intercept Model (2)

Variables:

- Dependent: (log) wage, occupational prestige
- Explanatory variable: (log) ranking
- Intervening variables: programme characteristics (demandingness, degree to which employers are familiar with content)
- Control variables: age, gender, parents' education, work experience, level of HE degree

Results hourly wage analysis (in LOG)

	Model 2		Model 3		Model 4	
	B	SE	B	SE	B	SE
Constant	2,512***	0,588	2,403***	0,595	2,356***	0,598
Log(ranking)	-0,024***	0,005	-0,017*	0,01	-0,015	0,01
Study programme regarded as demanding					0,020***	0,004
Employers familiar with content of study programme					0,003	0,003
Variance components	Est.	SE	Est.	SE	Est.	SE
Intercept						
Country level	0,063**	0,025	0,139**	0,06	0,134**	0,059
Field of study level	0,007***	0,001	0,007***	0,001	0,007***	0,001
Institute level	0,005***	0,001	0,005***	0,001	0,005***	0,001
Individual level	0,126***	0,002	0,125***	0,002	0,125***	0,002
Effect of log(ranking)						
Country level			0,001*	0,000	0,001*	0,000
Deviance	10835		10804		10577	
Change in deviance	26,7		30,7		226,6	

*** = $p<0.01$; ** = $p<0.05$; * = $p<0.10$

17

# Estimated deviations from mean effect of ranking per country: wage
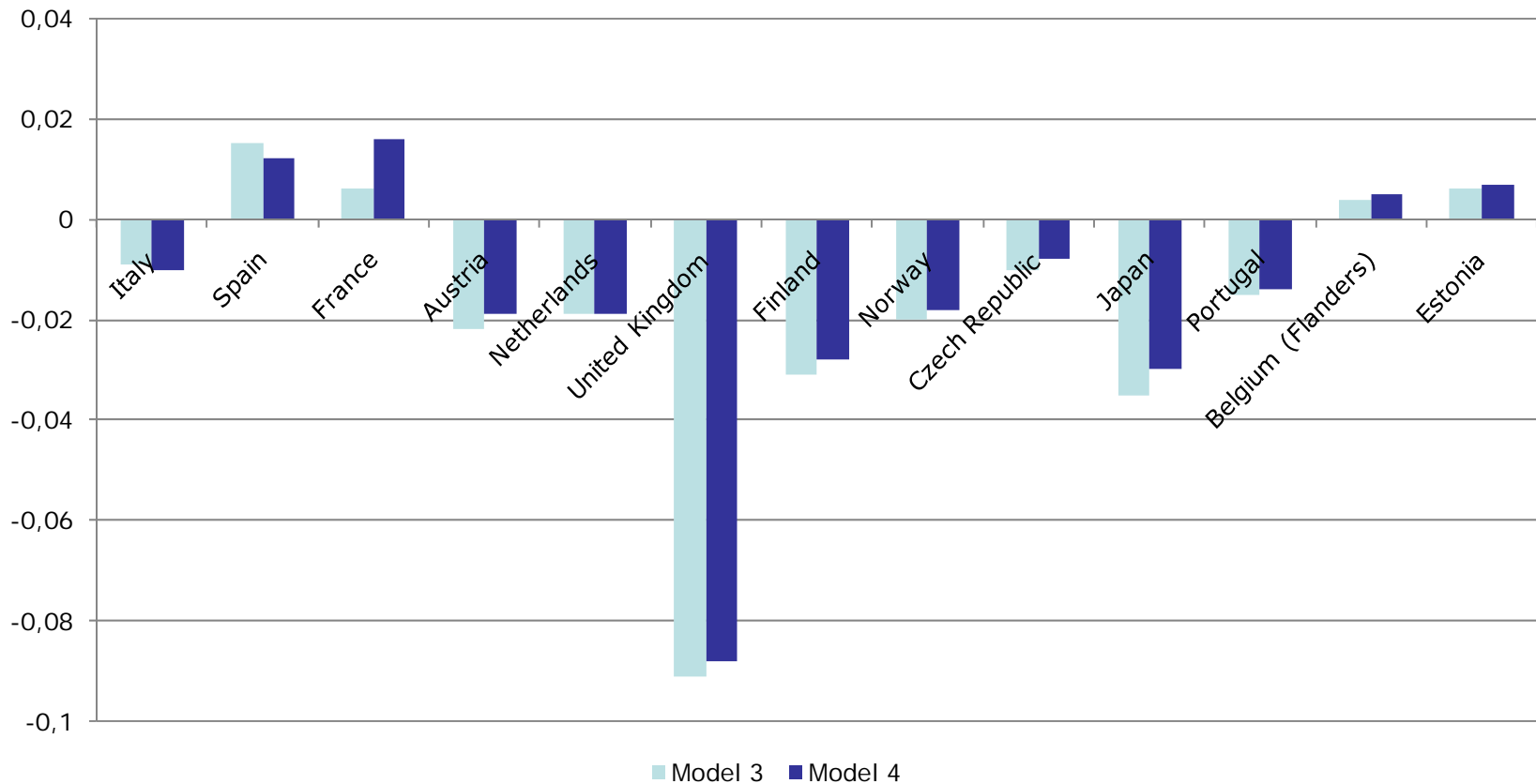
Results occupational prestige analysis

	Model 2		Model 3		Model 4	
	B	SE	B	SE	B	SE
Constant	48,750***	14,010	46,430***	14,08	46,030***	14,15
Log(ranking)	-0,491***	0,122	-0,472***	0,199	-0,470***	0,187
Study programme regarded as demanding					0,277***	0,097
Employers familiar with content of study programme					0,650***	0,073
Variance components	Est.	SE	Est.	SE	Est.	SE
Intercept						
Country level	5,082*	2,691	17,17	10,81	14,28	9,456
Field of study level	16,000***	2,352	15,880***	2,336	14,430***	2,149
Institute level	5,601***	0,617	5,310***	0,604	5,019***	0,591
Individual level	78,740***	0,959	78,730***	0,959	78,190***	0,961
Effect of log(ranking)						
Country level			0,272	0,185	0,221	0,162
Deviance	106538		106525		104440	
Change in deviance	16		13		2085	

*** = p<0.01; ** = p<0.05; * = p<0.10

Estimated deviations from main effects of ranking per country: prestige
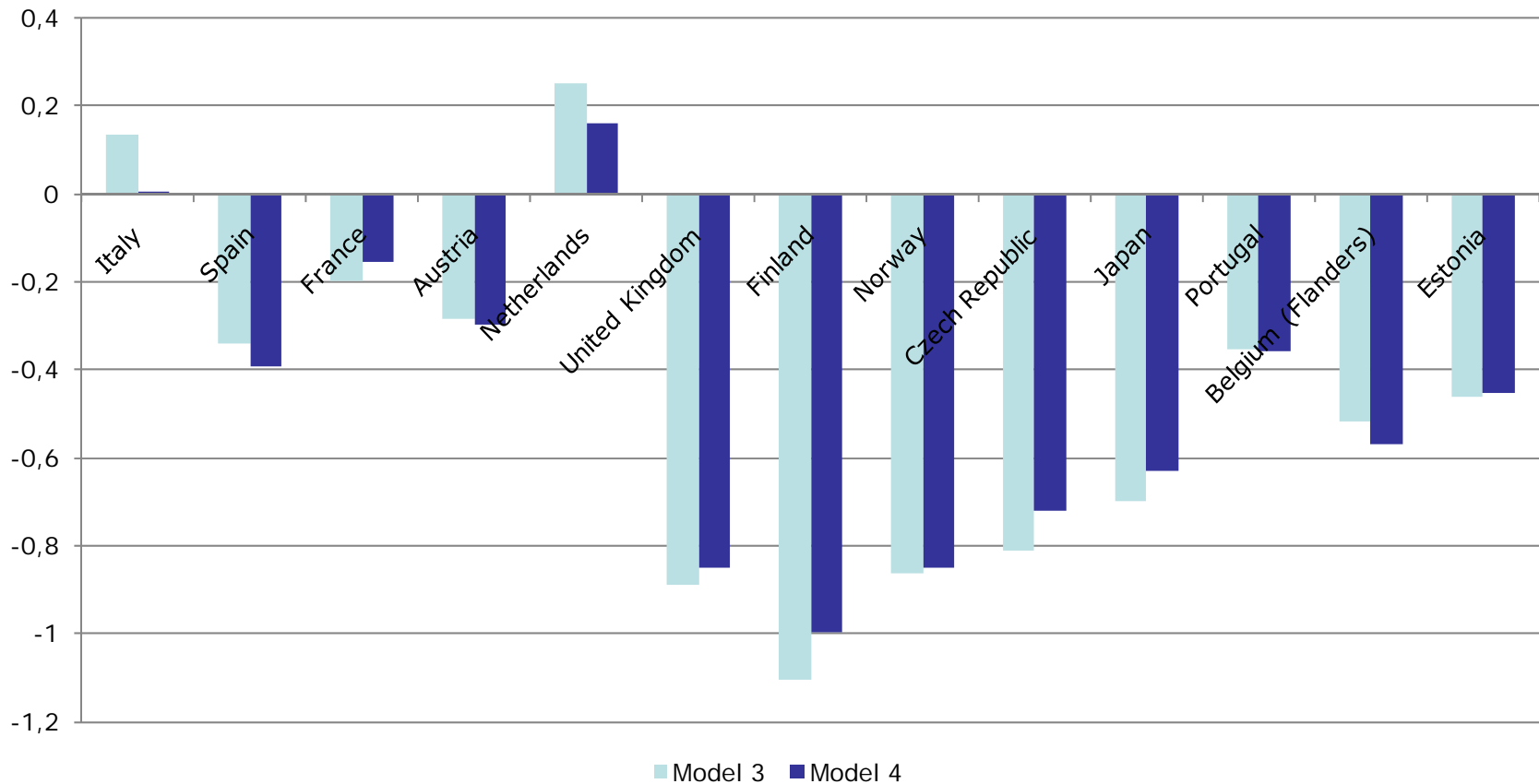
Preliminary Conclusions

- There is some evidence of a wage premium for graduates who attended more highly ranked universities

- Wage effects mainly located in UK

- In some countries attending more prestigious universities can results in significantly higher hourly wages, in others small or no effects are found

- There also seems to exists a positive relation between academic prestige of universities and the occupational prestige of graduates

- Effect also differs by country, but more countries show strong effect

Some remaining issues

- Our current model does not correct for possible selectivity bias: (self) selection of new students based on socio-economic status, wealth, ability, …

- One-sided ranking: no direct indicator of education quality

- No differentiation between fields of study

- Unclear whether effects are due to quality or a reputation premium

Further work on this paper

- Investigate possibilities of using instrumental variable, propensity score matching, etc. to correct for selection bias
- Non-linearity of the ranking data might require a different model
- Attempted replication using Times or Shanghai ranking
- Further fine-tuning of the model (this is only first version)
- Look for better indicators to disentangle reputation effects from educational quality effects

Appendix: descriptives REFLEX

Table 1: Averages per country for (1) real hourly wage, (2) hourly wage corrected for purchasing power parity and (3) ranking on occupational prestige (13 = lowest prestige, 78 = highest prestige)

Country	Hourly wage in €	Hourly wage ppp	Elite occupation ranking	N
Italy	10.21	9.94	59	1250
Spain	9.18	10.11	51	2359
France	14.54	13.53	58	968
Austria	15,01	14.55	62	732
Netherlands	15.17	14.42	56	2084
United Kingdom	15.84	14.68	55	984
Finland	15.21	13.17	56	1298
Norway	21.58	16.61	57	1300
Czech Republic	4.47	7.93	60	3863
Japan	15.73	16.82	50	1827
Portugal	7.99	11.36	60	346
Belgium (Flanders)	15.89	15.45	59	981
Estonia	4.52	7.73	59	392
Total	12.00	12.33	57	18384

Appendix: descriptives university ranking

Country	Ranking Webometrics			
	Mean	SD	Min	Max
Italy	661	652	95	3690
Spain	558	385	140	2195
France	1097	823	303	3917
Austria	626	708	77	3730
Netherlands	1201	1121	65	3827
United Kingdom	948	948	26	3525
Finland	1515	1404	43	3976
Norway	1249	1072	53	3994
Czech Republic	927	677	103	2431
Japan	1571	1033	256	3888
Portugal	1239	911	267	3235
Belgium (Flanders)	734	995	197	3939
Estonia	813	757	298	3991
Total	959	910	26	3994

Appendix: Full results for hourly wage

Table 4: Estimates and variance components for hourly wage (in LOG) of random intercept models with four levels (13,161 graduates within 359 Higher education institutes within 12 fields of study within 13 countries)

	Model 0		Model 1		Model 2		Model 3		Model 4	
	B	SE	B	SE	B	SE	B	SE	B	SE
Constant	2,443***	0,072	2,486***	0,588	2,512***	0,588	2,403***	0,595	2,356***	0,598
Study-related work experience before/during HE			0,001***	0,000	0,001***	0,000	0,001***	0,000	0,001**	0,000
Non study-related work experience before/during HE			0,001***	0,000	0,001***	0,000	0,001***	0,000	0,001***	0,000
Work experience since graduation			0,003***	0,000	0,003***	0,000	0,003***	0,000	0,003***	0,000
Academic secondary education			0,024***	0,009	0,021**	0,009	0,021**	0,009	0,022**	0,009
Higher education father			0,027***	0,008	0,026***	0,008	0,025***	0,008	0,026	0,008
Higher education mother			0,015*	0,008	0,013	0,008	0,013	0,008	0,014	0,008
Age			-0,006	0,039	0,003	0,039	0,007	0,039	0,004	0,039
Age-squared			0,000	0,001	0,000	0,001	0,000	0,001	0,000	0,001
Gender: female			-0,091***	0,007	-0,091***	0,007	-0,091***	0,007	-0,092***	0,007
level of HE: bachelor			-0,128***	0,011	-0,109***	0,011	-0,111***	0,012	-0,104***	0,012
Log(ranking)					-0,024***	0,005	-0,017*	0,010	-0,015	0,010
Study programme regarded as demanding									0,020***	0,004
Employers familiar with content of study programme									0,003	0,003

	Est.	SE	t	Est.	SE	t	Est.	SE	t	Est.
Variance components										
Intercept										
Country level	0,067**	0,027	0,064**	0,025	0,063**	0,025	0,139**	0,060	0,134**	0,059
Field of study level	0,011***	0,002	0,007***	0,001	0,007***	0,001	0,007***	0,001	0,007***	0,001
Institute level	0,008***	0,001	0,005***	0,001	0,005***	0,001	0,005***	0,001	0,005***	0,001
Individual level	0,131***	0,002	0,126***	0,002	0,126***	0,002	0,125***	0,002	0,125***	0,002
Effect of log(ranking)										
Country level							0,001*	0,000	0,001*	0,000
Deviance	13104		10861		10835		10804		10577	
Change in deviance			2242,6		26,7		30,7		226,6	

*** = p<0.01; ** = p<0.05; * = p<0.10

Appendix: Full results for occupational prestige

Table 6: Estimates and variance components for occupational prestige of random intercept models with four levels (14,385 within 359 Higher education institutes within 12 fields of study within 13 countries)

	Model 0		Model 1		Model 2		Model 3		Model 4	
	B	SE	B	SE	B	SE	B	SE	B	SE
Constant	57,360***	0,928	47,380***	14,020	48,750***	14,010	46,430***	14,080	46,030***	14,150
Study-related work experience before/during HE			0,024***	0,007	0,024***	0,007	0,024***	0,007	0,022***	0,007
Non study-related work experience before/during HE			-0,002	0,004	-0,002	0,004	-0,002	0,004	-0,001	0,004
Work experience since graduation			-0,022***	0,006	-0,021***	0,006	-0,021***	0,005	-0,023***	0,006
Academic secondary education			0,888***	0,215	0,835***	0,215	0,888***	0,216	0,918***	0,218
Higher education father			0,692***	0,183	0,679***	0,183	0,664***	0,183	0,674***	0,184
Higher education mother			0,628***	0,201	0,608***	0,201	0,596***	0,201	0,538***	0,202
Age			0,787	0,930	0,904	0,930	1,050	0,932	0,873	0,937
Age-squared			-0,012	0,015	-0,014	0,015	-0,016	0,015	-0,013	0,016
Gender: female			-0,498***	0,170	-0,494***	0,170	-0,489***	0,170	-0,423***	0,171
level of HE: bachelor			-6,495***	0,268	-6,182***	0,278	-6,210***	0,285	-5,977***	0,287
Log(ranking)					-0,491***	0,122	-0,472***	0,199	-0,470***	0,187
Study programme regarded as demanding									0,277***	0,097
Employers familiar with content of study programme									0,650***	0,073
Variance components	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE
Intercept										
Country level	8,999**	4,397	5,079*	2,711	5,082*	2,691	17,170	10,810	14,280	9,456
Field of study level	19,990***	2,924	16,530***	2,424	16,000***	2,352	15,880***	2,336	14,430***	2,149
Institute level	11,110***	0,872	5,858***	0,631	5,601***	0,617	5,310***	0,604	5,019***	0,591
Individual level	81,550***	0,931	78,700***	0,959	78,740***	0,959	78,730***	0,959	78,190***	0,961
Effect of log(ranking)										
Country level							0,272	0,185	0,221	0,162
Deviance	122337		106554		106538		106525		104440	
Change in deviance			15783		16		13		2085	

*** = $p<0.01$; ** = $p<0.05$; * = $p<0.10$