Bargaining over Maternity Pay: Evidence from UK Universities

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Appendix

A A Theoretical Model of Bargaining over Occupational Maternity Benefits

In this appendix, we present a parsimonious and stylized bargaining model between the university leadership and their female employees (or their representatives). The model is mostly meant to illustrate the main hypotheses described in the main body of text.

Consider a university with N employees and K students, defining a student-to-academic staff ratio η. The university employs N_f female employees, a proportion λ of which are academics (we omit integer issues for simplicity, but without loss of generality). We employ a Nash bargaining model between the leadership of the university (L) and the female employees (F) regarding the generosity of maternity leave provision m. The bargaining power of female employees is $\beta(f)$, which we assume is increasing in the proportion of women among professors f

The leadership tries to maximize the expected return on maternity leave provision. Better maternity leave provision (higher m) permits better retention of staff $p(m)$, increasing and strictly concave in m. The benefit of retaining staff depends on the research environment R. Higher R implies that academic staffs are more valuable to the university due to their research outputs (which increase the university reputation) and/or the cost of replacing such scholars (intense recruitment procedures with visits, job talks, etc.). Notice that, for simplicity, we assume that retaining administrative staff is also more valuable in a high research environment (high R) since stability can help scholars focus on their most important tasks: research and stability (anecdotal evidences and experience suggest that efficient administrative staffs are extremely valuable). Our results would still hold (under some conditions) if the benefit of retaining academic staff members is higher than the benefit of retaining administrative staff members.

On the cost side, we denote the marginal cost of maternity leave provision per female employee by $k_A(\eta)$ for academic and k_S for administrative support staff (the lin-

earity assumption is for ease of exposition only). We assume that $k_A(\eta) > k_S$ given that academics tend to have higher salary than administrative staff. We also assume that $k_A(\eta)$ is strictly increasing with η, the student-to-academic staff ratio. Higher η makes it more difficult to reallocate students to academics (given the system of advisee/advisor or mentee/mentors in the U.K.) or can force the university to hire replacement to academics in maternity leave.

Hence, the university leadership's payoff assumes the following form:

$$U_L(m) = N_f\big(Rp(m) - \lambda k_A(\eta)m - (1-\lambda)k_S m\big)$$

Turning to the female employees, they seek to maximize maternity leave provision. The (material and immaterial) benefit of m is denoted $u(m)$, increasing and strictly concave in m. The female employees' utility can thus be represented as

$$U_F(m) = N_f u(m)$$

The maternity leave decision faces two additional constraints. First, the cost cannot be higher than the university budget B. Hence, m must satisfy

$$N_f(k_A(\eta)m + (1-\lambda)k_S m) \leq B$$

Second, the maternity leave provision cannot be lower than the legal minimum which we denote $\underline{m}$ so $m \geq \underline{m}$.

Using the Nash bargaining framework, the maternity leave provision at the university is the solution to the following maximization problem

$$\max_m \Big(N_f\big(Rp(m) - \lambda k_A(\eta)m - (1-\lambda)k_S m\big)\Big)^{1-\beta(f)} \Big(N_f u(m)\Big)^{\beta(f)} \tag{A.1}$$
$$\text{subject to } N_f(\lambda k_A(\eta) + (1-\lambda)k_S)m \leq B \text{ and } m \geq \underline{m}$$

Observe that our model is flexible enough to encompass both a bargaining and a cost-benefit analysis approach. Indeed, if the female employees have no say in the decision

($\beta(f) = 0$), then the problem reduces to simply maximizing the university leadership's expected payoff. The cost-analysis approach is thus a special case of our overall framework.

While the model can be solved in general terms, our goal here is to provide an illustration of our empirical hypothesis. To facilitate this, we impose some additional assumptions. First, we suppose that $p(m) = \frac{m^\tau}{\tau}$, with $\tau < 1$. Second, we assume that $u(m) = \frac{m^\gamma}{\gamma}$, with $\gamma < 1$. Since we interpret $p(m)$ as a probability, we also impose $\frac{B}{N_f \lambda k_A(\eta) + (1-\lambda)k_S)} < \tau^{\frac{1}{\tau}}$ so that the probability of retention is always strictly less than 1 (this last assumption is meant to simplify the exposition).[1]

With these assumptions, we can state our main results. To do so it is helpful to define $\widehat{m}$ as the unique solution to

$$\frac{m^{\tau-1}}{\tau} = \frac{\lambda k_A(\eta) + (1-\lambda)k_S}{R} \frac{1-\beta(f)(1-\gamma)}{1-\beta(f)(\tau-\gamma)} \tag{A.2}$$

Notice that obviously $\widehat{m}$ is a function of all parameter values in Equation A.2. We come back to this when we consider comparative statics.

Our first proposition establishes the equilibrium level of maternity leave provision. Basically, $\widehat{m}$ is the solution to the (unconstrained) bargaining problem. However, as stated above, there are two constraints to satisfy. First, the maternity leave provision must be higher than the minimum legal. Second, it cannot be so high as to impose an undue financial burden on the university. The proposition establishes when this is the case.

Proposition 1. *The equilibrium level of maternity leave provision m^* satisfies*

$$m^* = \begin{cases} \underline{m} & \text{if } \widehat{m} \leq \underline{m} \\ \widehat{m} & \text{if } \underline{m} < \widehat{m} < \frac{B}{N_f(\lambda k_A(\eta) + (1-\lambda)k_S)} \\ \frac{B}{N_f(k_A(\eta)+k_S)} & \text{otherwise} \end{cases} \tag{A.3}$$

Notice that an increase in the legal requirement or in the university's budget both weakly increase the maternity leave provision at the university. However, these two variables matter only if the bargaining outcome is such that the constraints become binding.

If bargaining leaves financial room to the university, then the budget will have no impact on the maternity leave provision. Hence, the model provides one possible rationale for our null finding on this particular variable.

We now turn to the comparative statics regarding the bargaining solution. Assuming that the legal and financial constraints are not binding, then these comparative statics exactly correspond to our hypotheses. Conform with intuition, as the cost of maternity leave provision increases—due to higher student-to-academic staff ratio η, which raises $k_A(\cdot)$, or higher share of female academic staffs, since $k_A(\eta) > k_S$, maternity leave provision decreases. In turn, as the share of female professors (past or present) raise, so does the bargaining power of female employees ($\beta(f)$) which lead to better maternity leave provision (higher $\widehat{m}$). Indeed, female employees value maternity leave provision more than the university leadership. Finally, the more the leadership cares about retention (R increases), the more they are willing to offer generous maternity leave provision so $\widehat{m}$ also rises. To summarize, we obtain:

Proposition 2. *Suppose* $\underline{m} < \widehat{m} < \frac{B}{N_f \lambda k_A(\eta) + (1-\lambda)k_S)}$. *The equilibrium level of maternity leave provision*

(i) increases with research intensity (R) and the share of female professors (f)

(ii) decreases with the share of female academics (λ) and the student-to-academic staff ratio (η)

Proofs

Denote $m^{max} \equiv \frac{B}{N_f(\lambda k_A(\eta)+(1-\lambda)k_S)}$. We add the assumption that $p(m^{max}) - (\lambda k_A(\eta) + (1-\lambda)k_S)m^{max} \geq 0$. We first establish the solution to the bargaining maximization problem (A.1). Consider the function $V(m) = (1-\beta(f))\log\left((Rp(m) - \lambda k_A(\eta)m - (1-\lambda)k_S m\right) + \beta(f)\log(u(m))$. Under the assumptions, $V''(m) < 0$ on the interval $[0, m^{max}]$ so the problem is well behaved on this interval. Omitting the upper constraint for ease of exposition, taking the first order condition we obtain:

$$(1-\beta(f))\frac{Rp'(m) - \lambda k_A(\eta) - (1-\lambda)k_S}{Rp(m) - \lambda k_A(\eta)m - (1-\lambda)k_S m} + \beta(f)\frac{u'(m)}{u(m)} = 0$$

Imposing the functional forms, we obtain

$$
\begin{aligned}
& (1-\beta(f))\frac{Rm^{\tau-1}-\lambda k_A(\eta)-(1-\lambda)k_S}{R\frac{m^\tau}{\tau}-\lambda k_A(\eta)m-(1-\lambda)k_S m}+\beta(f)\frac{\gamma}{m}=0 \\
\Leftrightarrow \quad & (1-\beta(f))\big(Rm^\tau-\lambda k_A(\eta)m-(1-\lambda)k_S m\big)+\beta(f)\big(R\frac{m^\tau}{\tau}-\lambda k_A(\eta)ma-(1-\lambda)k_S m\big)=0 \\
\Leftrightarrow \quad & \big((1-\beta(f))\tau+\beta(f)\lambda\big)\frac{m^\tau}{\tau}=(\lambda k_A(\eta)+(1-\lambda)k_S)m\big((1-\beta(f))+\beta(f)\lambda\big) \\
\Leftrightarrow \quad & \frac{m^{\tau-1}}{\tau}=\frac{\lambda k_A(\eta)+(1-\lambda)k_S}{R}\frac{1-\beta(f)(1-\gamma)}{1-\beta(f)(\tau-\gamma)}
\end{aligned}
$$

We thus obtain Equation A.2 and define $\widehat{m}$ as the unique solution of this equation (to see existence and uniqueness, note that the left-hand side of Equation A.2 is strictly decreasing with m since $\tau < 1$ and tends to ∞ as m tends to 0 and to 0 as m tends to infinity, slightly abusing the range of m).

Proof of Proposition 1

The result follows directly from the analysis above (which defines an unconstrained solution) and the existence of constraints. In particular, $\widehat{m} \leq \underline{m}$ and $\widehat{m} \geq \frac{B}{N_f(\lambda k_A(\eta)+(1-\lambda)k_S)}$ signifies that the legal and financial constraints, respectively, are not satisfied by the unconstrained solution. □

Proof of Proposition 2

As noted above, the left-hand side of Equation A.2 is decreasing with m. Hence, an increase (resp. decrease) in the right-hand side of Equation A.2 yields a decrease (resp. increase) $\widehat{m}$ (by the Implicit Function Theorem, though we could also work with closed form solution). It can be checked that $\frac{\lambda k_A(\eta)+(1-\lambda)k_S}{R}\frac{1-\beta(f)(1-\gamma)}{1-\beta(f)(\tau-\gamma)}$ is increasing with η (since $k_A(\eta)$ is increasing with η), increasing with λ (since $k_A(\eta) > k_S$), decreasing with R and f (since $\beta(f)$ is increasing with f and $\frac{1-\beta(f)(1-\gamma)}{1-\beta(f)(\tau-\gamma)}$ is decreasing with $\beta(f)$). □

B Generosity across HEIs

Table B.1 Generosity of Occupational Maternity Pay across UK HEIs[2]

Weeks with full salary replacement	Number of packages	HEIS
0	15	Anglia Ruskin University, Conservatoire for Dance and Drama, Edge Hill University, Falmouth University, Guildhall School of Music and Drama, Leeds College of Music, Leeds Metropolitan University, Norwich University of the Arts, Queen Margaret University (Edinburgh), Ravensbourne, Royal Agricultural University, The University of Bolton
4	51	Bath Spa University, Bishop Grosseteste University, Buckinghamshire New University, Canterbury Christ Church University, Cardiff Metropolitan University, Central School of Speech and Drama, Coventry University, Falmouth University, Harper Adams University, Leeds Trinity University, Liverpool Hope University, Liverpool John Moores University, London Metropolitan University, London South Bank University, Rose, Bruford College, Royal Academy of Music, Royal College of Music, Royal Northern College of Music, St Mary's University College, St Mary's University College (Twickenham), Stranmillis University College, Teesside University, The Liverpool Institute for Performing Arts, The University of Chichester, The University of Huddersfield, The University of Lincoln, The University of Northumbria at Newcastle, The University of Plymouth, The University of Portsmouth, The University of Wales (Newport), The University of West London, The University of Wolverhampton, The University of Worcester, Trinity Laban Conservatoire of Music and Dance, University for the Creative Arts, University of Bedfordshire, University of Chester, University of Glamorgan, University of Gloucestershire, University of Hertfordshire, University of St Mark and St John, University of the Arts (London)
6	27	Anglia Ruskin University, Bournemouth University, De Montfort University, Falmouth University, Newman University, Roehampton University, Royal Conservatoire of Scotland, Southampton Solent University, Staffordshire University, Swansea Metropolitan University, The Arts University Bournemouth, The Arts University Bournemouth, The City University, The Manchester Metropolitan University, The Nottingham Trent University, The University of Bradford, The University of Brighton, The University of Northampton, The University of Westminster, The University of Winchester, University of Cumbria, University of Derby, University of the West of England (Bristol), Writtle College, York St John University
8	38	Aberystwyth University, Bangor University, Birmingham City University, Brunel University, Cranfield University, Goldsmiths College, Heriot-Watt University, Imperial College of Science Technology and Medicine, St George's Hospital Medical School, Swansea University, The Royal Veterinary College, The University of Bath, The University of Bristol, The University of Dundee, The University of East Anglia, The University of Edinburgh, The University of Essex, The University of Exeter, The University of Glasgow, The University of Hull, The University of Kent, The University of Leeds, The University of Leicester, The University of Liverpool, The University of Nottingham, The University of Stirling, The University of Strathclyde, The University of Surrey, The University of Sussex, The University of Warwick, The University of the West of Scotland, University Campus Suffolk, University of Durham, University of London
9	5	Courtauld Institute of Art, London School of Hygiene and Tropical Medicine, The University of Aberdeen, University College London
10	1	The University of East London
12	3	Aston University, Sheffield Hallam University, The University of Sheffield
13	9	Edinburgh Napier University, Glynd?r University, Oxford Brookes University, The Manchester Metropolitan University, The Robert Gordon University, The University of Central Lancashire, The University of Surrey, University of Abertay Dundee
14	2	The Institute of Cancer Research, The University of Sunderland
16	14	Glasgow School of Art, Imperial College of Science, Technology and Medicine, Institute of Education, The University of Bristol, The University of Edinburgh, The University of Glasgow, The University of Kent, The University of Leeds, The University of St Andrews, The University of Stirling, The University of Strathclyde, The University of Warwick, The University of the West of Scotland, University of Durham
17	1	Heriot-Watt University
18	37	Brunel University, Cardiff University, Courtauld Institute of Art, Edinburgh College of Art, Heythrop College, Imperial College of Science, Technology and Medicine, King's College London, Liverpool Hope University, London Business School, London School of Economics and Political Science, London School of Hygiene and Tropical Medicine, Loughborough University, Middlesex University, Queen Mary University of London, Royal Holloway and Bedford New College, The Open University, The Queen's University of Belfast, The School of Oriental and African Studies, The University of Aberdeen, The University of Birmingham, The University of Cambridge, The University of East London, The University of Hull The University of Keele, The University of Lancaster, The University of Newcastle-upon-Tyne, The University of Reading, The University of Salford, The University of Sheffield, The University of Sussex, The University of York, University College London, University of Ulster, University of the Highlands and Islands
19	1	Glasgow Caledonian University
20	3	Kingston University, The University of Greenwich
26	7	Aston University, Birkbeck College, Royal College of Art, Scottish Agricultural College, The University of Manchester, The University of Oxford, The University of Southampton

Table B.1: Generosity of Occupational Maternity Pay across UK HEIs

C Robustness and Outliers

Some of the important explanatory variables exhibit problematic distributions plagued by outliers. For example the RAE score, which we use to measure the research intensity of an institution, has both outliers at the bottom and top end of the distribution see figure C.1. Most HEIs score between 100 and 200. Some institutions received an RAE score of zero because they do not take part in the research assessment exercise or research excellence framework, these 14 institutions are either purely teaching based or teach drama and music, such as the Conservatoire for Dance and Drama, the Courtauld Institute of Art, the Liverpool Institute for Performing Arts, the Royal Agricultural University, the London School of hygiene and Tropical Medicine, or the Royal Veterinary College. One institution, the Institute of Education received an RAE score of 318 in 2008.

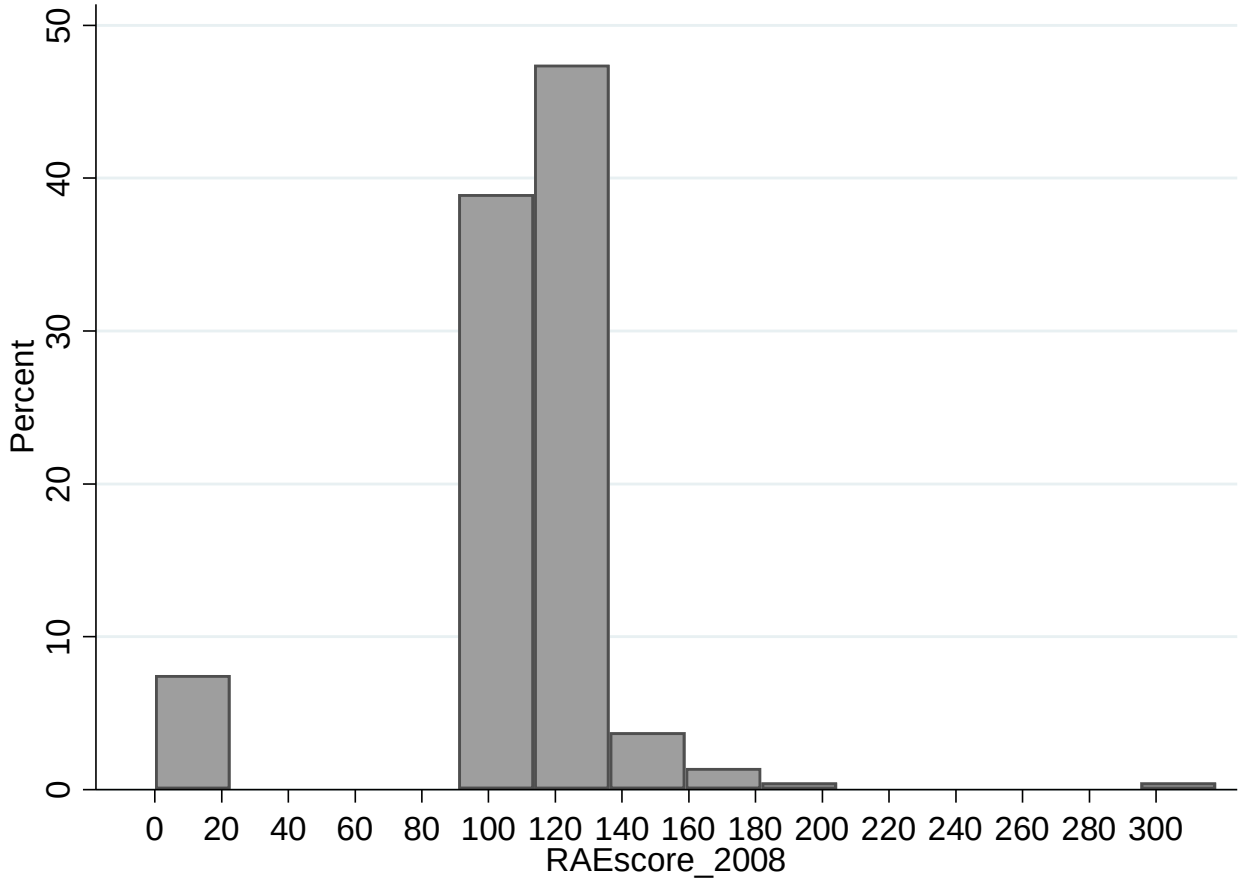


Figure C.1: Histogram - RAE score

In addition the share of female professors with respect to all employees is skewed and only two institutions (Courtauld Institute of Art and the Institute of Education) have a share of 0.04. All other institutions have shares between 0 and 0.025.

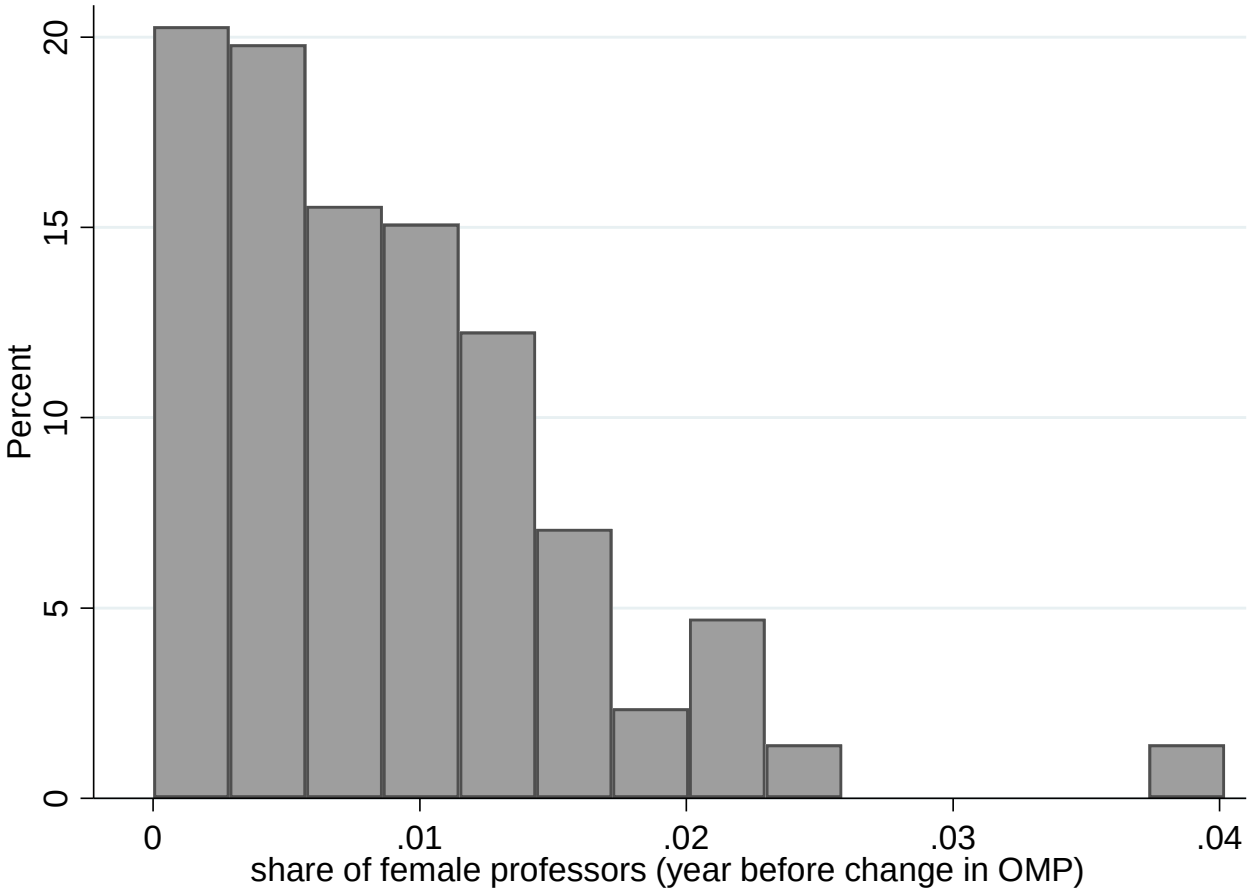


Figure C.2: Histogram - share of female professors

Only two institutions (the London School of Hygiene and Tropical Medicine and the Institute of Cancer Research) have a disproportionally large (25 percent) share of female academics at childbearing age.

We exclude these outliers from the analysis and estimate the baseline models (see **??**) again, in order to understand whether our findings are driven by these outliers. The results are shown in table C.1 and figure C.4. The overall findings remain stable to the inclusion/ exclusion of outliers, especially regarding the share of female professors, the research intensity of a university and the share of female academics at child bearing age, even though significance levels for the latter effect drop slightly.

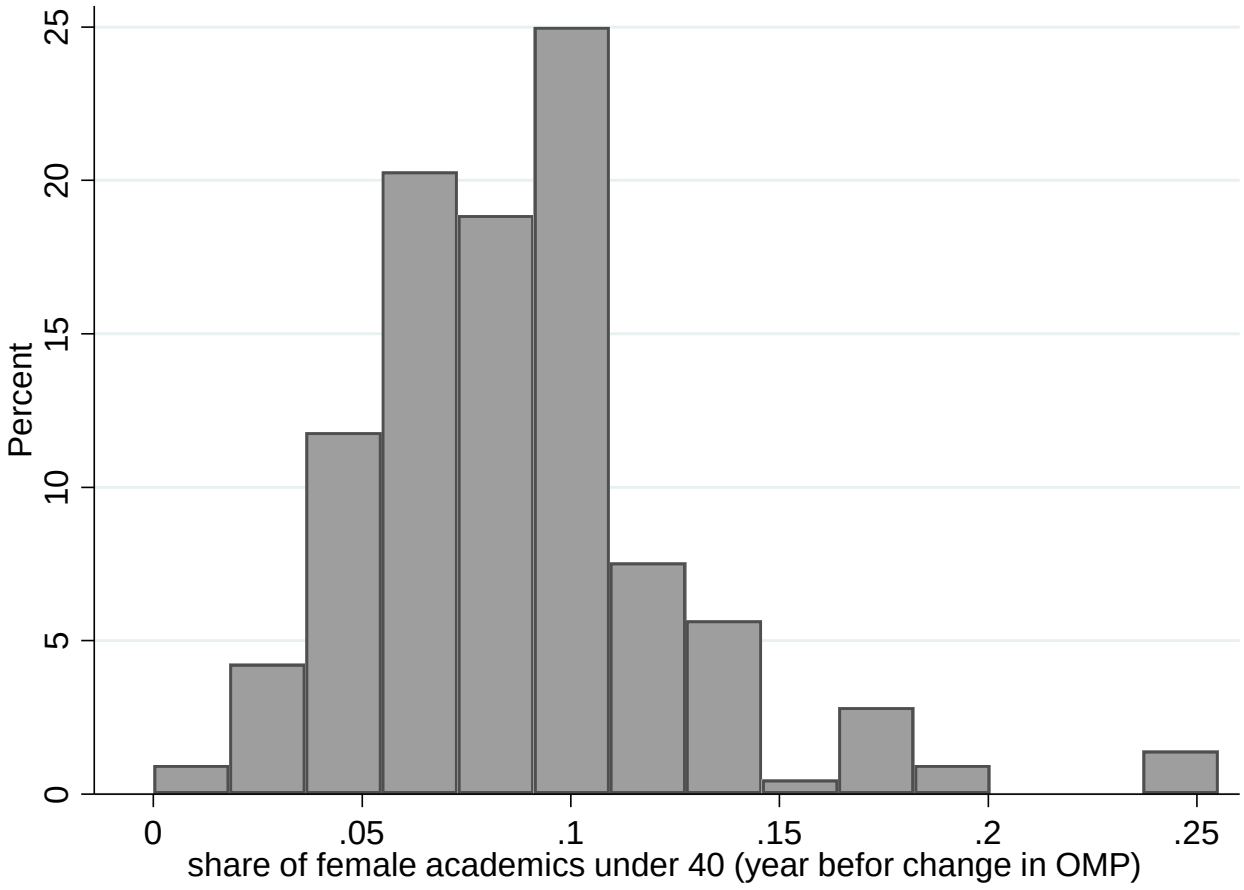
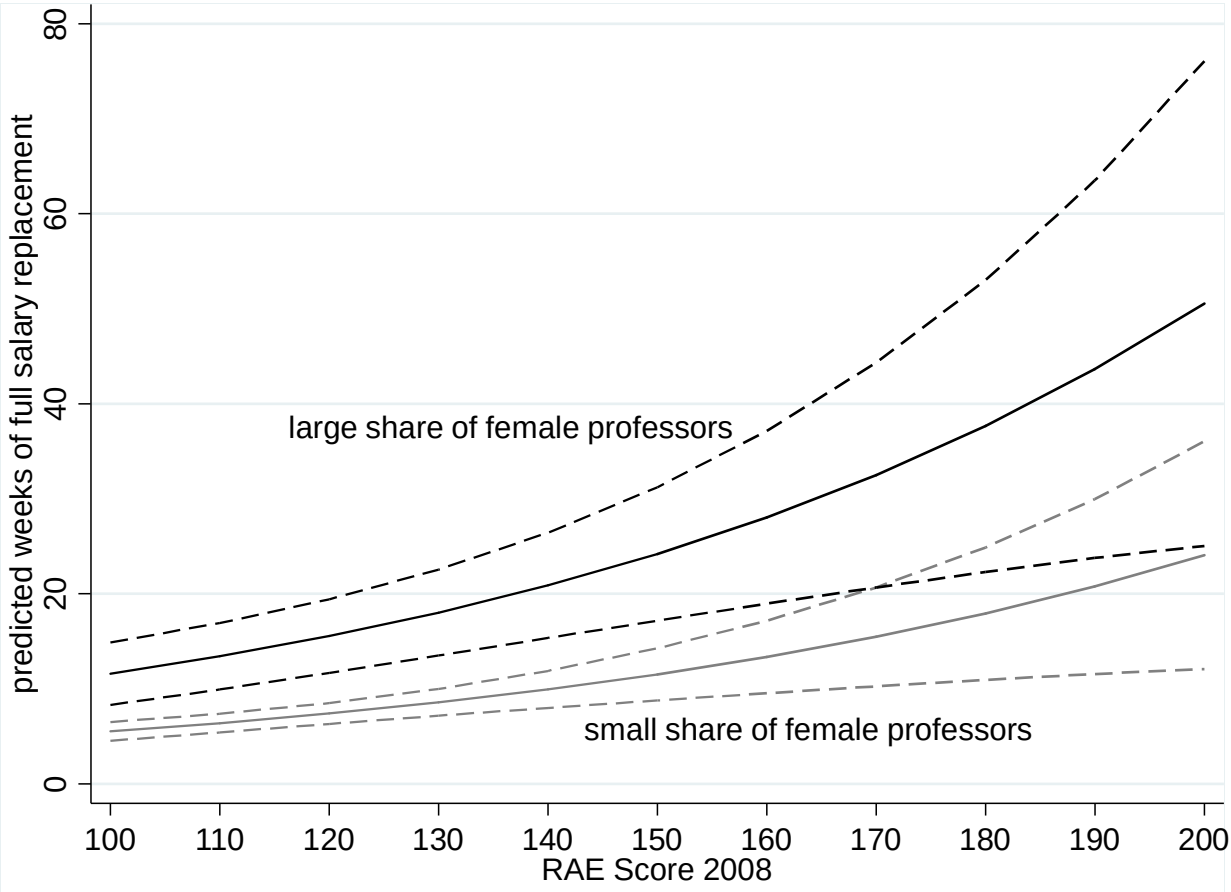


Figure C.3: Histogram share of female academics below the age of 40

DV: Weeks of Full Salary Replacement	1 Negbin	2 Poisson	3 OLS
Total staff in 1000s (BC OMP)	0.104***	0.094**	1.126**
	(0.040)	(0.040)	(0.467)
Ratio ac/admin females (BC OMP)	-0.307*	-0.268	-1.463
	(0.179)	(0.169)	(0.942)
Share of female professors (BC OMP)	29.719***	1.185***	311.379***
	(10.120)	(9.243)	(98.505)
Female academics under 40 (BC OMP)	3.259	2.988*	16.079
	(2.037)	(1.855)	(16.525)
Ratio staff costs/ income (2013)	-0.013	-0.012	-0.144*
	(0.008)	(0.010)	(0.084)
Income research grants (in mill. £ 2013)	-0.002	-0.001	-0.001
	(0.001)	(0.001)	(0.011)
Total income in mill. £ (20130	-0.000	-0.000	-0.008
	(0.001)	(0.000)	(0.007)
Student to staff ratio (BC OMP)	-0.002	0.001	0.017
	(0.013)	(0.014)	(0.109)
RAE score (2008)	0.015***	0.014***	0.163***
	(0.003)	(0.003)	(0.038)
Different packages	-0.458***	-0.469***	-4.864***
	(0.077)	(0.075)	(0.665)
Scotland	0.399***	0.309***	3.388***
	(0.113)	(0.106)	(1.197)
Northern Ireland	0.454**	0.457***	5.424**
	(0.189)	(0.158)	(2.257)
Wales	0.044	-0.066	0.103
	(0.231)	(0.174)	(1.720)
Intercept	1.175**	1.199*	-1.342
	(0.573)	(0.704)	(6.531)
N	191	191	191
R^2 (Pseudo)	0.083	0.227	0.463
Alpha	0.165		

Robust Standard Errors in Parentheses, * p≤0.1, ** p≤0.05, *** p≤0.01

Table C.1: Estimation Results Excluding Outliers



share: large=0.025, small=0

Figure C.4: Predicted Weeks of Full Salary Replacement Excluding Outliers

Finally, we examine whether the year in which the potentially endogenous explanatory variables are measured change the estimation results. Models 1, 2, and 3 in table C.2 use the same specification as our baseline model but measure the relevant right-hand-side variables in the years 2006, 2005, and 2004 all prior to the last major changes in statutory benefits. Models 4 and 5 show results with measurements for the right-hand-side variables in 2006 and with the alternative specifications of the dependent variable (weeks with full time equivalent pay and weeks with partial and full salary replacement).

DV: Weeks of Full Salary Replacement	**2006 Negbin**	**2005 Negbin**	**2004 Negbin**	**2006 FT-equivalent**	**2006 weeks SR**
Total staff in 1000s	0.093**	0.084**	0.078*	0.025**	0.001
	(0.037)	(0.041)	(0.044)	(0.011)	(0.028)
Academic to admin females ratio	-0.261	-0.162	-0.032	-0.099	-0.145
	(0.207)	(0.212)	(0.180)	(0.068)	(0.107)
Share of female profs	30.631***	32.706***	33.260***	7.131***	6.621
	(8.841)	(8.533)	(9.009)	(2.390)	(4.327)
Female academics under 40	4.131**	2.226	1.544	1.264**	2.150
	(1.719)	(1.745)	(1.647)	(0.550)	(1.376)
Staff costs to income ratio (2013)	-0.006	-0.030**	-0.029**	-0.000	0.008
	(0.009)	(0.013)	(0.013)	(0.003)	(0.009)
Income research grants in mill. £ (2013)	-0.002	-0.002	-0.002	-0.000	-0.000
	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
Total Income in mill. £ (2013)	0.000	0.001	0.001	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Student to staff ratio	-0.024*			-0.006	-0.003
	(0.013)			(0.004)	(0.010)
RAE score (2008)	0.005***	0.005**	0.005**	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Different packages	-0.443***	-0.448***	-0.428***	-0.103***	0.038
	(0.075)	(0.075)	(0.078)	(0.028)	(0.060)
Scotland	0.394***	0.397***	0.407***	0.097***	0.076
	(0.122)	(0.119)	(0.119)	(0.032)	(0.079)
Northern Ireland	0.384**	0.441***	0.473***	0.050	-0.149
	(0.181)	(0.170)	(0.163)	(0.040)	(0.190)
Wales	-0.002	-0.010	0.017	0.067	0.014
	(0.162)	(0.155)	(0.148)	(0.064)	(0.142)
Intercept	2.163***	2.216***	2.200***	2.866***	2.290***
	(0.511)	(0.500)	(0.486)	(0.146)	(0.435)
N	209	206	203	209	209
R^2 (Pseudo)	0.084	0.088	0.084	0.048	0.013
Alpha	0.184	0.169	0.179	0.000	0.101

Robust Standard Errors in Parentheses, * p≤0.1, ** p≤0.05, *** p≤0.01

Table C.2: Different RHS Years and Alternative DVs

The results in table C.2 largely confirm the findings in the baseline model as well as the models with alternative specifications of the dependent variable. Since the bulk of changes in occupational maternity benefits occurred between 2008 and 2012 the mea-

sures from 2006 seem to best account for the implemented changes in occupational maternity packages. This confirms our expectations that the process of consultation regarding changes in occupational maternity happens shortly before new maternity provisions are issued by a university. If we move further into the past (2005, 2004) some of the effects lose statistical significance, e.g. the share of female academics at child bearing age. However, the overall effects remain remarkably stable, adding to the notion that our findings are robust towards different specifications and inclusion of variables.

D Multicollinearity and Endogeneity of Institutional Income measures

Right-hand-side variables – measured in the year before last changes in OMP	Variance inflation factor	Tolerance
Total income in mill £ (2013)	28.81	0.035
Total number of staff	12.89	0.078
Income research grants in mill. £ (2013)	10.96	0.091
Share of female academics under 40	2.40	0.416
Ratio of female academic/admin staff	1.65	0.608
Student to staff ratio	1.61	0.622
Share of female full professors	1.53	0.654
Staff costs per income (2013)	1.30	0.767
RAE Score 2008	1.28	0.782
Different packages	1.20	0.833
Scotland	1.09	0.916
Wales	1.06	0.942
Northern Ireland	1.05	0.952

Table D.1: Variance Inflation Factor for RHS Variables in the Baseline Model

The variables closely related to the wealth or size of an institution, total income, number of staff, and income generated by research grants have the highest variance inflation factor indicating higher order correlation between these three measures and such potentially high multicollinearity which leads to inefficient estimation and might prevent identifying the effect of each of these factors. This is supported by the correlation between these three variables: the Pearson correlation coefficient for total income and research income is 0.93, for total number of staff and total income 0.95, and for total number of

staff and income generated from research grants 0.84. We therefore run models including only one of the three variables on the right-hand-side to check the robustness of the Null-finding for wealth of the institution. Results can be found in table D.2 below:

DV: Weeks of Full Salary Replacement	**1**	**2**	**3**
	Negbin	**Negbin**	**Negbin**
Total staff in 1000s (BC OMP)	0.048**		
	(0.023)		
Acad. to adm. females ratio (BC OMP)	-0.427**	-0.451**	-0.430**
	(0.172)	(0.186)	(0.182)
Share of female profs (BC OMP)	29.104***	31.465***	30.127***
	(7.293)	(7.492)	(7.363)
Female academics under 40 (BC OMP)	3.275**	3.872***	3.493**
	(1.426)	(1.468)	(1.445)
Staff costs/income ratio (2013)	-0.002	-0.000	0.000
	(0.008)	(0.009)	(0.009)
Income research grants in mill. £ (2013)		0.001	
		(0.001)	
Total income in mill. £ (2013)			0.000*
			(0.000)
Student to staff ratio (BC OMP)	-0.016	-0.014	-0.015
	(0.013)	(0.015)	(0.014)
RAE score (2008)	0.004***	0.005***	0.005***
	(0.002)	(0.002)	(0.002)
Different packages	-0.471***	-0.444***	-0.456***
	(0.073)	(0.069)	(0.070)
Scotland	0.345***	0.322***	0.338***
	(0.107)	(0.101)	(0.104)
Northern Ireland	0.379**	0.367**	0.375**
	(0.180)	(0.184)	(0.181)
Wales	-0.038	-0.054	-0.040
	(0.204)	(0.194)	(0.196)
Intercept	2.158***	1.991***	2.021***
	(0.459)	(0.488)	(0.478)
N	208	208	208
R^2 (Pseudo)	0.080	0.075	0.077
Chi^2	149.099	164.222	156.161
P_value (Chi^2)	0.000	0.000	0.000
Alpha	0.188	0.198	0.193

Robust Standard Errors in Parentheses, * p≤0.1, ** p≤0.05, *** p≤0.01, BC OMP = year before the last Change in Occupational Maternity Package

Table D.2: Robustness Check for Institutional Income

Separating out these 3 variables has no effect on the previously discussed results. Total income when included alone only becomes very marginally statistically significant.

DV:	Total staff in 1000s	Staff costs/ income ratio	Income research in mill. £	RAE score
Total Income in mill. £	0.011***	-0.000	0.322***	0.051***
	(0.000)	(0.002)	(0.009)	(0.011)
Partial R^2	0.897	0.000	0.874	0.100
N	208	209	209	209

Table D.3: Income and other Institutional Variables (OLS)

E Including Spatial Lags

In appendix E, we further investigate the peer group effect and potential inter-dependence of maternity packages by employing a spatial lag specification.

In the UK, universities have self-selected into formal and informal associations according to their research activities, teaching aims, research grants, contract income and entry requirements, *inter alia*. For example, the Russell Group, founded in 1994 and based in London, is arguably the most known HEIs association comprising of 24 universities, but many other formal and informal university grouping exist in the UK. The purpose of these affiliations is to represent the interests of member institutions and promote their shared values. [3] Albeit with some differences, group membership thus signals similarities between affiliated institutions. For example, the Million+ Group [4] specializes in courses on modern subjects and professional qualification while the Russell Group or the 1994 group [5] are more centred on traditional subjects.[6]

The self-selection of universities into groups is likely to affect the generosity of maternity schemes since the benefits granted by one institution are not necessarily independent of maternity benefits granted by other peer institutions. We add spatial lags into the empirical specification to test for this possibility. The results of the spatial lag specification are presented in table E1. We generate spatial lags of the dependent variable weighted by membership in a specific university group (e.g. Russell Group, Golden Triangle, New Universities, Northern Consortium etc.). This implies that when a University contemplates changing occupational maternity benefits they take into account what other institutions in their peer group have implemented. Hence this models directly the interdependence of maternity benefits across observations (institutions). We run spatial lag models with an OLS and a Negative Binomial Specification. Our findings strongly support the

findings in the generalized binomial specification presented in the main text in table **??**, model 4. We find that member institutions of the Golden Triangle group are likely to improve their provisions if other members do so as well (a positive significant spatial effect) while post 1992 institutions, which are much more diverse, are likely to lower their provisions in response to other members of the same group. In addition, and also consistent with previous results, Scottish universities tend to improve benefits if other institutions in Scotland do so as well. All other findings remain robust to this spatial specification.

DV: Weeks of Full Salary Replacement	OLS	Negbin
Weighted Spatial lag Russell Group	-0.008	0.001
	(0.101)	(0.009)
Weighted Spatial lag Golden Triangle	0.240***	0.019**
	(0.091)	(0.008)
Weighted Spatial lag Group 94	-0.006	-0.000
	(0.138)	(0.011)
Weighted Spatial lag New '92 former polytechnics	-0.329**	-0.029
	(0.158)	(0.019)
Weighted Spatial lag New '92 non- polytechnics	-0.916***	-0.123**
	(0.317)	(0.049)
Weighted Spatial lag Beloff's plateglass, original	-0.129	-0.014
	(0.146)	(0.011)
Weighted Spatial lag Beloff's plateglass, other	0.095	0.009
	(0.104)	(0.009)
Weighted Spatial lag Redbrick	0.017	0.002
	(0.145)	(0.011)
Weighted Spatial lag Cathedrals Group	0.165	0.048
	(0.237)	(0.038)
Weighted Spatial lag GuildHE	0.115	-0.018
	(0.281)	(0.042)
Weighted Spatial lag Million Plus Modern Universities	0.220	0.019
	(0.136)	(0.019)
Weighted Spatial lag 2006 University Alliance	0.252	0.034**
	(0.154)	(0.016)
Weighted Spatial lag Northern Consortium UK	0.087	0.005
	(0.133)	(0.010)
Weighted Spatial lag Universities of Scotland	0.218**	0.024***
	(0.097)	(0.009)
Total staff in 1000s (BC OMP)	0.785*	0.063
	(0.471)	(0.043)
Acad. to adm. females ratio (BC OMP)	-2.786***	-0.482***
	(0.734)	(0.146)
Share of female profs (BC OMP)	268.769***	25.881***
	(67.587)	(7.584)
Female academics under 40 (BC OMP)	20.814*	3.772***
	(10.757)	(1.321)
Staff costs/income ratio (2013)	-0.089	-0.010
	(0.084)	(0.011)
Income research grants in mill. £ (2013)	-0.001	-0.001
	(0.015)	(0.001)
Total income in mill. £ (2013)	-0.006	-0.000
	(0.006)	(0.000)
Student to staff ratio (BC OMP)	-0.005	-0.004
	(0.119)	(0.015)
RAE score (2008)	0.032**	0.004**
	(0.013)	(0.002)
Different packages	-5.054***	-0.461***
	(0.696)	(0.075)
Intercept	13.908***	2.592***
	(4.917)	(0.598)
N	208	208
R2 (Pseudo)	0.495	0.102
Chi^2		305.286
P_value (Chi^2)		0.000
Alpha		0.141

Robust Standard Errors in Parentheses, * p≤0.1, ** p≤0.05, *** p≤0.01, BC OMP = year before the last Change in Occupational Maternity Package

Table E.1: Baseline Model including Spatial Lags of the Main Dependent Variable Weighted by University Group Membership

F Union Density, Robustness

DV: Weeks of Full Salary REplacement	Negbin	Negbin	Negbin	Negbin
Total staff in 1000s (BC OMP)	0.107***	0.098**	0.083*	0.097*
	(0.039)	(0.040)	(0.047)	(0.051)
Acad. to adm. females ratio (BC OMP)	-2.063**	-1.347	-1.884*	-1.724
	(1.003)	(0.932)	(0.970)	(1.073)
Share of female profs (BC OMP)	-0.622***	-0.543***	-0.552***	-0.532***
	(0.162)	(0.156)	(0.161)	(0.163)
Female academics under 40 (BC OMP)	7.026***	6.600***	0.873***	2.806***
	(9.137)	(9.884)	(6.470)	(6.116)
Staff costs/income ratio (2013)	7.181***	5.051***	4.231***	4.307***
	(1.973)	(1.772)	(1.449)	(1.534)
Income research grants in mill. £ (2013)	-0.003	-0.008	-0.003	-0.009
	(0.013)	(0.009)	(0.010)	(0.008)
Total income in mill. £ (2013)	-0.003**	-0.002**	-0.002*	-0.002*
	(0.001)	(0.001)	(0.001)	(0.001)
student To staff ratio (bc OMP)	-0.000	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)
RAE score (2008)	0.001	-0.005	-0.012	-0.016
	(0.016)	(0.014)	(0.013)	(0.014)
Different packages	0.004*	0.004*	0.004**	0.004**
	(0.002)	(0.002)	(0.002)	(0.002)
Scotland	-0.466***	-0.452***	-0.452***	-0.464***
	(0.075)	(0.074)	(0.073)	(0.080)
Northern Ireland	0.244**	0.354***	0.313***	0.361***
	(0.107)	(0.112)	(0.112)	(0.110)
Wales	0.444***	0.443***	0.366**	0.378**
	(0.164)	(0.154)	(0.169)	(0.173)
Intercept	-0.222**	0.006	-0.076	-0.026
	(0.100)	(0.214)	(0.216)	(0.225)
UCU density 2007	-0.748**			
	(0.377)			
UCU density 2013		-0.780***		
		(0.284)		
UCU density 2015			-0.487	
			(0.312)	
UCU density 2018				-0.114
				(0.324)
Intercept	3.139***	3.269***	3.408***	3.492***
	(0.858)	(0.710)	(0.739)	(0.735)
N	186	194	207	197
R^2 (OLS)	0.491	0.485	0.465	0.457
R^2 (Pseudo)	0.095	0.095	0.088	0.087
Chi^2	264.662	274.919	254.093	252.623
P_value (Chi^2)	0.000	0.000	0.000	0.000
Alpha	0.147	0.148	0.170	0.163

Robust Standard Errors in Parentheses, * p≤0.1, ** p≤0.05, *** p≤0.01

Table F.1: Robustness Check for Union Density Measured in Different Years

G Membership in University Groups and Consortia

Russell Group University of Birmingham, University of Bristol, University of Cambridge, Cardiff University, Durham University, University of Edinburgh, University of Exeter, University of Glasgow, Imperial College London, King's College London, University of Leeds, University of Liverpool, London School of Economics and Political Science, University of Manchester, Newcastle University, University of Nottingham, University of Oxford, Queen Mary University of London, Queen's University Belfast, University of Sheffield, University of Southampton, University College London, University of Warwick, University of York
2. Golden Triangle (informal) University of Cambridge, Imperial College London, King's College London, London School of Economics and Political Science, University of Oxford, University College London, (London Business School, London School of Hygiene and Tropical Medicine)
1994 Group (dissolved in 2013) Birkbeck, University of London, University of East Anglia, University of Essex, Goldsmiths - University of London, Institute of Education - University of London, University of Lancaster, University of Leicester, Loughborough University, Royal Holloway - University of London, SOAS - University of London, University of Sussex
New Universities (post 1992 – former polytechnics and central institutions) (informal) Anglia Ruskin University, Birmingham City University , Bournemouth University, University of Brighton, University of Central Lancashire, Coventry University, De Montfort University, University of East London, University of Greenwich, University of Hertfordshire, University of Huddersfield, Kingston University, Leeds Beckett University, University of Lincoln, Liverpool John Moores University, London Metropolitan University, London South Bank University, Manchester, Metropolitan University, Middlesex University, Northumbria University, Nottingham Trent University, Oxford Brookes University, University of Plymouth, University of Portsmouth, Sheffield Hallam University, University of South Wales, Staffordshire University, University of Sunderland, Teesside University, University of the West of England, University of West London, University of Westminster, University of Wolverhampton, University of Abertay Dundee, Edinburgh Napier University, Glasgow Caledonian University, The Robert Gordon University, University of the West of Scotland
New Universities (post 1992, not former polytechnics) Arden University, University of the Arts London, The Arts University Bournemouth, Bath Spa University, University of Bedfordshire, University College Birmingham Bishop Grosseteste University, University of Bolton, BPP University, Buckinghamshire New University, Canterbury Christ Church University, Cardiff Metropolitan University, University of Chester, University of Chichester, University for the Creative Arts, University of Cumbria, University of Derby, Edge Hill University, Falmouth University, University of Gloucestershire, Glyndŵr University, Harper Adams University, University of the Highlands and Islands, University of Law, Leeds Trinity University, Liverpool Hope University, Newman University, University of Northampton, Norwich University of the Arts, Queen Margaret University, University of Roehampton, Regent's University London, Royal Agricultural University, Southampton Solent University, University of St Mark & St John, St Mary's University, Twickenham, University of Suffolk, University of Winchester, University of Worcester, York St John University
Beloff's plateglass universities (informal), (original) University of East Anglia, University of Essex, University of Kent, Lancaster University, University of Sussex, University of Warwick, University of York
Beloff's plateglass universities (informal), (other) Aston University, University of Bath, University of Bradford, Brunel University, University of Buckingham, City, University of London, Heriot-Watt University, Keele University, Loughborough University, Newcastle University, Open University, University of Salford, University of Dundee, University of Stirling, University of Strathclyde, University of Surrey, Ulster University
Redbrick Universities (informal) University of Birmingham, University of Liverpool, University of Manchester, University of Leeds, University of Sheffield, University of Bristol, University of Reading, University of Nottingham, Newcastle University
Cathedrals Group (officially the **Council of Church Universities and Colleges** or **CCUC**) Bishop Grosseteste University, Canterbury Christ Church University, University of Chester, University of Chichester, University of Cumbria, University of Gloucestershire, Heythrop College, University of London, Leeds Trinity University, Liverpool Hope University, Newman University, University of St Mark & St John, Roehampton University, St Mary's University (Twickenham), University of Wales, Trinity Saint David, University of Winchester, York St. John University
GuildHE **Full Members**: Abertay University, Arts University Bournemouth, Bath Spa University, Bishop Grosseteste University Lincoln, Buckinghamshire New University, Falmouth University, Harper Adams University, Leeds College of Art, Leeds Trinity University, Newman University, Norwich University of the Arts, Plymouth College of Art, Ravensbourne, Rose Bruford College, Royal Agricultural University, Royal Central School of Speech and Drama, Southampton Solent University, St. Mary's University College (Belfast), St. Mary's University College (Twickenham), The Anglo-European College of Chiropractic, The British School of Osteopathy, The Liverpool Institute for Performing Arts, The University of Law, University College Birmingham, University for the Creative Arts, University of Chichester, University of St Mark & St John, University of Suffolk, University of Winchester, University of Worcester, Writtle University College, York St John University **Associate Members:** Academy of Live Recorded Arts (ALRA), Bradford College, British and Irish Modern Music Institute, Cleveland College of Art and Design, GSM London, Hartpury College, Hereford College of Arts, The Institute of Contemporary Music Performance, SAE Institute, UCFB
MillionPlus = Coalition of Modern Universities (1997) Abertay University, Anglia Ruskin University, Bath Spa University, University of Bedfordshire, University of Bolton, Canterbury Christ Church University, University of Cumbria, University of East London, Edinburgh Napier University, University of the Highlands and Islands, Leeds Trinity University, London Metropolitan University, London South Bank University, Middlesex University, Southampton Solent University, Staffordshire University, University of Sunderland, University of West London, University of the West of Scotland
University Alliance (2006) Coventry University, Kingston University, Liverpool John Moores University, Manchester Metropolitan University, Nottingham Trent University, Oxford Brookes University, Sheffield Hallam University, Teesside University, The Open University, University of Brighton, University of Central Lancashire, University of Greenwich, University of Hertfordshire, University of Huddersfield, University of Portsmouth, University of Salford, University of South Wales, University of the West of England
NCUK (Northern Consortium) The University of Bradford, The University of Huddersfield (then as Huddersfield Polytechnic), Leeds Beckett University (then as Leeds Polytechnic), The University of Leeds, Liverpool John Moores University (then as Liverpool Polytechnic), The University of Liverpool (partnership ended), Manchester Metropolitan University (then as Manchester Polytechnic), The University of Manchester, The University of Salford, Sheffield Hallam University (then as Sheffield Polytechnic), The University of Sheffield, Aston University, The University of Birmingham, University of Bristol, Queen Mary University of London, University of Kent, Kingston University London
Universities Scotland University of Aberdeen, Robert Gordon University, Abertay University, University of Dundee, University of Edinburgh, Edinburgh Napier University, Heriot-Watt University, Queen Margaret University, University of Glasgow, Glasgow Caledonian University, Glasgow School of Art, Royal Conservatoire of Scotland, University of Strathclyde, University of St Andrews, University of Stirling, Open University in Scotland, Scotland's Rural College, University of the Highlands and Islands, University of the West of Scotland

Table G.1: University Groups

H Derivation of the Negative Binomial and Generalized Negative Binomial Estimators

In appendix H we derive the estimators for our preferred empirical specification. The negative binomial estimator models the number of occurrences or counts of an event when the event has extra-Poisson variation, that is, when it has over-dispersion. The Poisson regression model can be formally described as follows

$$y_j \sim Poisson(\mu_j)$$

where

$$\mu_j = exp(x_j\beta + offset_j)$$

for observed counts y_j with covariates x_j for the jth observation. One can derive the negative binomial mean-dispersion model with individual units following a Poisson regression model, but there is an omitted variable η_j, such that e^{η_j} follows a gamma distribution with mean 1 and variance α:

$$y_j \sim Poisson(\mu_j^\star)$$

where

$$\mu_j^\star = exp(x_j\beta + offset_j + \eta_j)$$

and

$$e^{\eta_j} \sim Gamma(1/\alpha, \alpha)$$

With this parameterization, a $Gamma(a; b)$ distribution will have expectation ab and variance ab^2. We refer to α as the overdispersion parameter. The larger α is, the greater the overdispersion. The Poisson model corresponds to $\alpha = 0$. The negative binomial model

parameterizes α as $ln(\alpha)$. The generalized negative binomial estimator allows $ln\alpha$ to be modeled as $ln(\alpha_j) = z_j$, a linear combination of covariates z_j.

The negative binomial estimator can fit two different parameterizations of the negative binomial model. The first has dispersion for the jth observation equal to $1 + \alpha exp(x_j\beta + offset_j)$. This is seen by noting that the above implies that

$$\mu_j^\star \sim Gamma(1/\alpha, \alpha\mu_j)$$

and thus

$$\begin{aligned} Var(y_j) &= E\{Var(y_j|\mu_j^\star)\} + Var\{E(y_j|\mu_j^\star)\} \\ &= E(\mu_j^\star) + Var(\mu_j^\star) \\ &= \mu_j(1 + \alpha\mu_j) \end{aligned}$$

The alternative parameterization models dispersion equal to $1 + \delta$; so that it is constant for all observations, because the constant-dispersion model assumes instead that

$$\mu_j^\star \sim Gamma(\mu_j/\delta, \delta)$$

and thus $Var(y_j) = \mu_j(1 + \delta)$. The Poisson model corresponds to $\delta = 0$.

For detailed derivations of both models, see Cameron and Trivedi (2013, 8089). In particular, note that the mean-dispersion model is known as the NB2 model in their terminology, whereas the constant-dispersion model is referred to as the NB1 model. In our specifications we use the mean-dispersion model throughout but the results remain fully robust to a constant-dispersion specification.