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GENDER IN THE ECONOMICS PROFESSION I[‡]

Gender Equality and Positive Action: Evidence from UK Universities[†]

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Despite increasing female representation among all faculty ranks in the United States between 2002 and 2012, the share of female faculty remained the lowest among hard science and economics departments (Lundberg and Stearns 2019). In the United Kingdom the picture is similarly disheartening. Figure 1 uses administrative-level data from the UK Higher Education Statistics Agency (HESA) to show the female faculty composition in the Russell Group top research universities in the United Kingdom over the last decade. Whereas the percentage of female faculty increased over this period, in 2016 only 15 percent of faculty were women in hard science departments compared to 50 percent in some social sciences departments such as sociology. Trends in female representation in economics departments over this period remained stubbornly flat at about 25 percent.

This paper examines the impact of the Athena Scientific Women's Academic Network (SWAN) Charter on the wages and employment trajectories of female faculty. The Athena SWAN Charter is a gender equality initiative that formally recognizes good practice toward the representation and career progression of women in science, technology, engineering, mathematics, and medicine (STEMM) through an accreditation process. Understanding the effects of the Charter on gender equality in STEMM is particularly relevant at a time when the Charter's scope is being widened to cover gender equality in the disciplines of arts, humanities, and social sciences, including economics.

Our paper contributes to a growing literature that aims to evaluate the causal impact of practices and interventions leading to greater gender equality in academia (see Buckles 2019 for a recent review). Such practices and interventions include gender-neutral tenure clock stopping policies (Antecol, Bedard, and Stearns 2018), the gender

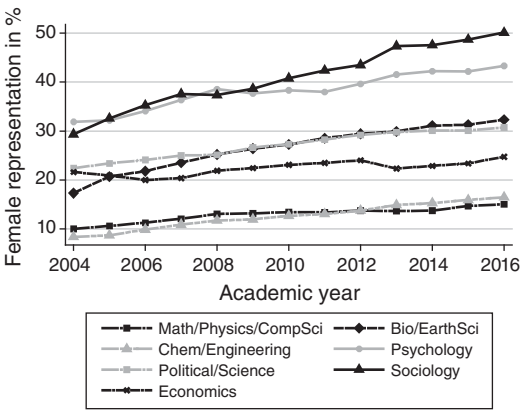

Figure 1. Representation of Women Across Disciplines Over Time

Source: 2004–2016 HESA dataset (see online Appendix A).

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composition of evaluation committees (Bagues, Sylos-Labini, and Zinovyeva 2018), single- versus double-blind peer review processes (Tomkins, Zhang, and Heavlin 2017), mentoring programs (Blau et al. 2010), and the matching of female students to female professors (Carrell, Page, and West 2010) among others. Our contribution comes from the nature of the intervention and the richness of the data. Here we causally evaluate the effects of a unique positive action intervention in the United Kingdom using high-quality administrative panel data, with information on the entire population of academics in the United Kingdom. The panel nature of the data allows us to look at career trajectories and wage growth.

I. The Athena SWAN Equality Charter

The UK Equality Challenge Unit (ECU) officially launched the Athena SWAN Charter in 2005, with the first accreditation awards conferred in 2006. The charter evolved from work between the Athena Project and the Scientific Women's Academic Network (SWAN), and its aim was to provide recognition to universities for their work toward the advancement in gender equality and diversity of women in science, technology, engineering, medicine, and mathematics (STEMM).[1]

The Athena SWAN Charter does not set any targets for female employment or wages, nor does it dictate specific interventions that universities need to put into place. Instead, it requires universities to undertake a quantitative and qualitative assessment of gender equality in the university and to propose policies and interventions to overcome gender equality challenges. Examples of these interventions include the design of more transparent process for appointing heads of departments, career track schemes to help women to move from fix-term contracts to permanent contracts, and to set up staff review and development groups where women are encouraged to submit their CV for advice that helps them in career progression and new career prospects.

Accreditation is a two-step process. First, in order to be eligible to apply for Athena SWAN accreditation, a university has to gain membership by joining the Charter. In particular, vice-chancellors or principals must indicate that their institution will take action to address the areas recognized in six key principles related to the representation and career progression of female academics in STEMM, such as that in order "to address gender inequalities requires commitment and action from everyone, at all levels of the organization," and that "to tackle the unequal representation of women in science requires changing cultures and attitudes across the organization.[2]

After gaining Athena SWAN Charter membership, universities can apply for Athena SWAN Charter accreditation through a biannual application process that takes place in April and November. Award panels make accreditation decisions during a six-hour assessment panel meeting, and review up to five applications in each meeting. Panel members are individuals who work in the university sector (faculty and administration), as well as individuals from the industry or professional societies, and need to register in advance and complete a one-hour online panelist training. There are around 1,500 registered potential panelists and around 225 spaces per panel round.

There are three possible levels of accreditation, from Bronze being the lowest level of commitment toward gender equality to Silver, and ultimately Gold accreditation. In this paper we focus on Bronze accreditation, which is the level of accreditation that universities apply for when applying for the first time. Compared to Silver and Gold accreditation, which require that the university shows evidence of successful policies and interventions toward the promotion of gender equality, success in getting Bronze accreditation does not require the university to have implemented any specific policy, but rather that the university elaborates an assessment of gender equality in the institution, alongside a four-year plan building on this assessment. There is also a requirement that the university develops an appropriate organizational structure, which may include a self-assessment team, to carry proposed actions forward. Once the accreditation status is

[1] Some research councils have recommended Athena SWAN accreditation to gain funding (see https://www.ukri.org/files/legacy/skills/equalitystatement-pdf/ and Gregory-Smith 2018).

[2] The full list of the Charter principles can be found at https://www.ecu.ac.uk/equality-charters/athena-swan/about-athena-swan/history-of-athena-swan/. In May 2015 these principles were expanded to other disciplines: https://www.ecu.ac.uk/equality-charters/athena-swan/about-athena-swan/).

awarded, it is valid for a period of three years. Renewal of Athena SWAN accredited status is conditional on the university having made sufficient progress toward addressing gender equality since the previous application was made.

II. Analysis

A. *Description of Data*

The analysis is based on two sources of data. We first construct a dataset containing information at the university level with the dates of Athena SWAN Charter membership, and if applicable, the date of *first* Bronze accreditation obtained (see online Appendix B1 for a detailed explanation of how this dataset is constructed). We link the university-level information about Athena SWAN membership and accreditation status to the 2009–2012 UK HESA dataset (see online Appendix B2 for a description of HESA data).

Our main sample is restricted to full-time faculty members with permanent contracts in STEMM disciplines engaged in teaching and research at universities that had signed the Athena SWAN Charter between 2005 and before 2015 (the year other disciplines were added to the charter). We are thus restricting the analysis to universities that have self-selected into the program. HESA only records information about professorial ranking after 2009, so we further restrict the sample to the years 2009–2016. Our final sample consists of 177,465 observations of 35,035 male faculty and 76,230 observations of 16,910 female faculty in 91 universities over a period of 8 years. During this period the number of universities with Athena SWAN Charter accreditation increased monotonically, from 23 in 2009 to all but 8 universities in our sample.

B. *Identification Strategy*

We estimate fixed effect models separately for men and women as follows:

$$(1)\quad Y_{ijt} = \alpha + \lambda D_{jt} + X_{ijt}\gamma + \eta_j + \delta_t + \gamma_j t + \varepsilon_{ijt},$$

where Y_{ijt} is the real log salary (using 2016 as the base year) for individual i in university j and year t. Our key regressor D_{jt} is a dummy variable that takes value one if the individual works in a university j that holds Athena SWAN accreditation in year t, and zero otherwise. The term X_{ijt} is a vector of socio-demographic characteristics that are known to be correlated with wages.[3] We also include university dummies η_j and a time trend δ_t. The university fixed-effect addresses unobserved and time-invariant university-specific characteristics potentially correlated with wages and not necessarily related to Athena SWAN accreditation, such as the fact that higher ranked universities pay higher salaries. The time trend accounts for aggregate level shocks potentially impacting wages in academia, as could have been the case with the 2008–2009 downturn. University-specific time trends ($\gamma_j t$) capture a variety of unobserved time-varying university-level traits that might remain unaccounted for. Whereas professor wages are individually negotiated, a sector-wide collective bargaining process between the unions and universities determines the pay of non-professorial staff (see online Appendix C). We thus estimate equation (1) separately for professors and non-professors.

We employ a difference-in-difference approach and look at the within-individual changes in wages of female faculty in STEMM before and after Athena SWAN accreditation status. Because the evolution of wages may be determined by other factors unrelated to Athena SWAN accreditation, we compare female faculty (our treatment group) wages to the wages of male faculty (our control group) in STEMM.

C. *Results*

Panel A in Table 1 shows the regression coefficient on the Athena SWAN accreditation dummy D_{jt} for men and women in our sample. Athena SWAN accreditation seems to bring about lower real wages for professorial staff, and higher real wages for non-professorial staff (columns 1 and 3). However, changes in wages after Athena SWAN accreditation can be confounded by other unobservable trends common to female and male wages. To net out the effect of Athena SWAN we compare the effect on women's wages relative to men's. We find that women are better off in terms of wages relative to men

[3] These are age, age squared, ethnicity, disability, highest qualification held, UK citizen, senior management position held, and years at current university (see online Appendix Table B2.1 for summary statistics).

Table 1—Pay, Promotion, and Moves

	Men		Women		Women − Men	
	Professor (1)	Non-professors (2)	Professor (3)	Non-professors (4)	Professor (5)	Non-professors (6)
Panel A						
log salary	−2.28	0.72	−1.40	1.70	0.88	0.97
	(0.00187)	(0.000789)	(0.0037)	(0.001)	$p < 0.05$	$p < 0.01$
R^2	0.129	0.21	0.206	0.201		
Mean	£82,158	£53,432	£77,733	£50,940		
Panel B						
Pr(Move)	1.32	0.082	1.70	0.28	0.38	0.20
	(0.00345)	(0.00218)	(0.0086)	(0.0028)	[0.65]	[0.58]]
R^2	0.098	0.058	0.148	0.069		
Mean	1.06%	1.40%	1.51%	1.57%		
Panel C						
Pr(Promotion)	0.36		0.09		−0.27	
	(0.00177)		(0.00203)		[0.37]	
R^2	0.006		0.008			
Mean	1.80%		1.44%			
Observations	55,520	121,940	11,425	64,810		
Individuals	11,200	26,910	2,600	15,325		

Notes: Sample full-time permanent academics on teaching and research contracts from 2009–2016 in 91 universities. Athena SWAN dummy coefficients from equation (1). All coefficients are multiplied by 100. log salary is in 2016 prices. Standard errors in parentheses $(\cdot)$ clustered at the individual level. $[\cdot]$ denotes p-value.

after Athena SWAN accreditation. Results from columns 5 and 6 suggest that women's wages are relatively higher than men's after Athena SWAN accreditation. Whereas the wages of professors decline after Athena SWAN accreditation, they do so less for female wages. Similarly, whereas the wages of non-professors increased after Athena SWAN accreditation, they did so more for women's. Overall, Athena SWAN accreditation closes the gap between female and male faculty by around £480 for non-professor and £800 for professors in favor of women.[4]

In order to further investigate the channels behind gender differences in pay after Athena SWAN accreditation we exploit the panel nature of the data and look at whether there are any differences in employment and promotion probabilities among men and women in our sample. Panel B in Table 1 shows the results of estimating equation (1) when the dependent variable is a dummy variable that takes value 1 if an individual i in university z moves to university j in year t. We find that the probability of moving to an Athena SWAN accredited university increases for faculty at the professorial level, both men and women. However the differences in the coefficients are not statistically significant. There does not seem to be any movement into Athena SWAN accredited universities for junior faculty. These results are consistent with the lack of increase in female representation after Athena SWAN accreditation found in the literature (see Gregory-Smith 2018 and online Appendix D).

Panel C in Table 1 shows the results of estimating equation (1) where the dependent variable is a dummy variable that takes value one if individual i is promoted from non-professor to professor in year t and university j. Results show that junior male faculty have a higher probability of being promoted to professor after Athena SWAN accreditation. The probability of promotion increases by 0.4 percentage points. This is a 23 percent increase over the average promotion probability of 1.7 percent. We do not observe similar increases in the probability of promotion for female faculty. Having more male professors at the bottom of the pay scale

[4] The wages of male professors go down by 2.3 percent from £82,158 to £80,268. The wages of female professors go down by 1.40 percent from £77,733 to £76,645. The wages of male non-professors go up by 0.72 percent from £53,432 to £53,817. The wages of female non-professors go up by 1.70 from £50,940 to £51,806.

resulting from junior male faculty being promoted to professors in Athena SWAN accredited universities may explain why the wages of female professors did not decrease as much as those of men in universities with Athena SWAN accreditation.

The validity of our identification strategy depends on the assumption that the relative trends in women's wages with respect to men's in STEMM prior to Athena SWAN accreditation were the same in universities with and without Athena SWAN accreditation. The design of the accreditation process makes it unlikely that anticipation effects took place, whereby universities who expected to get accreditation raised wages of their female faculty before accreditation. Firstly, as described in Section I, the initial application to Bronze accreditation does not require the implementation of any action to address gender equality. Secondly, the focus of the Athena SWAN Charter is on career progression and representation and not necessarily on pay. Further robustness checks for our findings and identification strategy are found in online Appendix E. We test for the parallel trend assumption and rule out that women's wages were becoming closer to those of men's before Athena SWAN accreditation. We also find that there is no differential effect of Athena SWAN accreditation on female wages relative to male wages in non-STEMM disciplines, suggesting that our findings are not the result of other policy changes favoring female faculty.

D. *Discussion*

We find that the gender wage gap closes after Athena SWAN accreditation. Female faculty at the non-professorial level are not more likely to be promoted to professor after accreditation, neither are they more likely to move to an Athena SWAN accredited university. Taken together these results suggest that the higher wage growth experienced by female non-professorial faculty after Athena SWAN accreditation is likely to come from pay raises within a particular rank. HESA data do not contain information about the academic rank below professorial level.

We cannot rule out the presence of positive spillover effects for men and non-STEMM faculty members as a result of university-wide practices implemented after Athena SWAN accreditation. However, there are also concerns that women bear the burden of implementing the organizational changes necessary to meet Athena SWAN accreditation standards. Given the negative long-run career impact identified in the literature from female faculty taking on too many administrative responsibilities (Babcock et al. 2017), closer attention should be paid to how the costs to a particular group play against the positive externalities to the wider academic community.

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