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WHY ARE PROFESSORS "POORLY PAID"?

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Abstract:

Using American Community Survey data, I demonstrate a nearly 20-percentage point earnings disadvantage among academics compared to other doctorate-holders with the same demographics. American Time Use Survey data show that academics' workhours are distributed more evenly over the week and day, although their total workweeks are at least as long. This smoother distribution of work time can account for one-fourth of the wage disadvantage. Survey data (of economists only) indicate that flexible scheduling is an attraction, but only fourth among the characteristics of academic life. Freedom to do research and lack of interference from supervisors are far more important.

Keywords: time use, compensating wage differentials, flexibility

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1. Introduction

An immense ongoing literature extending back at least to the early 1970s has provided econometric evidence on the determinants of salaries of economists (Johnson and Stafford, 1974a; Hilmer *et al*., 2015).[1] The econometric literature on salary determination more generally in academe is also extensive and continuing, with substantial concentration on differences by gender (Johnson and Stafford, 1974b; McDonald and Sorensen, 2017). Far less research has provided evidence on how earnings of university faculty differ from those in other professions and from workers generally. A few comparisons of averages exist (AAUP, 2002, Figure 4; AAUP, 2006, Figure 3), and a comparison of long-term trends in relative earnings (in Germany) is available (Sohn, 2016).

Apparently missing from this literature is a detailed comparison of how the earnings of university instructors differ from those of otherwise identical workers who have spent the same amount of time in formal schooling, which is the relevant measure of the purely pecuniary advantage/disadvantage of being in academe. Even more important, there is no econometric evidence exploring the underlying causes of any (adjusted) earnings differential between academics and other highly-educated workers. Here I use a variety of data sets, including two publicly-available nationally representative American surveys and an online survey of academic economists that I conducted, to shed light on these issues.

2. Are They Really Paid Poorly?

To examine these pay differentials, I first use the American Community Survey (ACS) for 2012-16, restricting the sample to those respondents who indicated that they had a doctoral degree

[1]Bok (1993) is a good general discussion of the compensation of academics and other highly-educated professionals.

(referred to hereafter as doctorate-holders). In the ACS these are almost all Ph.D.s or Ed.Ds. J.D.-holders, M.D.s and others with advanced professional degrees are excluded from the samples used here and in the next section. Other restrictions required that the respondent report usually working at least 20 hours per week. A doctorate-holder who indicated an occupation of "postsecondary teacher" was coded as an academic; the other doctorate-holders included in the sample were not.[2] The ACS provides information on annual earnings, which I use for comparisons throughout this section.

While I hold constant for various demographic characteristics of the postsecondary teachers and other doctorates in multivariate regressions, the two groups are very similar in the ACS. In both the average age is 51.5 years; 48.5 percent of other doctorates are men, whereas 48.7 percent of postsecondary teachers with doctorates are male; and 55.9 percent of other doctorates are married, while 55.4 percent of postsecondary teachers are.

The upper panel of Table 1 presents statistics describing the earnings of these doctorate-holders. Comparing pay differences at various quantiles of the distributions, near the bottom of the pay distributions academics earn more than other doctorate-holders; but the differences rise steadily as we move up the earnings distributions, with academics' pay beginning to fall below that of other doctorate-holders at the 17th percentiles of the distributions. At the 25th percentiles of the distributions the earnings advantage has turned into a disadvantage of 6 percent; at the medians it is 19 percent; and it rises to an astounding 50 percent disadvantage at the 95th percentiles. At the means academics receive 24 percent lower pay than non-academic doctorate-holders.[3] Although

[2] The code for this group is 116 on the variable *educd* in the ACS. As postsecondary teachers I code those listing 2200 in the variable *occ*. The postsecondary teachers were in industry 7870, postsecondary education. The other doctorate-holders were widely dispersed across industries, but nearly one-fourth were in professional, scientific, etc., services, and another fourth were in educational, health and social services.

[3] The pattern of earnings differentials is similar if we add doctorate-holders who usually worked fewer than 20 hours per week (since their addition expands the sample by only four percent).

on average professors appear poorly paid compared to other doctorate-holders, their average annual earnings are 92 percent above those of workers without doctorates (who are of the same age and sex, and who have a workweek of the same length of at least 20 hours).

Even though the means of the most important demographic characteristics do not differ between the two groups, these raw differences in earnings might be generated by differences between the two groups in other characteristics and in the distributions of these demographics. To examine this possibility in a regression context I relate the logarithm of earnings to an indicator of being in academe or not, including as control variables many of the respondents' demographic and economic characteristics.[4] The least-squares estimate of the adjusted pay difference between professors and other advanced-degree-holders shows a disadvantage of about 17 percent. Quantile estimates of the same equation yield essentially the same conclusions as the comparisons of unadjusted earnings at various percentiles. At the 25th percentile the adjusted earnings disadvantage is 8 percent; at the median the pay disadvantage is about 20 percent, and it rises steadily moving further up the pay distribution. Professors are "poorly paid" compared to others with the same educational attainment and many other demographic characteristics.[5]

The ACS for 2012-16 provides information on the field of the undergraduate degree of those respondents who have at least a bachelor's degree, not on the field of doctorate-degree holders. In our sub-sample about 26 percent of the respondents who list their undergraduate fields have degrees in STEM. Not all those who have doctorates in STEM fields majored in them as

[4]These are quadratics in usual weekly hours and age, indicators of gender and marital status and vectors of indicators of metropolitan status, survey year and state of residence.

[5] Adding racial/ethnic indicators to these equations hardly changes the estimates, nor does adding the small number of very part-time workers. The changes in the estimates are tiny if we restrict the sample to workers under age 70, and if we exclude all immigrants from the sample.

undergraduates; but linking undergraduate to graduate field for is probably closer link than it would be for other doctoral fields.[6]

As a rough cut to see whether the academics' earnings disadvantage differs by field, I thus distinguish between those doctorate-holders with undergraduate STEM specialties and others, re-estimating the OLS equations separately by an indicator of STEM as an undergraduate major. The estimated disadvantage was -0.195 log-points for doctorate-holders who had been STEM majors, -0.183 log points among others. At least with this broad cut of the data, there is little evidence of any important difference in the wage disadvantage across fields between academics and other doctorate-holders.[7]

Professors have a disadvantage in their earnings compared to non-academic doctorate-holders. Perhaps, however, that shortfall is at least partly compensated for by more generous employee benefits in academe. No large survey provides micro data on employee benefits of academics and other doctorates; but the annual *AAUP Report on Academic Compensation* for 2017-18 (AAUP, 2018) shows that among the entire professoriate non-wage monetary compensation was 35.3 percent of salaries. The BLS *Employer Cost of Employee Compensation* (BLS, 2018) indicates that in 2017 non-wage monetary benefits equaled 35.4 percent of wages and salaries among all management, professional and related occupations. This comparison implies that the disadvantage in compensation facing professors is the same as that demonstrated here in earnings.

[6] Given the coding of undergraduate majors in the ACS, of those whom I classify as STEM majors over 90 percent studied engineering, biology/life sciences, physical sciences or medical/health sciences.

[7] The differences between academics and other doctorate-holders at each of the quantiles listed in Table 1 also differ only minutely between STEM graduates and others.

3. What Causes the Pay Disadvantage?

3.1 The Temporal Distribution of Work

The American Time Use Survey (ATUS), 2003-2015, provides enough observations on academics and other doctorate-holders to draw reliable inferences about how differences in work time and timing might account for some of the pay disadvantage in academe. The ATUS takes a sub-sample of people who were recent CPS respondents and asks them to complete diaries cataloging their activities on the previous day (Hamermesh *et al*., 2005). Using the same restrictions as in Section 2 to create a sub-sample of doctorate-holders yields 481 doctorate-holders in university teaching and 1,622 other doctorate-holders. 23 percent of the ATUS sample are academics compared to 24 percent in the much larger ACS sample.

Table 2 presents various statistics describing the work time of these doctorate-holders. As seen in the top row of the table, recalled usual weekly hours (the standard CPS measure, which is also included in the ATUS) are slightly higher among academics. The second row presents estimates of the work time reported in the time diaries, calculated by averaging over days to obtain the implied work hours in a representative week.[8] Like recalled hours, diary workhours are also higher among academics than among non-academic doctorate-holders. In both groups the weekly hours implied by the time diaries exceed recalled usual hours, an excess that is larger among academics. But for both groups diary workhours are not much different from recalled hours.

While average hours are similar in the two groups, their temporal distributions differ significantly. As the third and fourth rows of Table 2 show, professors do much more of their work

[8]The measure of work time is the variable *bls_work* provided in the ATUS-X. This includes time spent commuting to/from a workplace, which differs only very slightly between academics and other doctorate-holders. The 46 hours are well below the work time reported in the large national sample of professors used by Allgood and Walstad (2013). The difference might result from differences in the survey questions or perhaps from that survey's basis in very long recall.

on weekends than do other doctorate-holders, and they do very slightly less during weekdays. They put in nearly 50 percent more worktime on weekends than other highly-educated workers (and 50 percent more than less-educated workers too). Professors spread their work effort more evenly over the week than other doctorate-holders.

They also spread their work more evenly over the day. The fifth row of Table 2 lists the percentage of days on which members of the two groups are working and performing part of their work in the evening (at some time between 7:01PM and 10PM). The sixth row presents the same calculations, but for work performed at night (at some time between 10:01PM and 6AM). Both comparisons show that academics are significantly more likely than holders of other doctorates to be working in the evening or at night—to be spreading their work more over the day—with the excess being greater at night than in the evening.

Unsurprisingly too, professors' time allocations across the year also differ from those of other highly-educated workers. For professors and other doctorate-holders the final pair of rows in Table 2 presents calculations of the average workweek during the American academic summer months (June-August) and during the other nine months. Professors' work is more variable seasonally; unlike the weekly and daily variation in work timing it implies less temporal smoothing of leisure, which may seem undesirable. But summer breaks might in fact be desirable, as they enable academics to spend more time with their families (which might be especially attractive if the academic has school-age children who have school vacations in summer).

Ignoring the seasonal and intra-day differences, we can examine how much the weekly smoothing of leisure might contribute to utility, and thus how much of the wage disadvantage in academe might reflect a compensating pay differential for the greater equality of leisure time

across days of the week. Consider the CES utility function defined over weekdays and weekend days:

$$U = 5[\delta X_d^{\rho} + (1-\delta)L_d^{\rho}]^{1/\rho} + 2[\delta X_e^{\rho} + (1-\delta)L_e^{\rho}]^{1/\rho} \quad (1)$$

where X is goods expenditure, L is non-market time (assumed to be 16 - daily work hours), the subscripts d and e denote weekdays and weekend days respectively, and $\sigma = 1/(1-\rho)$ is the elasticity of substitution between goods and time. I assume that weekly utility is additive in utility across the days and that each day is weighted equally. Clearly this measures only the extent of the compensating differential for the worker at the margin of choice between the two occupations, academic and other. Those academics with inframarginal preferences for the characteristics of academic life are earning rents given the market wage differential.

The simulation exercise bases the measures of average daily non-work time on weekdays and weekend days for professors and other doctorate-holders using the estimates from the ATUS sub-sample that are presented in Table 2. It then asks: Given the mean of other doctorate-holders' annual earnings in the ACS sample, converted to a daily basis, what earnings disadvantage would yield the same utility to a professor at the margin of choice between the two occupations (under the assumption that all earnings are spent and that they are consumed equally across days)?

For various combinations of δ and σ, ranging from nearly fixed-proportions to quite easy substitution of goods and leisure, Table 3 lists the percentage shortfall in professors' earnings that would equalize utility in (1) given the observed day-to-day distributions of work hours in academe and in the other doctorate-holders' occupations. When substitution is quite difficult, the spreading of professors' work time across the week can account for 4-1/2 percentage points of the wage differential, i.e., about one-fourth of the adjusted earnings difference at the means shown in Table 1. With higher values of σ—easier goods-time substitution—the compensating differential is

smaller; but only if substitution is very easy—$\sigma \geq 0.75$—does the difference in work timing account for much less than 10 percent of the adjusted difference in earnings.[9] Under what seem like reasonable assumptions about utility a not tiny, but also not huge part of the earnings differential can be explained by the more equal distribution of leisure across days of the week that academics enjoy.

No doubt other, more complicated utility functions, perhaps including other dimensions of temporal variety as arguments, might rationalize more of the earnings differential, since temporal variety is a superior activity (Hamermesh. 2005). These might include the reduced work hours in summers and the within-day flexibility demonstrated in Table 2. All these differences might be classified as allowing flexibility in scheduling/time use, which might make this occupation more attractive than others requiring the same educational attainment.

3.2 How Important is Temporal Flexibility?

To examine this question, I emailed a very short open-ended survey (shown in the Appendix) to nearly 1000 academics located around the world, all Fellows/Affiliates of the worldwide IZA network, and thus all specializing in the study of labor markets broadly defined.[10] Completed usable responses were received from 288 of them. Those surveyed were asked to list their gender and the year when their teaching career began, and also to describe the three aspects of their job as university instructor that made it most attractive to them.[11] I coded these free-form responses into six categories: Freedom and novelty of research; teaching/dealing with students,

[9] There are very few direct estimates of σ in the literature. Evidence for the category food—a broad class, but one that accounts only for a small fraction of expenditures of goods and time, suggests that even this narrower elasticity of substitution is no more than 0.33 (Hamermesh, 2008).

[10]Surveys attempting to infer the sources of academics' job satisfaction are ubiquitous (e.g., Hagedorn, 2000).

[11]Their location, North America versus elsewhere, was inferred from their email addresses, as was the identity of their institution. Where not possibly inferred from the address, the respondent's online CV was used.

undergraduate and/or graduate; intellectual and social interactions with colleagues; scheduling freedom (any mention of flexible time); impact on policy or the public; and miscellaneous (including being one's own boss, travel, job security and others). In addition, from their email addresses I coded whether their institution is in North America and whether it could be classified as being in the Top 50 in North America, as one of the top three in a large European country (France, Germany and the U.K.) or as the top school in a smaller European country.

All the sample respondents are in at least partly research-based institutions, but there is tremendous diversity in their locations and characteristics. As the final column in Table 4 shows, barely 20 percent are in institutions that might be classified as being among the top schools in the economics profession. Moreover, the range of experience in academe is huge, with 18 percent having fewer than ten years in academe, and one percent having at least 50 years of academic experience. The sample is not representative of all of academe—if nothing else, it excludes doctorate-holders who teach in community and junior colleges; and it is restricted to social scientists. With these restrictions, however, the range of the respondents' characteristics is quite wide.

Figure 1 shows the probabilities (in percentages) that an academic listed the attraction. Freedom and novelty of research, and the satisfaction of working with young minds, are by far the most important attractions of academe, listed by 88 and 74 percent of survey respondents respectively. Only 36 percent of respondents listed time flexibility as a top-three attraction, slightly fewer than listed enjoying intellectual and social interactions with colleagues. Flexible work-timing matters somewhat to these academics; but since its importance to them differs little by gender, and since female academics with children spend more time in child-care activities than

men (in the ATUS 102 minutes per day compared to 74 minutes/day), we cannot conclude that its role arises from academic life facilitating the discharge of parental duties.

Table 4 presents the results of the probit estimation of the equations describing each job characteristic as a function of the four variables on which demographic information was collected. Probit derivatives and their standard errors are listed for each variable and for each of the six outcomes. Female academics are very slightly more interested than men in flexible scheduling, but not significantly so. The other three personal characteristics on which the survey obtained information, however, have at least marginally significant impacts on the probability of listing "flexible scheduling" as a top-three desired characteristic of an academic job. More experienced academics are less likely to mention this aspect of academic life. Most interesting, North American faculty are more likely to do so, perhaps because the characteristics of work timing in this occupation in North America, especially in the U.S., are more different from those of non-academic work compared to the differences in the rest of the world.[12] Flexibility is also marginally less important to academics in top-level institutions. With the description "flexible scheduling" covering much more than merely flexibility across days, the inability of the simulations whose results are presented in Table 3 to attribute more than one-fourth of the earnings shortfall of academics to their more even day-to-day distribution of work time is not surprising.

IV. Conclusion

I have documented a large pay disadvantage of academics behind otherwise identical doctorate-holders. Part of this disadvantage is a compensating pay differential arising from the more equal distribution of work time across days of the week among academics; but in a simple

[12]Consistent with this implicit double-difference, North-American academics are significantly less likely than others to list having an impact on policy as an attraction, perhaps because the size of the U.S. makes having such an impact more difficult than elsewhere.

model of utility this difference alone can account for no more than one-fourth of the disadvantage. This small proportion is not surprising: The expressed preferences of a sample of academics who, while mostly not in elite schools, are nearly all in at least partly research-based institutions, suggest that the advantages of work-timing in academe are far from its most important attraction.

The unexplained part of the pay disadvantage in academe might be accounted for by the job security offered by academic tenure. This is consistent with evidence for young economists (Ehrenberg *et al.*, 1998) that entry salaries are lower where the chance of obtaining a tenured position are greater. But with only seven percent of respondents to the survey of social scientists stating that job security matters to them; and with this characteristic being unrelated to experience in academe, the role of job security does not seem likely to explain much of the remaining pay differential between doctorate-holders in academe and those elsewhere.

The pay disadvantage might arise from self-selection due to differences in preferences of those who choose this sector compared to others (as in Goddeeris, 1988, examining attorneys' choices, and Stern, 2004, examining biologists' choices). It may also result, even if workers' preferences for job characteristics are homogeneous, from the greater importance of other aspects of the academic life unrelated to work timing. That respondents to the survey of social scientists noted that such things as independence and thinking about new ideas, and spending time with students, are more important to them than flexibility of time use suggests that this might be the case. Indeed, isolating the role of independence from being supervised by others in determining compensation would be a useful avenue for future study of academic labor markets and indeed of professional occupations more generally.

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APPENDIX: Survey Instrument of Professors' Preferences

Please list the three aspects of your job that contribute most to your enjoyment of being a professor. One sentence for each is all that needs to be written.

1.

2.

3.

Gender: F_____ M_____

Year Began University Teaching: _____

Table 1
Annual Earnings of the Highly-Educated, Workers Half-time or More, ACS 2012-16.

		Quantile:					
	Mean and SE	**5**	**25**	**50**	**75**	**95**	**N**
Academics	$91,902 (429)	$23,072	$56,417	$81,104	$109,043	$197,464	23,804
Other Doctorates	$121,704 (374)	$20,895	$60,000	$99,808	$144,749	$394,058	74,081

ln(Weekly Earnings), Parameter Estimate, Indicator Academic=1 (N=97,885)

OLS Estimate	**Quantile Estimate**				
-0.185	0.132	-0.080	-0.225	-0.281	-0.582
(0.006)	(0.012)	(0.007)	(0.005)	(0.006)	(0.008)

Notes: Standard errors in parentheses below means and coefficients. All estimates use sampling weights. Other doctorate-holders have a Ph.D., Ed.D. or other doctorate, but are not postsecondary teachers. All the estimating equations include as controls: Quadratics in usual weekly hours and age, indicators for gender and marital status, and vectors of indicators of metropolitan status, survey year and state of residence.

Table 2
Descriptive Statistics, Distributions of Hours, ATUS 2003-15.

	Academics	Other Doctorates
Recall usual weekly hours	46.27	45.08
	(0.58)	(0.34)
Week diary total	46.79	45.27
	(1.34)	(0.73)
Weekly distribution of work:		
Weekday diary total	41.32	41.44
	(1.83)	(1.01)
Weekend diary total	5.47	3.83
	(0.61)	(0.31)
Daily distribution of work: Percent with part of workday in:		
Evening (7PM-10PM)	23.76	18.47
	(2.04)	(1.13)
Night (10PM-6AM)	27.65	19.58
	(2.14)	(1.15)
Seasonal distribution of work:		
Weekly hours, June-August	40.02	45.08
	(1.88)	(1.01)
Weekly hours, Sept-May	49.05	45.33
	(1.11)	(0.60)
N =	481	1,622

Notes: Standard errors in parentheses below means. All estimates use sampling weights.

Table 3
Compensating Wage Differential Attributable to Weekly Work Smoothing in Academe (Percent Wage Shortfall).

	σ				
δ	**0.25**	**0.50**	**0.75**	**1**	**1.50**
0.25	4.4	2.4	1.4	0.9	0.4
0.50	4.4	2.4	1.2	0.6	0.2
0.75	4.4	2.3	0.8	0.3	0.1

Table 4
Determinants of the Probability of Listing a Job Characteristic in a Survey of Academic Economists, Probit Derivatives and Descriptive Statistics (N=288).

	Characteristic:						
	Research	**Teaching**	**Interactions**	**Schedule**	**All other**	**Impact**	
Ind. Var.:							**Mean (SE) [Range]**
Male	-0.005	0.121	-0.100	-0.026	-0.001	0.022	0.75
	(0.041)	(0.064)	(0.069)	(0.067)	(0.056)	(0.045)	(0.03)
North-American	-0.035	0.028	0.022	0.125	-0.092	-0.074	0.40
	(0.041)	(0.055)	(0.064)	(0.062)	(0.051)	(0.042)	(0.03)
Top 50	0.087	-0.099	0.141	-0.089	-0.009	-0.016	0.21
	(0.037)	(0.072)	(0.077)	(0.071)	(0.064)	(0.052)	(0.02)
Experience/10	0.014	0.026	0.003	-0.041	-0.006	0.010	21.20
	(0.016)	(0.022)	(0.024)	(0.024)	(0.020)	(0.017)	(0.74)
							[0, 61]
Pseudo-R^2	0.026	0.020	0.015	0.021	0.014	0.016	

Note: Standard errors in parentheses below parameter estimates.

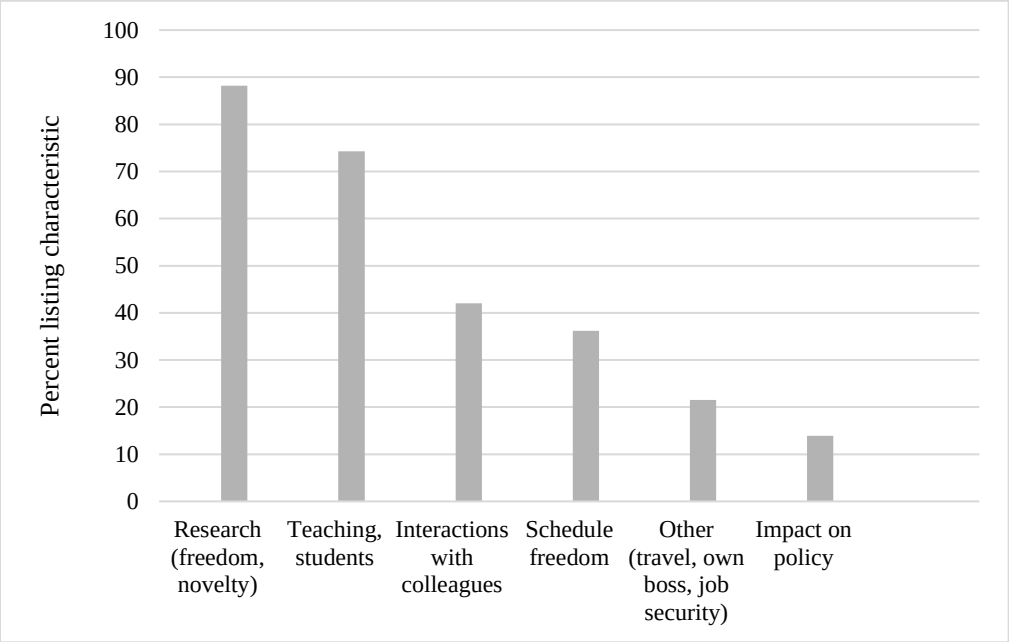

Fig. 1. Predicted Percentage of Respondents Indicating the Characteristic Is a Top-Three Attraction (N = 288).