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Do Public Ph.D.-Granting Economics Departments Invert Salaries?

Christiana Hilmer
San Diego State University

Michael Hilmer
San Diego State University

Abstract

This study analyzes a unique data set containing current salary and detailed job history information on a sample of 902 individuals drawn from 43 public U.S. Ph.D.-granting departments of economics. An analysis of current salaries by academic rank shows that 25% of Assistant Professors earn more that 50% of Associate Professors and 25% of Associate Professors earn more than 25% of Full Professors. Regression analysis suggests that salary inversion is most likely to exist between Associate and Assistant Professors and is more prevalent in lower ranked programs.

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Salary determination is important for members of any profession. Within the academe, a particular concern is how the salaries of newly-hired junior professors compare to those of senior professors with decades of work experience at the same institution. In such environments, a common complaint among senior faculty is that due to the nature of the academic labor market, loyalty to one's institution tends to be dismissed to such an extent that the salaries of senior faculty have become compressed, and even inverted, relative to those of the newly-minted Ph.D.s. While such beliefs are disconcerting to the affected parties, most of the supporting evidence remains anecdotal rather than empirical.

In their seminal paper on self-enforcing labor contracts with costly mobility, Black and Loewenstein (1991) develop a three-period model demonstrating how the dominant negotiating strategy for a department chairman who cannot directly observe each faculty member's true moving cost is to front-load the contracts of newly hired Ph.D.s and to repeatedly offer below-market salary adjustments to individuals who reveal higher innate moving costs by making the decision to remain at the initial institution rather than move to a new institution in subsequent periods. According to their model, such predicted behavior suggests that negative returns to seniority should exist within academic labor markets. Bratsberg, Ragan, and Warren (2003) and Moore, Newman, and Turnbull (1998) have found empirical support for this prediction for academic economists. Yet, while not explicitly stated in their paper, the model developed by Black and Loewenstein predicts that under reasonable conditions, not only should negative returns to seniority exist but due to the optimal front-loading of contracts, the salaries of experienced senior faculty should be compressed enough to become inverted relative to those of new hires should those more seasoned faculty fail to publish enough to increase their marketability. To our knowledge, among previous empirical studies of the market for academic economists, only Siegfried and Stock (2006) explicitly address the possible existence of salary inversion, with their data only enabling salary comparisons between 10 matched-pairs of faculty belonging to the same programs. As such, while strong anecdotal priors likely exist, the empirical verdict remains unsettled concerning the degree to which salary compression and inversion exists with the academic economics profession.

In our view, one of the main reasons that previous studies have failed to address this issue in a wide-scale fashion is that salary data is difficult to come by and as a result researchers are often left to analyze fairly limited samples. In the modern information age (and thanks in large part to the Freedom of Information Act), this need not be the case. To construct a large-scale data set that allowed us to examine the issue of salary compression and inversion, in August 2007 we requested and received usable AY2007 salary data for 902 faculty members from 43 public Ph.D.-granting economics programs listed among the top 106 NRC-ranked programs in the U.S. We note that this large sample from a wide cross-section of institutions represents a dramatic improvement over the samples analyzed by Siegfried and Stock (2006), Bratsberg, Ragan, and Warren (2003), and Moore, Newman, and Turnbull (1998).

Individual-specific non-salary data are collected from publicly-available sources. Gender and current academic rank are determined from departmental websites and/or individual homepages. Individual employment histories are determined from CVs that the vast majority of faculty members currently post on their individual homepages. Individual-specific peer-reviewed publication data through 2007 are collected from *Econlit*, which is the American Economic Association's bibliography of economics literature throughout the world. The database currently contains information on articles published in more than 700 journals, including all the major field and general interest economics journals. To account for potential

differences in the quality and/or likely importance of different publications, we distinguish between three different types of publications: (1) articles in the top 5 economics journals according to Scott and Mitias (1996)[1], (2) articles in the remainder of their top 36 economics journals, which are primarily top field journals, and (3) articles in all other *Econlit* listed economics journals. Finally, we rank economics programs according to Siegfried and Stock's (2001) multi-tier breakdown of programs in the 1995 NRC rankings (1-6, 7-15 and 16-30, 31-60, and 61-106).

For salary inversion to exist, the cross-rank distributions of current salaries must overlap. The box-plot of current salaries by current academic rank presented in Figure 1 suggests that, at least in raw terms, this is indeed the case. Specifically, the top quarter of Assistant Professors earn more than nearly 50 percent of all Associate Professors, the top quarter of Associate Professors earn more than the bottom quarter of Full Professors, and the top quarter of Full Professors earn more than the bottom quarter plus some of all Named Professors. Finally, the very top Assistant Professors appear to have current salaries that exceed those of many Full and even Named Professors. Although these raw data do not control for differences in research productivity and program tier, it does appear that salary inversion may well exist for academic economists.

To make the comparison more concrete, Table 1 presents summary current salary statistics across current academic ranks and program tiers. Perhaps the most striking trend to emerge from these entries is the degree to which tier 2 programs (those ranked #7-#15) pay higher salaries than programs in the remaining tiers (those ranked #16-#98).[2] In particular, average salaries for individuals of a given rank within tier 2 programs exceed average salaries for individuals of the next highest rank within each of the three lower program tiers. For instance, Assistant Professors within tier 2 programs average current salaries of nearly $107,000 while Associate Professors within tier 3, 4, and 5 programs average current salaries between $94,000 and $103,000. At the same time, the maximum values presented in Table 1 indicate that there are currently many very highly paid economists on faculty within U.S. public Ph.D.-granting economics programs. Specifically, the highest-paid Named Professor in our sample receives a current annual salary of $342,142 while the highest paid Full, Associate, and Assistant Professors receive current annual salaries of $321,172, $277,378, and $144,445, respectively.

Table 2 presents log current salary regression results that control for years of work experience, current academic rank, career research productivity, and gender. Comparing across columns suggests that, all else equal, within each program tier senior professors are estimated to earn significantly higher current salaries than Assistant Professors. The estimated current salary premia for the different ranks of senior professors are all largest for tier 2 programs and smallest for tier 5 programs, with the estimated premia for Associate Professors ranging from 13 to 33 percent, for Full Professors ranging from 35 to 61 percent, and for Named Professors ranging from 57 to 73 percent. As such, the results seem to indicate that salary compression is more pronounced with lower-ranked programs and less pronounced within higher-ranked programs. At the same time, top 5 publications are estimated to have statistically positive effects on salaries in all program tiers, with each additional top 5 article being associated with a current salary increase of between one and one-quarter and two percent. Finally, all else equal, there are never statistically significant differences between the current salaries of males and females.

While these comparisons are interesting, the purpose of this research is to investigate if some portion of current Associate and Full Professors earn less than newly-hired Assistant Professors, all else equal. The potential for salary inversion is captured by combining the

estimated coefficients for the experience terms with those for the academic rank dummies and the research measure terms. Because Associate and Full Professors differ from newly-hired Assistant Professors not only in terms of experience but also in terms of published research, the latter values are set to the average numbers for Associate and Full Professors in each tier. The bottom panel combines the appropriate coefficients to estimate the number of years after which Associate and Full professors would be expected to earn less than new Assistant Professors. The first column in the bottom panel indicates that within the full sample, holding all else constant, Associate Professors are predicted to earn less than new Assistant Professors after accumulating 22 total years of experience, while Full Professors are predicted to earn less than new Assistant Professors after accumulating 51 total years. A natural question accompanying these entries is whether such faculty members actually exist. According to the second row in the bottom panel, 21 percent of the Associate Professors possess 22 or more years of work experience while 0.5 percent of Full Professors possess 51 or more years of experience. As such, the results suggest the phenomenon of salary inversion exists mainly between Assistant and Associate Professors.

To get a better idea of the root causes of salary inversion, it is important to consider in more detail the individuals for which salary inversion exists. In general, within the U.S. economics programs, initial tenure and promotion decisions are made after the 6^{th} or 7^{th} year while promotion to Full Professor is expected by at least the 14^{th} or 15^{th} year. For the full sample salary inversion is predicted to develop once individuals have accumulated 22 years of total experience while still holding to the rank of Associate Professor. In other words, it appears that programs typically only invert salaries after individuals reveal themselves to have stagnated in their publishing to the extent that they do not merit promotion to Full Professor.

Looking across the bottom panel of Table 2 suggests that tier 2 and tier 4 programs are quickest to invert salaries between Assistant and Associate Professors, with both doing so after 21 years of experience have been accumulated by individuals still holding the rank of Associate Professor. This, however, highlights the importance of considering whether such individuals exist, as among the 17 current Associate Professors within tier 2 programs only one possesses more than 21 years of experience. Conversely, 23 percent of the 31 Associate Professors within tier 3 programs possess more than 23 years of experience, 26 percent of the 51 Associate Professors within tier 4 programs possess more than 21 years of experience, and 13 percent of the 71 Associate Professors within tier 5 programs possess more than 29 years of experience. Hence, it appears that elite programs are actually the least likely to participate in salary inversion while lower-ranked programs are much more likely to do so. This is not surprising when one considers that elite programs likely develop their reputations because they place a higher premium on retaining only highly prominent faculty and they are therefore willing to pay top dollar to senior faculty and are unwilling to tenure individuals who are not fairly certain to become highly prominent. Conversely, because lower-ranked programs are likely less-stringent in their tenure standards, they are more likely to have tenured faculty who prove to be undeserving of ever being promoted to Full Professor and therefore are in line to have their salaries inverted.

We note that our analysis potentially suffers from certain data limitations. For one, due to the data collection process, we are only able to examine public Ph.D.-granting economics programs. As such, we suppose that it is possible that the empirical evidence is different for faculty within private programs. Second, given that we only examine faculty within economics programs, we do not claim that these results are generalizable to faculty members within all disciplines.

Notes

[1] These are the *American Economics Review*, *Econometrica*, the *Journal of Political Economy*, the *Quarterly Journal of Economics*, and the *Review of Economics and Statistics*.

[2] Tier 2 programs are UC Berkeley (#7), Minnesota (#10), UCLA (#11), Michigan (#13), and Wisconsin (#15).

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Figure 1
Salary Box-Plots by Academic Rank

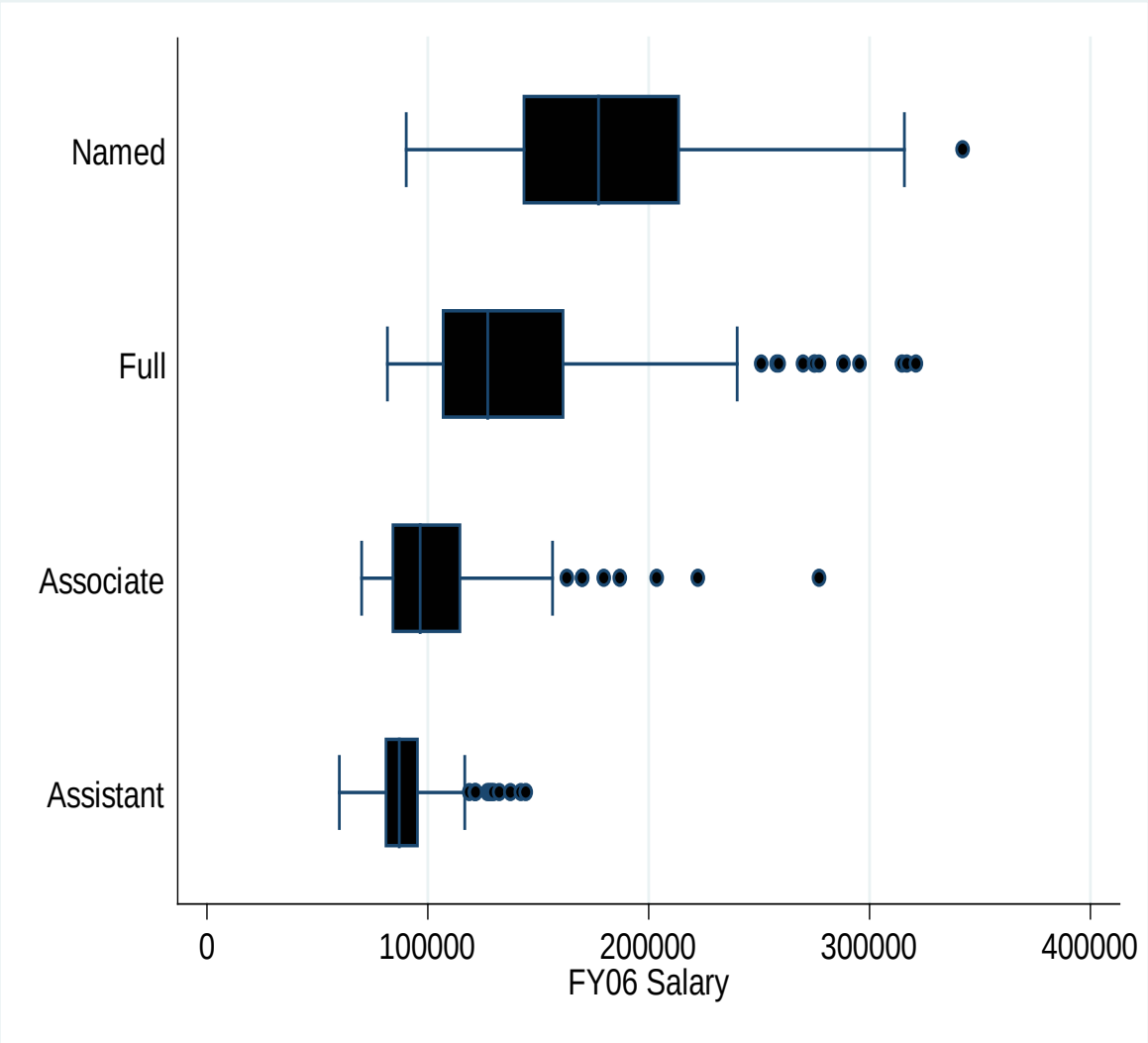

Table 1
Summary 2006 Salaries by Program Tier and Academic Rank

		All Faculty	Tier 2	Tier 3	Tier 4	Tier 5
Assistants	Average	90,213.24 (14,072.27)	106,576.10 (15,355.27)	88,215.06 (11,947.60)	86,646.45 (7,758.75)	83,113.86 (9,421.40)
	Minimum	60,000.00	74,124.00	68,353.00	68,579.00	60,000.00
	Maximum	144,445.30	144,445.30	142,278.00	107,000.00	116,900.00
	Observations	208	43	55	53	57
Associates	Average	103,560.50 (28,937.81)	153,698.70 (49,879.82)	99,417.61 (16,888.84)	102,870.60 (23,303.45)	93,859.96 (15,132.67)
	Minimum	70,039.00	77,343.00	74,200.00	70,039.00	71,962.00
	Maximum	277,377.80	277,377.80	136,909.60	187,200.00	135,765.00
	Observations	170	17	31	51	71
Full	Average	139,190.50 (43,553.91)	182,020.20 (54,173.92)	137,645.00 (35,908.51)	126,209.20 (27,570.34)	119,607.80 (29,054.74)
	Minimum	81,900.00	88,741.00	68,353.00	82,000.00	81,900.00
	Maximum	321,172.00	321,172.00	142,278.00	191,352.00	224,695.00
	Observations	395	84	95	118	98
Named	Average	182,923.80 (52,772.31)	227,186.40 (47,867.30)	174,652.80 (40,635.22)	164,094.30 (47,019.86)	171,713.20 (49,282.51)
	Minimum	90,500.00	138,500.00	117,900.00	90,500.00	103,035.00
	Maximum	342,141.90	342,141.90	313,000.00	315,838.60	274,667.00
	Observations	129	31	21	44	33

Table 2
Log Salary Regression Results Overall and by Program Tier

	All Faculty	Tier 2	Tier 3	Tier 4	Tier 5
Experience	-.0118**	-.0198**	-.0094	-.0133**	-.0060
	(.0037)	(.0085)	(.0062)	(.0072)	(.0073)
Experience Squared	.0001	.0002	.0000	.0002**	.0001
	(.0001)	(.0002)	(.0001)	(.0001)	(.0002)
Associate Professor	.2130**	.3341**	.1658**	.2241**	.1332**
	(.0303)	(.0844)	(.0497)	(.0636)	(.0516)
Full Professor	.4778**	.6082**	.5177**	.4562**	.3490**
	(.0372)	(.0869)	(.0702)	(.0748)	(.0681)
Named Professor	.6584**	.7334**	.7052**	.6427**	.5699**
	(.0449)	(.1036)	(.0989)	(.0771)	(.0882)
Top 5 Articles	.0168**	.0159**	.0190**	.0128**	.0200**
	(.0028)	(.0050)	(.0055)	(.0064)	(.0054)
Top 36 Articles	.0041**	.0060**	.0016	.0079**	.0036
	(.0021)	(.0035)	(.0034)	(.0031)	(.0029)
Other Articles	.0019**	.0019**	.0024	.0009	.0023**
	(.0007)	(.0019)	(.0021)	(.0013)	(.0010)
Male	-.0036	.0855	-.0220	-.0196	-.0320
	(.0157)	(.0367)	(.0309)	(.0293)	(.0293)
R-Square	.6573	.5874	.6386	.5501	.6266
Observations	902	175	202	266	259
Years Experience After Which a New Assistant Professor Earns More Than An Associate					
	22	21	23	21	29
Percentage of Associate Professors With That Much Experience					
	.206	.059	.226	.255	.127
Years Experience After Which a New Assistant Professor Earns More Than A Full Professor					
	51	39	68	43	74
Percentage of Full Professors With That Much Experience					
	.005	.107	.000	.025	.000

Notes: Dependent variable is the log of the individual's 2006 salary. Values in parentheses are heteroskedasticity consistent standard errors. **, * indicate significance at the 5 and 10 percent levels. The first column regression results also includes program tier dummies (tier 2 omitted).