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The ‘Big Bang’ in Public and Private Faculty Salaries*

Jennifer A. Rippner and Robert K. Toutkoushian

ABSTRACT

The gap between average faculty salaries at public and private institutions has been growing wider over the past 40 years, yet little is known about the nature and causes of the gap. This study uses data on more than 1,000 institutions to examine institutional average faculty salaries and how they have changed for public and private institutions. We found that the current average salary disadvantage for public institutions is primarily concentrated in research-intensive institutions and the average salary gaps between public and private research institutions have continued to increase between 2001 and 2011 even after controlling for selected factors including financial resources.

INTRODUCTION

Faculty compensation is an enduring topic in the field of higher education research. Much of the interest in this topic in the United States can be traced back to the passage of Equal Pay legislation in the 1960s and early 1970s, as researchers sought evidence as to whether female faculty were paid less than comparable male faculty. Attention has also been given to the overall level of faculty compensation, how it is changing over time, and how it varies by type of institution.

An interesting—and yet understudied—phenomenon regarding faculty compensation is the growing salary advantage for faculty at private not-for-profit institutions. Data collected by various agencies show a steadily increasing pay gap between public and private four-year institutions. Table 1 draws on data from the National Center for Education Statistics (NCES) to show how average

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Table 1. Average Faculty Salaries at Four-Year Public and Private Institutions, 1970–2013

Year	Public	Private	Gap (\$)	Gap (%)
1970	\$13,121	\$11,824	\$1,297	11.0%
1975	\$17,400	\$16,116	\$1,284	8.0%
1980	\$24,373	\$22,325	\$2,048	9.2%
1985	\$34,033	\$31,732	\$2,301	7.3%
1990	\$44,510	\$42,224	\$2,286	5.4%
1995	\$51,172	\$50,819	\$353	0.7%
2001	\$62,013	\$63,088	-\$1,076	-1.7%
2005	\$67,951	\$71,263	-\$3,312	-4.6%
2010	\$76,857	\$82,098	-\$5,242	-6.4%
2011	\$77,843	\$83,701	-\$5,858	-7.0%
2012	\$78,012	\$85,096	-\$7,085	-8.3%
2013	\$79,711	\$86,467	-\$6,756	-7.8%

Notes: Values represent the average salaries for faculty on 9-month appointments at institutions granting bachelor degrees or higher. Salary figures have not been adjusted for inflation (in current dollars). Source: Digest of Education Statistics 2014 (Table 316.10).

faculty salaries by type of institution have changed for selected years from 1970 through 2013 (NCES 2014). In the 1970s, across all four-year institutions the average salaries for faculty were actually higher in public than in private institutions. However, starting in the 1980s average faculty salaries at private four-year institutions began growing at a faster pace than at public institutions. By the mid-1990s, salaries were on average approximately equal across the two sectors, and by the 21st century there was a sizable average salary advantage for faculty at private institutions. The American Association of University Professors (AAUP) found that the average salary gaps between public and private institutions are particularly large for research-oriented institutions and faculty in higher ranks (Curtis and Thornton 2014). For example, in 2013 full professors in public doctoral-granting institutions were paid almost 37% less than faculty in private not-for-profit institutions without religious affiliations.

The growing disparity in faculty pay between public and private institutions has caught the attention of researchers and policy makers (Alexander 2001; Ehrenberg 2003; Zoghi 2003). Naturally, questions arose as to the possible causes for the emerging gap in average pay between the public and private higher education sectors. The most frequently cited explanation for the gap is that private institutions have been more successful than public institutions in raising revenues, which in turn are used to pay professors. Alexander (2001), for example, posited that the heightened emphasis on revenue generation began

in the 1980s as colleges faced increased pressure to compete with each other on prestige and reputation. Alexander (2001) noted "...disparities in the abilities of institutions to expend educational resources are widening between public and private universities, and these trends directly correlate with a university's ability to compete for quality faculty" (113).

Financial disparities provide one narrative for the emergence of the average salary gap between public and private institutions, but it may not be the only explanation. Anecdotally, the financial success of private institutions has been mainly concentrated on the most prestigious and research-intensive private institutions. Although much of the attention on the relative pay between public and private institutions is directed towards these institutions, we have observed growing gaps in average faculty pay between less prestigious public and private institutions as well even though many of these institutions have experienced financial difficulties.

There are numerous studies in the higher education and economics literature examining differences in individual faculty members' salaries (see, for example, Hearn 1999; Hedrick, Henson, Krieg, and Wassel, Jr. 2001; Perna 2001; Porter, Toutkoushian, and Moore 2008; Toutkoushian, Bellas, and Moore 2007; Umbach 2007), and yet relatively little research has focused on why the level of faculty pay differs across institutions, and in particular, between public and private institutions. The few exceptions include studies by Cohn (1973), Alexander (2001), and Zoghi (2003), which examined how institutional characteristics such as public/private status affected average faculty salaries. Of these studies, the most relevant for our purposes is the study by Cohn (1973), who found that average faculty salaries were lower at private/church related institutions than at public institutions. However, the study was conducted prior to the emergence of the private institutional salary advantage, and did not attempt to measure separate public/private pay differences by type of institution within each sector.

Research into faculty salaries and the private/public gap remains important to individual faculty members, institutions of higher education, and states. Salary levels can influence whether individuals decide to work in academe as faculty members, and if so, at which institutions. This means that salaries are also important to institutions of higher education because they compete for faculty, and compensation is a factor in attracting and retaining high-quality employees. The public/private salary gap may also have implications for society at large. If private institutions are able to hire the best faculty from the available pool of labor, then it may have negative consequences for the quality of research, teaching, and service that takes place on public campuses. Given that states rely on their public institutions to educate students and contribute to their quality of life, a shift in high-quality faculty from public to private institutions has consequences that go beyond the campus.

In this study, we use institution-level data from the Integrated Postsecondary Education Data System (IPEDS) to examine how selected financial and institutional characteristics influence average faculty salaries, and in turn, the average salary gaps between private and public institutions. We focus on the private / public salary gaps for five groups of four-year, not-for-profit institutions ranging from doctoral-granting to bachelor-granting institutions, and how the gaps are influenced by selected supply and demand factors. We estimate regression models to explain the difference in the average level of faculty salaries in 2011, as well as the change in average salaries from 2001 to 2011.

There are several ways in which our study fills an important void in the research and policy literature. First, in using data from 2001 and 2011 our study provides an updated snapshot of the relative pay between public and private institutions, and encompasses years over which salaries in public institutions have not kept pace with private institutions. Second, our analysis focuses on both the level of average faculty salaries and the changes in average faculty salaries. In doing so, we shed light on some of the reasons why the public/private gaps in average salaries have widened in the 21st century. Finally, we examine whether the public/private average salary gaps vary by type of institution, rather than only consider the gap as an aggregate for all institutions combined.

REVIEW OF THE LITERATURE

Theoretical and Conceptual Frameworks

The field of economics offers several theoretical and conceptual frameworks that can be used to help understand the underlying reasons why differences in faculty salaries exist across individuals and institutions. Economists assert that faculty salaries are determined through the interaction of labor demand and supply. Demand factors include the characteristics of colleges and universities that would influence the number of faculty that they want to employ and the salaries that they can offer. These characteristics may include the mission, size, geographic location, financial resources, and quality of the organization.

McPherson, Schapiro, and Winston (1989), Bowen (1980), Winston (1999), and others argue that the level of institutional revenues can affect spending and that accordingly we might expect a positive relationship between an institution's level of revenues and the salaries paid to faculty. If private institutions have more revenues at their disposal than do public institutions, then it might be a contributing factor to the rising average salary gap between the sectors. Another demand-side factor in faculty salaries is the level of non-salary benefits paid by the organization. Labor economics asserts that organizations face a tradeoff

between salary and non-salary benefits. Accordingly, colleges that provide more generous non-salary benefits for faculty may in turn give lower salaries to its professors.

Turning to the supply side of faculty labor markets, there are characteristics of individuals that in theory should affect their level of pay. Human capital theory describes the relationship between the labor market skills and attributes possessed by a person and his/her salary. Economists generally find that more education and more experience increases a person's human capital and thereby their earnings (Becker 1975; Mincer 1958). Based on this theory, economists have examined the relationship between a faculty member's salary and attributes such as years of experience, academic rank, research productivity, and educational attainment.

Colleges and universities compete for faculty in separate labor markets defined by the field of study. If the level of pay for faculty varies by labor market, then this may be reflected in the overall average salary of faculty at an institution (Ehrenberg, McGraw, and Mrdjenovic 2006). The number of students in each discipline and the number of individuals with the skills and attributes required to be a professor can also affect the supply/demand conditions for these distinct labor markets. Because institutions have varying missions and mixes of faculty by discipline, the average salary for an institution can be influenced by the disciplinary mix of its faculty members.

Discrimination in academic labor markets is another factor that could influence the average salaries of an institution's faculty. Many research studies have documented that female faculty are paid less than male faculty with comparable supply and demand characteristics (Perna 2001; Toutkoushian, Bellas, and Moore 2007; Umbach 2007). As a result, institutions with a high concentration of female faculty may have a lower average faculty salary level than another similar institution with more male faculty.

Literature Review

There have been numerous studies conducted to examine the level of pay for faculty (see, for example, Barbezat 2002; Nettles, Perna, and Bradburn 2000; Toutkoushian and Conley 2005; Ashraf and Shabbir 2006; Toutkoushian, Bellas, and Moore 2007). These studies used individual-level data and usually focused on the effect of gender on salary after controlling for various demand- and supply-side factors that could also influence faculty pay. Overall, the studies have shown that faculty salaries are affected by a range of individual and institutional characteristics.

In contrast, there have been relatively few investigations into the variations in average faculty salaries at the institutional level. Probably the most frequently

cited source of information on average faculty salaries is the annual reports from the AAUP. However, the AAUP reports do not attempt to explain the variations in the data. AAUP data from 2013–14 confirm a continually increasing gap in faculty pay between the sectors with increases in average faculty salaries greater at private institutions than publics (Curtis and Thornton 2014).

The study that is most similar to ours is by Cohn (1973), who used regression analysis to analyze the determinants of institution-level average faculty salaries at 204 institutions in 1970–71. He found that factors such as teaching load and institutional size had significant impacts on average faculty salaries. Of particular relevance to our study, Cohn (1973) concluded that there was no significant salary difference between public and private institutions. However, the study measured a single public/private pay gap for all institutions, and due to data limitations, many institutions were excluded from the analysis.

Other researchers have empirically investigated the public/private differential in subsequent years and found that private institutions, on average, do pay faculty more (Alexander 2001; Ehrenberg 2003). Using AAUP data from 1980 to 1998, Alexander (2001) noted that “average faculty salary disparities between comparable public and private universities substantially expanded, favoring private university faculty at all levels” (120). Zoghi (2003) investigated whether the salary gap could be attributed in part to the greater benefits (e.g. retirement and insurance) and/or amenities paid to faculty at public institutions, and determined that this was not the case. Likewise, Curtis and Thornton (2014) showed that the public/private gaps in salary were about the same as the gaps in total compensation.

Finally, Ehrenberg, McGraw, and Mrdjenovic (2006) examined differences in average faculty salaries across institutions by examining faculty fields of study. While confirming differentials in pay by faculty field depending on the external labor market for faculty, their analysis found that “field differences in average full professor salaries across universities are associated with variations in field differences in average faculty quality” with no similar differential for associate or assistant professor salaries (Ehrenberg, McGraw, and Mrdjenovic 2006, 247).

Data and Methodology

Data. Data for this study were obtained from the National Center for Education Statistics through the IPEDS database for the years 2001 and 2011. Due to data limitations with IPEDS, the variables for enrollments by major and Carnegie classifications relied on data for 2000 and 2010 and endowments in 2002 were used for the year 2001. Our sample was restricted to four-year public and private not-for-profit institutions that award bachelors and possibly master’s and doctorate degrees. We excluded from the sample institutions with fewer than 30

faculty members and/or 400 students. After deleting observations with missing values on the variables used in the following regression models, the final dataset included 1,033 institutions.

Variables. This section provides an overview of the variables used in this study. A more detailed description of the variables is available upon request. The first dependent variable was the natural log of average salary for faculty at the institution in 2011 ($\ln(\text{AvgSal})$). The natural log transform of salary is consistent with the notion that salaries are compounded over time. This variable was calculated as the weighted average of the mean salaries for faculty at the Assistant, Associate, and Full Professor ranks within each institution, with the weights corresponding to the numbers of faculty within each rank. The second dependent variable was the change in the natural log of inflation-adjusted average faculty salaries from 2001 to 2011 ($\Delta \ln(\text{AvgSal})$).

We constructed several groups of independent variables for this study. The first group of variables (abbreviated *C*) reflects the type of institution as categorized by the 2010 Carnegie classifications: *Carnegie A* = Doctoral – Higher Research, *Carnegie B* = Doctoral – Lower Research, *Carnegie C* = Masters (reference group), *Carnegie D* = Bachelor – Liberal Arts, and *Carnegie E* = Bachelor – Non-Liberal Arts. To examine the average salary gaps within each Carnegie group, we created five variables (abbreviated *PxC*) for the interactions of Carnegie groupings and a dummy variable for whether the institution was public. These five variables are labeled *Pub x Carn A* through *Pub x Carn E*. The second grouping of variables (abbreviated *S*) captures attributes of the institution that are fixed across time and may affect faculty compensation, such as geographic region (*East*, *Midwest*, *South* (reference group), and *West*), a dummy variable for whether the institution is located in an urban area (*Urban*), whether the institution is a historically black college or university (*HBCU*), and whether the institution has a medical school or hospital (*MedHosp*). The geographic variables and urbanicity measure capture whether cost-of-living differences are reflected in faculty salaries. The variable for HBCU status may affect faculty compensation due to differences in their missions, research intensity, and other attributes. Institutions with either a medical school or hospital may have a different faculty composition than other institutions, which in turn could influence the average faculty salary level.

The third category of variables (abbreviated *X*) represents mission-related characteristics of an institution that change over time and could affect the average salaries paid to faculty. These factors include the percent of students majoring in STEM fields (*%STEM*), the percent of students majoring in business (*%Business*), and the percentage of graduate students at the institution (*%Grad*). The first two factors reflect the disciplinary mix of students at the institution,

which may influence the mix of faculty across disciplines and therefore the overall average salary. The percent of graduate students is related to the mission of the institution and the relative emphasis on research. Also included in this category are variables for the ratio of students to faculty (*StudProf*), total student enrollment and enrollment squared (*Enroll*, *Enroll*²) and the percent of students admitted (*%Admit*). These variables are intended to capture the possible effects of the scale of operation and selectivity on average faculty salaries.

The fourth set of variables (abbreviated *Z*) measures aspects of the composition of the faculty that may in turn influence average salaries. The first variable is the percent of faculty who are female (*%FemProf*). Due to the higher concentration of female faculty in lower-paying fields, as well as concerns over possible gender-based pay discrimination in academe, it is possible that average faculty salaries are lower in institutions with higher proportions of female faculty. We also created three variables for the rank distribution of faculty at an institution (*%FullProf*, *%AssoProf* (reference group), *%AsstProf*), where each denotes the percentage of faculty members at the respective ranks. Given that average salaries tend to rise with academic rank and the dependent variable is a weighted average of the rank-specific mean salaries, it is expected that institutions with higher concentrations of faculty at the top rank will have higher overall average salaries.

The final group of variables (abbreviated *F*) captures finance-related factors that may in turn influence average salaries for faculty. The first is the total revenue per student (*RevStud*). Given the public/not-for-profit status of institutions in our sample, colleges with more financial resources at their disposal would be expected to spend more each year, possibly using some of these resources to increase salaries for faculty. The second finance-related variable is the log of an institution's endowment per student (*ln(EndowStud)*). It is expected that this variable would also have a positive association with average salaries because some portion of endowments may be used to fund faculty positions. Finally, the last finance-related variable that we created denotes the ratio of benefits to average salary (*%Benefits*). It may be true that institutions that offer relatively generous benefits in turn have lower average salaries for faculty.

Table 2 presents descriptive statistics for the variables used in this study. For each variable, we calculated the mean, standard deviation, minimum, and maximum values. The average faculty salary across ranks at these institutions ranged from a low of \$39,513 to a high of \$176,366, with a mean of \$73,312. The institutions in our sample varied considerably in terms of emphasis on STEM and business fields, graduate versus undergraduate education, ratio of students to faculty, acceptance rate, and enrollments. Of particular note is the large variation in financial resources that we observed for institutions (standard deviation = \$50,057).

Table 2. Descriptive Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
AvgSal	\$73,312	\$19,322	\$39,513	\$176,366
Public	0.37	0.48	0	1
Carnegie A	0.17	0.38	0	1
Carnegie B	0.06	0.24	0	1
Carnegie C	0.45	0.50	0	1
Carnegie D	0.17	0.37	0	1
Carnegie E	0.15	0.36	0	1
East	0.28	0.45	0	1
Midwest	0.27	0.44	0	1
South	0.32	0.47	0	1
West	0.12	0.33	0	1
Urban	0.34	0.47	0	1
HBCU	0.04	0.20	0	1
MedHosp	0.10	0.30	0	1
%STEM	11.2%	10.3%	0.0%	81.0%
%Business	14.2%	9.3%	0.0%	94.8%
StudProf	28.4	12.3	8.0	118.8
%Grad	18.3%	15.4%	0.0%	80.8%
Enroll	8,302	9,775	496	72,254
%Admit	63.5%	17.6%	6.3%	100.0%
%FemProf	42.9%	10.1%	13.1%	86.7%
%FullProf	33.0%	11.5%	4.8%	81.7%
%AsstProf	34.8%	10.8%	5.1%	75.6%
RevStud	\$35,077	\$50,057	\$6,763	\$943,325
EndowStud	\$36,861	\$110,351	\$0	\$1,889,250
%Benefits	31.1%	7.4%	9.7%	71.1%

Notes: Sample size = 1,033. Variables for average faculty salary and revenues per student are reported in dollars. The number of students is reported in individual students.

Methodology

To examine the difference in average salaries in 2011 between public and private not-for-profit institutions, we begin by estimating the following four multiple regression models:

$$\text{Model (1a): } \ln(\text{AvgSal}) = \alpha + (PxC)\delta + C\gamma + \varepsilon$$

$$\text{Model (2a): } \ln(\text{AvgSal}) = \alpha + (PxC)\delta + C\gamma + S\omega + X\theta + \varepsilon$$

$$\text{Model (3a): } \ln(\text{AvgSal}) = \alpha + (PxC)\delta + C\gamma + S\omega + X\theta + Z\tau + \varepsilon$$

$$\text{Model (4a): } \ln(\text{AvgSal}) = \alpha + (PxC)\delta + C\gamma + S\omega + X\theta + Z\tau + F\varphi + \varepsilon$$

The key variables of interest are the interaction effects between public status and Carnegie groupings. The coefficients δ ($= \delta_A, \delta_B, \delta_C, \delta_D, \delta_E$) capture the average pay gaps between public and private institutions within each Carnegie

group after taking into account the other factors in the model. When $\delta < 0$, it shows that within the designated Carnegie group of institutions, average faculty salaries are lower at public than private institutions. We converted the estimated coefficients from these models into percentage differences in average salaries by type of institution by using the following formulas:

Private Institutions: $\text{Exp}(\gamma) - 1$

Public Institutions: $\text{Exp}(\gamma + \delta) - 1$

where “Exp” is the exponential function and γ and δ are the corresponding coefficient estimates for the Carnegie and interaction variables from each regression model.

We estimated four regression models to examine how the gaps in public/private average faculty salaries are influenced by selected supply and demand factors. The first regression model (1a) controls for only the Carnegie grouping of each institution and its interaction with public status and thus represents the baseline average pay differences by type of institution. The second model (2a) includes additional variables for institutional characteristics that are either fixed (*S*) or change over time (*X*). In the third model (3a), we added another set of variables (*Z*) to the model that represent faculty characteristics that may affect average faculty salaries. In the last model (4a), we included measures of an institution’s financial resources (*F*) to the model. Changes in the coefficients δ across these four models therefore show how supply and demand factors contribute to the public/private average salary gaps.

To examine the change in average faculty salaries between 2001 and 2011 for public and private institutions, we estimated the following regression models:

Model (1b): $\Delta \ln(\text{AvgSal}) = \alpha + (PxC)\delta + C\gamma + \varepsilon$

Model (2b): $\Delta \ln(\text{AvgSal}) = \alpha + (PxC)\delta + C\gamma + S\omega + \Delta X\theta + \varepsilon$

Model (3b): $\Delta \ln(\text{AvgSal}) = \alpha + (PxC)\delta + C\gamma + S\omega + \Delta X\theta + \Delta Z\tau + \varepsilon$

Model (4b): $\Delta \ln(\text{AvgSal}) = \alpha + (PxC)\delta + C\gamma + S\omega + \Delta X\theta + \Delta Z\tau + \Delta F\phi + \varepsilon$

where “ Δ ” represents the change in specific variables from 2001 to 2011. Our primary focus in models (1b) through (4b) is whether the change in the natural log of average faculty salaries over this 10-year period differed for public and private institutions within specific Carnegie classification groupings. When the coefficients in the vector δ are negative, it shows that average salaries at public institutions in the designated Carnegie category grew at a slower rate than at private institutions over this 10-year period. As before, the coefficient estimates for δ in model (1b) provide baseline values for the different growth rates in average salaries for public and private institutions. The models (2b) through (4b) allow us to determine how selected supply and demand factors

may explain some of the differences in average growth rates in faculty salaries between public and private institutions.

We estimated all of the models using ordinary least squares, and applied White's (1980) test for heteroscedasticity. Because we rejected the null hypothesis of homoscedasticity in each of the models using White's (1980) test, we applied White's procedure to correct for heteroscedasticity using robust regression analysis, and only report the heteroscedasticity-corrected estimates here.

RESULTS

Analysis of Average Salaries in 2011

Table 3 provides a breakdown of the average faculty salaries in 2011 by type of institution (public vs. private, Carnegie grouping). The third column shows the differences in mean salaries between public and private institutions, and whether or not the differences are statistically significant. Finally, in the last column we express the dollar gaps in percentage terms. When viewed in the aggregate, average faculty salaries are actually higher in public institutions (\$76,830)

Table 3. Comparison of Average Faculty Salaries at Four-Year, Not-for-Profit Institutions by Public / Private Status, 2011

Group	Public	Private	Difference (\$)	Difference (%)
Only Carnegie A	\$90,944 (n=123)	\$116,717 (n=53)	+\$25,773***	+28.3%
Only Carnegie B	\$73,176 (n=24)	\$80,599 (n=37)	+\$7,423	+10.1%
Only Carnegie C	\$71,665 (n=192)	\$68,185 (n=269)	-\$3,480**	-4.9%
Only Carnegie D	\$65,730 (n=14)	\$71,651 (n=159)	+\$5,922	+9.0%
Only Carnegie E	\$61,359 (n=31)	\$55,831 (n=128)	-\$5,529**	-9.0%
All Institutions	\$76,830 (n=385)	\$71,223 (n=648)	-\$5,607***	-7.3%

Notes: Carnegie A = Research University, Carnegie B = Doctoral/Research University, Carnegie C = Masters University, Carnegie D = Bachelor Liberal Arts Institution, Carnegie E = Bachelor Non-liberal Arts Institution (2010 Carnegie classifications). ***p<.001, **p<.01, *p<.05 (two-tailed tests). Percent changes are calculated using public average salaries as the base value.

than they are in private institutions (\$71,223). However, the aggregate salary advantage for public institutions is due to the uneven distributions of public and private institutions across Carnegie categories.

When we calculated the average salary gap by type of institution as represented by their Carnegie classifications, a different story emerges. Within the subset of research-intensive institutions (group A), average salaries at private institutions exceed the average in public institutions by \$25,773 or 28%. For the other groups of institutions, there is no evidence that the average faculty salaries in private institutions are significantly higher than they are at public institutions (in part due to the small numbers of institutions within groups B and D), and in fact the average salary at public bachelor non-liberal arts institutions was \$5,529 higher than for private institutions in the same category. Accordingly, faculty salaries are not uniformly higher across all types of private institutions.

In Table 4, we turn to the results from the first four regression models. The dependent variable in each model is the log of average faculty salary at the institution in 2011. In the first model (1a), we only controlled for the Carnegie

Table 4. Determinants of Average Faculty Salaries, 2011

	Model (1a)	Model (2a)	Model (3a)	Model (4a)
Pub x Carn A	-0.2403*** (0.0296)	-0.1352*** (0.0262)	-0.0997*** (0.0248)	0.0001 (0.0221)
Pub x Carn B	-0.0839 (0.0472)	-0.0660 (0.0361)	-0.0693* (0.0340)	-0.0146 (0.0293)
Pub x Carn C	0.0597*** (0.0170)	0.0046 (0.0162)	-0.0156 (0.0154)	0.0531*** (0.0143)
Pub x Carn D	-0.0641 (0.0502)	-0.0345 (0.0361)	-0.0438 (0.0339)	0.0557 (0.0300)
Pub x Carn E	0.0927* (0.0360)	0.0953*** (0.0265)	0.1010*** (0.0249)	0.1669*** (0.0221)
Carnegie A	0.5384*** (0.0270)	0.1602*** (0.0258)	0.1076*** (0.0248)	0.0101 (0.0218)
Carnegie B	0.1776*** (0.0316)	0.0733** (0.0233)	0.0524* (0.0221)	0.0456* (0.0186)
Carnegie D	0.0486** (0.0180)	0.0561** (0.0171)	0.0275 (0.0162)	-0.0490*** (0.0143)
Carnegie E	-0.1893*** (0.0193)	-0.1037*** (0.0164)	-0.1138*** (0.0155)	-0.1111*** (0.0132)
East	-----	0.1702*** (0.0109)	0.1632*** (0.0104)	0.1476*** (0.0093)
Midwest	-----	0.0254* (0.0108)	0.0197 (0.0102)	0.0279** (0.0088)

(Continued on next page.)

Table 4. Determinants of Average Faculty Salaries, 2011

	Model (1a)	Model (2a)	Model (3a)	Model (4a)
West	-----	0.1143*** (0.0138)	0.0832*** (0.0134)	0.0796*** (0.0116)
Urban	-----	0.0124 (0.0088)	0.0191* (0.0084)	0.0255*** (0.0071)
HBCU	-----	-0.0716*** (0.0214)	-0.0360 (0.0206)	-0.0447* (0.0179)
MedHosp	-----	-0.0009 (0.0179)	0.0071 (0.0169)	-0.0752*** (0.0152)
%STEM	-----	0.0034*** (0.0005)	0.0025*** (0.0005)	0.0016*** (0.0004)
%Business	-----	0.0005 (0.0005)	0.0006 (0.0005)	0.0013** (0.0004)
StudProf	-----	-0.0037*** (0.0004)	-0.0032*** (0.0004)	0.0010* (0.0004)
%Grad	-----	0.0014*** (0.0004)	0.0013*** (0.0004)	0.0011*** (0.0003)
Enroll	-----	0.0221*** (0.0018)	0.0204*** (0.0017)	0.0191*** (0.0014)
(Enroll)2	-----	-0.0003*** (0.0000)	-0.0003*** (0.0000)	-0.0003*** (0.0000)
%Admit	-----	-0.0026*** (0.0003)	-0.0026*** (0.0002)	-0.0012*** (0.0002)
%FemProf	-----	-----	-0.0009 (0.0005)	-0.0002 (0.0004)
%FullProf	-----	-----	0.0013* (0.0005)	0.0005 (0.0005)
%AsstProf	-----	-----	-0.0032*** (0.0006)	-0.0026*** (0.0005)
Ln(RevStud)	-----	-----	-----	0.1761*** (0.0124)
Ln(EndowStud)	-----	-----	-----	0.0140** (0.0050)
%Benefits	-----	-----	-----	-0.0018*** (0.0005)
Intercept	11.1036*** (0.0109)	11.1534*** (0.0269)	11.2864*** (0.0499)	10.5253*** (0.0618)
R2	0.470	0.727	0.759	0.830

Notes: Dependent variable = log of average faculty salary in 2011. Sample size = 1,033. Standard errors corrected for heteroscedasticity using robust regression are shown in parentheses. Reference category for Carnegie classification is master's institutions (group C). Reference geographic region is South. Reference category for faculty rank is Associate Professor. Revenue per student and endowment per student are measured in thousands of dollars. * p<0.05, ** p<0.01, *** p<0.001.

classification of each institution and its interaction with public status. The second model (2a) adds controls for fixed and variable institutional characteristics that could affect faculty salaries. In the third model (3a), we added controls for faculty characteristics, and the last model (4a) also includes financial characteristics.

Collectively, the R^2 statistic shows that the variables in Models (2a) to (4a) accounted for 73% to 83% of the variance in average salaries across institutions. Looking across the models, we found that average faculty salaries were higher in institutions that focused more on STEM fields ($\theta = +0.0016$ to $+0.0034$), likely reflecting the different mix of faculty that in turn affects the overall average salary. More selective institutions, as represented by their lower admission rate, were found to pay higher salaries to faculty than less selective institutions ($\theta = -0.0012$ to -0.0026). The rank distribution of an institution's faculty contributed to its average salary, in that institutions with a higher concentration of faculty at the assistant professor rank had lower overall average salaries than other institutions. The results showed that an institution's financial resources, as represented by revenue per student ($\varphi = +0.1761$) and endowment per student ($\varphi = +0.014$), each had a positive and significant effect on average faculty salaries. Finally, there is a tradeoff in terms of benefits and salary for institutions in that institutions offering benefits that are more generous in turn had lower average salaries.

Turning to the effects of private status on average salaries, we found that the average salary disadvantage for public institutions was mainly concentrated among research-intensive institutions. When we did not control for supply and demand factors in model (1a), we found that average salaries at institutions in the Carnegie A group relative to masters institutions were 71% higher in private institutions ($\exp(0.5384) - 1 = 0.71$ or 71%) and 35% higher in public institutions ($\exp(0.5384 - 0.2403) - 1 = 0.35$ or 35%). These percentage differences for private and public research-intensive institutions fell to 11% and 1% respectively in Model (3a) after we controlled for demand factors such as an institution's location, disciplinary focus, size, selectivity, and supply factors. Finally, Model (4a) shows that there was no longer a statistically significant interaction effect between public and private institutions in group A after we controlled for financial variables.

The patterns for average faculty salaries were different, however, for the other four groups of institutions that we examined. For the less research-intensive doctoral institutions (Carnegie B), the salary advantages relative to master's institutions were smaller, and the differences in pay between public and private institutions (δ) were generally not statistically significant across the four models. Within the Carnegie C category, average faculty salaries were actually 6% higher in public institutions prior to controlling for other factors, and the difference

was approximately the same after accounting for all of the factors in model (4a). Turning to the next group (D), we found that the public/private differences in average faculty pay were not statistically significant across the four models. Finally, average faculty salaries in the last group (E) were 17% (private) and 9% (public) lower than masters institutions prior to making adjustments for other institutional factors that could affect average salaries. Taking all of these factors into account in the last model shows that relative to masters institutions, average salaries in private Carnegie E institutions were 11% lower and for public institutions average salaries were 5% higher. The differences in average pay between public and private institutions were large and statistically significant across all four models, and in contrast to the research-intensive institutions, the pay gaps were in favor of public institutions.

Analysis of Change in Average Salaries 2001 to 2011

We now turn to the changes in average faculty salaries by type of institution over the 10-year period from 2001 to 2011. In particular, we explore whether changes in the factors used in the cross-sectional models have contributed to the growing disparities in average faculty salaries between public and private institutions during this time.

In Table 5, we focus on the mean changes in average faculty salaries by institution type from 2001 to 2011. The first five rows show the changes in average faculty salaries for public and private institutions within each of the five Carnegie groups that we considered. The final row contains similar statistics for all institutions. All figures from 2001 have been converted to 2011 dollars and thus represent real (inflation-adjusted) changes in average salaries. Not surprisingly, we found that for all groups except the bachelor liberal arts institutions the gaps in average faculty salaries between public and private institutions increased over this 10-year period. The gaps grew the fastest for the most research-intensive institutions, with the rise in average salaries at private institutions outpacing the rise at public institutions by \$8,154 constant dollars. The gaps grew by about \$5,000 for other doctoral and masters institutions, and by \$3,705 in non-liberal arts bachelor institutions. For these institutions, average salaries at private institutions increased while they decreased for public institutions. The only exception to this pattern was for bachelor liberal arts institutions, where the average salary growth rates for both public and private institutions were small and roughly the same (difference = \$26).

To determine how these changes may have affected average faculty salaries and the gaps between public and private institutions, we estimated a series of regression models corresponding to Models (1b) through (4b). The results from

Table 5. Changes in Average Faculty Salaries at Four-Year, Not-for-Profit Institutions by Public/Private Status, 2001 to 2011

Group	Public	Private	Difference (\$)
Only Carnegie A	+\$2,909.57 (n=123)	+\$11,063.26 (n=53)	+\$8,153.70***
Only Carnegie B	-\$80.44 (n=24)	+\$4,995.58 (n=37)	+\$5,076.02**
Only Carnegie C	-\$1,335.45 (n=192)	+\$3,653.44 (n=269)	+\$4,988.89***
Only Carnegie D	+\$169.34 (n=14)	+\$143.34 (n=159)	-\$26.00
Only Carnegie E	-\$2,604.91 (n=31)	+\$1,099.89 (n=128)	+\$3,704.80***
All Institutions	+\$65.35 (n=385)	+\$2,960.40 (n=648)	+\$2,895.05***

Notes: Average faculty salaries have been adjusted for inflation using the Consumer Price Index (base year = 2011). Carnegie A = Research University, Carnegie B = Doctoral/Research University, Carnegie C = Masters University, Carnegie D = Bachelor Liberal Arts Institution, Carnegie E = Bachelor Non-liberal Arts Institution (2010 Carnegie classifications). *** $p < .001$, ** $p < .01$, * $p < .05$ (two-tailed tests).

the models are shown in Table 6. The dependent variable in each model is the change in the log of average salary between 2001 and 2011. The explanatory variables include the fixed institutional characteristics as well as the changes in institutional, faculty, and financial characteristics over this period. As noted, all financial variables have been adjusted for inflation by converting them to 2011 dollars.

The R^2 statistics show that the four regression models explain about 16 to 32 percent of the variation in the change in average faculty salaries from 2001 to 2011. With regard to the key variables for our study, we found that the coefficients for the interaction effects between public status and institutional group were negative and statistically significant for all groups except D. Accordingly, average salaries at private institutions grew faster than at public institutions in all but the bachelor liberal arts category. For the Carnegie A group, for example, prior to controlling for any other factors, average salaries grew by 5.7% at private institutions relative to the Carnegie C group ($\exp(0.0552) - 1 = .057$ or 5.7%). At the same time, average salaries for public institutions in the same group fell by 1.6% ($\exp(0.0552 - 0.0713) - 1 = -0.016$ or -1.6%).

Surprisingly, we found that the increases in the private/public salary gaps were largely unaffected by the supply and demand factors that we included in

Table 6. Determinants of Change in Average Faculty Salaries, 2001 to 2011

	Model (1b)	Model (2b)	Model (3b)	Model (4b)
Pub x Carn A	-0.0713*** (0.0127)	-0.0547*** (0.0128)	-0.0491*** (0.0121)	-0.0372** (0.0123)
Pub x Carn B	-0.0549** (0.0203)	-0.0526** (0.0198)	-0.0472* (0.0188)	-0.0444* (0.0186)
Pub x Carn C	-0.0695*** (0.0073)	-0.0578*** (0.0076)	-0.0537*** (0.0072)	-0.0475*** (0.0073)
Pub x Carn D	0.0095 (0.0216)	0.0077 (0.0208)	-0.0041 (0.0197)	0.0093 (0.0197)
Pub x Carn E	-0.0518*** (0.0155)	-0.0556*** (0.0150)	-0.0476*** (0.0142)	-0.0338* (0.0142)
Carnegie A	0.0552*** (0.0116)	0.0369** (0.0127)	0.0353** (0.0120)	0.0277* (0.0121)
Carnegie B	0.0083 (0.0136)	0.0168 (0.0130)	0.0104 (0.0124)	0.0095 (0.0122)
Carnegie D	-0.0506*** (0.0077)	-0.0394*** (0.0076)	-0.0353*** (0.0073)	-0.0445*** (0.0076)
Carnegie E	-0.0351*** (0.0083)	-0.0158 (0.0082)	-0.0137 (0.0078)	-0.0194* (0.0077)
East	-----	0.0412*** (0.0063)	0.0398*** (0.0060)	0.0399*** (0.0060)
Midwest	-----	-0.0120 (0.0063)	-0.0138* (0.0060)	-0.0104 (0.0060)
West	-----	0.0193* (0.0079)	0.0166* (0.0075)	0.0195** (0.0075)
Urban	-----	0.0057 (0.0050)	0.0076 (0.0048)	0.0068 (0.0047)
HBCU	-----	-0.0086 (0.0123)	-0.0076 (0.0116)	-0.0017 (0.0116)
MedHosp	-----	0.0079 (0.0097)	0.0100 (0.0092)	0.0081 (0.0091)
Δ%STEM	-----	0.0001 (0.0003)	0.0001 (0.0003)	0.0001 (0.0003)
Δ%Business	-----	0.0005* (0.0003)	0.0005* (0.0002)	0.0006* (0.0002)
ΔStudProf	-----	-0.0008** (0.0003)	-0.0008** (0.0003)	-0.0003 (0.0003)

(Continued on next page.)

Table 6. Determinants of Change in Average Faculty Salaries, 2001 to 2011

	Model (1b)	Model (2b)	Model (3b)	Model (4b)
$\Delta\%$ Grad	-----	0.0007* (0.0003)	0.0005 (0.0003)	0.0006 (0.0003)
Δ Enroll	-----	0.0051*** (0.0013)	0.0056*** (0.0012)	0.0059*** (0.0012)
$\Delta\%$ Admit	-----	-0.0001 (0.0001)	-0.0002 (0.0001)	-0.0002 (0.0001)
$\Delta\%$ FemProf	-----	-----	-0.0006 (0.0004)	-0.0005 (0.0004)
$\Delta\%$ FullProf	-----	-----	0.0021*** (0.0003)	0.0020*** (0.0003)
$\Delta\%$ AsstProf	-----	-----	-0.0007* (0.0003)	-0.0007* (0.0003)
$\Delta\ln(\text{RevStud})$	-----	-----	-----	0.0303*** (0.0080)
$\Delta\ln(\text{EndowStud})$	-----	-----	-----	-0.0002 (0.0023)
$\Delta\%$ Benefits	-----	-----	-----	-0.0009** (0.0003)
Intercept	0.0455*** (0.0047)	0.0172* (0.0069)	0.0186** (0.0069)	0.0126 (0.0072)
R2	0.161	0.242	0.303	0.318

Notes: Dependent variable = change in log of average salary from 2001 to 2011. Sample size = 1,033. All financial variables have been adjusted for inflation using the Consumer Price Index (base year = 2011). Standard errors corrected for heteroscedasticity using robust regression are shown in parentheses. Reference category for Carnegie classification is master's institutions (group C). Reference category for geographic region is South. Reference category for faculty rank is Associate Professor. Revenue per student and endowment per student are measured in thousands of dollars. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

the analyses even though many of these factors contributed to the change in average salaries during this period. After controlling for variables shown in the last model, faculty salaries at private doctoral institutions still grew 3.7% faster than at similarly situated public institutions. Comparable results were found for Carnegie groups B, D, and E. Therefore, the increasing divergence in average faculty salaries between public and private institutions do not appear to be driven by the various factors considered in our analyses, in particular the financial resources at institutions.

Summary and Discussion

In this study, we focused on the relative pay of faculty in different types of institutions, and the role that demand and supply factors play in these differences. We found that the current public/private salary gap is mostly concentrated in research-intensive institutions. As expected, the percentage of faculty at higher levels (as a proxy for experience) had a significant effect on institutions' average faculty salaries. The region in which the institution is located, revenues per student, institutional size, selectivity of the institution, percentage of the student body composed of graduate students, and the percentage of degrees issued that were STEM-related all significantly impacted average faculty salaries. Some potential good news for gender equity is that the percentage of female faculty had no effect on average salaries.

In looking at the public/private pay gap change over time, we concluded that for all but the bachelor liberal arts institutions the average salary gaps between public and private institutions grew between 2001 and 2011. Although prior researchers have suggested that the gaps are attributed to differences in the financial resources of public and private institutions, our results showed that the growing gaps were not affected by the revenues or endowments at institutions. The public/private salary gaps cannot be solely attributed to differences in the financial resources in the two sectors.

It seems clear that public research-oriented institutions are having difficulty competing with private institutions for faculty. These differences persist even after taking into account the advantages held by many private institutions in that they are better funded and more selective in admissions. If these gaps continue to grow, we can predict that more top faculty will seek employment at private, rather than public, institutions. This salary gap may also have implications for the type of research produced. If more research-oriented faculty migrate to private institutions, we may see more research dollars and output being concentrated in private institutions. This divergence in pay may ultimately affect the type and quality of research produced if less emphasis is given to research that complements the land-grant mission of leading public institutions.

At the same time, concerns over the changing composition of faculty by type of institution will be constrained by the fact that there are a limited number of faculty positions at private research institutions. Private institutions are, on average, much smaller than public research-oriented institutions, and nearly four out of every five students at the bachelor level attends public institutions. Therefore, it could be argued that regardless of the size of the salary gap, public institutions will always have an adequate supply of high-quality faculty from which to choose.

There are some limitations and potential extensions of this research. As with many research studies, there are other variables and factors that could affect average faculty salaries and are not included in this study. For example, this study does not include a direct measure of faculty productivity. However, the variables for Carnegie classification and academic rank in our study may capture part of this effect. Further research could introduce new variables into the model and/or include new data as it becomes available.

It is our hope that this study contributes to the literature on faculty salaries and spurs interest on the part of policymakers. One hundred and fifty years after the passage of the Morrill Act, which created our nation's land-grant universities, we must be cognizant of maintaining the tradition of top-quality research in our public institutions. This can only be done if public institutions offer salaries comparable to those at similar private institutions. The topic calls for continued monitoring of the public/private salary gap and the effects that the gaps are having on where faculty are employed and what is produced by their institutions.

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