How Do Public Higher Education Institutions Adjust Their Salary Structure and Faculty Composition in Response to Financial Challenges?

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Abstract

We employ new data to examine how public higher education institutions adjust the salaries and composition of their business faculty in response to funding challenges. For faculty salaries, we exploit the data's multilevel structure by examining changes in between-institution inequality, within-institution inequality, and their interaction. To examine the role of finances, we compare public and private institutions and employ fixed-effects models to study the effect of state appropriations. Our results indicate that financially stressed publics almost matched the salary increases of their competitors between 1999 and 2006, but reductions in the number of professors – especially full professors – accompanied this salary growth. The salary gap across public institutions increased, while within institutions, salary compression and salary inequality within rank grew.

Keywords: Faculty salaries, State appropriations, Higher education finance.

Introduction

The funding base for many public institutions is eroding. These institutions have relied historically on state governments for much of their revenue, but structural problems with the budgets of many state governments are creating serious challenges (Hovey, 1999). The costs associated with Medicaid and underfunded pensions are rising steadily, and a number of other items in the state budget – such as corrections – are unlikely to be cut substantially (Kane et al., 2003). Higher education is typically viewed as a balance wheel within state budgets, an item that is disproportionately cut during bad times and disproportionately increased during good times (Hovey, 1999). As state governments continue to struggle financially, we should expect state appropriations to public higher education institutions to decline.

Such cuts are challenging, because higher education is a personnel-services industry that relies heavily on highly educated skilled labor and cannot easily reduce costs through technological progress. Costs rise more rapidly over time in industries with these characteristics (Archibald & Feldman, 2011). So, public higher education institutions must try to cover increasing costs while a major portion of its revenue base is deteriorating. These institutions are seeking to find new sources of revenue to replace state funding, but no source can easily replace these dollars (Cheslock & Gianneschi, 2008). For most institutions, the most promising alternative is tuition and fees, but further increases in tuition and fees may eventually become counterproductive if they reach levels that dissuade student enrollment substantially. Furthermore, many public institutions are under pressure to restrain price increases so they do not contribute to worsening socioeconomic stratification, increasing loan debt for students, and stagnating or falling levels of college attainment by U.S. citizens.

For all these reasons, public institutions likely will face major financial challenges for the foreseeable future. These challenges will impact all activities and elements of higher education, and this study will examine their impact on the compensation and composition of faculty. Public higher education institutions will have difficulty increasing salaries to reflect non-academic job opportunities and maintaining the size and composition of their faculty. Furthermore, publics must compete for faculty with private higher education institutions that are less hurt by reductions in state government spending. The literature has clearly established that public institutions have seen their average faculty salaries fall relative to the average salaries of private institutions since the early 1980s (Alexander, 2001; Thornton, 2011). Previous studies, however, have not thoroughly examined important components of changes in faculty salaries at public institutions.

Past work has almost entirely examined average faculty salaries, so we know very little about how the full salary structure has changed. If publics cannot adjust their salaries to equal those offered by the institutions with whom they compete, where do they adjust? Do they concentrate their available dollars on a select group of "superstars"? Do they instead allocate their resources throughout the salary distribution to ensure a deeper roster of desired faculty? Do they compete vigorously for assistant professors with the hope of retaining them after they develop an attachment to the institution and its location? Fogg (2004) and Smallwood (2001) note that without answers to these sorts of questions, one cannot fully understand the consequences of the public-private salary gap.

Past work also has not thoroughly examined variation across public institutions in how they have restructured faculty salaries. Elite public institutions can more easily generate revenue from non-governmental sources than their less prominent counterparts can (Cheslock &

Gianneschi, 2008). Student demand for enrollment at these institutions is relatively high, donors

typically prefer to give to elite institutions, and the large research activity and reputation of elite

institutions provide entrepreneurial opportunities. Elite public institutions, however, often

compete with the wealthiest private institutions for leading researchers, and the financial

advantage of these private universities over other schools has been growing over time (Winston,

2004). So, while elite publics have the ability to tap more sources of revenue than other publics,

they face greater pressures to increase compensation. The interaction of these considerations

suggests that examination of the variation across publics may produce interesting results.

This study examines how public higher education institutions are changing the salary

structure of their faculty by describing changes to the full distribution of salaries within

institutions and the full distribution of average salaries across institutions. Furthermore, we

examine how public institutions have changed the size and composition of their faculty. By

limiting the size of its faculty or reducing the share of its faculty that are tenure stream, a higher

education institution can free up dollars to increase its faculty salaries. Alternatively, it can

lower salary growth so faculty size can be maintained or increased. The use of furloughs in

recent years by cash-strapped institutions is a short-term method of lowering salaries to maintain

employment levels. By studying faculty salaries alongside employment levels, we examine

whether or not these sorts of strategies have been employed.

Our descriptions are enhanced by two types of comparisons. The first comparison is

between public and private institutions, because competitive pressures mean that the relative

salaries at public institutions are just as important as the absolute salaries. By presenting figures

for private institutions alongside public institutions, we describe one of the pressures driving

changes in the public sector. Furthermore, this presentation provides a secondary contribution of

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this paper: insights into how salaries and faculty size are changing at private institutions. Our second comparison is between public institutions experiencing very different trends in state appropriations. We examine how changes in salaries and faculty size and composition relate to changes to an institution's level of state appropriations. Such analysis provides more direct insights into the adjustments public institutions make in response to financial challenges.

This study employs a distinctive data set and methodological approach. Our data comes from an Association to Advance Collegiate Schools of Business (AACSB) survey that contains faculty-level salary data for all full-time faculty at most colleges of business within the United States. This data set is – to our knowledge – the only one that allows researchers to fully describe the range of salaries for an area of study for a large set of institutions. Of course, these data are focused on one particular area of study – fields within business schools – so we will do a thorough job describing the full range of salaries within these academic fields, but we will not provide an overall description for the full range of fields. In our conclusion, we discuss the generalizability of our results and future lines of research that would complement our approach.

Our methodological approach relies heavily upon the graphing of percentiles, which allows us to richly describe changes to the full distribution of faculty salaries (Cleveland, 1993; 1994). We also exploit the multilevel structure of our data set so that we can examine between-institution salary differences, within-institution salary differences, and the intersection between the two (Cheslock & Rios-Aguilar, 2011). The between-institution differences reveal the spread across institutions in their average salary while the within-institution differences reveal gaps across faculty who reside at the same institution. We often combine this multilevel graphing of percentiles with regression analysis so we can better understand how faculty salaries vary across faculty-level and institution-level characteristics.

Past Research

At the start of the 1980s, private and public institutions offered roughly similar salaries to their faculty on average, but a gap emerged during the 1980s and grew in the subsequent years (Alexander, 2001; Thornton, 2011). The growing salary gap between public and private institutions has made it difficult for publics to attract and retain top professors. Zoghi (2003) finds that the lower salary increases at publics were not offset by increases in other work-related benefits. Because Ehrenberg et al. (1991) demonstrate that professors are less likely to continue at a school when their salaries are lower, it is not surprising that Ehrenberg (2003a, 2003b) finds that continuation rates were lower at publics relative to privates during the 1990s.

Several studies suggest that inequality in average faculty salaries increased across institutions within both the public and private sectors (Bell, 2000; Ehrenberg, 2003a; 2003b). By examining the 5th, 50th, and 95th percentiles, Bell (2001) provides evidence that this increase in inequality is due primarily to the highest-paying institutions further increasing their salary advantage. Closer examination of these trends suggests that much of the increasing inequality across publics is due to growing inequality in state appropriations and much of the increase across privates is due to growing inequality in endowment assets (Ehrenberg, 2003a; 2003b).

Several recent studies could partially explain these patterns. Kim et al. (2009) find that the positive effect of being affiliated with a top 25 university on an individual faculty member's research productivity disappeared in the 1990s. They attribute this result to a reduced importance of physical access to productive research colleagues due to innovations in communication technology. Importantly for our purposes, they show that these trends caused some leading institutions to increase their faculty salaries. Another explanation for growing

salary differences across institutions is the rapid increase in wealth at elite private institutions (Carbone & Winston, 2004; Winston, 2004). Brown et al. (2010) find that doctoral universities alter the compensation, size, and composition of their faculty in response to fluctuations in endowment levels.

We know less about how salary differences within institutions have changed. Some evidence suggests that differences across certain academic fields have grown (Ehrenberg, 2004). Other research has documented an unexplained salary gap between male and female faculty that has mostly persisted over time (Porter et al., 2008). Monks (2003) finds that within-institution salary inequality has grown in general; he reports large increases in within-institution salary inequality between 1987 and 1998 for both the public and private sectors. For any individual year, the literature has demonstrated that private institutions have greater salary inequality than public institutions, and this phenomenon has been partially attributed to the greater dissemination of salary information in public institutions (Card et al., 2010; Pfeffer & Langton, 1988).

The literature has clearly demonstrated that higher education institutions are increasingly employing fixed-term faculty (Baldwin & Chronister, 2001; Thornton, 2010). For example, Ehrenberg and Zhang (2005) find that between 1989 and 2001 at four-year institutions, there has been an increase in the share of full-time faculty that are non tenure-track, the share of all faculty that are part-time, and the share of new-hires that are non tenure-track. Zhang and Liu (2010) find that the composition of an institution's faculty is related to the faculty salary levels provided. Institutions that offer higher salaries to professors employ more part-time faculty, and institutions that provide higher salaries to full-time instructors employ fewer faculty of this type.

Private institutions are more likely to employ part-time faculty while public institutions are more likely to employ full-time lecturers and instructors (Zhang & Liu, 2010). Hiring

patterns also vary by Carnegie classification as Doctoral/Research Institutions I and Liberal Arts Colleges I are less likely to employ part-time faculty and more likely to employ full-time lecturers and instructors (Zhang & Liu, 2010). An institution's level of financial resources also appears to alter the composition of an institution's faculty. Zhang and Liu (2010) find that an institution's total revenues is positively related to the level of professorial faculty and full-time teaching faculty and negatively related to the level of part-time faculty. Brown et al. (2010) find that less selective institutions respond to negative endowment shocks by decreasing the number of tenure-stream faculty and increasing salaries of non-tenure track faculty.

How Might Public Institutions Respond to Relative Funding Declines?

A public institution facing a difficult budgetary situation will have trouble remaining competitive in the labor market for faculty if it competes with private institutions or with public institutions not facing financial difficulties. Unless an institution is willing to reduce spending on non-faculty expenditures substantially, it cannot continue to increase salaries at market rates while maintaining the size and composition of its faculty. Consequently, the institution must make adjustments to its salary structure or its personnel.

Reducing the size of the faculty is an obvious way to save costs, but unless substantial inefficiencies can be identified and corrected, a smaller faculty will produce less teaching, research, and other activities. If a reduction in these activities decreases revenues, the financial situation may not be improved. The reputation of the institution and the quality of work it produces could also suffer, which would create long-term challenges. These considerations suggest that many institutions will find adjustments to the composition of their faculty to be a preferred or complementary strategy.

The most drastic way to reduce salaries through composition changes would be to shift instruction from tenure stream professors towards full-time fixed-term instructors or part-time adjuncts. Full-time instructors and part-time adjuncts are typically paid substantially lower salaries per class than professors are paid (Monks, 2007). Not only does this strategy reduce costs without reducing the number of courses taught, it also allows institutions to remain competitive for research-oriented professors.[1] While the number of professors would decline at an institution, its remaining professors still could be offered salaries and teaching loads that are similar to those offered by other institutions.

A more minor adjustment would be to increase the share of assistant professors and decrease the share of full professors, because salaries typically rise with faculty rank. A public institution facing a difficult financial situation may not have enough dollars to compete effectively for a new full professor, but they could have sufficient funds to attract a promising assistant professor (Hobbs et al., 2005). This strategy allows the institution to continue to recruit the same type of professors within rank by recruiting more professors of lower ranks. If the financial problems facing an institution cause it to lose multiple full professors to raids by other institutions, this form of personnel restructuring could occur fairly quickly.

In the short run, adjustments to the size and composition of tenure stream faculty are difficult to implement due to the job stability provided by tenure. In addition, some institutions may not wish to implement such adjustments for reasons pertaining to educational quality or other considerations. In such cases, an institution facing relatively difficult financial times must

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[1] Increased reliance on non-tenure-track faculty could also alter the quality of instruction and student outcomes. See Bettinger & Long (2006; 2010), Carrell & West (2010), Ehrenberg & Zhang (2005), Jaegar & Eagon (2010), and Umbach (2007) for evidence in this area.

restrain professors' salaries below market levels.[2] Such changes to the salary structure can be partially implemented through the yearly adjustment process, because salaries can be increased at relatively low rates or frozen during the most severe economic difficulties. Absolute decreases to salaries are also possible during extreme times, but such decreases typically take the form of temporary reductions through furloughs.

Small yearly adjustments can alter the average salary at the institution, but by themselves, they should not fundamentally alter other parts of the salary structure. Salary freezes or uniform increases at relatively low rates will not directly increase the level of salary inequality within an institution. Inequality could be increased if deans responded to funding challenges by increasingly differentiating across faculty when providing yearly adjustments. Deans may feel pressured to do so, because over time, small uniform salary adjustments could lead to large gaps between the current salary and the outside offers potentially received by those professors most in demand. On the other hand, differentiating salaries during periods of extended financial difficulty could have major complications in terms of morale. Faculty members whose past salaries adjustments were small or nonexistent will react quite strongly to receiving no raise or a minimal raise in a highly differentiated salary adjustment process. If true, annual adjustments could be more differentiated during good financial times than during bad times.

Market considerations will be more influential during other parts of the salary determination process, such as decisions regarding initial starting salaries and whether or not to match external offers for individual faculty. In such cases, deans are forced to consider

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[2] A simple model would predict that an institution would quickly lose their most desired faculty if offered wages fell below those offered by other institutions. In contrast, Ransom (1993) presents a monopsonistic discrimination model that predicts that some desired faculty would remain even if their wages fell below market levels. The key aspect of Ransom's model is the presence of moving costs, which includes the psychic costs of separating from friends and family. In the monopsonistic discrimination model, a higher education institution could pay below-market salaries and still retain desired professors who face high moving costs.

immediately the salaries paid by other institutions. If they do adjust their salary offers to attract or retain faculty members, they will slowly adjust their salary structure especially when their yearly salary adjustments are small or nonexistent (Lazear, 1986). If they respond to the outside offers during initial hires, this will lead to salary compression and inversion across rank and across seniority levels within rank. If they respond to outside offers to existing faculty, this could lead to increasing differentiation across faculty within rank.[3] Such differentiation will be especially strong at institutions facing difficult financial times, because they are unlikely to implement substantial yearly salary adjustments.

This discussion highlights a number of cost savings that could be instituted by colleges when their financial situations worsen relative to the situations of the institutions with whom they compete for faculty. Specifically, it predicts that these institutions may (a) reduce the size of their faculty; (b) decrease the share of their faculty that are tenure stream; (c) reduce the share of professors that are full professors and increase the share that are assistants; (d) decrease average salaries of their faculty relative to the salaries at competing institutions; (e) increase salaries of assistant professors relative to associate and full professor salaries; or (f) differentiate salaries within rank to a greater or lesser extent. Public institutions may only engage in some of these strategies that lead to the various outcomes highlighted in this section, and empirical analysis can produce insight into which ones are most prevalent.

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[3] Of course, matching external offers could decrease salary differentiation if the outside offer is obtained by a faculty member whose salary trailed behind his/her counterparts within the institution. The discussion in the text is implicitly assuming that administrators are most likely to match outside offers for those faculty they deem most valuable and that faculty of this type are unlikely to have salaries below their counterparts. If that assumption is wrong, the predicted effects would change. These points relate to another potential driver of changes to the salary structure: attrition. If faculty members leave the institution, the salary structure will be altered in a way that depends upon the departing faculty member's location in the institutional salary distribution.

Data

        Our primary data set is an AACSB survey that contains faculty-level salary data for all full-time business school faculty within a large number of colleges and universities within the United States. For us to examine salary differences across faculty within individual institutions thoroughly, we require faculty-level data for a sizeable number of faculty members per institution. For us to examine salary differences across institutions thoroughly, we need data for faculty for a large set of institutions. For us to best examine changes over time, we need data for the same set of institutions across multiple years. To our knowledge, the AACSB survey is the only data source that meets these requirements.

        We focus on data from the 1998/99 to 2005/06 period for a simple reason: For the data made available by the AACSB, these were the years containing consistent reporting standards that allowed for valid comparisons over time. As the results will demonstrate, this period was long enough to reveal substantial changes in salary and employment structures. The period also contains general trends that allow our two types of comparisons to produce insight into the adjustments made by public institutions when their financial situations are poor in relative terms. Between 1998/99 and 2005/06, state appropriations per FTE student did not keep pace with inflation while the average annual total net returns of endowments was 5.9%.[4] In other words, the traditional source of funding for elite privates fared much better than the traditional source of funding for public institutions. The trends for state appropriations, however, were not uniform across states. Delaney and Doyle (2011) report results demonstrating substantial variation.

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[4] Endowment returns data were taken from the *2009 NACUBO-Commonfund Study of Endowments*. State appropriation trends were computed using information from the *Grapevine Summary of State Higher Education Tax Appropriations* and the *Digest of Education Statistics*. Our analysis suggests that between FY1999 and FY2006, state appropriations per FTE student fell by 13% when inflation adjustments were conducted using the Consumer Price Index (CPI) and by 21% when the Higher Education Price Index (HEPI) is used instead.

For most of our analysis, we simply report the figures for the 1998/99 and 2005/06 academics years and use the designations 1999 and 2006 to simplify. We did run analysis separately for individual years, but we were not able to identify interesting trends at this level during the period of study. The period did contain some variation in state appropriation funding as total state appropriations fell by 2.1% between FY2003 and FY2004 and only increased by 1.2% between FY2002 and FY2003. In all other years, total state appropriations increased by 4-7% (Palmer & Franklin, 2006).

When examining salaries, we restrict our analysis to full-time faculty with a rank of assistant, associate, or full professor who reside at research/doctoral and master's universities with 10 or more full-time business school faculty. Three hundred sixty-five institutions reported data for both 1999 and 2006, and they have around 18,000 faculty members in each year. Of these 365 institutions, 250 are public institutions and 115 are private institutions. Due to missing data and institutions with zero faculty for certain ranks, our sample size declines slightly when we examine salaries separately by faculty rank or when we include data on institutional finances. Although we do not include full-time instructors in much of our salary analysis, we do examine them when studying faculty employment levels.[5]

The AACSB data set contains only a small set of faculty-level variables, but the variables it does possess are important. It reports salary for each faculty member, and we transform all salaries into inflation-adjusted 2005-06 dollars using the Consumer Price Index (Commonfund, 2009). The AACSB survey also requires information on the rank, field, and gender of the faculty member. The discussion in the previous section noted the importance of making comparisons across rank and within rank, so the presence of that variable is vital.

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[5] We do not examine employment of part-time instructors because the AACSB survey does not capture detailed information on the number of part-time instructors that each institution employs.

In some analysis, we examine the influence of a number of institution-level variables on the size and compensation of an institution's faculty. Certain variables – such as the business degrees offered and business school accreditation status – were drawn from the AACSB survey. The institutional control, Carnegie classification, state appropriations, enrollment levels, and tuition and fees were taken from the Integrated Postsecondary Education Data System (IPEDS).[6] Data on business school rankings were taken from the *U.S. News & World Report's* America's Best Graduate Schools annual rankings.[7] The unionization status of an institution's faculty was determined using the *1998 Faculty Directory of Faculty Contracts and Bargaining Agents in Institutions of Higher Education*. Finally, state personal income per capita was derived using information from the Bureau of Economic Analysis and the U.S. Census Bureau.

Methods

By comparing means from different time periods, we can easily describe changes over time in the average salary and composition of faculty. More complicated analysis is required when we describe changes to the full distribution of faculty salaries. Our initial approach describes the salary structure using inequality indices that provide an overall description of the variation in salaries across faculty members. We found the results did not vary across the available indices, so we simply report the results for two indices with special properties.

We use the Thiel index because it is a member of a family of indices known as generalized entropy measures. These indices have a number of desirable properties, including

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[6] The state appropriations variable was divided by enrollment figures to create the variable state appropriations per student. The enrollment figures use a weighted formula whereby part-time students are treated as 1/3 full-time equivalent (FTE), undergraduates are 1.0 FTE, and graduate students are 2.0 FTE to reflect their different costs. This variable is missing for 10 public institutions, so regression analysis using state appropriations only examines 240 public institutions.

[7] We used data from the U.S. News ranking to create a variable entitled "ranked". This variable equals 1 if an institution's MBA program was ranked within the top 50 in any year during the period of study.

the ability to decompose overall inequality into between-group and within-group portions

(Cowell, 1995). For this study, between-group inequality refers to differences across higher

education institutions in their average salary. Within-group inequality refers to differences in

salaries across faculty members who reside at the same institution.

We also use the variance of log salary, because this index can measure the level of salary

inequality that remains after controls for various faculty-level characteristics are implemented.

To further explain, consider the following regression equation:

$$lnY_i = \beta_0 + \beta_1 R_i + \beta_2 F_i + \beta_3 G_i + e_i \qquad (1)$$

Y_i refers to the salary received, R_i refers to a set of dummy variables representing different

academic ranks, F_i refers to set of dummy variables representing different academic fields, and

G_i refers to a female dummy variable. After estimating regression coefficients, an e_i can be

computed for each faculty member using the following equation.

$$e_i = lnY_i - \hat{\beta}_0 - \hat{\beta}_1 R_i - \hat{\beta}_2 F_i - \hat{\beta}_3 G_i \qquad (2)$$

In this paper, we refer to e_i as the "log real salary regression residual." One can compute the

variance of log salary using this residual rather than the salary level. By comparing the variance

of log real salary with the variance of the log real salary regression residual, we can describe how

the variation in salaries is altered when controls for key faculty-level characteristics are added.

Overall inequality indices provide limited insight, because they do not describe

thoroughly the "shape" of changes to salary inequality. If inequality is increasing, is it due to

relative increases in the upper tail, relative decreases in the lower tail, or both? In either case, do

the disproportionate changes occur for a narrow portion of the tail or a wide portion? To address

this problem, we graph the full range of percentiles so we can see where in the distribution

changes occurred. The xth salary percentile equals a salary level that exceeds or is equal to the

amount received by approximately x percent of the faculty. The most commonly used percentile is the 50th percentile, which is referred to as the median. When percentiles are graphed, the wealth of information that exists within the data is more fully conveyed (Cleveland, 1993; 1994).

We employ percentile graphs separately for between-institution and within-institution comparisons. For the between-institution analysis, we compute the average salary for each institution, and then compute percentiles (1-99) using these institution-level observations. When examining changes over time for particular percentiles, we compare the Xth percentile in the initial year with the Xth percentile in the ending year. For within-institution percentile graphs, we compute percentiles (1-99) separately for each institution. In other words, we select the faculty employed by the first institution and then compute all 99 percentiles for that institution using just these observations. We then use the same method to compute percentiles for every other institution in our sample. The within-institution percentiles we report are the averages of these institution-specific percentiles. For example, the reported 50th percentile is the average median for the institutions in our sample.

Identical percentile graphs are computed using the "log real salary regression residual" defined in equation (2). These graphs describe variation in salaries within academic ranks, within fields, and within gender groups. By comparing the regression residual graphs with the basic salary graphs, one can better understand how salary differences across rank, field, and gender categories help shape the distribution of salaries.

We employ a different form of regression analysis when further examining differences between public and private institutions in their within-institution distribution of salaries. We estimate separate regressions for each of the 99 within-institution salary percentiles and graph the 99 coefficients that are produced by these regressions for the independent variable of primary

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interest. These 99 regressions are identical in terms of the independent variables and the sample

of institutions used; the only difference is the particular within-institution salary percentile that

serves as the dependent variable. The independent variable of primary interest is an indicator

variable for private control, and to allow for more meaningful comparisons of public and private

institutions, the following independent variables are also included: institutional control,

unionization, degree level, Carnegie classification, U.S. news ranking, and accreditation status.

To more directly examine how public higher education institutions adjust their salary

distribution in response to funding challenges, we also estimate difference and fixed effects

regressions. Our difference regressions are simply basic OLS regressions that employ variables

that measure changes between 1999 and 2006. Our fixed-effects regressions use data from all

years contained in the 1999-2006 period and estimate equation (3), which is essentially identical

to equation (4).

$$(Y_{it} - \bar{Y}_i) = \left(\sum_{k=1}^{4} \beta_k \left(X_{itk} - \bar{X}_{ik} \right) \right) + (\mu_{it} - \bar{\mu}_i) \qquad (3)$$

$$Y_{it} = \beta_0 + \left(\sum_{k=1}^{4} \beta_k X_{itk} \right) + \alpha_i + u_{it} \qquad (4)$$

In both types of regressions, the following independent variables are employed: state

appropriations per student, listed tuition and fees, weighted FTE enrollment, and state personal

income per capita. [8] The state appropriations measure is the independent variable of primary

interest for the purposes of these regressions. We estimate regressions for a variety of dependent

variables that measure different aspects of an institution's salary offerings and number of faculty.

Both the difference and fixed-effects regression solely use within-institution variation to

identify its results (Cheslock & Rios-Aguilar, 2011). The results reflect how individual

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[8] In additional specifications, we also included the change in the endowment assets per students, but the addition of
this variable did not alter the results for the state appropriation variable for the sample of institutions that reported
valid endowment information. Because endowment information was missing for a substantial number of
institutions, we do not include that variable in the specifications we report in this paper.

institutions adjust their salary structure and faculty size as state appropriation levels change over time. By going within, we implicitly add controls for all time-invariant characteristics of the higher education institutions in our sample.[9] Our fixed-effects and difference regressions differ in that the fixed-effects specifications will focus more on short-run relationships because they considers year-to-year changes in the included variables.

Results

For both public and private institutions, Table 1 reports the average salary for 1999 and the change in this figure between 1999 and 2006. The overall results show a substantial gap between public and private institutions in terms of 1999 salary and a slight increase in that gap over time. The gap is much larger for full professors than for assistants, and this pattern strengthened over the period. Salary compression by rank occurred within both sectors, but the disproportionate growth in assistant professor salaries was especially strong in the public sector.

Table 1 also reports results separately for institutions with MBA programs ranked in the top 50 at some point during the period of study and for non-ranked institutions. In 1999, average salaries and the salary gap between public and private institutions were substantially higher within ranked business schools. Within both the public and private sectors, salary growth between 1999 and 2006 was much larger at ranked institutions than at non-ranked institutions. Surprisingly, salary growth was greater at ranked public institutions than at ranked privates.

Figures for faculty size and composition are also reported in Table 1. In 1999, public institutions had a larger number of professors than private institutions, a larger share of faculty

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[9] One of the limitations of "going within" is that it does not control for all time-variant institutional characteristics, and the omission of controls for these variables could complicate the interpretation of our results. Unfortunately, the various research designs that could rule out such concerns are difficulty to apply to this study. Instrumental variables is likely the most promising approach, but Cheslock & Gianneschi (2008) found that the most plausible instruments were not effective predictors of state appropriations during the period of study used in this paper.

that were full professors, and a smaller share that were assistant professors. These differences

were mostly eliminated over the period of study, as the number of professors grew at privates

and fell at publics. More than half of the increase at privates was due to growth in the number of

full professors while at public institutions, growth only occurred among assistant professors.

The differential trends across sectors were especially strong for ranked universities. The number

of business school professors increased by 11 for ranked privates but fell by 4 for ranked publics.

These results help explain why ranked publics were able to match the high rates of salary growth

that occurred among ranked privates. When their funding base declined relative to ranked

privates, ranked public institutions chose to sacrifice faculty size rather than competitive salaries.

Table 1 also contains information on the number of full-time instructors at each

institution. Public institutions had larger numbers of these instructors at the beginning of the

period, and this gap grew over time. The increases were especially large at ranked publics. The

lower salaries paid to instructors allowed these institutions to increase salaries and maintain low

teaching loads for professors so they can remain competitive with research-focused privates. In

their interviews with business school deans at public research universities, Callie and Cheslock

(2008) found a number of deans who were intentionally restructuring their faculty with these

goals in mind.

The trends for average salary and faculty size are fairly easy to establish. The task

becomes more complicated when we seek to examine salary differences across business school

faculty. Table 2 provides an overview of how salary inequality changed over time for both

public and private institutions. As described in the earlier methods section, we report overall,

between-institution, and within-institution estimates of inequality. The Thiel Index results show

that for all three categories, salary inequality was increasing within both the public and private

sectors. The inequality growth was higher within the public sector, but the private sector still had higher inequality levels in 2006 because their initial levels were substantially larger. Most of the overall growth in salary inequality was driven by increasing between-institution salary inequality, which means that the gap between high-paying and low-paying institutions was increasing much more rapidly than the gaps between higher-paid and lower-paid faculty who reside at the same institutions.

The results in Table 2 for the variance of log salary allow us to examine how controls for particular faculty traits affect inequality trends. These trends are just slightly altered by field and gender controls but are fundamentally altered by controls for faculty rank. The growth in within-institution salary inequality rises from 11% to 37% for publics and from 6% to 31% for privates when controls for rank are added. These results suggest that salary compression across rank was obscuring large growth in within-rank salary inequality at many business schools.

The results in Table 2 only provide a general overview of how salary inequality is changing between institutions and within institutions. Figures 1 through 4 provide much more detailed descriptions by graphing salary percentiles and the changes in salary percentiles. Figures 1a and 1b demonstrate that for both the public and private sectors, average salary rises slowly across between-institution salary percentiles until it starts to increase quickly after the 80th percentile. The rise is especially strong within the private sector. So, the top 20% of business schools within each sector offer substantially higher salaries than other schools, and the top 20% of private institutions offer substantially higher salaries to their business faculty than the top 20% of public institutions.

Figure 1c reports the change in log real salary over the period of study. The results indicate that within both the public and private sectors, the salary advantage of the top 20% of

business schools grew in the early and mid-2000s. The gap between public and private

institutions within the top 20%, however, did not rise in general. Below the 70th percentile,

salary increases in the private sector were slightly higher than the increases in the public sector.

To allow for direct comparisons of within-institution inequality across sectors, Figure 2a

reports the difference between the public and private sectors for each within-institution salary

percentile. The public-private gap steadily rises after the 30th percentile, so the salary differences

across sectors are largest for the highest-paid faculty members at each business school. This

result is consistent with Table 1, which found the public-private gap to be much larger for full

professors (the highest-paid professors) than for assistant professors (the lowest-paid professors).

By graphing percentiles for residuals from regressions that control for faculty members'

rank, field, and gender, Figure 2b demonstrates that the public-private gap is no longer

concentrated in the upper percentiles once comparisons are made within rank.[10] There is a slight

uptick after the 90th percentile, but other than that, the largest gaps now occur within the bottom

half of the distribution. So, while the public-private gap is definitely largest for the highest-paid

ranks, the public-private gap does not appear to be substantially larger for the higher-paid faculty

members within each rank except for those receiving the highest 10% of salaries.

Figures 2c examines the change in log real salary for each within-institution percentile

for both the public and private sector. The results suggest the largest growth occurred between

the 20th and 60th percentiles, especially for the private sector. These findings are also consistent

with Table 1. Salary growth was highest for assistant professors and lowest for full professors,

so we should expect the lower middle part of the within-institution distribution to have the

largest growth.

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[10] For all of our analyses in which faculty-level controls were added, further examination demonstrated that almost all of the changes created by these controls are due to the inclusion of rank. If controls for field and gender are omitted, the results do not fundamentally change.

To examine how inequality changed within rank, Figure 2d graphs the regression residuals. Salary growth now steadily increases as we move along the range of within-institution salary percentiles. Business schools have been increasingly differentiating salaries within rank, and that differentiation occurred throughout the distribution. Strikingly, the patterns in the public and private sectors are almost identical in Figure 2d. On average, public and private business schools are found to be adjusting salaries in similar ways once controls are added to remove the influence of salary compression and changing faculty rank composition.

The public-private gap in salaries might change if we were to account for differences across sectors in the types of institutions contained. Log salary regressions with no institution-level controls find coefficients for a private dummy variable that equal 0.051 in 1999 and 0.069 in 2006. When controls are added for unionization, business degree offerings, Carnegie classification, U.S. News ranking, and business school accreditation status, the coefficients slightly rise to 0.062 and 0.080. To investigate how these controls alter the shape of the public-private gap in terms of the within-institution salary distribution, we ran regressions that estimated the public-private gap for each within-institution salary percentile with controls added for the above institutional characteristics. Separate regressions were estimated for each of the 99 percentiles, and the coefficients for the private dummy variable are reported in Figure 3a (for regressions in which log real salary percentile is the dependent variable) and Figure 3b (for regressions in which the log real salary regression residual is the dependent variable).

The shape of Figure 3a is roughly similar to that of Figure 2a.[11] The regression coefficients steadily increase after the 30th percentile with more rapid increases after the 70th

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[11] To ensure readability, we did not graph the confidence intervals in Figure 3. For almost every single percentile, the coefficient for the private dummy variable is statistically significant at conventional levels. The standard errors are below 0.03 in all regressions, and for over 90 of the 99 regressions, the standard errors are between 0.012 and 0.020.

percentile. In other words, the largest public-private gaps occur among the highest-paid professors within each institution. As in Figure 2b, these results are substantially changed when controls for rank, field, and gender are added, but in this case, the basic pattern somewhat remains. In Figure 3b, the smallest gaps occur in the bottom 30 percentiles while the largest gaps occur within the top 20 percentiles, but the magnitude of the differences across percentiles is much smaller than in Figure 3a.

Our analysis of within-institution and between-institution salary inequality can be combined to investigate whether within-institution salary inequality differs between high-paying and low-paying institutions within each sector. Figures 4a and 4b demonstrate that for both the public and private sector, salary inequality – as measured by the variance of log salary – increases with an institution's average salary. Starting around the 70th between-institution percentile, the level of salary inequality starts to rise steadily, so the 30 percent of institutions with the highest average salaries within each sector also have the highest levels of within-institution salary inequality.

Although figures 4a and 4b tell us that high-paying institutions have greater salary inequality, they do not tell us the form of this inequality. For each within-institution salary percentile, Figure 4c reports the differences between high-paying institutions (the 30% of institutions paying the highest average salaries within a sector) and low-paying institutions (the other 70% of institution in that sector) for 1999. The results clearly indicate that the higher salary inequality is a result of the gap between high-paying and low-paying institutions being especially large for the highest within-institution salary percentiles. Within both sectors, the gap starts to rise at the median institutional salary and steadily grows as we advance towards comparisons between the highest paid professors on each campus.

Figure 4d reports the change in the salary gap between high-paying and low-paying institutions over the period of study. For each within-institution salary percentile, the gap grew over time, which is consistent with the findings in Figure 1c that average salaries increased most at the top of the between-institution distribution. The growth was larger for public institutions throughout the figure, which provides further evidence that between-institution inequality is increasing faster within the public sector than within the private sector over this period. The change in the salary gap between high-paying and low-paying institutions was slightly larger for the higher within-institution salary percentiles, so the relationship presented in Figure 4c slightly strengthened over the period. For all results presented in Figure 4, the shape of the relationships remain when controls for rank, field, and gender are added, but the magnitude of the relationships is diminished.

To this point, the primary comparisons have been between public and private institutions. We turn now to analysis that essentially compares public institutions whose state appropriation trends are relatively positive with public institutions experiencing relatively negative trends. Table 3 contains the results for regressions that examine how changes in state appropriations per FTE student influence changes in a variety of dependent variables that measure different aspects of an institution's salary offerings and number of faculty. This table is structured differently than most regression tables in that the results are only presented for one independent variable (state appropriations) and each row contains a different dependent variable. The first column contains results for difference regressions that just use data from 1999 and 2006, while the remaining columns contain results for two types of fixed-effects regressions that use data from all years during the 1999-2006 period. The two fixed-effects regressions differ in that the latter includes a lagged value of state appropriations.

The results in Table 3 demonstrate a moderate positive relationship between state appropriations and average faculty salaries. The coefficients for lagged state appropriations are indistinguishable from zero, suggesting an instantaneous relationship between state appropriations and salaries. The difference regression results indicate that the salary effect might vary by faculty rank, but in the fixed-effects specifications, the results do not differ by rank.

State appropriations have a stronger effect on the number of professors employed. In addition, the lagged terms become positive and statistically significant when faculty size is examined, with the primary lagged effect coming through a relative increase in the number of full professors. The lagged relationship likely reflects full professors leaving institutions experiencing state funding declines. The process by which professors switch institutions is prolonged so a lagged, rather than an instantaneous, response should be expected.

The results for specific faculty ranks are worthy of discussion.[12] For full professors, the difference regression coefficient is more than four times as large as the fixed effects regression coefficient, while for assistant professors, the opposite occurs. The varying results for full professors likely reflect the timing considerations just discussed, as the difference regression is more likely to capture long-term relationships. The fixed effects results for assistant professors may reflect the hiring patterns of business schools that are facing difficult long-term trends. In the years during the period in which state funding is strongest, these schools may hire assistant professors to replace departed faculty.

The analysis of salaries in Table 3 only examines average levels. To investigate how state appropriations influence the shape of the within-institution salary distribution, we estimate separate regressions for each of the within-institution salary percentiles and graph the

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[12] We also ran analyses where the dependent variable is the number of full-time instructors. For all specifications, the state appropriations coefficients were not statistically significant and were very close to 0.

coefficients from these 99 regressions in Figure 5.[13] Figure 5a suggests that the effect of state appropriations generally grows as we move up the within-institution salary distribution, but the differences are mostly concentrated in narrow percentile bands. Furthermore, the effect of state appropriations does not seem to vary systematically by percentile when faculty–level controls are added (Figure 5b) or when the fixed-effects specification is used (Figures 5c and 5d).

Conclusion

Entering the 1998-99 academic year, the faculty salaries at public business schools were below those paid by private business schools. Over the next 7 years, the purchasing power of state appropriations per FTE student fell at public institutions on average while the traditional funding sources for private institutions fared better. Despite these trends, ranked publics were able to increase salaries at slightly higher rates than ranked privates while unranked publics were able to increase salaries at rates that were only a couple of percentage points below the increases at unranked privates.

These opposing trends suggest that other changes must have also occurred during the period. An institution with a worsening relative financial situation cannot match the salary increases instituted by their peers unless it makes additional adjustments that reduce expenses. We find that other changes did indeed occur. Public institutions – especially ranked publics and those experienced the worst state appropriations trends between 1999 and 2006 – decreased their number of overall professors and altered the composition of their faculty by increasing the

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[13] To ensure readability, we did not graph the confidence intervals in Figure 5. For most percentile regressions, the standard errors are similar to those reported for the mean regression in Table 3. For Figure 5a, the standard errors for percentiles 16-90 are within 0.01of the standard error reported in Table 3. The relevant ranges are roughly similar for Figure 5b (percentiles 15-92), Figure 5c (percentiles 30-97), and Figure 5d (percentiles 8-97). The standard errors grow when we move into the tails of the within-institution distribution, especially the lower tail.

number of assistant professors while decreasing the number of full professors. In contrast, private institutions – especially ranked privates – made the opposite changes.

Entering the period, the public sector had much lower levels of salary inequality than the private sector, but these differences narrowed as inequality increased more rapidly within the public sphere. Although the salary gap between the highest-paying institutions and other institutions grew over the period within both sectors, the growth was greater among publics. Within institutions, both salary compression across ranks and salary inequality within ranks increased over the period, with the greatest growth occurring at public institutions. Within-institution inequality was especially large at those institutions with the highest salaries, as the salary advantage at elite institutions was especially strong when comparisons are made between the highest paid professors at each institution.

While producing these findings, we exploited the multilevel structure of the data by examining changes in between-institution inequality, within-institution inequality, and their interaction. To limit data reduction – which can obscure important information contained within the data – we examined inequality by studying the full range of percentiles (Cleveland, 1993; 1994). Although multilevel analysis has flourished within educational research, the particular approach utilized in this paper has rarely been employed despite its ability to shed considerable insight into the phenomenon under study. This approach can improve our understanding in a number of research areas (e.g. student academic performance, student loan debt, faculty research productivity), and we hope our work will encourage greater use.

Our findings raise a number of important questions about the U.S higher education system that future research can address: How will public higher education systems change as institutions within the system diverge in areas such as faculty compensation? How will elite

public higher education institutions be altered by the extreme transformations that are needed for them to remain competitive with wealthy elite privates for faculty? At public institutions where salaries are public information, can salary compression/inversion and salary inequality within rank continue to increase without substantially harming faculty morale and collegiality, which could then harm faculty productivity? Can public institutions retain current assistant professors as they progress through their careers or will private institutions successfully recruit those who develop most successfully?

Future research should also further examine the research questions of this study. The use of AACSB data restricted our analysis to business school faculty, and as a result, we could not fully examine whether results vary across academic fields. One might expect the results to be similar for other professional fields such as law and medicine, but one might also expect the results to differ in fields where there is a surplus rather than a shortage of potential faculty or fields where the culture may be especially resistant to within-institution pay differentials.

The opportunities to examine these possibilities are heavily shaped by data availability. Overall results for faculty size, faculty composition, average total salary, and average total salary by rank can be produced using data from IPEDS and the American Association of University Professors (AAUP) faculty salary survey. Analysis of within-institution salary inequality, however, is less promising. IPEDS and the AAUP survey do not contain faculty-level data, and the NSOPF survey is limited by its sampling strategy and its discontinuation. Data warehouses maintained by state systems and individual institutions are the most promising option, but researchers may only be able to gain access to such data for a limited number of institutions.

This paper sought to estimate the effect of state appropriations on a public institution's salary structure and faculty size by using difference and fixed-effects regressions. Future

research could employ alternative research designs to examine whether results vary by the methodology employed. The range of available designs, however, may be limited. State appropriations cannot be experimentally assigned and are not distributed in a manner that would easily allow for the use of regression discontinuity models. Instrumental variables is likely the most promising approach. Although past research found that the most plausible instruments are not effective predictors of state appropriations during the time period used in the study, future research using longer time spans and novel instruments may prove more successful (Cheslock & Gianneschi, 2008).

Finally, research employing more fine-grained analysis would also be helpful. Faculty size and composition can be altered by faculty moving to another position, faculty retiring, faculty being newly hired, and faculty moving between ranks; research that distinguishes between these alternatives would provide valuable insights. Research that considers the quality of individual faculty members, which could speak to the implications of faculty moving across institutions, would also be helpful. These types of studies would likely require data from state system or institutional data warehouses.

In all of these research areas, substantial data improvements are needed for knowledge to advance. This paper employed a rarely-used data set and methods that exploit the unique strengths of the data to produce new insights into how public institutions are adjusting their salary structure and faculty compensation in response to funding challenges. We hope future research builds upon our work by introducing other data sets that can produce novel findings.

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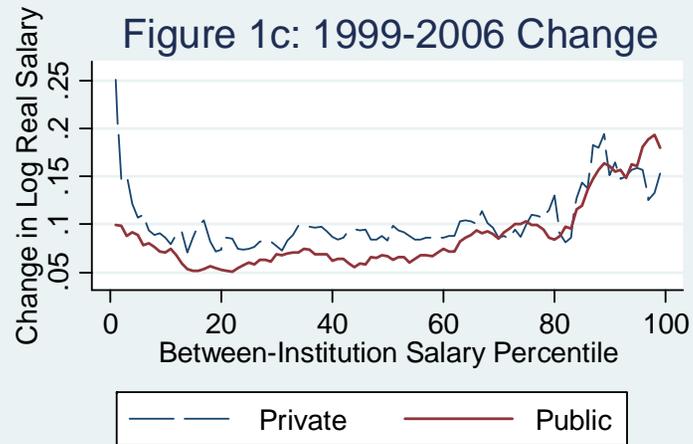
Figure 1: Between-Institution Inequality

Figure 1a: 1999
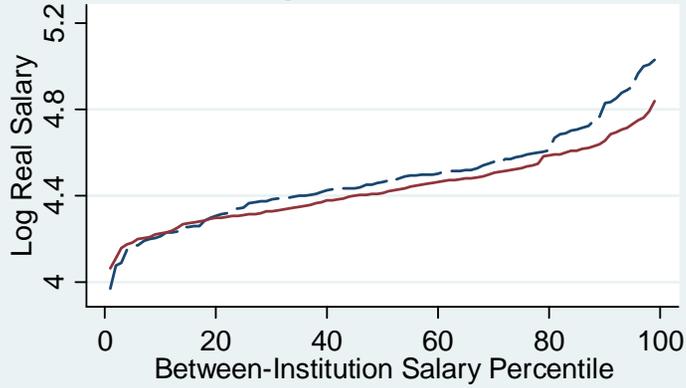
Figure 1b: 2006
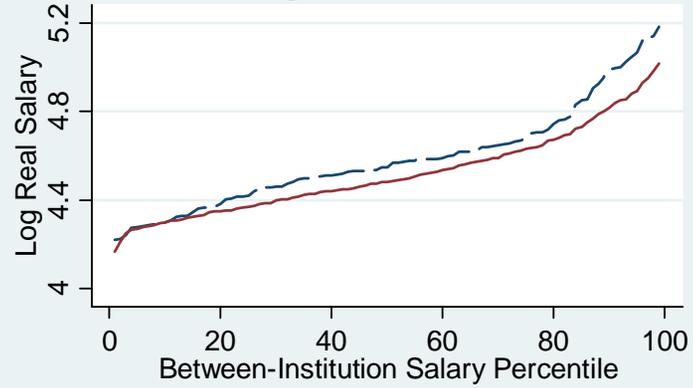
Figure 1c: 1999-2006 Change

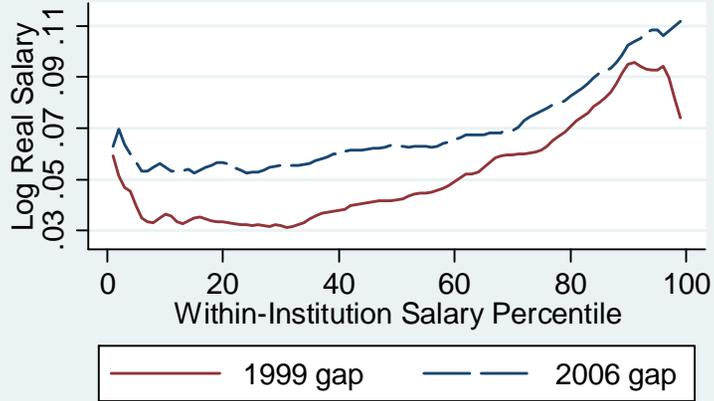# Figure 2: Within-Institution Inequality

Figure 2a: Public-Private Gap

Log Real Salary

Within-Institution Salary Percentile

1999 gap — — 2006 gap

Figure 2b: Public-Private Gap (w/ controls)

Log Real Salary Regression Residuals

Within-Institution Salary Percentile

1999 gap — — 2006 gap
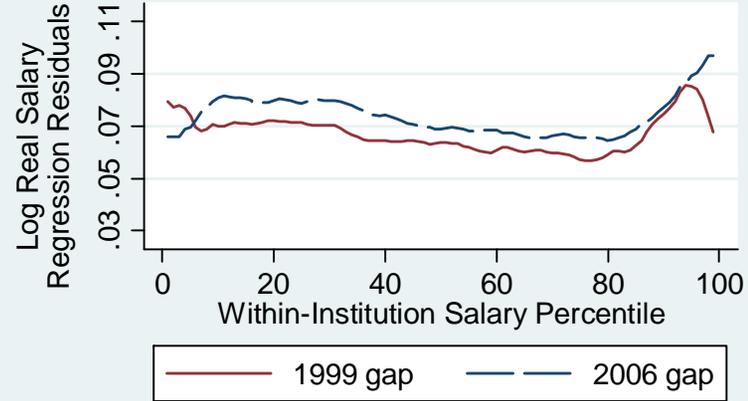
Figure 2c: 1999-2006 Change

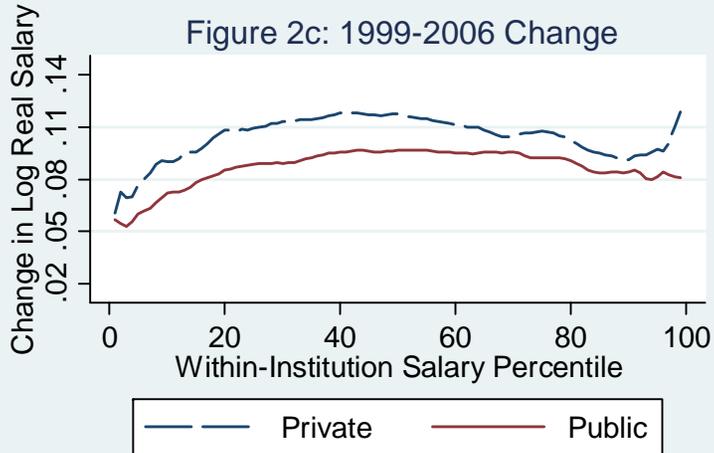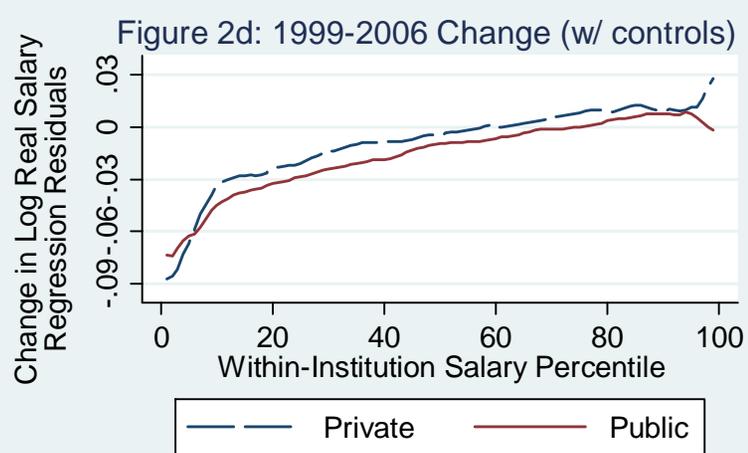

Change in Log Real Salary

Within-Institution Salary Percentile

— — Private — Public

Figure 2d: 1999-2006 Change (w/ controls)

Change in Log Real Salary Regression Residuals

Within-Institution Salary Percentile

— — Private — Public

34

Figure 3: Regression Coefficients - Private Dummy Variable

Figure 3a: No Faculty-Level Controls   Figure 3b: With Faculty-Level Controls
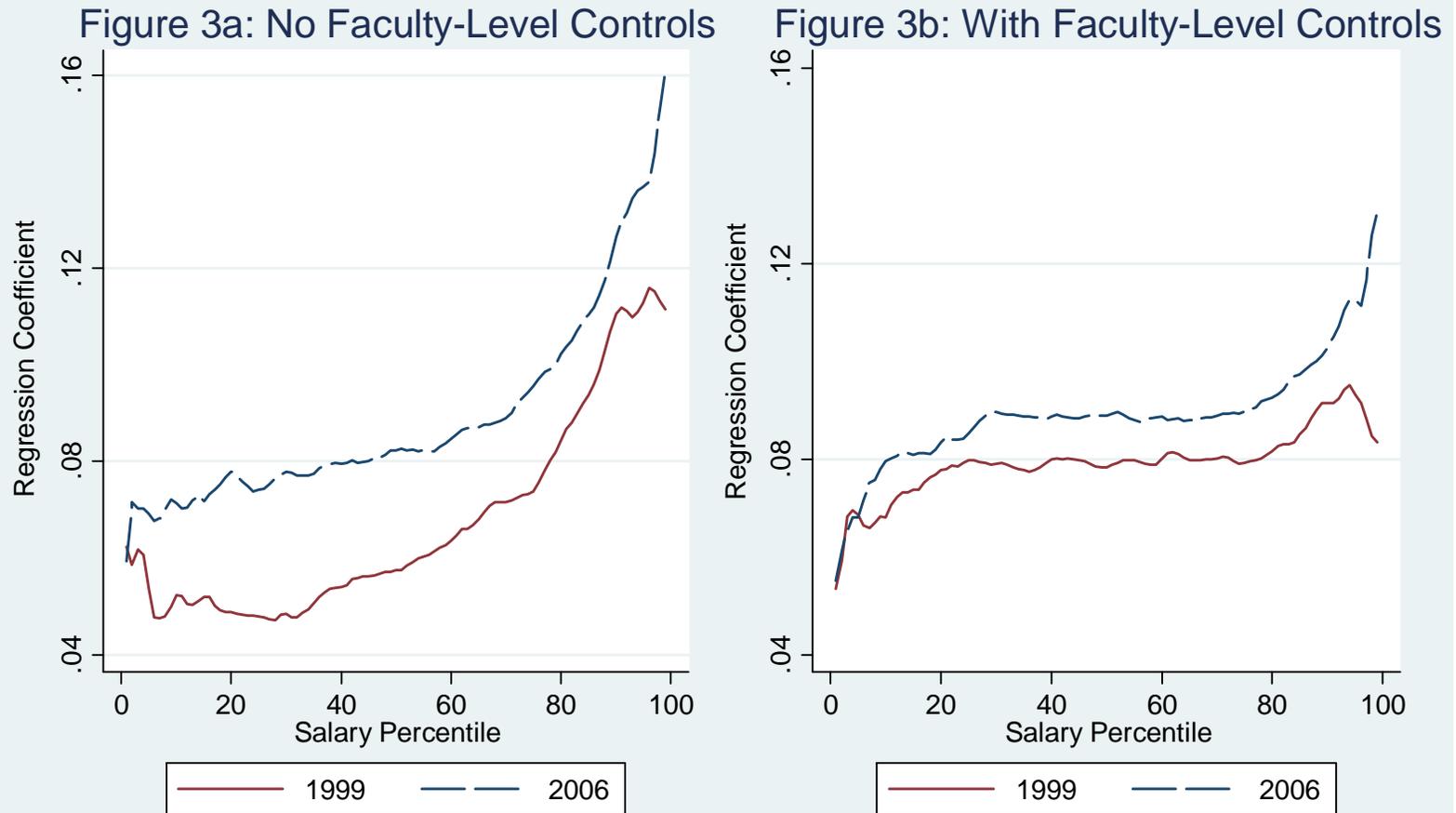
Note: Regression coefficients are taken from cross-section regressions where the dependent variable is log real salary percentile and the independent variables include indicators for institutional control, unionization, degree level, Carnegie classification, U.S. News ranking, and accreditation status. Individual regressions are run for each of the 99 percentiles.

Figure 4: Between- and Within-Institution Inequality Intersection

Figure 4a: Public Institutions, 1999

kernel = epanechnikov, degree = 1, bandwidth = 4.93

Figure 4b: Private Institutions, 1999

kernel = epanechnikov, degree = 1, bandwidth = 6.29

Figure 4c: High-Pay vs. Low-Pay Gap, 1999

Figure 4d: Change in Gap, 1999-2006
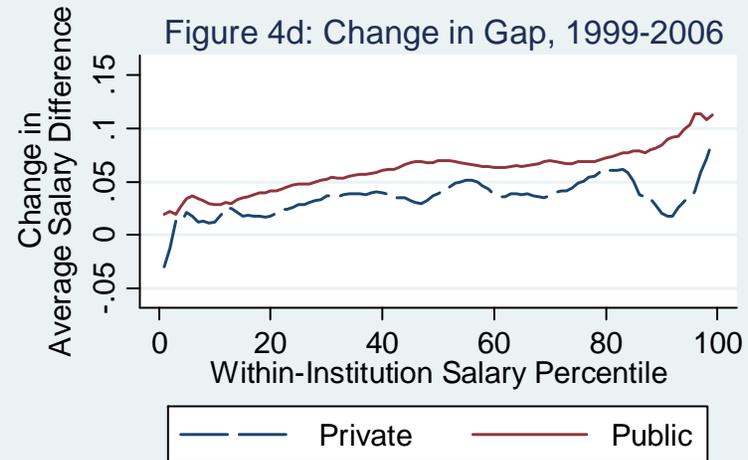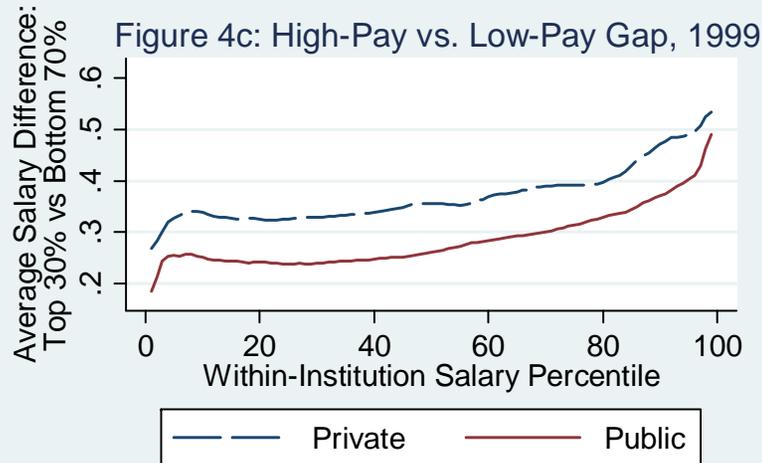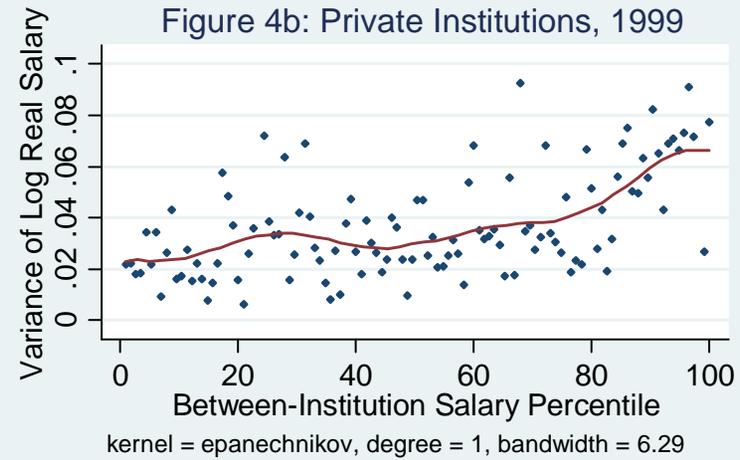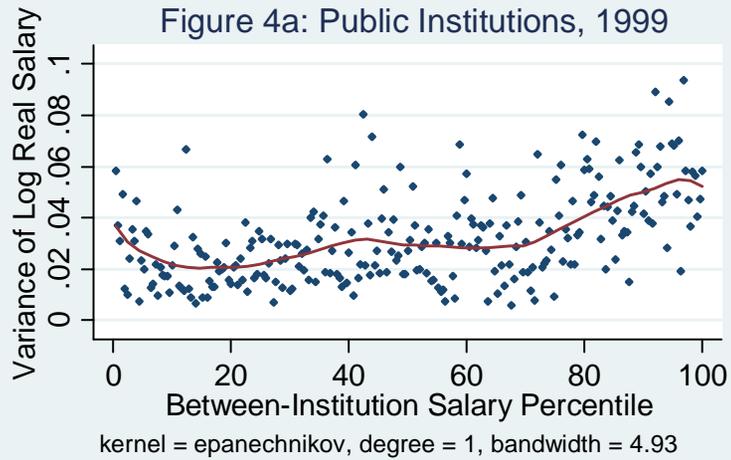
Figure 5: Regression Coefficients - State Appropriations

Figure 5a: Difference Regression
No Faculty-Level Controls

Figure 5b: Difference Regression
With Faculty-Level Controls

Figure 5c: Fixed-Effects Regression
No Faculty-Level Controls

Figure 5d: Fixed-Effects Regression
With Faculty-Level Controls
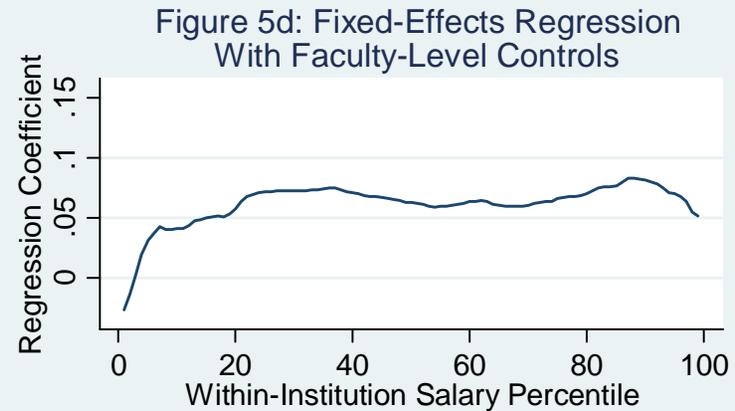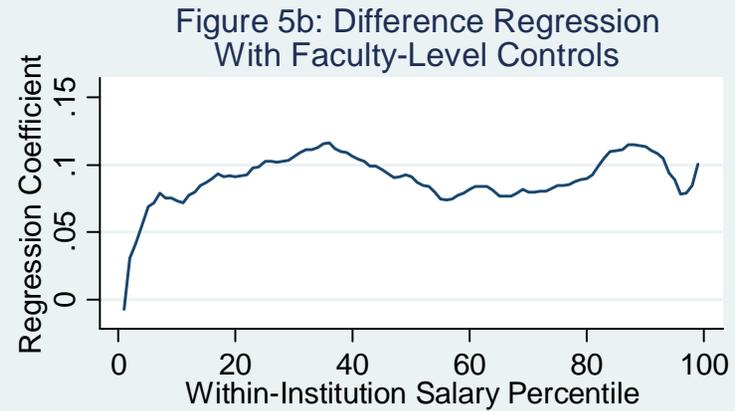
Note: Regression coefficients are taken from regressions where the dependent variable is log real salary percentile and the independent variables are log state appropriations per student, log tuition and fees, log weighted FTE enrollment, and log state personal income per capita. Individual regressions are run for each of the 99 percentiles

Table 1: Average Faculty Salary (in $1,000s) and Faculty Size by Rank

	Public Institutions			Private Institutions		
	All	Ranked: 99-06		All	Ranked: 99-06	
		Yes	No		Yes	No
1999 Salary						
Full Professor	$98.3	$132.8	$94.1	$110.2	$157.1	$98.0
Associate Professor	$81.7	$102.0	$79.2	$87.6	$114.9	$80.5
Assistant Professor	$74.6	$97.7	$71.8	$78.7	$104.6	$72.0
All Professors	$86.6	$115.5	$83.0	$92.9	$127.9	$83.7
1999-2006 Percentage Change in Salary						
Full Professor	8.3%	17.0%	6.8%	9.3%	12.1%	8.1%
Associate Professor	9.4%	19.3%	7.9%	11.6%	16.3%	9.8%
Assistant Professor	15.9%	21.9%	14.9%	15.4%	17.2%	14.7%
All Professors	10.0%	18.6%	8.5%	11.7%	15.2%	10.4%
1999 Number of Faculty						
Full Professor	22.1	41.4	19.7	16.4	28.7	13.1
Associate Professor	18.0	24.7	17.2	17.4	18.3	17.1
Assistant Professor	12.9	21.3	11.8	13.5	23.5	10.8
All Professors	53.0	87.4	48.8	47.2	70.5	41.1
Full-Time Instructors	5.3	6.4	5.2	3.3	3.3	3.3
All Full-Time Faculty	58.3	93.9	53.9	50.5	73.7	44.4
1999-2006 Change in Number of Faculty						
Full Professor	-1.4	-2.1	-1.3	2.6	5.4	1.8
Associate Professor	-2.5	-4.8	-2.2	0.6	3.8	-0.2
Assistant Professor	2.1	2.7	2.0	1.0	1.6	0.9
All Professors	-1.8	-4.1	-1.5	4.2	10.8	2.5
Full-Time Instructors	3.6	7.4	3.1	1.7	2.3	1.6
All Full-Time Faculty	1.8	3.3	1.6	5.9	13.2	4.1
# of Observations	247	27	220	111	23	88

Table 2: Measures of Overall, Between-Institution, and Within-Institution Inequality, FY1999-FY2006

	Overall			Between-Institution			Within-Institution		
	1999	2006	Change	1999	2006	Change	1999	2006	Change
Public Institutions									
Thiel Index									
Overall	0.0340	0.0449	32.1%	0.0149	0.0216	45.1%	0.0155	0.0164	6.2%
Between Share	0.0147	0.0232	57.3%						
Within Share	0.0192	0.0217	12.8%						
Variance (Log Salary)									
No controls	0.0629	0.0843	33.9%	0.0274	0.0378	38.2%	0.0318	0.0354	11.4%
Controls: Rank	0.0491	0.0743	51.3%	0.0259	0.0369	42.7%	0.0206	0.0282	36.8%
Controls: Field	0.0584	0.0766	31.2%	0.0249	0.0332	33.3%	0.0300	0.0330	10.0%
Controls: Gender	0.0613	0.0831	35.7%	0.0267	0.0371	39.3%	0.0309	0.0352	13.7%
Controls: All three	0.0436	0.0655	50.3%	0.0232	0.0320	38.4%	0.0178	0.0250	40.7%
# of Observations	13,192	12,751		250	250		250	250	
Private Institutions									
Thiel Index									
Overall	0.0516	0.0594	15.2%	0.0277	0.0325	17.1%	0.0189	0.0196	3.3%
Between Share	0.0274	0.0325	18.3%						
Within Share	0.0241	0.0269	11.5%						
Variance (Log Salary)									
No controls	0.0926	0.1069	15.5%	0.0490	0.0551	12.4%	0.0382	0.0406	6.4%
Controls: Rank	0.0699	0.0896	28.2%	0.0446	0.0519	16.3%	0.0225	0.0295	31.2%
Controls: Field	0.0864	0.0986	14.2%	0.0453	0.0498	9.9%	0.0364	0.0384	5.6%
Controls: Gender	0.0899	0.1050	16.8%	0.0477	0.0540	13.3%	0.0372	0.0400	7.5%
Controls: All three	0.0628	0.0811	29.1%	0.0407	0.0466	14.4%	0.0200	0.0269	34.9%
# of Observations	5,307	5,778		115	115		115	115	

Table 3: The Effect of State Appropriations on Salary and Faculty Size

Dependent Variable	Difference	Fixed Effects	Fixed Effects	
			Same Yr	Lag
Log Real Salary	0.105*	0.058**	0.060**	-0.002
	(0.041)	(0.011)	(0.013)	(0.013)
Log Real Salary	0.090*	0.062**	0.062**	0.000
(with controls)	(0.037)	(0.011)	(0.012)	(0.012)
Log Real Full Salary	0.068	0.054**	0.053**	0.000
	(0.044)	(0.013)	(0.015)	(0.015)
Log Real Associate Salary	0.115*	0.065**	0.067**	0.002
	(0.045)	(0.013)	(0.015)	(0.015)
Log Real Assistant Salary	0.002	0.054**	0.063**	-0.016
	(0.051)	(0.017)	(0.019)	(0.020)
Log Total Professors	0.393**	0.156**	0.121**	0.081*
	(0.099)	(0.033)	(0.038)	(0.039)
Log Full Professors	0.673**	0.145*	0.080	0.161*
	(0.198)	(0.066)	(0.076)	(0.078)
Log Associate Professors	0.448*	0.140*	0.168*	-0.051
	(0.203)	(0.066)	(0.076)	(0.078)
Log Assistant Professors	0.050	0.222*	0.149	0.119
	(0.269)	(0.086)	(0.100)	(0.102)
# of Observations	237	2295	2288	

Notes: *(**) denotes statistical significance at the 5%(1%) level. Difference regressions just include data from 1999 and 2006 while fixed-effects regressions include data from all years contained within the 1999-2006 period. The dependent variable for each regression is listed in the row title. The reported coefficient and standard error are for the included independent variable of primary interest: log state appropriations per FTE student. All regressions also included the following independent variables: log tuition and fees, log weighted FTE enrollment, and log state personal income per capita.