Purpose of Study:

- Describe process of ensuring equitable and competitive faculty salary compensation at a typical public state university in the United States
Goals of a Faculty Compensation System

- Attract and retain the most qualified faculty
- Equitable pay within the institution
- Competitive pay vis-à-vis other institutions
- Affordable and cost effective
- Legally defensible
- Appropriate for the variety of academic and administrative faculty appointments

Equity in Faculty Compensation

- Equal Pay Act (EPA) of 1963 to protect against gender-based discrimination, requiring “equal pay for equal work”
- Title VII of Civil Rights Act of 1964 (and 1972 amendment) to protect, either in form or practice, against discrimination on basis of gender, race/ethnicity, national origin, or religion

But,

- EPA allows for “affirmative defenses” if based on merit, seniority, quantity/quality, or systematically applied factors other than gender (e.g., market)
Challenges in Faculty Compensation

- Promote excellence through performance-based compensation instead of automatic salary increases based on “entitlement” mentality
- Encourage competency-based salary, which focuses on individual capabilities and recognizes that people
  - assume responsibility for their own success
  - advance based on their aspirations and demonstrated performance
  - move to higher salaries based on skill development, not due to ‘job changing’
  i.e., individual capabilities and development determine career progression

Challenges in Faculty Compensation

- Differentiate between merit pay for past performance and competency-based pay for future skills/capabilities development
- Devise a compensation model that
  - Faculty trust in (buy-in aspect)
  - Properly accounts for key factors associated with compensation level
    - E.g., measures productivity/performance/merit in acceptable way (internal validity), properly ‘matches’ position to market salary (external validity)
  - Is understandable and transparent (parsimonious and accessible)
  - Is fundable by the institution (within limits of available resources)
Recent Litigation on Salary Equity

- “Substantial equivalency”
  - Female gender bias can be based on reference to ‘male comparator’ in another, comparable discipline/position (Lavin-McEleney v. Marist College, 1989)
- Market force
  - Supply and demand consideration for certain faculty may override perceived discrimination (Farmer v. U. of Nevada, 1997/98; Donnelly v. Rhode Island BoG for HE, 1996/97)
- Merit/performance pay
  - Discrimination may result from merit determination based on opaque decision-making process at administrative level (Kovacevich v. Kent State U., 1997)
- Reverse discrimination
  - Salary adjustments for women and/or ethnic minorities must not result in reverse salary imbalance and must not exclude relevant pay factors (Rudebusch v. Hughes, 2004)

Salary Equity Studies at the UNR

- First approved by the Board of Regents in 1985
- Conducted in 3-5 year intervals, now likely on annual basis
- Two committees, representing diverse units, to oversee studies for academic and administrative faculty
- Committee recommendations discussed with VPs and Deans, forwarded to Provost and President for review
- Identification of inequities via statistical models for both academic (teaching/research) and administrative faculty
  - Original models developed by outside consultant
  - Current models developed by Institutional Analysis Office
- Salary adjustments are based on
  - Results from statistical models
  - Discretionary input of supervisor, VP, Dean, and Provost
  - Available funds as set by University Planning Committee
Informed by human capital theory (economics), faculty salary is a function of factors that contribute to productivity, e.g., educational attainment, academic experience, research output, etc. To simultaneously account for multiple factor (variable) effects on salary, some form of multiple regression is typically used to calculate a predicted salary, including models based on:

- total population of faculty with actual salary as dependent variable
- total population of faculty with natural logarithm (ln) salary as dependent variable (proportional measure)
- Caucasian male faculty only with actual or n-log salary; model coefficients applied separately to all other faculty

Difference in predicted vs. actual salary is the starting point in determining possible inequities.

Variables Examined in the UNR Models

**Academic faculty**
- Gender
- Age
- Ethnicity/race
- Current rank
- Entry rank
- Highest degree
- Appointment type
- Years at institution
- Years in current rank
- Years with tenure
- Years with doctorate
- Academic discipline
- Average performance rating
- Market factor
- Actual contract salary (DV)

**Administrative faculty**
- Gender
- Age
- Ethnicity/race
- Years in current range (rank)
- Average performance rating
- Market factor
- Actual contract salary (DV)

Rank and promotion-related variables ought to be included, and possible inequities associated with rank and promotion decisions should be separately tested.
Data Sources and Validation

Sources:
- Human Resources Office (HR), all variables except as below
- Oklahoma State University Faculty Salary Survey
  - market factor by discipline/rank for academic faculty
- College and University Professional Association (CUPA)
  - market factor for administrative faculty

Validation:
- Data screened by faculty member and HR
- Market factor is based on average salaries by academic discipline and rank at comparable institutions (49 land-grant universities), expressed as ratio to actual UNR salary
- Market factor for administrators is based on matched CUPA positions (average from 49 land-grant universities)
- Academic disciplines are grouped into ten clusters (à la Biglan’s taxonomy) to maximize variable homogeneity
- Performance rating is based on average job evaluation score from past 3 to 5 years
- Data are limited to regular faculty (excluding adjunct/temporary faculty) with at least 3 years of service (Acad. N=581; Admin. N=561)
- All academic faculty salaries adjusted to 9-month contract amounts

Statistical Method and Results

Data reliability confirmed via:
- Collinearity diagnostics (VIF, condition index, variance decomposition) [Results: VIF < 10]
- Outlier and residual analysis (e.g., Cook’s D, scatter diagram)

Three-step process:
1. Canonical correlation to identify general bias
2. Discriminant analysis to check for bias in academic rank or tenure
3. Multiple linear regression to generate a predicted salary after removing age, gender, ethnicity/race variables (based on statistical non-significance, i.e., $R^2$, F-statistic, $\alpha = .05$.)

Model results:
- Six misclassifications on rank (with 2 potential adjustments), 11 misclassifications on tenure (with 4 potential adjustments)
- Both academic and administrative faculty models explain about 80 percent of variation in salary ($R^2 = .80$ and .78, respectively)
Relative Importance of Variables

-0.15
-0.1
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3

Beta Weights (SE)*

Prof Assoc Instr
Ten-tra
Non
-TT
3-Y Cntr
Ma
硕士’s
Bac
其他
Yrs w/ ten
Yrs w/ doc
Prof
Assoc
As
Assist
Perform
Ma
硕士’s
Bac

Rank/contract     Education               Entry/yrs in rank
Experience

'Senior status’ Job evaluation rating

*Reference position: Asst. Prof, tenured, doctoral degree, hired as Asst.Prof., years as Instructor

Relative Importance of Academic Field
(vis-à-vis Humanities)

-0.08
-0.06
-0.04
-0.02
0
0.02
0.04
0.06
0.08
0.1

Beta Weights (SE)

Engineering
Math/Science
Business
Natural Sci
Pre/Professional
Fine Arts
Social Sci
Health Sci
Education

Determination of Salary Adjustment

- Criteria used:
  - An actual salary that is 90 percent or less than the predicted salary indicates a potential need for adjustment
  - Base salary of adjusted faculty would be raised to 90 percent of the predicted amount (i.e., predicted salary*0.9 – actual salary)
  - Discretionary judgment by supervisor(s) in cases of substantial difference between actual and predicted salary, low performance, or special circumstances
  - Available funds as determined by the University Planning Committee

- If adjustment is not fundable at 100 percent due to insufficient resources, additional criteria may be applied:
  - Market salary must be higher than contract base salary
  - Person must have minimum average job performance rating of ‘commendable’
  - Adjustment may be the smallest amount among the following
    - Difference between actual salary and 90 percent of predicted salary
    - Difference between actual salary and market salary
    - Ten percent of actual salary (i.e., no larger than promotion amount)

Issues to Consider

- Salary compression associated with newly hired faculty
- Relative value of teaching vs. research
- Attracting quality, diverse faculty
- Ensuring fair, transparent performance-based pay for meritorious faculty
  - Allocation of funds for meritorious performance among university units
  - Flat amounts vs. percentage-derived amounts
  - Plutocracy vs. meritocracy: Skewed at top or balanced across all levels
- Applying proper ‘position-matching’ to determine market salary
- Analysis of executive administration and faculty in athletic programs, medical school, and research faculty paid through outside grants and contracts
- Limited resources to fully fund salary adjustments
- Improvement of statistical models
Salary Compression and Inversion

- **Compression**: Compensation level of newly hired faculty approximates that of more senior, higher-ranked faculty
- **Inversion**: Compensation of junior faculty exceeds that of senior faculty in terms of experience and/or qualifications
- **Problem is likely overstated** due to lack of solid analyses. Only some fields may be affected (e.g., Business, Economics; Barbezat, 2005)

**Statistical identification**:
- Comparing average salaries of junior vs. senior faculty via gap or ratio indicators over time, or rank-order correlation
- *A more accurate approach*: Comparing actual vs. predicted salary (residual analysis) via multiple regression while controlling for relevant promotion-related factors
- *The challenge*: Which factors to include/exclude, how to measure each, and whether to exclude performance-based pay increments or control for faculty productivity (e.g., number of local promotions, tenure status, inclusion/exclusion of performance pay from base salary, annual cost-of-living increases)
- *UNR approach*: Estimate multiple regression model for faculty hired 3 or more years ago, run results on recently hired faculty, and determine if systematic compression/inversion exists via residual analysis (t-test), institution-wide or within disciplines/departments

Other Issues to Consider

- **Relative value of teaching vs. research**
  - Performance indicator in salary determination that judiciously measures teaching, research, and service contribution
  - E.g., do women spend more time on teaching, men on research? (Toutkoushian, 1999)
  - Research continues to be more positively related to faculty compensation than teaching (Fairweather, 2005)
  - Consider development of productivity scale for peer-review rating rather than counts of publications, student evaluations etc.

- **Personal vs. family/marital characteristics**
  - How do parental, marital status and employment status of spouse impact career progress? (Perna, 2005)

- **Access to resources**
  - Institutional research funds, lab space and equipment quality
Salary Model for Administrators: Areas for Improvement

- Age as proxy for professional experience is imprecise
- Range* is too broad a taxonomy to render homogeneity for statistical analysis
- Too much weight on market salary?
- Difficulty in matching entry and mid-level positions to determine market salary

*Range is based on average salary for comparable positions at other 49 land-grant universities, extended up or down by 25 percent of average, adjusted for inflation. Placement within range is based on eight weighted job-related factors.

Compensation Analysis Elsewhere*

- U. of California-Irvine: Excludes productivity and rank-related information (e.g., hired/current rank, years in rank)
- U. of California-Davis: Excludes productivity and years in rank information
- New York University: Excludes productivity information, uses bivariate approach to examine promotion in rank across gender
- U. of Illinois-UC: Excludes productivity information
- U. of Illinois-Chicago: Excludes productivity information
- U. of Michigan: Excludes productivity information; to be included in future
- Washington U. (St. Louis): Included productivity information in 2000 pilot study for three social science departments
- Emory University: Excludes productivity information
- North Carolina State U.: Excludes productivity information and academic discipline
- Only one institution among the above used a market factor to measure external equity

* Sources available with the author
Model Specification Is Key to Good Compensation Analysis

- Thorough analysis starts with controlling for variables that are correlated with compensation, including
  - Rank and tenure status
  - Experience, both before and since hire date
  - Productivity and/or quality in teaching, research, service (weighted based on institutional mission)
  - Academic discipline
  - Market influence, if external equity and competitive compensation are important
  - Significant interaction effects among selected variables
- Controlling for such variables improves model explanation (see, e.g., Toutkoushian and Martin-Conley, 2005)
- Gender, ethnicity/race, and age variables to be dropped after testing for inequities associated with rank/tenure status via
  - Multi-step analysis (e.g., canonical correlation, discriminant/logit analysis, Cox regression, Kaplan-Meier survival analysis)

Steps to Improve Compensation Analysis

- Data quality
  - Use comparable peer-institution data for market factor (external equity)
  - Ensure accurate position-matching to establish ‘market factor’ for administrative personnel
  - Establish accurate base salaries for faculty with administrative duties
- Statistical model
  - Test for salary compression/inversion using ‘senior faculty model’ on newly hired faculty (Toutkoushian, 1998)
  - Test for systematic inequities in promotion (tenure, rank) associated with age, gender, ethnicity/race prior to running final model without these factors (as they should not determine salary)
  - Include rank, discipline, experience (years in rank/at institution) productivity/quality measure(s), and market factor (if concerned with external equity)
  - Test for ‘time-to-promotion’ bias using survival analysis (Cox regression, Kaplan-Meier)
  - Test for significant interaction effects for other potential systematic biases
  - Run model with N-log transformation of actual salary (semi-log model) and squared predictors (e.g., age, years in rank) to test for curve-linear effects
  - Conduct thorough exploratory analysis of data (e.g., outliers), regression diagnostics (multicollinearity), and model fit analysis
Words of Caution

- No model explains anything in a causal way
- Statistical models identify *systematic* issues, not *individual* problems in compensation
- Compensation models should reflect institutional mission, e.g.
  - relative importance of teaching vs. research
  - Internal vs. external equity

Selected References


