

THE ECONOMIC AND INSTITUTIONAL DETERMINANTS
OF FACULTY SALARIES
AT MONTANA STATE UNIVERSITY

by

Celia Ahrens Allard

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APPROVAL

of a thesis submitted by

Celia Ahrens Allard

This thesis has been read by each member of the thesis committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

7/30/85
Date

Robert Taylor
Chairperson, Graduate Committee

Approved for the Major Department

8/1/85
Date

Myron Watt
Head, Major Department

Approved for the College of Graduate Studies

Date

Graduate Dean

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ABSTRACT

Salary differentials are characteristic of faculty salaries in universities lacking rigid pay scales, and are attributable to a wide variety of factors. Economic theories of wage determination reveal that supply and demand, wage expectations, marginal productivity, and human capital are important salary determinants. Literature describing institutional organization suggests that funding, administrative rules and customs, and departmental power affect a university's decision-making processes, including salary determination. Federal antidiscrimination legislation and the lawsuits filed in response show that demographic factors may also influence salaries.

Faculty at MSU tend to explain this year's salary as a function of last year's salary and the legislative allocation for raises, with some consideration given to university priorities and faculty performance. This thesis undertook to investigate that perception, drawing upon evidence from literature and past salary studies to construct a cross section time series model that would test possible reasons for salary differentiation. Factors were included at both department and individual levels. Some factors were explicit in MSU salary policies, while others arose through the informal arrangements that tend to evolve in universities. Data for a five-year period permitted evaluation of these effects over time.

Regression analysis confirmed the faculty perception and also indicated that some of the informal salary determinants explained more variation in salary than some of the formal ones. The informal determinants included two department-level variables, one indicating an active doctoral program to represent a department's proximity to MSU's land grant mission, and another indicating growth in number of majors to represent pressure to hire and retain faculty in high-demand areas. Both variables served as crude proxies for institutional priorities, and both were statistically significant, although not strongly so. An informal determinant at the individual level indicating promotion to a higher rank was also significant.

By contrast, the human capital variables did not suggest strong salary differentiation based on education and experience. Of the departmental merit variables, only the one indicating high research productivity was positive and significant. Because of weaknesses in the available data the results are not conclusive, but they are suggestive enough to warrant further investigation.

CHAPTER 1

THE PROBLEM OF FACULTY SALARY ANALYSIS

The Functions of Salaries and Wages

Salaries and wages play a number of vital roles in our society. First and foremost, they represent a crucial link in the economic cycle of production and consumption, for they are the means by which the profits of business are distributed to individuals. Workers use their money either to purchase goods and services or to invest, thus returning the money to business as income or investment capital (Hirshleifer, 1980, pp. 17-19).

Salaries and wages have a social role in addition to their economic one, however. The amount of money a worker receives in payment for labor services to a great extent delineates that individual's livelihood by setting bounds on the quantity and quality of goods and services or investments that he or she can afford. These consumption boundaries are an important factor in defining an individual's social status. Occupation and salary are major determinants of prestige in our society (Tumin, 1967, pp. 31-38), defining not only the pecking order within an organization, but to some extent that of society as well. In fact, the Marxist view is that salary and wage differentials fragment the workforce, subverting the formation of class consciousness and thus preventing workers from overthrowing their capitalist oppressors (Bowles and Gintis, 1975, pp. 76-77).

Since salaries and wages have important social and economic dimensions, it is not surprising that both economic and social factors determine the allocation of salaries and wages. Wage determination is a complex process in the business world—an economic problem involving money as well as a social problem involving people. It is a phenomenon which also generates academic interest, and aspects of the problem have been studied in many fields: Economists, psychologists, sociologists, public administrators, educators, and business professionals have all contributed to the literature on wage determination.

Literature on the subject reveals factors that influence salary at two levels: the individual and the institution. Some factors operate strictly at one level, such as an individual's years of experience or an organization's budgetary process, while other factors can be influential at both levels, such as market forces or productivity. Economics has developed the fundamental theories of wage determination, but can ill afford to ignore ideas from other fields pertinent to the process, particularly when wage determination in a specific sector of the economy is under scrutiny. A sector-specific model of wage determination, such as the faculty salary analysis proposed in this thesis, needs both the economic and social components represented by individual and institutional factors to encompass the complexity of the process.

The Incentives to Examine Faculty Salaries

Faculty salary comparisons are presumably as old as faculty compensation. Faculty salary analyses involving conceptual models and advanced statistical techniques are a relatively recent phenomenon,

however. Most of the incentives to perform complex analyses and the means to do so have developed over the last two decades. The introduction and rapid spread of computers and statistical software packages provided the means, and much of the incentive arose through efforts to either document or disprove the existence of salary discrimination in universities, both before and after the Educational Amendments Act of 1972. A decline in real incomes for faculty over the last decade (Hansen, 1984, p. 3), uneven salary increases across disciplines (Prokasy, 1984, p. 80), general tightening of budgets in a retrenchment environment (Cooke, 1979, pp. vii-viii), and increasing demands for accountability in public universities provide continuing incentive to study faculty salaries for both equity and budgeting purposes.

Recent Trends in Higher Education

The past two decades have witnessed major changes in higher education. During the rapid growth phase of the 1960s, funds were abundant, optimism was high, and salary imbalances were regarded as temporary ills to be corrected in the next fiscal year. High production of PhDs continued past the period of growth and led to an oversupply of qualified candidates for faculty positions in many fields. But a shift in student interest from liberal arts and social sciences to business and computer-related fields after the Vietnam War created a demand in those areas that outstripped the supply of available faculty. Entry-level salaries in the high demand areas began to be driven increasingly by the labor market as a whole rather than the traditional academic

market as universities were forced to compete directly with industry for qualified professionals.

Demographic pressures compounded the faculty salary problems; by the early 1980s high schools were experiencing a significant downturn in student enrollment. Funding for higher education, particularly in the public sector, tends to be linked to student enrollment. When the number of entering freshmen dropped, so did legislative allocations and tuition revenues, and many public universities entered a period of retrenchment.

Faculty Salary Differentials

During this period, differences in entry level salaries for faculty increased because engineers and business professionals were being heavily recruit by industry while artists, educators, and social scientists were not. Table 1 presents the average salaries for new assistant professors taken from the Oklahoma State University salary studies of 1975-76 and 1983-84 (Office of Institutional Research).

The presence of salary differentials among academic disciplines is hardly a recent phenomenon. Most universities have long been characterized by a salary structure in which the highest salaries are paid to law or medical faculty, if present, followed by engineering faculty, business faculty, and faculty in the physical sciences. Law and medical faculty are the long-term beneficiaries of market-driven salaries; the relative isolation of these specialties and their graduate level emphasis made the salary differentials generally tolerable to other faculty. Currently, however, entry-level salaries are

Table 1. Changes in the Average Salaries of New Assistant Professors in Selected Disciplines (constant 1975-76 dollars).

	1975-76	1983-84	% Increase
Electrical Engineering	\$15,387	\$19,220	25%
Civil Engineering	15,044	18,260	18
Banking & Finance	17,105	20,068	17
Accounting	17,608	20,135	14
Physics	13,468	14,784	10
Mathematics	13,306	14,390	8
Economics	15,288	16,458	8
English	12,285	12,760	4
Foreign Languages	12,270	12,248	0
History	12,895	12,631	-2
Agricultural Economics	16,419	15,357	-7
Philosophy	12,977	11,870	-9
Foods & Nutrition	15,867	14,056	-11

comparatively high and rapidly accelerating in business, engineering, and even such fields as molecular biology and applied statistics, a trend which may create two levels of salary within a single academic department (Prokasy, 1984, p. 80).

This trend has obvious implications for widening faculty salary differentials in the future. Those fields with high entry-level salaries tend to be the areas of high student demand, and in order to attract these students, many universities respond to the demand by trying to add more courses and faculty in those fields. Increased demand for faculty in turn drives up faculty salaries in those disciplines. The funds to cover program expansion are found not infrequently through reallocation of resources from departments whose course offerings are less in demand. This tendency, coupled with recent years of austerity in financing higher education, has resulted in a

gradual widening of salary differentials among academic departments in many universities.

The problem of salary differentials has been exacerbated by a sizeable decline in real salaries over the past decade, with public universities hit even harder than private institutions (Hansen, 1984, p. 3). In this economic climate, salaries have become an equity issue for faculty and a management problem for administrators, who frequently turn to statistical techniques to illuminate the problem.

Faculty Salary Analysis

Many of the models employed for faculty salary analysis derive from those developed to investigate the question of discrimination in higher education. Government enforcement of federal regulations and court settlements of discrimination lawsuits set policies and precedents for salary analysis throughout the labor market. The techniques usually involve either comparing the salaries of individuals with matching qualifications, or regressing salary on its relevant human capital determinants.

The human capital regression models used to produce statistical evidence in class action discrimination suits have been extremely influential in shaping the models used to assess faculty salaries outside the court setting. These models focus on employees' qualifications and experience and are well suited to the traditional blue collar occupations characterized by modest educational and training requirements, stratified job classifications, explicit performance expectations, and perhaps union regulation as well. They are less well

suiting to academic faculty, who frequently hold similar titles but whose range of expertise and experience varies markedly (Lester, 1975).

The formal educational requirements for university faculty are among the highest in the work force, yet extremely diverse in content for the various academic disciplines. All faculty perform essentially the same functions—teaching, research, and service—but the emphasis and expectations in each area differ greatly among disciplines and universities. The large number of disciplines represented in a public university makes measurement of the relevant salary factors extremely difficult, particularly since the large number of subspecialties form a "continuum of disciplines" where discrete and mutually exclusive fields once existed. The models used to analyze faculty salaries have become increasingly sophisticated over time, but the easily quantified human capital factors characteristic of individual faculty remain the primary focus of analysis among higher education administrators, who are extremely sensitive to the arguments and statistical models used in court.

The models usually employed by universities for salary analysis have a strong basis in human capital theory, but are less complete than other economic and social theories would suggest. Competitive market theories do not adequately account for institutional factors that may influence salaries in a contemporary public bureaucracy. Theories from economics and the social sciences which address the workings of public bureaucracies offer fruitful insights into institutional factors that may have an impact upon faculty salaries.

Montana State University (MSU) is a good example of a public bureaucracy with an established internal labor market. Past salary analyses at MSU focused on human capital factors almost exclusively, relying on departmental dummy variables to cover all salary variance due to institutional factors. Separating the departmental differences due to market factors from those due to differential allocations of salary dollars is impossible with this strategy, although it is widely known that not all colleges and departments receive the same percentage increase in salary in a given year. Various theories suggest that deans who perceive a differential value in departments may award salary increases commensurate with the incentive system of an internalized public bureaucracy.

An analysis of faculty salaries which attempts to isolate the influential factors is quite different from an analysis which attempts to assess salary equity. The former is undertaken to describe objectively an existing salary structure, while the latter is undertaken to determine whether a salary structure is fair. This thesis is concerned with determining which factors are relevant to the salary structure at MSU, based upon the belief that an understanding of the structure should serve as the foundation for equity studies. The main concern in this thesis is to determine whether the addition of institutional factors to a human capital model improves its explanatory power. Normative judgments of whether institutional factors should influence salaries can best be made with the informed knowledge of whether or not they do.

Thesis Objective

The purpose of this thesis is to investigate the relationship of selected individual and institutional factors in a dynamic environment to the distribution of faculty salaries at Montana State University. Like many state institutions of higher education, MSU is heavily dependent upon public funds for support and manifests an internally-oriented, bureaucratic organizational structure. The top-down allocation of salary dollars, lack of a rigid pay scale, and differential salary increases across departments all suggest that factors at the department level may exert an influence on faculty salaries in conjunction with characteristics of individual faculty members.

The model developed for this investigation is not a tool for allocating salaries to individuals; the data necessary for developing an allocation tool are not currently available on campus. The model neither attempts to predict what the departmental distribution of salaries should be nor justify the status quo. Rather, the model is used to determine what combination of institutional and individual factors dynamically influence faculty salaries at MSU.

Thesis Organization

The thesis is divided into two parts: (a) a general discussion of theoretical principles, historical influences, and practical problems relevant to quantitative faculty salary analysis; and (b) the development of a model which applies this knowledge to faculty salaries at MSU.

Chapter 2 examines economic theories dealing with wage determination—specifically, neoclassical market theory, macroeconomic theory, and human capital theory—and extracts those factors particularly relevant to faculty salaries. Chapter 3 introduces theories of institutional organization and behavior, including theories of internal labor markets, bureaucracies, and coalitions, which have implications for salary allocation decisions.

Chapter 4 describes the techniques most often employed to study faculty salaries: matching or counterparting, descriptive statistics, and multiple regression analysis. The chapter also demonstrates the influence of federal antidiscrimination legislation upon quantitative salary studies, particularly the impact of class-action suits under Title VII of the Civil Rights Act. The chapter ends with summaries of faculty salary analyses taken from the literature to illustrate the variety of models employed for different purposes; these models create a point of departure for developing a model specific to MSU.

Chapter 5 gives a brief overview of the mission and organization of MSU, and then describes two major influences on faculty salaries that have occurred in recent years. A review of current salary policies is followed by a discussion of possible ways to quantify important salary determinants.

Chapter 6 describes a comprehensive cross-section time-series model of MSU's salary structure, identifying formal and informal salary determinants for both individuals and departments. An inventory of the data available for quantifying the factors shows that the data are too limited to run the comprehensive model, so a submodel is developed.

The variables are described, and the faculty sample is defined. Results of the regression analysis are presented, including an examination of the error term.

Chapter 7 concludes the thesis with an evaluation of this analysis in the context of past MSU salary analyses and a discussion of strategies to be investigated in the future. An appendix contains justifications for the departmental merit assessments used in the analysis.

CHAPTER 2

ECONOMIC DETERMINANTS OF FACULTY SALARIES

The payments for contracted labor services are termed salaries and wages. Although the terms are often used interchangeably, there is a distinction between the two, based primarily upon the length of time for which labor services are contracted. A wage is a rate traditionally paid by the hour, day, or week, while a salary is a fixed amount paid periodically. There is also a connotation of class distinction between the two terms, with wages implying blue-collar work—intermittent or seasonal manual, mechanical, or menial labor—and salary implying white-collar, year-round employment. In both contexts, faculty receive salaries rather than wages.

Economists develop theories in terms of wages because a short contract time permits rapid response to economic conditions. This chapter discusses economic theories relevant to the determination of faculty salaries and uses the term "wages" in most of these discussions. The latter portion of the chapter focuses upon specific factors that might influence faculty salaries in public universities, so the term "salaries" appears throughout this latter discussion.

Theories of Wage Determination

Several areas of economic theory specifically address the topic of wage determination: theory of the firm, which applies the marginalist

principles of neoclassical theory to production and the labor market; macroeconomic theory, which offers insights derived from observations of aggregate markets; and human capital theory, which extends the principles of physical capital to human resources. A brief review of the wage-oriented ideas embodied in these theoretical perspectives will help to illuminate the more specific problem of wage determination for university faculty. The discussion is not intended to be comprehensive, but rather to highlight elements of theory which suggest factors to be considered in a model for analyzing faculty salaries.

Neoclassical Theory of the Firm

In the world of neoclassical economics all markets operate in a price-auction framework. Buyers and sellers compete to varying degrees for goods and services, and the forces of supply and demand bring about an equilibrium solution between the quantity of goods or services purchased and the price paid for them. Supply and demand also govern the amount of competition which prevails in a particular market (Hirshleifer, 1980, pp. 412-413). At the one extreme, a firm may be a sole producer or sole buyer and exhibit the total monopoly power of a true price setter. At the other extreme, a firm may be one competitor among many buyers and sellers and must pay the prices set through freely competitive bidding. The neoclassical approach differs from the classical in its emphasis upon the role of the marginal unit in allocating factors optimally among possible uses.

The theory of the firm develops the marginalist view to explain the firm's production decisions. The fundamental assumption is that the entrepreneur's objective is to maximize profits; he achieves this goal

by rationally selecting the optimum input-output combination for his production process. The inputs to his production process, broadly categorized as labor and capital, can be varied according to quantity constraints specified by a production function. The entrepreneur will choose the combination of labor and capital that he can purchase most cheaply and still remain within the production constraints. He must purchase labor and capital at prevailing rates, which are determined by the forces of supply and demand operating in each input market. The market wage is the going price for labor, and the interest rate is the price of capital.

In any particular market all laborers will receive the market's equilibrium wage, a condition graphically illustrated as the point of intersection of the labor supply and demand curves. A price-taking firm will hire more employees and pay them higher wages than a price-setting firm. The demand for labor is derived from the firm's production function and consumers' demand for the product, and the supply of labor is a function of individuals' preferences for wages vs. leisure (McCloskey, 1982). As wages rise, individuals tend to prefer labor to leisure; as they fall, leisure becomes the more attractive alternative. Wage flexibility ensures that the labor market will always clear at the level of full employment.

The law of diminishing marginal productivity reveals an additional limitation upon the purchase of inputs. Adding one factor to the production process without increasing the amounts of other inputs used will at some point yield diminishing returns to the entrepreneur; thus,

the entrepreneur will hire labor until its marginal revenue product equals its marginal cost, or wage rate.

The detailed logic and well-developed calculus of the neoclassical model have not protected it from attackers whose real-world observations appear to contradict portions of the theory. Although few challenge the importance of supply and demand in the process of wage determination, the existence of wage rigidity and wage differentials in many economic sectors are cited as problems which neoclassical theory does not adequately address.

Two more recent economic theories attempt to deal with these issues. Macroeconomic theory focuses on the disequilibrium in the labor market, particularly the interrelated problems of unemployment and inflation. The assumption of wage rigidity is central to much of macroeconomic theory. Human capital theory focuses on the differential productivity that skills and knowledge make possible, thus providing a rationale for wage differentials. The contributions of these two theoretical perspectives to an understanding of wage determination are discussed separately below.

Macroeconomic Theory

Macroeconomists unite in attacking the speed of the market-clearing process implied by the neoclassical model. They maintain that although equilibrium may be expected in the long run, wage adjustment in the short run is hampered by transaction costs associated with hiring and firing and by the contractual agreements made between employers and employees (Dornbusch and Fischer, 1978, p. 347).

Hiring and firing are costly procedures for both worker and firm.

Employers incur advertising, interviewing, and training costs, while workers must bear the costs of searching for employment. These transaction costs motivate firms to terminate employees reluctantly and to adjust employees' hours rather than wages. Workers also find contractual arrangements and schedule adjustments preferable to undertaking a job search. Consequently, firms extend workers' hours and pay them overtime during periods of peak demand; during slack periods, firms either absorb the loss paid for wages or resort to temporary lay-offs. Both employers and employees thus prefer the security that results from stable wage rates to the competitive edge of flexible ones.

The macroeconomists' distinction between nominal and real wages introduces another interesting element in the dynamics of the wage-setting process. Real wages represent the employer's actual labor costs, but nominal wages are more visible and therefore a major employee concern. Labor may demand a real wage gain, but receives whatever gain is commensurate with growth in productivity unless labor is unusually powerful. Two decades of inflation have created an economic climate in which employees expect sizeable nominal gains as their due. Employers in turn offer their employees nominal wage increases and may raise prices to cover them, further fueling the process of wage inflation.

Not only do nominal wages tend to adjust slowly, but they tend to be "sticky downward"—that is, money wages may rise rapidly in times of labor shortages or increased product demand, but they seldom fall when these conditions reverse. Nominal wage increases may actually result in

a real wage loss for some employees. Nevertheless, money wages tend to rise or remain constant while the level of unemployment fluctuates.

The neoclassical model assumes a world of perfect certainty; in the business world, however, firms are often uncertain about real wages and future sales. In the presence of uncertainty, a firm's demand for labor must be speculative, based upon expected wages and sales. The rate of inflation may confound the entrepreneur's wage payment expectations, and firms often anticipate being unable to sell their entire product at prevailing prices. The result of uncertainty may be a demand for labor lower than the neoclassical model would suggest, and a wage that is the product of many countervailing forces.

There seems to be no consensus among macroeconomists about the determinants of the wage adjustment process. Opinions range between the extreme that wages are governed entirely by rational expectations and the opposite extreme that wages are ultimately the product of institutional forces. Nichols (1983, p. 212) concludes his investigation of the process with the statement, "Wages appear to be determined by a complex mixture of institutional and macroeconomic factors, a mixture whose complex nature remains to be identified."

Human Capital Theory

The theory of marginal productivity postulates that all workers will be paid a wage equal to the marginal productivity of the last worker hired (McCloskey, 1982, p. 477). In fact, wage differentials among workers are common within a firm because not all workers are equally productive. The employer has a strong incentive to reward workers on the basis of their productivity and thereby encourage them to

maintain that level or even increase it. Thus, differential productivity leads to wage differentials, and these differential rewards encourage individuals to invest in resources that will increase their productivity (Becker, 1975). Such resources are called human capital, emphasizing their similarity to physical capital assets: People make capital investments in themselves by incurring the costs of such activities as education and training, searching for better jobs, and migrating to new job markets (Becker, 1975).

Human capital theory thus modifies the neoclassical view of homogeneous labor by providing a rationale for differentiation of the workforce. Workers perceive, and empirical evidence supports the perception, that there is a positive net return to investment in human capital activities. Workers make rational choices to invest in developing their human resources, and sacrifice their current earnings in order to improve their future earning power (Welch, 1975). The assumption that investment in human resources can raise an individual's marginal revenue product provides a smooth transition between the neoclassical and human capital theories.

Most detractors of human capital theory (such as Bowles and Gintis, 1975) do not deny the association between schooling and increased income, although many detractors offer modifying assumptions to weaken the link. For example, when the effects of worker's innate ability and family background upon education and income are considered, the statistical association between education and income is reduced but not removed (see Griliches and Mason, 1972; Gintis, 1971; Morgan and David, 1963).

Two assumptions of human capital theory are that a worker's productivity is a function of his or her knowledge and skills, and that workers with more education and experience have higher wages and more steady employment. These assumptions have obvious intuitive appeal, since both education and experience should increase a worker's understanding of the job. Even education nonspecific to a particular job is usually thought to be beneficial for increasing the worker's powers of observation and reasoning.

A questionable implication of human capital theory is that the individual can rely on a standard rate of return to an investment in human capital. This implication is based on the assumption that wage differentials are short-run deviations which will be eliminated when investment shifts from areas of low return to areas of high return.

Factors Influencing Faculty Salaries

The economic theories just discussed apply to labor markets in general; the principles can be further qualified to better describe specific labor markets, such as the market for academic faculty. The remainder of this chapter focuses on the influences of factors introduced above--supply and demand, wage expectations, marginal productivity, and human capital investments--upon salaries in this market.

Supply and Demand

The demand for university professors is derived from the demand for their services, such as student demand for instruction, institutional demand for research, and public demand for specialized services.

Student demand is a major factor at most public universities because legislative funding and tuition revenue are both functions of enrollment.

For the first time in the history of higher education, demographic trends have produced a decline in the number of high school students. By the 1990s the number of high school graduates will have decreased by one fifth of its highest level (Cyert, 1983, p. vi). This demographic downturn may sound the death knell for some 10-30% of the country's 3,100 colleges and universities (Keller, 1983, p 3.); the remainder will survive by reorienting their program offerings to serve reentering adults and an increasing number of foreign students as well as the traditional entering freshmen. This shift in student population will be accompanied by a corresponding shift in demand for career-oriented courses designed to secure college graduates high-paying jobs (Keller, 1983, pp. 12-16). Consequently, the demand has skyrocketed for professors of accounting, business management, computer science, and various fields in engineering. At the same time, demand has slackened for professors in social sciences, education, and the humanities.

The supply of faculty does not necessary reflect the demand for their services. One legacy of the phenomenal growth in higher education during the 1960s was an overproduction of highly qualified PhDs who had to compete for a dwindling number of university faculty appointments in the 1970s. Colleges and universities continue to overproduce PhDs in many fields, and the number of faculty positions continues to shrink due to cutbacks in funding for higher education combined with a slow exit from the profession virtually guaranteed by the tenure system. Keller

(1983, p. 22) speculates that "by 1990 many faculty could be almost geriatric in makeup."

According to neoclassical microeconomics, the oversupply of potential faculty and the reduced demand for faculty services should quickly reach an equilibrium solution in the faculty labor market via a drop in faculty wages. Although there has been a decline in real wages for university faculty, the decline has been gradual and equilibrium has not yet been achieved.

Investigations into supply and demand for university faculty are complicated by the fact that faculty are not a homogeneous group. They are specialists in a wide variety of academic disciplines, and each discipline constitutes its own small labor market. In some highly competitive fields, universities are price takers, forced to offer wages high enough to attract new PhDs to university teaching. In other fields universities are price setters, able to take advantage of fierce competition among qualified candidates for faculty positions.

Competition to recruit highly qualified PhDs is intense in such fields as business, engineering, and computer science, and many institutions are able to offer higher salaries in these areas by shaving salaries in low-demand areas such as home economics, foreign language, and social work. Many campuses already exhibit significant salary differentials among their faculty, and these differentials are usually justified on the basis of market considerations (Perry, 1983). Thus, market forces are significant determinants of faculty salary even at the level of academic discipline and definitely warrant inclusion in analytical models.

Wage Expectations

Since 1974 and the scare of double-digit inflation, many businesses have been indexing wages and prices by tying them to the consumer price index (Thurow, 1980, p. 59). The practice has become widespread throughout both the public and private sectors, including many universities, and inflationary expectations fuel the pressure to continue. Some of the pressure exists because workers tend to interpret nominal raises as their just rewards for productivity. Faculty in universities where salary increases are explicitly linked to merit are particularly prone to this illusion.

An analysis of faculty salaries could be done entirely in terms of real dollars, but such an analysis would overlook the behavioral dynamics associated with the money illusion that often accompanies nominal wage increases. The amounts of the increases are of paramount importance to many faculty. Most faculty are dimly aware that as a group their purchasing power has been eroding; what frequently generates considerably concern, however, is an extra \$200 given to Professor X, or an additional 5% increase given to Department Y. The neoclassical assumption of independent utility functions—that a worker is oblivious to the salaries of his or her peers—is contradicted by a growing body of sociological literature indicating that economic satisfaction is a function of relative rather than absolute income (for example, Coser 1967, pp. 53–72). That is, the utility functions of faculty appear to be interdependent.

Nominal faculty salaries are not only sticky downward, but they are slow to change in relative terms as well. Since salary rewards are

given and compared in nominal terms, retaining the nominal focus is advantageous for a study of an institutional salary structure. The amount of money available for raises is thus an important ingredient in a nominal salary study.

Marginal Productivity

The theory of marginal productivity holds that workers will be paid the value of their marginal products. One worker is paid more than another because the market value of his or her services is higher, and workers make differential contributions to the value of production. The greater the difference in productivity, the greater would be the expected wage differential among workers. Frank (1984, p. 549) observes, however, that

Many firms . . . follow strict pay formulas based on education, experience, and length of tenure with the firm, even when there are apparently very wide differences in productivity among individual workers who are alike with respect to the characteristics specified in the pay formula.

Frank does not intend to imply that wage differentials based upon productivity do not exist, but that the wage differential is smaller than would be expected from the difference in productivity. As an example, he offered the observation that among faculty in a given department, the combined salaries of the three least productive members of an age cohort almost invariably exceed the combined salaries of the two most productive. His analysis of the salaries of chemistry faculty further substantiates his claim; he equated marginal product with the indirect costs brought into the university by their grants and found salary differentials to be much smaller than indirect cost differentials. To those who maintain that the production of "knowledge"

by faculty is far too complex to be measured, Frank (1984, p. 559) responds that

Despite the obvious difficulties involved in assigning value to the contributions of specific employees, however, it is important to bear in mind that many thousands of judgments are made every year.

McKenzie (1979, p. 114) distinguishes between two types of faculty pay systems: the lump sum method and the accountability method. Most public universities receive their faculty salary money as a lump sum to be divided among the faculty, but there is considerable variation among institutions in the methods of that division. Some universities operate entirely on lump sum pay schedules, while others evaluate faculty performance and base their salary decisions largely upon professional accountability. Accountability is also a feature, sometimes hidden, of some pay schedules. Faculty rewards, chiefly tenure and salary, have long been practically automatic in higher education, but the recent trend in higher education is to reward faculty on the basis of productivity. Keller (1983, p. 23) reports an accelerating trend away from across-the-board pay increases to raises based on merit.

Many universities have developed elaborate quantitative schemes to measure faculty productivity in order to justify salary, tenure, and promotion decisions. There are two major difficulties with these schemes. First, faculty productivity is notoriously difficult to measure, particularly the quality of output. Faculty are quick to learn the game and produce the output for which rewards are greatest. Unfortunately, this often means substituting quantity for quality. McKenzie (1979 pp. 120-122) cites as an example the system of

publication types and weights developed by the College of Business at the University of Georgia:

. . . many faculty members found that it was to their advantage to write short papers for publication in second and third rate journals (as defined by 22 single-spaced pages of journal ratings). Others produced letters to the editor. Faculty tended to shy away from writing extended articles for publication in first rate journals because the reward structure was not sufficient to justify the effort required.

Quantitative methods may not provide evaluations which are superior to the ad hoc assessments done by careful administrators, but such methods do provide records for justifying administrative decisions.

The second major difficulty with faculty performance evaluation systems is a byproduct of the lump sum distribution of salary dollars to institutions. Since the size of the pie is fixed, a faculty member can increase his or her relative share either through productive behavior, by increasing his or her own output, or through predatory behavior, by decreasing the output of others (McKenzie, 1979; Mandell, 1977). McKenzie (1979, pp. 118-119) suggests universities can counter the tendency toward predatory behavior in two ways: by rewarding departments rather than individuals for productivity, or by rewarding individuals on the basis of easily quantified factors such as academic degree and years of experience. The difficulty with both suggestions, particularly the latter, is that while they may decrease predatory behavior, they provide little incentive to increase productive behavior.

In sum, productivity, whether individual, departmental, or collegiate, is often an important determinant of faculty salaries. The relationship between the value of the output produced and the subsequent salary reward may be less than anticipated, however, given the

indications that faculty are not paid the full value of their marginal products.

Human Capital Investments

Human capital theory posits that workers are differentially rewarded according to their productivity, and that those differential rewards provide incentive for investment in human capital factors, primarily education and experience. Preparing for a college teaching career requires a substantial investment in formal education: four years of undergraduate work followed by three to six years of graduate education. These are the minimum credentials for entry-level positions in most disciplines at many universities, and the national trend is toward requiring PhDs for tenure-track faculty positions at four-year colleges and universities. This hard-won human capital provides the basis for a new faculty member's starting salary; additional training, such as that obtained through postdoctoral work, may also be rewarded by a university, but such work tends to add minimally to the starting salary.

The theory further implies that identical wages will be paid for identical skills, an application of neoclassical stabilization at equilibrium. All faculty are expected to exhibit skills in teaching, research, and service, but they are hardly paid identical wages on that basis. A professor's area of specialty has far more influence on salary, but even faculty having similar skills within a discipline frequently manifest considerable salary differentials. Furthermore, specialists in a university often earn thousands of dollars less than their similarly-skilled counterparts in private industry.

Economists recognize that much of the human capital required to perform a job is acquired as on-the-job training (OJT) (Friedman, 1984; Thurow, 1984, pp. 173-174). OJT for faculty is not formalized, but occurs during the period prior to granting of tenure. The skills in teaching, research, and service required of a faculty member are often developed on the job; it is quite common for a new professor to have no teaching or service experience and to have done only intensively specialized research under the supervision of a faculty committee. Education qualifies a new PhD for a faculty position, but the actual business of being a faculty member is learned through trial and error, collegial advice, and observation.

So one has to conclude that the labor market is not a place where people with fully developed skills bid for jobs. Rather, it is primarily a market where supplies of trainable labor are matched with training opportunities, which is to say, with the number of job openings that exist. And job openings, in turn, means that demand exists for the skills in question (Thurow, 1984, p. 200).

This is certainly true of university faculty, and they as a group have some of the highest human capital requirements of all workers.

The long-standing practices of sex and race discrimination are sometimes cited as evidence against human capital theory, since women and minorities with skills and training equal to those of white males tend to earn lower incomes. Few studies based on the human capital factors of education and experience account for more than one-fifth of the difference in men's and women's earnings (Treiman and Hartmann, 1981, p. 13-19). An extensive body of literature on faculty salaries indicates that the problem of sex and race discrimination is pervasive

at that level as well (for example, Bayer and Astin, 1975; Tuckman, Gapinski, and Hagemann, 1977, pp. 692-702).

For faculty, human capital is primarily an input to the production process. Job qualifications are based upon the assumption that a qualified professor will be a productive member of the university. Once the job has been obtained and the necessary professorial skills acquired on the job, the role of human capital factors in determining salaries varies considerably across institutions. Some schools base their salary schedules heavily upon education and experience, while others concentrate on evaluating professorial productivity. The importance of human capital factors in a salary study depends a great deal upon the influence of those factors at the institution in question, but they should be included as factors for analysis. Often a substantial portion of variation faculty salaries can be explained by such factors, even at institutions oriented toward merit raises.

Summary

This chapter has presented a superficial review of some of the wage-oriented ideas embedded in established economic theories--specifically, neoclassical theory of the firm, macroeconomic theory, and human capital theory. The discussion was not intended to be an exhaustive review of economic theory, but rather an attempt to isolate elements of economic theory that would specifically relate to university faculty.

The factors identified thus far are supply and demand, marginal productivity, wage expectations, and human capital. All of these

factors influence the salaries of individuals and some influence their salaries by group affiliation as well.

Although these factors constitute major determinants of faculty salaries, there are other influences on salaries that originate in the structural organization of the public university. These factors are not well integrated into economic theory or any other formal treatment of wage determination, but some can be extracted from the literature pertaining to organizational structure and administrative decision-making. These processes can have a significant impact upon how money is distributed to the employees of an organization, so theories of institutional organization and their impact upon faculty salaries are the subjects of the next chapter.

CHAPTER 3

INSTITUTIONAL INFLUENCES ON FACULTY SALARIES

Market forces and marginalist principles have been the mainstays of economic doctrine throughout this century. The neoclassical model of wage determination is not central to the field of labor economics, however, which has its roots in institutional studies of trade unionism and collective bargaining. Labor economics was often at odds with the parent discipline during the 1920s and 1930s because most of its adherents were actively opposed to the laissez-faire position of traditional economists and tended to sympathize with the burgeoning union movement. During the 1940s and 50s, however, impetus from the Chicago School transformed the moribund specialty into a quantitatively rigorous branch of applied microeconomics (Darity, 1984, pp. 4-5). The rise of human capital theory brought labor economics considerably closer to mainstream economic thought, but many modern labor economists still have serious reservations about the adequacy of the neoclassical framework for analyzing labor problems (McNulty, 1980, pp. 201-202).

These labor economists call for a return to the institutional realism that characterized the early development of the field. Early labor economists drew heavily upon the works of sociologists, political theorists, historians, psychologists, and other social scientists, and their modern counterparts echo that pattern in their search for valid institutional perspectives (McNulty, 1980, p. 203). Much of modern labor

economics owes its formal beginnings to John Dunlop (1958), who conceptualized the "industrial relations system"—a labor market subsystem which develops a complex set of rules governing the workplace. What is now termed "labor theory" is essentially a loose collection of ideas which address in different ways the economic ramifications of the growth of "big business," both corporate and government. The first part of this chapter introduces three theories of institutional organization, and the second part develops the implications of these organizational perspectives for decision making in the public university, emphasizing those decisions affecting faculty salaries.

Theories of Institutional Organization

Contributions to the literature on institutional organization come from labor economics and many other fields. The theories are not oriented toward wage determination, but many of the ideas help to clarify the influence of institutional organization upon the decisions allocating resources to labor. Given the nature of the public university as a modern bureaucracy, these ideas are particularly useful for isolating institutional determinants of faculty salaries. The concepts developed in the first part of this chapter include internal labor markets, bureaucracies, and coalitions.

Internal Labor Markets

The competitive labor markets of neoclassical theory are often belied by the structure of modern firms, particularly large corporations, many of which function internally as small labor markets. Generally speaking, industries with high educational requirements tend

to have well-developed internal labor markets (Treiman and Hartmann, 1981, p. 47). Such firms rely on the "external" labor market for recruiting entry-level workers, but staff many higher positions through internal promotions. These firms may exhibit wage structures at variance with those characteristic of the external market.

Doeringer and Piore (1971) describe two segments of the labor market: a primary market offering jobs with high wages, good working conditions, stability, advancement, and fairness governed by a body of administrative rules; and a secondary market characterized by low wages, poor working conditions, high turnover, little advancement, and rules often left to the discretion of the supervisor. They see the primary labor market as composed of a series of internal markets within the corporate world. Their studies focus on large corporations, but their descriptions of internal labor markets often fit government bureaucracies as well.

Doeringer and Piore (1971, pp. 1-2) define an internal labor market as "an administrative unit . . . within which the pricing and allocation of labor is governed by a set of administrative rules and procedures." They stress that the existence of administrative rules is less important in defining an internal labor market than the rigidity with which those rules are enforced:

If the rules are rigid, they will interrupt or transform economic influences causing the internal labor market to respond to dynamic economic events in a manner not readily predicted by economic theory (Doeringer and Piore, 1971, p. 5).

That is, the administrative rules in an internal labor market may override the economic considerations that the rational entrepreneur of neoclassical economics is expected to bring to bear on labor decisions--

for example, tenure rules instituted to protect academic freedom sometimes ensure that unproductive faculty are retained until retirement.

Administrative rules need not be written; customs, if rigid, play crucial roles in the internal labor market. Customs are unwritten rules based largely upon past practice and precedent ("we've always done it that way..."). Vague terms such as "just," "fair," and "equal" which appear in employee manuals are given meaning through custom, and some of the most serious controversies within an organization occur when the unwritten rules are challenged.

Administrative procedures are particularly important for staffing the organization, because not all jobs in an internal labor market are filled competitively. The internal labor market draws upon the external one for jobs which are ports of entry, but the remainder of jobs are filled by internal promotion or transfer of workers according to the specifications set by administrative procedures. Competitive market forces have maximum effect on entry level jobs and a considerably reduced effect on jobs at higher levels.

Doeringer and Piore (1971, p. 28) maintain that internal labor markets develop from traditional competitive ones due to cost considerations associated with:

- the value of the internal market to the labor force,
- the cost of labor turnover to an employer,
- the technical efficiencies of an internal labor market for recruiting, screening, and hiring labor.

An internal labor market is valuable to employees because it offers job security and promotion possibilities. Employees are willing to

sacrifice some percentage of wages possible in the competitive market in return for these advantages, and employers are willing to grant the advantages because of the savings in wages. Turnover is reduced because security and advancement are tied to seniority. An employee has an incentive to remain for rewards, and the employer rewards senior workers with those jobs which would be most costly to fill from the external labor market.

Bureaucracies

A bureaucracy is a type of internal labor market that may be publically or privately controlled. A government bureaucracy is even further removed from the perfectly competitive firm than is the private corporate one because the former dispenses public goods and services. Bureaucracies have a long history, dating back at least to the Sumerians, but economists did not begin to study them until fairly recently. Most of the formal study of bureaucracies has been done by sociologists. Max Weber produced the seminal work on bureaucracy, and Ludwig von Mises introduced bureaucracy as a topic for economists. William Niskanen (1971) was among the first to investigate the budget and output behavior of bureaucracies and to propose a formal economic model.

Niskanen (1971, p. 15) identifies three critical elements for a theory of supply by bureaus: "the distinguishing characteristics of bureaus, the nature of the relations between bureaus and their environment, and the maximand of bureaucrats." He specifies two distinguishing characteristics of bureaus:

The employees of the bureau do not appropriate any part of the difference between revenue and cost as personal income.

Some part, or all, of the recurring revenues of the organization derive from other than the sale of output at a per unit rate.

That is, bureaus are nonprofit organizations funded either fully or partially by some external entity.

Rather than selling goods and services at a per-unit rate, bureaus dispense them over the period of time covered by their funding. The goods and services they provide tend to be those with high fixed costs and those difficult to charge on a per unit basis; however, any good or service may be offered by a bureau if some organization is willing to subsidize it.

Niskanen (1971, p. 24) defines a bureau's environment according to its relations with three groups: "the collective organization which provides the bureau's recurring appropriation or grant, the suppliers of labor and material factors of production, and, in some cases, the customers for those services that are sold at a per-unit rate." The first relationship, that with the sponsoring funding source, most definitively distinguishes it from other organizations.

The bureau depends upon the sponsor for funding, and the sponsor depends upon the bureau to dispense the contracted service. This link of mutual dependency gives rise to a relationship between the bureau and the sponsoring organization characterized by "threat, exchange, and integrative relations [in Boulding's terminology]" (Niskanen, 1971, p. 24), quite unlike the rational, impersonal relations which characterize both Weber's bureaucrat and the neoclassical entrepreneur. The locus of this volatile relationship is the bureau's budget.

Even if the bureau depends upon the sponsoring organization for only part of its operating costs, the bureau's existence is still contingent upon its budget. The budget in turn influences the bureau's purchases of factors of production (including labor) and its relations with its consumers. Interestingly, the sponsor's demand for the bureau's services are more crucial to the bureau than the demands of the bureau's constituents:

The budget-output function of the sponsor as revealed to the bureau will be related to that of the constituents through the processes by which the officers of the collective organization are selected and by its internal decision processes, but will not necessarily be identical with that of the constituents. . . . A bureau may appeal to the constituents of its sponsor organization in an attempt to increase the demand for the bureau's services, but it is not the preferences of the constituents that are important to the bureau, but rather their influence on the revealed preferences of the bureau's sponsor (Niskanen, 1971, p. 27).

Since bureaus are nonprofit organizations dependent to some extent upon a budget delimiting both the service offered and the rewards accruing to members of the bureau, Niskanen (1971, pp. 36-42) argues that it is in the best interests of the rational bureaucrat to maximize the budget. Many of the components of a bureaucrat's utility function, including "salary, perquisites of office, public reputation, power, patronage, output of the bureau . . . are a positive monotonic function of the total budget of the bureau" (Niskanen, 1971, p. 38). The constraint on budget maximization is that "the budget must be equal to or greater than the minimum total costs of supplying the output expected by the bureau's sponsor" (Niskanen, 1971, p. 42).

Other scholars' modifications of Niskanen's model have direct implications for the bureau's staffing pattern and possible indirect

effects on salaries. Williamson (Orzechowski, 1977, pp. 232-236) hypothesizes that bureaucrats operate above minimum costs by choosing an input mix which is biased in the direction of labor. A large staff is important to the bureaucrat for two reasons unrelated to productivity: first, because managers of large staffs tend to have higher salaries than managers of few employees, and second, because a large staff increases the security of the institution.

Migue and Belanger (1974) offer a compromise between the models of Niskanen and Williamson which incorporates elements of both. They point out that Niskanen's hypothesis of budget maximization is equivalent to maximizing output within the bureau's budget constraint, a strategy that would leave the bureaucrat with no residual funds and hence no utility. They suggest that bureaucrats produce above minimum costs to maximize both output and residuum, and that bureaus are consequently inefficient in both production and exchange.

The impact of budget and staff maximization upon staff wages is unclear. On the one hand, maximizing staff size implies that funds are used to hire new employees rather than raise existing wages. On the other hand, if increasing staff size leads to increasing hierarchical differentiation, the salaries of some workers will rise due to promotions. The net result of staff maximization, however, is probably to depress the wages of workers relative to their peers in private industry, where cost minimization motivates management to hire fewer workers and reward them more generously for productivity. Productivity has a higher priority in the corporate reward structure than the bureaucratic one.

Coalitions

The theory of the firm and the concept of bureaucracy just discussed assume that the organization has a single, stable goal and a decision maker who can work toward implementing it. This assumption may be realistic for small organizations, but for large corporations and government bureaucracies it is true only in the most general sense, and that general goal may be of little use in explaining the decision-making process within the organization. Cyert and March (1963, p. 26) define the problem of the "organizational goal" in the following manner:

- People (i.e., individuals) have goals; collectivities of people do not.
- To define a theory of organizational decision-making, we seem to need something analogous--at the organization level--to individual goals at the individual level.

In order to develop the concept of organizational goals, Cyert and March view the organization as a coalition of individuals, some of whom organize into subcoalitions. Individuals in the coalition may exhibit substantially different preference rankings, thus creating the potential for goal conflict. Cyert and March (1963, p. 28) reject the idea that organizational goals can be expressed as a joint preference ranking, citing studies that suggest such rankings actually reflect agreement on rather vague objectives while masking conflict and uncertainty over subgoals.

Rather than striving for a model of internal goal consistency, Cyert and March assume that organizations are characterized by unresolved conflicts caused by the disparate preferences and demands of participants in the coalition. Each individual has a preferred focus of attention and a limited ability to encompass all organizational

problems simultaneously. Therefore, the goals of an organization arise through bargaining among coalition members (Cyert and March, 1963, p 29). Policy commitments are the most popular medium of exchange in these transactions.

Bargaining within an organization is a continuous process which results in an ongoing series of policy commitments. The budget serves as an important control mechanism within the organization because it is "an explicit elaboration of previous commitments" (Cyert and March, 1963, p. 33). The number of decisions required in the day-to-day operation of an organization would result in a complete standstill were it not for the power of precedents. Precedents remove items from consideration that would otherwise have to be continuously renegotiated: "Past bargains become precedents for present situations; a budget becomes a precedent for future allocations" (Cyert and March, 1963, p. 34).

Today's coalition agreements become tomorrow's precedents and are renegotiated only when members of the coalition make reassessment an issue. This may occur when new members bring different preferences and aspirations to the coalition, or because changing external conditions and shifting attention foci bring a new set of demands to the fore. The issue of salaries arises each budget period, with the salary base set by precedent and the raise a possible subject for negotiation. In Niskanen's model, the bureaucrat would dispense raises in accordance with his or her defined objectives; in the model proposed by Cyert and March, the raises could be an object of bargaining among subunit coalitions. Negotiated salaries could give rise to salary patterns

within the organization that might be considerably different than those developed by a bureaucrat.

Institutional Factors Affecting Faculty Salaries

The internal labor markets, bureaucracies, and coalitions just described are more structurally complex than the simple firm outlined in Chapter 2. Wage determination is not specifically addressed by these structural theories, but they do address the process of decision-making within the organization, and setting salaries is one of the decisions that any nonvolunteer organization must make. Some organizations adopt strict pay schedules; others define parameters which set bounds to the sizes of salaries that individuals in various positions may receive; still others utilize both systems, with negotiable salaries for administrative and professional positions and pay schedules for the support staff.

Public universities exhibit characteristics of each type of organization: they are state bureaucracies, receiving a sizeable portion of their operating funds from state legislatures; they are internal labor markets, with well-developed internal promotion patterns; and they are divided into departmental coalitions, which vie with each other for scarce resources. These characteristics suggest three potential influences on faculty salaries: the institutional funding, the administrative rules governing distribution of funds, and the power structure influencing allocation decisions.

Institutional Funding

According to Buchanan and Devletoglou (1970, p. 8), the public university is unique among industries because "those who consume its product do not purchase it; those who produce it do not sell it; and those who finance it do not control it." That is, the students do not pay the full cost of the instruction they receive; the faculty do not sell their services directly to the students; and the taxpayers who are the source of legislative revenue have little voter voice in the determination of the budget and operation of a state university. Direct voter input is seldom solicited on state university issues.

These features can be attributed to the bureaucratic nature of public universities, which meet Niskanen's (1971, p. 15) defining criteria for bureaus: They are nonprofit organizations which receive a significant portion of their funding from an external entity, specifically, state legislatures. Given that a university operates to a large extent on a fixed budget that cannot be altered by the university's actions during the budgetary period, the goal of the public university is not profit maximization. Indeed, its legal status as a nonprofit institution renders the idea of profit maximization meaningless.

Public universities are good examples of Niskanen's (1971, p. 87) "mixed bureaus"—those that receive part of their funding as a budget allocation and part from the sale of a service. The budget is allocated by the state legislature, and the university must actively participate in the political process to compete against other state agencies—including, perhaps, other state colleges and universities—for the

largest possible slice of the legislative pie. Tuition and fees represent income generated from the sale of a service: education sold to students. These two sources generate the bulk of revenue for most public universities.

Few universities rely entirely upon these two sources of income, however. Most actively solicit donations and contributions from corporations and individuals, particularly the alumni. Most also actively encourage their faculty to obtain funding for research through grants and contracts from public and private agencies.

None of the sources of university funding provide strong incentives for neoclassical cost efficiency, and none are monitored for cost efficiency in production. Funds are audited to ensure that money received is being spent according to specifications, for very little money comes into the university with no strings attached, but the funding sources are generally satisfied if the specifications are properly followed. Money for faculty salaries is allocated in the university budget, so this funding source directly affects faculty pay. The impacts of the other funding sources upon salary are less direct.

Not only do public universities lack incentives for efficiency, but disincentives actually exist. Public universities are generally expected to return unused appropriations to the government at the end of the fiscal year, a requirement that acts as a deterrent to cost efficiency. In fact, this policy gives rise to a "use it or lose it" philosophy that triggers a year-end spending spree in university departments fortunate enough to have remaining funds.

Another disincentive for efficiency is the line-item orientation of many university budgets. Some universities receive funds earmarked for broad administrative areas, but many schools' budgets are detailed so that savings in one area cannot be transferred to another. For example, capital savings cannot be diverted to pay faculty. For such budgets, the salary appropriation is typically based on student enrollment in the context of some norm for desired student/teacher ratios. Criteria used to determine salaries include the "number of students and the educational and experience level of teachers and administrators" (Staaf, 1977, p. 156).

Public universities differ in this respect from their private counterparts. Most of the revenue generated by private colleges and universities comes from tuition and fees charged to students. Most of the finances available to public institutions are derived from tax revenues. Private schools must compete on the basis of the price and quality of their service. Public schools can charge much lower fees to taxpayers' children because the public subsidy grants them a certain degree of monopoly power. They can so undercut the private schools in terms of price that they have no need to compete in terms of quality.

Orzechowski (1977, pp. 248-253) cites several studies which indicate that private suppliers are more efficient than public suppliers, and then presents evidence that public universities use proportionally larger staffs than private institutions. He surmises that the constraints placed upon private schools make them much more likely to choose an optimal mix of inputs, and that the monopoly advantage enjoyed by the public schools permits the sort of utility

maximizing by bureaucrats that manifests itself in overstaffing. The critical factor in the staff-maximizing activities of university bureaucrats is that staff size is to a large extent a function of the university budget, which is enrollment driven. Thus, the public university has a strong incentive to maximize the number of students enrolled rather than the quality of education offered to those students. Educational quality becomes an important factor for a select few public institutions, however, and these institutions may be able to limit enrollment to maintain educational quality once it is attained.

Bureaucratic objectives affect faculty salaries by tempering the traditional economic influences. If the bureaucratic objectives are to increase the budget and expand the staff, then the university administration will focus on strategies designed to achieve those ends rather than employ strategies oriented toward profit maximization. Since most public university budgets are formula-driven, with student enrollments and student/faculty ratios being the most crucial elements, university administrators tend to concentrate their efforts on enhancing the school's status in these areas.

Generally, faculty are supportive of these goals. Although professors are not rewarded financially for the number of students they teach, the university's rewards for increasing student enrollment may be allocated to departments as additional staff members rather than to individuals as additional salary. Because most new faculty are hired as assistant professors, expansion gives existing faculty the prestige of seniority, first choice of classes, and sometimes increased opportunity

for promotion. Their salaries may also be raised to keep them higher than those of the incoming faculty.

The effect upon faculty salaries of pursuing these bureaucratic objectives is unclear, however. Buchanan and Devletoglou (1970, p. 15) point out that "much of the faculty member's reward is made up of nontaxable, nonmonetary perquisites of university life"—the security of tenure coupled with considerable personal freedom to control time and activity, to organize course content, to design research, to consult off campus. These perks are the "compensating differentials" (McCloskey, 1982, p. 530) that induce specialists to teach at universities rather than accept the higher financial rewards of industry.

Administrative Rules

Jobs for university faculty are filled primarily at four levels: instructor, assistant professor, associate professor, and full professor. Faculty can be recruited at any level, but in practice the majority of recruiting occurs at the level of assistant professor. Increasingly, universities no longer consider the rank of instructor as a tenure-track position. The higher-level jobs of associate and full professor are filled by promoting the assistant professors and then recruiting new assistant professors as replacements.

The rules which most strongly characterize the university as an internal labor market are those associated with faculty tenure, promotion, and salaries. These policies emphasize credentials, academic productivity, and to a lesser extent years of experience. A university's internal rules must be similar enough to the rules of other schools to

maintain institutional stability, but flexible enough to respond to outside threats to groups or particular individuals. The reliability of an institution's rules is a function of the degree of observance, acceptance, and reinforcement by both faculty and administration (Reagan and Maynard, 1974, p. 16).

Tenure, originally designed to protect academic freedom, also provides a negative incentive for productivity. Competitive market theory suggests that the entrepreneur will replace a nonproductive worker with a more productive one, so the threat of replacement serves as an incentive for employees to remain productive. The replacement option is usually available to a university only during the early years of a professor's employment, however, because once granted tenure, a professor can be fired only under extraordinary circumstances. Because the tenured professor no longer faces the threat of replacement by someone more productive, the threat of dismissal ceases to be a factor in motivating productivity.

To counter the potentially debilitating effect of tenure, universities offer promotion as a reward for productivity. After several years of service as assistant professor, the productive individual is offered the status of associate professor. Similarly, the productive associate professor can aspire to the rank of full professor. When faculty were relatively scarce two decades ago, tenure and promotions tended to be awarded almost automatically; standards are much more stringent now that the supply of PhDs exceeds the number of faculty positions in many fields.

A lack of external mobility is characteristic of internal labor markets. Promotions are the only advancement many university faculty receive, since usually only the most productive faculty are eligible for recruitment into higher-level positions at other universities. Such openings at the higher ranks are quite limited; external recruitment usually is undertaken only when the relatively high direct and indirect costs are outweighed in importance by other considerations, such as upgrading the quality of a department (Reagan and Maynard, 1974, p. 16).

The time between promotions is set by administrative rule and measured in years to enhance the status of the achievement. Generally speaking, promotions are the most important rewards for productivity. Economic rewards are often associated with promotion as well, but universities differ considerably in their monetary treatment of promotion. Some institutions give standard pay increases by rank, some explicitly prohibit promotion increases, while others have no institutional policy and allow promotion rewards to vary by department. These variations thus constitute one source of salary differentials among similarly qualified, similarly productive faculty.

The administrative process by which faculty salaries are set can be another source of salary differentials. University administrators usually try to link their faculty salaries to external benchmarks, such as the Oklahoma State University salary study, the annual report of the American Association for University Professors, or the salaries in a self-defined peer group. Keeping a school's salaries within "acceptable" bounds increases an institution's stability by reducing the incentive for faculty to seek better-paying jobs elsewhere.

In the absence of a rigid pay schedule, distribution of salary money commonly occurs through a "top down" process, with the president allocating money to the academic vice president, the vice president allocating money to the deans, the deans allocating money to the department heads, and the department heads finally setting individual salaries. Not all salary decisions concerning individual faculty are made by department heads, but they do make the overwhelming majority of those decisions. Provisions for monitoring the process also vary considerably among institutions and departments within institutions.

Customs within departments, rather than explicitly written rules, often dictate how annual raises are given. Some department heads give percentage raises, and others give raises in absolute dollars. Some department heads may give all faculty an equal increase; some heads may give merit money to the individuals promoted during the past year and approximately equal percentage increases to all others; still other heads may make merit decisions annually and reward their faculty on the basis of merit. Similarly, some deans may allocate money disproportionately to their "productive" departments while others may give each department an equal percentage. The result in both cases is the development of salary differentials, first at the individual level, then at the department level. The inconsistencies may also be compounded over time.

Power Structure

Like large corporations, universities are organized into administrative hierarchies for decision making and resource allocation. A president or chancellor heads the hierarchy; vice presidents or vice

chancellors report to the president, and deans, directors, and department heads report to the vice level. The department is the basic unit of faculty affiliation in the university, and thus the basic unit of the hierarchical structure.

Hiring, tenure, promotion, and salary decisions originate in the academic department. Committees may evaluate and monitor these decisions, and higher-level administrators may directly intervene, but these actions are all initiated at the department level. The department defines the qualifications for a vacant position and decides whether to recommend an individual for tenure or promotion. Decisions concerning individual salaries are usually made by the department head or a departmental committee. The department also functions as a unit to compete for university resources, with the department head as chief negotiator. All theories of institutional organization stress the importance of administrative rules; the coalition model developed by Cyert and March (1963) is unique in incorporating the potential for intrainstitutional competition for resources into the organizational structure.

Effects of Power. In a study of the United States Department of Agriculture, Wildavsky and Hammond (1965) determined that budgeting was incremental rather than comprehensive. Zero-based budgeting is the exception rather than the rule in public universities also. Thus, historical precedents are very important in budgeting; the base budget is taken as a starting point, and budget decision makers allocate the incremental resources available.

Pfeffer and Salancik (1974) studied the effect of departmental power on budget allocation at the University of Illinois at Urbana-Champaign from 1958 to 1970. They defined power as "the ability of the department to affect decisions so that they conformed more closely to what the department wanted" (Pfeffer and Salancik, 1974, p. 141) and developed two measures of power: a rating based on interviews with department heads, and departmental membership on important university committees. Their power variables correlated well with each other and poorly with workload criteria; their analysis indicated that departmental power had a significant effect on the proportion of the general funds budget allocated to each department.

Salancik and Pfeffer (1974) continued their study to test the hypothesis that departmental power is partly explained by the extent to which departments provide critical resources for the university. They used the same measures of power and developed measures of resources important to the university. Interviews with department heads revealed that they considered the top indicators to be number of graduate students, number of undergraduates, and national ranking of the department; grant activity was toward the bottom of their list.

A study of the university records revealed that 40% of the university's budget derived from outside grants and contracts, however. Grants and contracts revenue was the most significant predictor of subunit power in all regression equations, followed by the number of graduate students and the department's national prestige. All of these measures indicated a department's ability to attract resources from outside the university. Despite popular rhetoric, undergraduate

instruction definitely occupied a secondary position. Salancik and Pfeffer concluded (1974, p. 470) that the units with the most outside support also tended to obtain the most internal support, probably based on the rationale that those responsible for acquiring the resources should receive the greatest share of them.

Hills and Mahoney (1978) hypothesized that standard rules and universalistic criteria govern the allocation of discretionary budget increments during times when resources are relatively abundant, but during times of scarcity the allocation of these increments depends predominantly on departmental power. They tested this hypothesis by analyzing data from 30 departments at the University of Minnesota for a twelve-year period, examining budget allocation to departments as a function of standard criteria such as relative workload and change in workload, variables measuring dimensions of political power, and an indicator of resource scarcity. Their analysis confirmed their hypothesis, and they suggested that "only during periods of scarcity of resources will there be competition for resources, competition normally resisted because of its potentially disruptive effects upon the coalition" (Hills and Mahoney, 1978, p. 455).

Moore and Pfeffer (1980) studied faculty advancement through steps within ranks at 40 departments on two campuses of a large state university system. They hypothesized that departmental affiliation, and particularly departmental power, had significant effects upon the advancement process. In many universities, decisions concerning tenure, promotion, and salary are reviewed by administrators or committees outside the individual's department. Since "the departmental

affiliation of a faculty member is one of the most salient institutional labels" (Moore and Pfeffer, 1980, p. 294), they suspected that departmental characteristics might have important structural effects on individual careers.

The departmental characteristics they chose for their analysis included departmental power, growth, proportion of senior faculty, level of paradigm development, and national prestige. Departmental power and faculty seniority mix were the most important predictors of faculty career speed in a regression analysis. Moore and Pfeffer (1980, pp. 303-304) maintained that the traditional demographic variables used to explain faculty promotion and salaries were important but incomplete, and suggested that some of the discrepancies in faculty salary studies might be resolved when the structural aspects of faculty labor markets were taken into account.

Duration of Power. The factors determining departmental power vary considerably among campuses and reflect both the mission and history of each institution. Mission partially determines the subset of departments likely to achieve power: A department of modern languages is unlikely to be a major power at a land grant university, and a nonresearch department will probably have little political clout at a major research institution. The historical development of power is important because power tends to grow gradually and change slowly, although change probably occurs more rapidly today than it did two or three decades ago. Studies of the national reputation of graduate programs, one proxy measure of departmental power, tend to substantiate this observation.

Cartter (1966) and Roose and Anderson (1970) attempted to determine the relative quality of doctoral programs at institutions across the nation by surveying representatives of various disciplines. These studies spawned considerable controversy, with some authorities (Dolan, 1976) questioning the basic assumptions and rationale behind their endeavors, and others offering evidence of proxy variables that correlate well with the departmental rankings, such as salary, size, and research productivity. In fact, departmental productivity seems to be the major factor in departmental reputation, although Beyer and Stevens (1977) caution that the set of predictive factors varies considerably across disciplines.

One frequent criticism of these quality rankings is that the relative rankings change quickly and are soon outdated. Muffo (1979, p. 27) reports, however, that research done on this question shows the relative rankings to be remarkably stable over time. This stability can probably be attributed to two characteristics of academe: relatively low turnover among the professoriate, and the tendency for faculty perceptions of individuals and departments to change slowly.

The turnover rate among faculty has been decreasing as the high school population has declined. Positions for faculty in many fields have become scarce, and the tenure system secures the jobs of faculty who might not otherwise be retained. Low turnover contributes to the slowness in change of perceptions, because rapid change in the productivity of a department generally occurs with an influx or outflux of faculty. Several new "hotshots" may double or triple a department's productivity, while the resignation of several published scholars may

decimate it. Rapid changes in faculty staffing patterns are the exception rather than the rule in academe, however; the slow evolution of a department is much more typical. The same is true of individuals, typified by a professor gradually building a scholarly record or slowly tapering off scholarly activity. The reputations of most faculty, and the departments they represent, are slowly won and also slowly lost.

These conclusions about departments interinstitutionally probably hold for departments at a single institution as well. Although it is certainly likely that faster communication occurs across a single campus, it is also true that many professors are more in tune with developments in their fields than with activities in other departments on campus. Relatively low turnover in most departments coupled with the time required for a faculty member to build a campus-wide reputation probably ensure that department status on campus is slow to change.

Muffo used the Roose and Andersen rankings and the annual reports of academic salaries published by the American Association of University Professors for the years 1971 through 1977 to determine whether salary scales were related to departmental rankings. Of the 30 institutions studied, all but four correlations were significant at the 0.01 level and those four were significant at the 0.05 level. The strength of the correlations increased with rank, with the salaries of full professors most highly correlated to departmental ranking. Highly rated universities pay to get and keep good people, particularly full professors. Muffo also noted a strong consistency of results over the seven year period, adding further weight to the hypothesis that relative rankings change slowly.

Muffo repeated this study using data for a single campus, the University of Illinois at Urbana-Champaign, using data gathered from the same 30 departments Roose and Andersen used in their study. He found that the average salary relationships across ranks held internally across disciplines as well as externally across institutions, with salary rewards distributed disproportionately to professors in highly rated departments.

Summary

Labor economists have long argued that economic forces operate within institutional frameworks and should be analyzed in the proper institutional context. Institutional organization is relevant to salary determination because salary decisions are part of the institutional resource allocation process. This chapter has presented three views of institutional organization that are applicable to the modern public university: internal labor markets, bureaucracies, and coalitions. Each concept has a different focus, but the three are not incompatible: A public university is a state bureaucracy with a well-developed internal labor market divided into departmental coalitions.

These types of organization suggest possible structural influences on faculty salaries, including university funding, the set of administrative rules and customs defining the reward system, and the determinants of power that allow departments to sway allocation decisions in their favor. Empirical evidence assembled over the last decade shows that the academic department is a significant locus of power for faculty. Power usually develops in departments whose charge

is in line with the mission of the university and tends to resist change over time.

This chapter and the last have reviewed a number of economic and institutional factors that can influence the salaries that individual faculty receive. The next chapter discusses the process of quantifying these factors and statistically measuring their effect on faculty salaries.

CHAPTER 4

ANALYZING FACULTY SALARIES

Previous chapters have suggested that faculty salaries are determined by the complex interaction of economic and institutional factors. Economic theories suggest that market, human capital, and productivity are important salary determinants, and studies of decision-making processes within organizations suggest that these processes are influenced by organizational structure. In short, faculty salary decisions are made by people about people in the context of an institutional setting—a hierarchical setting characterized by subunit differences in policies, personalities, and priorities, all of which may have an impact upon the weights given to the various market, human capital, and productivity factors detailed in economic theory.

This chapter describes the process of empirically analyzing the influence of various factors on faculty salaries. The chapter first focuses on the design of a faculty salary analysis, beginning with the critical step of defining the problem and the model, and continues with a discussion of analytical techniques. The next section deals with the considerable impact that antidiscrimination activism and legislation have had on faculty salary analysis. A description of the applicable laws is followed by a discussion of the government's role in emphasizing easily quantifiable salary determinants. The chapter then summarizes several salary analyses described in the literature; the examples are

not comprehensive, but they are representative of the type of work done in this area. The chapter concludes by briefly evaluating the salary determinants identified in these studies in terms of the theories introduced in earlier chapters.

The Study Design

How can the strength of various influences upon faculty salaries be measured? How can the important influences be separated from the unimportant? The design of a study of faculty salaries has four principal stages:

- defining the purpose of the study
- specifying the model to be analyzed
- quantifying the salary determinants
- selecting the analytic technique

Defining the purpose is an essential but often overlooked first step. The hypothesis of a study is embedded in its purpose, and choices made in subsequent stages of the design also reflect the purpose of the study. The results of the analysis, regardless of the technique employed, can be interpreted only in the context of a guiding hypothesis.

Defining the Purpose

Salary analyses are usually undertaken for one of three reasons. The first and most common is to study salary equity. Such studies are frequently initiated by university administrators in response to faculty charges of inequitable salary distribution. The charge may take the form of an individual's complaint, general faculty unrest, or a lawsuit filed against the university, either on behalf of an individual or a

protected class. Salary equity studies include legitimate determinants of salary as well as factors indicative of discrimination, such as sex, ethnicity, or age. The results of an equity study may be produced as evidence in court or used to adjust the salaries of faculty identified as underpaid.

Another reason university administrators analyze salaries is to determine the institution's actual salary structure. An understanding of the salary structure can be helpful for making difficult budgeting decisions necessary for reorganization or retrenchment. A study undertaken for this purpose can incorporate factors that might be deemed inappropriate for an equity study but quite useful for explicating various influential relationships, such as the priority ranking of academic departments.

The third reason, typified by journal articles in many fields, is to satisfy academic curiosity, which may be piqued by an institutional study undertaken by the university administration. Academics are an inquisitive lot with a vested interest in salary policies. Those who disagree with the assumptions inherent in salary studies at their institutions may be moved to test their suspicions via empirical analysis, sometimes even presuming that university administrators will pore over academic journals in search of enlightening results.

Specifying the Model

The next step in a study design is to identify the target population and specify the factors believed to influence the salaries of the target group. Some studies may include all faculty at the university, and others may be limited to tenured and tenure-track

faculty; department heads may be included in some studies, excluded from others. Identification of the target population should logically follow from the purpose of the study.

Depending on the purpose of the study, the factors specified as determinants of salary may be gleaned from university policies, observations of the administrative process, state and federal laws, and theories of wage determination. Faculty handbooks and policy manuals are good starting points for determining how salary decisions are made. Follow-up discussions with deans and department heads are essential. Vague language in the manuals may be symptomatic of a reward system that offers few practical guidelines for decision makers. But it is as important to know how the school officially says salaries are allocated as it is to know the practical criteria upon which administrators actually base their salary decisions.

Factors chosen for the model will vary with the purpose of the study. Some of the factors selected for inclusion may not be "legitimate" determinants of salary, and some relevant factors may be deliberately omitted. A salary equity study will include indicators of sex and race to test their influence even though allocating salaries on the basis of these factors is illegal. A study concerned primarily with structural differences may include indicators of departmental affiliation even though university policy states that discipline and not department is a salary determinant. An academic study may include only a few factors to test the hypothesis that they are significant rather than all factors relevant to the overall salary picture. Important factors are deliberately omitted from many studies due to inavailability

of data. In any case, the list of factors resulting from the specification process constitutes a crude model which must be defined more explicitly for the analysis.

Quantifying the Factors

Once the salary factors have been identified, they must be expressed in quantitative terms so that measurable comparisons can be made. This is frequently the most troublesome phase of an analysis because the factors are often difficult--even virtually impossible--to measure.

"Education" is a simple example. A faculty member's education is usually measured for salary studies in terms of degrees received, particularly the level of the highest degree. This measure indicates only the quantity of education and not the quality, however. In order to add a quantity component to the study, some analysts will include a variable indicating the quality of the graduate program at the institution where the degree was obtained. These measures are often criticized as vague and subjective, however, and the standing of an institutional graduate program may be a poor measure of the quality of a particular individual's educational experience. For example, the individual's area of specialty may not coincide with that portion of the program responsible for its rating. Another example: Participating in a postdoctoral program is an indicator of education past the doctoral degree, but the participation may have been motivated by a desire to maintain a holding pattern during a job search rather than by a desire to do additional research. In sum, measuring how much formal schooling

an individual has received is a relatively easy matter; measuring how much education an individual has received is far more difficult.

Despite the obvious difficulties involved in trying to measure what an individual has learned, education is usually regarded as one of the easier factors to quantify because most analysts are willing to settle for a simple indicator of highest degree. To some extent the quantity/quality problem just described plagues all efforts to define abstract concepts in concrete terms. Professional experience is usually represented by variables indicating years since highest degree, or years at rank, or years in the university community. Once again, these variables measure only the quantity of professional experience. Good measures of merit and productivity in the profession are much more difficult to establish.

Selecting the Technique

The goals and objectives of faculty salary analysis are sufficiently diverse that no one method has been universally accepted as the technique of choice. Some analyses are done entirely in terms of descriptive statistical procedures such as frequency distributions, first-order correlations, crosstabulations, and t-tests. Others involve factor analysis, multiple discriminant analysis, log linear analysis, or canonical correlation (Carter et al., 1984). The methods most frequently employed are matching, descriptive statistics, and multiple regression analysis (Hengstler and McLaughlin, 1985, p. 98).

Matching. Matching, sometimes called counterparting, is often used for salary equity studies. The technique involves comparing the

salaries of two individuals matched in terms of the relevant salary determination criteria. This approach has the advantage of focusing on individuals, but for the same reason presents at times an impossible challenge. Satisfactorily matching two individuals in terms of all relevant determinants of salary is at best extraordinarily difficult and at worst impossible. Even in a large department two professors are seldom exactly equal even in education and experience (Muffo et al., 1979, p. 70). Who is the counterpart of the lone associate professor in a small department?—an associate professor in another department?—if so, which department? Or is the proper counterpart an assistant professor in the same department? If so, how is the salary differential attributable to rank determined?—and the expectations for scholarly performance?

Furthermore, who makes the match? The dean or department head? The departmental faculty? The faculty member whose salary is in question? The matches produced by these sources may differ, and who decides which is the "best" match? A related problem with matching involves the animosity that the process may generate at a personal level. Many professors have a high degree of ego involvement in their work, as well as inflated assessments of its worth to the profession. Officially declaring two individuals to be "the same" may be threatening or offensive to both parties.

The biggest problem with using matching to study salary equity is that the matching technique can determine only the existence of inequity, not its extent (Pezzullo and Brittingham, 1979). Matching focuses upon the difference in salary between the two matched

individuals. Matching does not allow for all possible comparisons among individuals who may be similar by various criteria. Unless two individuals are "perfectly" matched, a basis exists for maintaining some difference in salary. But no criterion exists to indicate how much difference in salary is "too much." Statistics provide no help in this determination since they pertain to populations and samples rather than individual comparisons.

Descriptive Statistics. Many simple questions can be answered using basic descriptive statistics, and the answers provide a good background for more elaborate analysis, if needed. For example, simple statistical procedures and tests of significance can be used to address questions such as: Are the mean salaries of historians and English professors significantly different? Do minority faculty wait longer than white males for tenure? What are the average salaries of men and women in different academic ranks?

The choice of a descriptive method depends upon whether the variable in question is continuous or discrete. The numerical values of continuous variables cover a wide range with only small incremental differences between adjacent values. Salary is a good example of a continuous variable; faculty salaries may range from \$15,000 to \$50,000, and the smallest incremental difference between salaries is \$1, although universities may maintain increments of \$10, \$50, or \$100. Years of experience is another continuous variable, often calculated as the number of years between the current year and the year in which the highest degree was awarded. The number of years of experience may range from 0 to 50 or more, and the increment is a single year.

Several descriptive statistics can be used to summarize the values of a continuous variable for a sample or a population. The mean is the most common measure, often reported with standard deviation. Minimum and maximum values bound the range. The sum of all values is another frequently used statistic.

Discrete variables, on the other hand, usually have a much smaller range of values with distinct increments between groups. Rank is a discrete variable, with at least three categories--assistant professor, associate professor, and full professor. Sex is a discrete variable with two values, male and female. Continuous variables may be recoded into discrete categories; salary, for example, could be grouped by \$1000 increments--\$15,000-19,999, \$20,000-24,999, and so forth.

Many of the descriptive statistics for discrete variables involve counting the cases in various categories. A univariate frequency distribution reports the number of cases in each category and usually its percentage of the total number of cases as well. A bivariate frequency distribution presents this report for two variables simultaneously. Crosstabulations present this information in a row-by-column format.

Descriptive statistics can provide an overview of the salary distribution on a campus. An analyst might begin by dividing the faculty population into different groups--by sex or by rank, for example, and calculating the mean salary for each group. A t-test will tell whether a statistically significant difference exists between these mean values. Pearson product moment correlations will show the relative amount of association between two variables, such as salary and years of

experience. The analyst would use frequency distributions to check the number of cases in different groups—sex, rank, degree, department, and discipline, for example.

Graphic plots of the variables are also useful to determining whether two variables are related and, if so, in what fashion. A well-designed graph often makes a stronger impression upon an audience than does a table of numerical data.

Descriptive statistics overcome the idiosyncratic disadvantage of matching by dealing with aggregate data, but investigations of univariate and bivariate relationships often give rise to questions involving relationships among multiple factors: Are approximately equal salaries paid to men and women of the same rank and tenure status? Do men have higher salaries than minority faculty with comparable publication records? Although these questions can be addressed by repeating the appropriate descriptive statistical procedures for as many groups as necessary, the number of tests tends to proliferate past the point of easy evaluation. Multiple tests also increase the likelihood that random occurrences will be considered significant.

Multiple Regression Analysis. Since explanations of salary differentials usually involve multiple factors, salary analyses often involve multivariate statistical techniques, such as analysis of variance, analysis of covariance, and multiple regression analysis. Of these, multiple regression analysis using the ordinary least squares technique is by far the most popular method for analyzing salaries and has gained acceptance in many fields.

The goal of regression analysis is to determine the relationship between the dependent variable, salary, and the independent variables believed to be important determinants of salary. This relationship is expressed in functional form as

$$Y_i = b_0 + b_1X_{1i} + \dots + b_kX_{ki} + e_i$$

where Y is the dependent variable

i is the case indicator

b_0 is the intercept term (y axis)

X_1-X_k are the independent variables

b_1-b_k are the regression coefficients, or unknown parameters

e is the random effects

Multiple regression analysis is an appropriate technique for salary analysis when the data meet certain assumptions upon which the procedure is based. One important assumption is that a linear relationship exists between the dependent variable, salary, and each of the independent variables (Snedecor and Cochran, 1967, p. 136). This requirement is not as restrictive as it might first appear, however, for the linearity condition applies to the unknown parameters rather than the raw data. That is, the expectation of the dependent variable in the unknown parameters must be linear (Thiel, 1978, p. 188). In cases where the relationship is not linear, adding a quadratic term or expressing a variable in another form may alleviate the problem. If the relationship between the independent and dependent variables cannot be expressed as a linear function, then ordinary least squares regression is not an analytical technique of choice.

The other assumptions of multiple regression analysis are best expressed as properties of the random effects term, e, and the explanatory variables, X. Kmenta (1971, p. 202) refers to these as the

sic assumptions, which apply to all observations. The basic assumptions of linear regression are stated by Kmenta (1971, p. 202, p.

8) as follows:

normality: e_i is normally distributed

zero mean: $E(e_i) = 0$

homoskedasticity: $E(e_i^2) = \sigma^2$

nonautoregression: $E(e_i e_j) = 0 \ (i \neq j)$

nonstochastic X : X_i is a nonstochastic variable with values fixed in repeated samples and such that, for any sample size,

$$\frac{1}{n} \sum_{i=1}^n (X_i - \bar{X})^2 \text{ is a finite number different from zero}$$

the number of observations exceeds the number of coefficients to be estimated

no exact linear relation exists between any of the explanatory variables

These assumptions describe the "classical normal linear regression model" in the context of multiple regression (Kmenta, 1971, p. 348). The first two assumptions require that the random effects be normally distributed around zero. The assumption of equal variance rules out a relationship between variance and values of X_i . These three assumptions imply that the random effects are uncorrelated and independent. The assumption of nonautoregression rules out serial correlation in the error term. The assumption of nonstochastic X_i merely requires that the values of the independent variables be predictable rather than random. The number of observations must exceed the number of estimated parameters to preserve sufficient degrees of freedom for estimation. Finally, the assumption of nonlinearity between dependent variables rules out the problems associated with multicollinearity.

The data used in salary analyses are never perfect, of course. The variation in salary for full professors may exceed the variation for assistant professors, and some of the measurements of experience may be tightly related. But the more strongly these assumptions hold, the greater the likelihood that the model will yield estimates of the unknown parameters that are unbiased, efficient, and consistent (Wonnacott and Wonnacott, 1979, pp. 55-66). A parameter estimate is unbiased if its mean is equal to the true value of the parameter. An estimator is efficient if its variance is smaller than that of other estimators. It is consistent if its probability distribution approaches the true value as the sample size gets very large.

The results of a multiple regression analysis yield indicators of the overall significance of the model as well as indicators of the significance of each independent variable. The adjusted R^2 estimates the proportion of variation in salary explained by the independent variables; the standard error of the estimate is essentially the standard deviation of the actual salaries from the values predicted by regression; and the overall F-statistic tests the hypothesis that the set of explanatory variables or their linear combination have no relationship to faculty salary. The regression coefficients, standard errors, and t-tests calculated for each explanatory variable indicate the strength of each variable's impact on salary.

The widespread support accorded multiple regression analysis does not mean that results generated by the technique are inviolable. It is easy to overlook potential violations of the assumptions underlying regression analysis and place too much credence in the results. No

gression analysis with degrees of freedom greater than zero explains 1 of the variation in faculty salary, yet too often analysts treat their results as though they had achieved total correspondence between model and data rather than the amount of explained variation indicated by adjusted R^2 (usually in the range of .50-.80). A tendency for analysts to overinterpret the results of multiple regression analysis is not intended as an argument against its use; rather, it is intended as a warning against relying too heavily upon a strict formula approach.

Salary Analysis and the Law

Civil Rights activism, the pressure of the women's movement, and extension of the coverage of antidiscrimination legislation to institutions of higher education in 1972 brought an urgency to faculty salary analysis far beyond the desire to test the implications of theories in the academic sphere. The activism and legislation were based on the premise that faculty salaries had demographic determinants as well as the economic and institutional ones suggested by theory. Colleges and universities suddenly had to defend themselves against charges of discrimination filed in the wake of the Educational Amendments Act. The majority of these charges involved salary discrimination on the basis of sex.

Prior to 1972, most courts avoided intervening in academic affairs; judges felt unqualified to arbitrate tenure, promotion, and salary disputes because of the abstruse variety of academic specialities and conventions (Bompey and Saltzman, 1982-83, p. 265; Green, 1981-82, p. 06). Since antidiscrimination legislation was extended to include

aculty, however, the courts and the federal government have taken a much more active role in monitoring employment processes in the academic community, and the types of monitoring acceptable in these arenas have had a major impact upon model specification at the university level. The laws affecting universities are described below; a discussion of federal monitoring techniques is followed by an evaluation of the impact of class action lawsuits on faculty salary analysis.

Laws Addressing Salary Discrimination

The Equal Pay Act of 1963 (29 U.S.C. S206[d]) was an amendment to the Fair Labor Standards Act (29 U.S.C. S201, et seq.) established to prohibit sex-based wage discrimination by requiring equal pay for equal work. The Act was amended in 1972 to cover professional, executive, and administrative personnel, including faculty. According to the Act, wage differentials are permissible if based on merit, seniority, quality or quantity of production, or any factor unrelated to gender. The Equal Pay Act was originally enforced by the Wage and Hour Division of the Department of Labor, but in July of 1979, enforcement responsibilities were transferred to the EEOC (Campbell et al., 1983, pp. 5-17). Individual suits are the norm under this Act; the class action procedures cannot be used.

Title VII of the 1964 Civil Rights Act (42 U.S.C. S2000e et seq.) became effective in 1965; it too was amended in 1972 with the Equal Employment Opportunity Act to cover all employers of 15 or more employees, specifically including educational institutions. Title VII explicitly bans discrimination in all employment practices on the basis of sex, race, color, religion, and national origin. Title VII requires

series of attempted administrative remedies prior to suit. The EEOC is charged to investigate and conciliate charges of discrimination and issue "right-to-sue" notices to parties in public institutions. Both private and class-action suits may be filed under Title VII.

Executive Order 11,246 (30 Fed. Reg. 12,319 [1065]) and its amendments (Executive Orders 11,375 [32 Fed. Reg. 14,303 (1967)] and 11,248 [34 Fed. Reg. 12,985 (1979)]) prohibit employment discrimination by all employers with federal contracts for goods, services, and construction in amounts over \$10,000. Institutions holding contracts in excess of \$50,000 are required to have written affirmative action plans. The Order became effective in 1966 and was extended to cover sex discrimination in 1968. It is enforced by the Office of Federal Contract Compliance Programs (OFCCP) within the U.S. Department of Labor. Suits are not filed under the Order; individual and class complaints are directed to the OFCCP, which transfers individual complaints to the EEOC and investigates those complaints involving a protected class.

The Age Discrimination in Employment Act of 1967 (29 U.S.C. §621, et seq.) and the Additional Provisions of the Age Discrimination in Employment Act Amendments of 1978 (92 Stat. 189; Public Law 95-256, 95th Congress) prohibit employment discrimination based on age. Specifically, they prohibit discrimination in hiring, firing, compensation, terms, conditions, or privileges of employment; generally, they prohibit classifying employees in any way with respect to age that would adversely affect their status as employees (Yancey, 1985, pp. 60-1). The Act protects individuals between the ages of 40 and 70.

These federal laws are the ones most often invoked in faculty discrimination complaints. Other antidiscrimination laws and regulations exist, such as Title IX of the Educational Amendments of 1972, enforced by the Office of Civil Rights of the Department of Education; the National Labor Relations Act of 1934, enforced by the National Labor Relations Board; and the Fifth and Fourteenth Amendments to the Constitution. In addition, some states have antidiscrimination laws more stringent than those at the federal level (Campbell et al. 1983).

Monitoring Antidiscrimination Legislation

Given the number of laws relevant to discrimination and the number of state, regional, and federal offices involved in investigating complaints, it is not surprising that the enforcing offices would strive to standardize their procedures for all occupations. Unfortunately, the type of standardization these offices tended to employ in response to the concise language of the Acts was not equally applicable to all occupations. Lester (1975, p. 38) echoed the sentiments of many academics in his warning concerning the monolithic nature of the Equal Pay Act:

The specific wording of the four-sentence Equal Pay Act was designed for application to sex discrimination in pay for rather simple, routine, low-paying work. Although workers in a job category may not be completely homogeneous and performance may not be exactly identical, the range of individual variation is usually not significant, so that for all practical purposes, performance differences can be disregarded.

Lester's criticisms apply to all of the antidiscrimination legislation, because in each case faculty were grafted onto laws designed to be used

in simpler circumstances than the university faculty environment. Determining seniority for faculty is straightforward enough, but valuating them in terms of "merit" and "quality or quantity of production" is a much more difficult undertaking due to the tremendous variation in work expectations for faculty.

Implicit in this law is the assumption that pay should be based on the characteristics of the job rather than the characteristics of individuals performing those jobs. University professors are usually not paid according to job content, however, because the job content of all professors is roughly the same: teaching, research, and service. The academic community considers pay to be fair when it is based on faculty contributions in these areas (Lester, 1975, p. 40).

Valuating faculty contributions is complicated by the extreme diversity of academic specialties and performance expectations. The fact that expectations differ for faculty in different departments is obvious; biologists are not expected to do the work of anthropologists, and vice versa. However, even within departments a considerable range of variations in expectations exists. A typical department of agricultural economics, for example, may contain specialists in ag finance, farm management, production economics, international agriculture, quantitative methods, and perhaps other areas as well. Specialists within a single department may write for different journals, undertake different kinds of research, be responsible for providing different loads and levels of service, and so on. Some faculty are expected to devote the majority of their time to teaching; others have heavy research commitments and much lighter teaching loads.

Lester also strongly criticized the procedure used to investigate faculty complaints from universities:

Lacking adequate knowledge of university faculty practices and a proper conceptual framework for analyzing faculty salaries, the staff of the Wage and Hour Division has tended to take the same approach [they take to routine jobs] to faculty salaries. . . . And the staff has not been prone to apply the provision in the Equal Pay Act with respect to "merit systems" (Lester, 1975, pp. 41-42).

Investigators from the Wage and Hour Division used the technique of pair matching, emphasizing easily quantifiable factors such as highest degree and years of experience. The U.S. Office of Civil Rights (OCR) also emphasized easily quantifiable factors in its settlement with the University of Wisconsin at Madison in 1977:

The University will conduct an analysis to determine potential salary inequities. In one part of the analysis, professional job-related criteria will be identified as basic variables for use in the analysis. Basic variables will be quantified and include: department, rank, time in rank, and measure(s) of length of professional service. Other valid quantifiable variables may be included, provided, however, that prior to inclusion the university shall consult with OCR regarding inclusion of those variables. Using these variables, the University will conduct valid statistical or other empirically verifiable and auditable studies, such as a multiple regression analysis of faculty and academic staff salaries to identify wage discrepancies (Change, 1978, p. 45).

The approaches of both the Wage and Hour Division and the Office of Civil Rights tended to disregard the specialty and productivity factors that are crucial in setting salaries at an institution of higher learning because matches in these areas were so difficult to achieve. The drawbacks of using the matching technique to compare faculty were discussed earlier in this chapter. The multiple regression recommended by the OCR gave the university little incentive to add productivity variables to the analysis. The danger, in Lester's opinion, was that a superficial equality would be attained on the basis of these easily

identified factors that would result in serious inequalities in terms of quality.

Title VII is considered to be the most encompassing of the federal antidiscrimination laws, and due to its provision for class action litigation it has had the greatest impact on colleges and universities. The other laws periodically invoked by faculty are much more limited in scope or effectiveness (Campbell et al., 1983, pp. 5-26). The penalty for Title IX violation is termination of federal funds, but the Grove City decision currently limits fund termination to the specific program in which discrimination is practiced. Efforts to broaden this restriction have not yet been passed by Congress and may never be. The Equal Pay Act does not permit class action suits, and violations are rather narrowly defined. Executive Order 11,246 precludes litigation, relying entirely upon government intervention.

By contrast, Title VII requires active monitoring of employment in higher education. All institutions of higher education having 15 or more employees must submit a biennial Higher Education Staff Information report, which is evaluated by a committee representing EEOC, CR, and OFCCP (EEOC, 1983, p. 1). The report requests counts of employees at various salary levels, academic ranks, and job classifications by sex and minority status. This reporting procedure sends a clear signal to universities that discrimination issues are being monitored in terms of easily quantifiable data. Reporting of this sort is understandable from a practical standpoint, but it has the unfortunate side effect of emphasizing the quantitative factors at the expense of the qualitative ones.

Salary Analysis and the Courts

Title VII has had an additional impact in quantitative emphasis through class action suits. Under Title VII, a plaintiff may bring action under either a "disparate impact" or "disparate treatment" theory of discrimination (Bompey and Saltzman, 1982-83, p. 264). The disparate treatment theory presumes that an employer treats an employee differently because that individual is a member of a protected group; in disparate treatment cases, demonstration of motive is necessary. Using the disparate impact theory, the employee need only show that the impact of some employment practice falls disproportionately on a protected group. The employer is held liable for discrimination unless the employment practice can be justified as a business necessity. This theory readily lends itself to class action suits.

Although the vast number of Title VII suits are brought by individuals on their own behalf, it is the class action suits that have influenced statistical assessment of faculty salaries. Statistics are seldom emphasized in individual Title VII suits (Bompey and Saltzman, 1982-83, p. 271), but in class action suits the evidence may be almost entirely statistical (Bodner, 1983-84; Baldus and Cole, 1980). Salary analyses are used as primary, and occasionally as exclusive, evidence of discrimination. "Statistical analyses have been at the very core of every class action discrimination suit involving faculty salaries that as so far reached decision on the merits" (Bodner, 1983-84, p. 305).

The first step in a class action suit is to establish a prima facie case of discrimination (Baldus and Cole, 1980). In order to do this, claimants must show "(1) that there exists an observable difference in

salary and rank levels between members of the class and faculty outside the class; (2) that this difference is significant in magnitude; and (3) that this difference could hardly occur by mere chance" (Simpson and Rosenthal, 1982, p. 6-7). Most prima facie cases are established using simple descriptive statistics, such as men's and women's average salaries with accompanying t-test, or salary differences by rank with a chi-square test. Graphical presentations of the percentage differences between men and women at different salary levels make compelling court demonstrations (Simpson and Rosenthal, 1982, p. 8). In order to counter the simplistic assumptions inherent in such presentations, the university usually resorts to multiple regression analysis.

Multiple regression analysis is used in the majority of Title VII cases and has also been used under the Equal Pay Act. Proper specification of the determinants of salary, a demanding and sensitive task under any circumstances, is the key to a valid regression analysis. Unfortunately, such factors as supply of faculty, demand for services, and the relative positions of schools, departments, and individuals in the bureaucratic hierarchy are all extremely difficult to quantify. Quantifying faculty productivity is even more difficult, particularly when the quality of the product is an issue, as it invariably is with university faculty. Evaluating such important factors as quality of teaching and quality of research require subjective judgments, which may be biased. Because of the difficulty of evaluating faculty productivity and other hard-to-quantify salary determinants, government agencies and attorneys have tended to omit them from salary analyses and focus

nstead on the more easily quantifiable human capital factors of education and experience.

Omitting relevant factors from an analysis exacts a toll, however, because the variance in salary actually attributable to those factors will appear as part of the "unexplained" variation and may also bias some of the remaining parameter estimates. Unfortunately, there is no way to neutralize these factors or remove them from analysis. Regression analysis evaluates the influence of all factors upon the dependent variable, including the independent variables specified and the residual or unexplained variation attributable to factors not explicitly included in the model. Although many relevant factors may have been omitted from a regression model, the courts tend to attribute unexplained variation to discrimination. Bodner (1983-84, p. 316) therefore regards regression analysis as "misleading and often dangerous," but its status as an acceptable statistical technique for assessing salary discrimination in the courts is secure (Fisher, 1980, Linkelstein, 1980).

Case Studies Illustrating Faculty Salary Analysis

The Civil Rights movement of the 1960s served as the inspiration for the women's movement of the 1970s, and the combined equal rights activity which gave rise to legislation also had a profound effect upon academic research, motivating scholars in various disciplines to search for evidence of discrimination throughout the labor market. Virtually all articles describing faculty salary analyses include sex as a

eterminant; if testing for sex discrimination was not the primary purpose of the article, the authors included it as a side issue.

As discussed earlier, faculty salary analyses have been performed by different groups for different purposes. Academics test hypotheses relating specific factors, both economic and institutional, to faculty salaries. University administrators study salaries before making budgeting or equity decisions. As a result, the literature on faculty salary analysis is widely distributed among disciplines. A representative sample of studies is presented here to illustrate the variety of approaches taken as well as the elements common to all.

The studies were chosen to present a broad spectrum of faculty salary analyses. Some of the studies are more than a decade old; some are fairly recent. Some are interinstitutional; some focus on a single university; other analyze salaries within a single department. Some are multidisciplinary; others address only one discipline or specialty. Each study is presented under a heading naming the authors of the paper. The determinants of salaries presented in these analyses will serve as points of reference for developing a model of MSU's salary structure in chapter 6.

Stin and Bayer

During the academic year 1968-69, the Carnegie Commission on Higher Education, in cooperation with the Office of Research of the American Council on Education, conducted a national survey of college and university teaching faculty. The 60,028 responses were analyzed by Stin and Bayer (1972) for indications of sex discriminations in academe, and their results are particularly interesting because they

redate the Educational Amendments Act of 1972 and thus serve as a baseline for comparison with studies following the Act. In fact, the American Council on Education once again surveyed college and university faculty in 1972-73, and Bayer and Astin (1975) studied the 53,034 responses for changes in sex differentials since the implementation of federal antidiscrimination regulations.

In their earlier analysis, Astin and Bayer (1972, pp. 101-102) pointed out that sex discrimination in academe begins long before a woman is hired by a college or university, having its roots in early sex role socialization. Once on the faculty, women must contend with a reward system

. . . biased toward behaviors and activities exhibited more often by men than women. . . . so rewards go primarily to those women who accept and share men's criteria for academic rewards. Thus, administration, research, and publications, which men engage in to a greater extent than women, receive higher rewards than teaching, which women devote more time to than men (Astin and Bayer, 1972, p. 101).

The Carnegie Commission survey represented the most comprehensive and systematic gathering of national faculty data at that time. Astin and Bayer noted that earlier studies were limited by small sample sizes and few explanatory variables. Their own study analyzed three dependent variables--rank, tenure, and salary--in terms of four sets of independent variables: demographic characteristics, educational background, professional/work activities, and characteristics of the institution of employment (Astin and Bayer, 1972, p. 104). The specific variables included in each set are listed on the following page.

Demographic characteristics:

- sex
- age
- race
- citizenship
- religious background
- current religion
- father's education
- marital status
- number of children
- political orientation

Education:

- highest degree held
- graduate school stipend support
- year of highest degree
- major field
- quality of higher education

Professional experience:

- teaching department
- years employed in academe
- years employed at current institution
- amount of time spent in administrative work
- teaching/research interests
- number of published articles
- number of published books
- number of students taught
- degree to which one discourages office visits by students
- basis for salary (11-12 month or other)

Institutional characteristics:

- type
- control
- sex composition
- location
- racial composition
- curriculum(liberal arts, teacher education, technical)
- enrollment size
- affluence (total revenues per student)
- selectivity (average ability test scores of entering students)
- percentage of PhDs on staff
- size of library in number of volumes

Astin and Bayer regressed each dependent variable on all independent variables except sex using a stepwise multiple regression procedure, and then determined the extent to which sex by itself explained the residual variation in the dependent variable. This

technique guaranteed a conservative estimate of sex discrimination, since they presumed that discrimination inherent in some of the other variables, such as rank and graduate school stipend.

They discovered a clear bias against women with respect to rank; F-ratios indicated that "sex is a better independent predictor of rank than such other factors as the number of years since completion of education, the number of years employed at the present institution, or the number of books published" (Astin and Bayer, 1972, p. 105). Sex was not a significant predictor of tenure because its influence on tenure was subsumed under rank. Rank was the single best predictor of tenure, followed by length of employment at the current institution.

The three best predictors of salary were rank, productivity, and type of parent institution. Even after controlling for all other independent variables, sex emerged once again as a better predictor of salary than such factors as number of years of professional employment and possession of a doctorate. Higher salaries went to faculty at two- and four-year institutions than similar faculty at universities, although large and/or prestigious universities paid the highest salaries. Variables indicating specialization and teaching department were also significant, with salaries highest in the areas of engineering and business and lowest in the humanities. Number of years of employment at the current institution was a negative predictor of salary, implying that mobile faculty are likely to be better paid. In sum, women were at a greater disadvantage than the partial-r associated with sex indicated because they tended to work in the less prestigious

schools, teach in the less well-paid departments, preferred teaching to research, and were generally less mobile.

Traditionally, the academic reward structure—rank, tenure, and salary—has been defined chiefly by publication productivity and degree credentials. Persons are recruited more vigorously and rewarded more generously if they are visible and credentialed scholars. At most academic institutions, a person's teaching ability and interests are paid lip service only; they are not used as the primary performance criteria (Astin and Bayer, 1972, p. 116).

Astin and Bayer speculated that publications and degrees were more observable and quantifiable than teaching success, and that this visibility extended beyond the institution to colleagues at other schools. The ratings of Cartter and Roose and Anderson directly reflected faculty visibility in these areas. Astin and Bayer (1972, p. 17) also pointed out that the importance of productivity is taken for granted in the academic world, even though little work has been done to assess the effects of these characteristics on students and the education they receive.

Astin and Bayer repeated the regressions for males and females separately. The same variables were the primary predictors of rank for both men and women: age, number of articles published, the doctorate, years spent in continuous service, and time spent in administration (Astin and Bayer, 1972, p. 110). Much greater differences existed among the predictors of salary, although rank was the best predictor for both men and women. The second best predictor for men was number of published articles, and for women, having the doctorate. Field of specialization and teaching departments were more important for men, while institutional characteristics were more important for women.

Bayer and Astin's (1975) report of the 1972-73 survey shows that the status of women relative to rank had improved very slightly, with the partial correlation between being a woman and holding a high rank at .13 ($F=86$) compared with $-.17$ ($F=197$) in the 1968-69 analysis. Sex was still an insignificant predictor of tenure. The greatest change was in women's salary status; the partial correlation between sex and salary was considerably lower at $-.04$ (though still significant at $F=9$) than in the 1968-69 study, when the partial correlation was $-.16$ ($F=192$). Bayer and Astin (1975, p. 799) suggested that the salary differential by sex partially reflected differential rates of promotion; there were no salary differentials by sex within ranks.

In the 1972-73 study, salary predictors differed substantially for men and women. Only four predictors entered the female equation in the stepwise regression analysis: highest degree, number of published articles, two-year institution, and amount of time spent in administration. Those four variables plus 13 others were significant for men.

These shifts in results between 1968-69 and 1972-73 suggest that the traditional criteria used in the awarding of salaries may be in the process of being abandoned or reformulated, or at least are not being uniformly applied to women and men throughout the various sectors of academe (Bayer and Astin 1975, p. 800).

Bayer and Astin (1975, p. 801) concluded that progress toward equity was evidenced by the two studies, which also indicated that much had yet to be achieved.

Scott

Scott has also been very active in the area of salary analysis. In 1977 the American Association of University Professors published her Higher Education Salary Evaluation Kit, "a recommended method for lagging women and minority persons for whom there is apparent salary inequity and a comparison of results and costs of several suggested methods" (Scott 1977, p. i). Her list of data required for each faculty member includes:

- actual contracted salary in dollars, adjusted to one base
- year of birth
- indicator of highest degree (0=Bachelor's, 1=Master's, 2=doctorate)
- year of highest degree
- sex
- white or minority
- indicator of department or unit (each with at least 15 white males)

Three of the variables are demographic (age, sex, race), two represent human capital (degree and year of degree), and one is an institutional/market determinant (department or unit making decisions about the individual). According to Scott (1977, p. 1), regressing salary upon these variables will provide "an estimate of what the salary of the women or minority person would be if she or he were a white male with the same attributes and experience" and also "an estimate of the amount of money needed to bring the actual level of the woman or minority person up to the level of comparable white males." Her recommended procedure, sometimes referred to as the white male model or best male model (Waters and Milliken, 1982), is to compute the predicted salary equation for the white males in each group and then substitute the attributes of each female in that equation to calculate her predicted salary. If the difference between her actual and predicted

salaries is negative, the woman is flagged for apparent underpayment and referred for administrative review.

Scott admitted that the model is simplistic, but stated that "our studies confirm that more complicated and sophisticated methods for predicting salaries, although apparently more realistic, yield roughly the same estimates of underpayment of women and minority persons with the same persons flagged" (Scott, 1977, p. 3). She also reported that additional predictors will improve the estimates only slightly. The reason for this is that the white male comparison population has succeeded in the system thus far and tends to be rather homogeneous in attributes; white males "progress at roughly similar rates in systems which base salary decisions on continual academic achievement" (Scott, 1977, p. 4). She suggested that quality would tend to drop out as a predictor if almost everyone was performing optimally.

Scott (1977, p. 8) warned against using predictors that could be contaminated by sex or race bias, and she found evidence of discrimination in almost all possible predictors of salary. She specifically warned against using the following potentially biased variables:

- admission to graduate school
- number of years to obtain the doctorate
- articles and books published
- administrative experience
- rank
- tenure

Scott was particularly opposed to using rank as a predictor of salary because she believed rank and salary were determined through the same decision-making process. For institutions having a rank-step pay system, such as schools in the University of California system, rank

almost completely determines salary; merit increases are given as rank-step promotions rather than explicitly as raises. Scott admitted that rank and step are not as closely associated at all schools, but maintained that "the relation is always so strong that rank cannot be used as a predictor variable when studying salary inequities" (Scott, 1977, p. 8).

Scott's method seems like Lester's warning come true. Her variables explained 82% of the variation in salary for a test group, and she suggested that year of highest degree added little explanatory power to the model and could easily be omitted. This leaves an equation containing three demographic, one human capital, and one institutional/market variables, with no specific indicators of quality. Her model may be appropriate for a high-powered institution that consistently maintains an elite faculty through selective recruitment and strict tenure policies. For an institution trying to improve faculty productivity through salary rewards, her model would work against these efforts by providing no incentive to enforce the reward policies.

Siegfried and White

In order to identify the relative salary rewards given for teaching and research activities, Siegfried and White (1973) focused on a single economics department at a large public university, the University of Wisconsin at Madison. Salaries at this university were set through an internal evaluation process at the departmental level and thus should reflect the criteria that members of the department viewed as important. The absence of formal salary scales permitted flexibility in salary

cisions, so that salary could be offered as a reward for preferred and productive activities. The relatively narrow focus of this study has the advantage of avoiding interinstitutional and interdepartmental implications by focusing on a relatively homogeneous group; it has the advantage of applying conclusively only to that test group.

The study was based upon data gathered in the 1971-72 academic year for 45 faculty members in the economics department (Siegfried and White, 1973, p. 91). The dependent variable was salary for that year, and the independent variables included:

- experience: years since completion of graduate studies
- cumulative research output: total number of publications
 - monographs
 - articles in national journals
 - articles in regional or specialty journals
 - all other publications
- teaching productivity: constructed from teaching evaluations
- administrative duties:
 - department chair
 - research institute director

The teaching index was adjusted for course level, seasonal variations, and extreme observations. Rank was deliberately omitted from the model because it was also determined by experience, publishing, and teaching performance. The proper specifications of the salary and teaching productivity variables were found by maximum likelihood methods, which revealed that the linear form of salary was preferable to its logarithmic transformation and that the fourth integer power of the teaching variable was the preferred expression.

Regression analysis yielded an R^2 of .881 and revealed that all variables were significant predictors of salary at the .01 level except teaching, which was significant at .10, and monographs, which was not significant (Siegfried and White, 1973, p. 94). Articles published in

ditional journals were worth an additional \$392 per year, and each article in specialty journals was worth \$345 per year; any other type of publication was worth only \$76 per year. Improvement in teaching performance had a relatively small impact on salary; a change from the departmental average to the top 15 percent would yield a salary increase of 2.5 percent, while a similar improvement in research productivity would yield an increase of 18 percent. The incentive structure in this department was obviously oriented toward research, although Siegfried and White (1973, p. 95) stated that the department had high teaching standards and worked to maintain them. Salary rewards, however, accrued research rather than teaching.

Siegfried and White also elected to test the hypothesis that good researchers are usually good teachers. The evidence prior to their study had been contradictory: Voeks (1962) had found no significant correlation between teaching and publishing at the University of Washington; Hayes (1971) also failed to find a correlation at Carnegie-Mellon University; Bresler (1968) found teaching evaluations and receipt of research grants to be correlated at Tufts University, however. Regressing the teaching index on the publication variables and professor's age yielded no conclusive positive association. Siegfried and White (1973, p. 96) concluded that "there now exist three studies, using independent samples, that reject the notion that good faculty researchers are necessarily good teachers." Thus, using a variable measuring research productivity as a proxy for teaching productivity—or even overall productivity would be counterindicated by this study.

Tuckman, Gapinski, and Hagemann

Universities desire faculty members skilled in teaching, research, public service, and administration. Faculty members seldom possess these skills in equal measure, for skills require time to develop. To some extent faculty must choose among skills, and the returns from each may affect their decisions. Tuckman et al. (1977, p. 692) postulated that "the salaries of faculty members are determined to a substantial degree by market valuation of their skills."

They speculated that the demand is limited for outstanding teaching skills, and that the reward is low. Most new faculty are hired before their teaching has been tested, and even among experienced faculty good teaching is usually known only locally. Research output, however, is much more visible, more easily judged by experts, and can result in a national reputation as well as a local one. Thus, returns to research would likely be higher than those to teaching. Public service activities, like teaching, receive local rather than national attention. Furthermore, the definition of public service varies considerably, making the assessment of a faculty member's skills in that area difficult. Consequently, returns to this skill would be expected to be lower than to research. Finally, administrative skills are learned on the job and are hard to measure; the market may be limited, but the demand for qualified individuals is high.

Tuckman et al. used a sample of the American Council on Education 1972-73 survey also analyzed by Bayer and Astin. They selected full-time university faculty drawn from five broadly-defined disciplines: social science, liberal arts, math-engineering, biological sciences, and

physical sciences. The dependent variable in their analysis was salary, and the independent variables included:

- articles, partitioned into six categories
- books, partitioned into two categories
- teaching, indicated by receipt of an award
- public service, indicated by unpaid organizational commitment
- administration, current dean or department head
- past administration, past dean or department head
- experience, measured as number of years since highest degree
- PhD, receipt of a doctoral level degree
- starting age, age at which the highest degree was received
- eleven-month salary indicator
- departmental quality, indicated by the Roose-Anderson ratings
- region--North, Great Lakes, Southeast, and West/Southwest
- black race indicator

Preliminary regression analyses negated the hypothesis that the salary structure was identical across the ten discipline-sex groups (Tuckman et al., 1977, p. 695). Next, the hypothesis of homogeneity cross the sexes was rejected, as was the hypothesis of homogeneity cross discipline-sex groups. Therefore, they analyzed each discipline-sex group separately.

Analysis of the males in each discipline showed that salaries generally rose monotonically with articles published; the returns to publishing books were much more discipline-dependent. Outstanding teaching yielded a low rate of return, lower in four of the five disciplines than even nominal publication of articles. Public service was generally more lucrative than teaching, but less than publication. The greatest rewards accrued to administration; in each discipline the gain was at least three times that from teaching and public service combined (Tuckman et al., 1977, p. 697). The experience variables suggested diminishing marginal returns, which varied by discipline.

ulty with doctorates earned more than those without. The coefficients associated with black faculty were all insignificant.

For females, the publication coefficients resembled those of their counterparts. Current administrators received high returns, but lower than those of male administrators. The experience variables showed a lower rate of return for females, but the quadratic term indicated a catch-up process beginning after 44 years of experience and achieving parity with males at 87 years of experience! Females earned less than males for all skill combinations listed, with the greatest amount of discrimination in administration and the least in publishing. Tuckman et al. (1977, p. 700), criticized studies that fail to recognize the importance of skill differences and suggested that attempting to equalize male and female salaries based upon education and experience might create new inequities and inefficiencies.

Tuckman et al. (1977, p. 701), concluded that

The structure of faculty salaries differs by discipline and sex. These differences are fundamental and cannot be captured by the mere insertion of intercept dummies into an estimating equation.

Intercept dummies fail to take the market for skills into consideration, as demands for skills vary among disciplines. Tuckman et al. hoped that articulating the rewards to specific skills would help women more effectively pursue salary parity.

tingham, Pezzullo, Ramsay, Long, and Ageloff

Like many other colleges and universities during the 1970s, the University of Rhode Island (URI) chose to examine faculty salaries for evidence of sex discrimination. Descriptive data indicated that the

average male faculty member was paid more than the average female at all ranks. Brittingham et al. studied characteristics of 694 full-time tenure-track faculty for systematic inequities between men's and women's salaries during the 1975-76 academic year. They hypothesized that not all inequalities were inequities, since many differences could legitimately be attributed to differences in education, experience, discipline, and merit (Brittingham et al., 1979, pp. 93-94).

The research team identified the following independent variables as potentially legitimate determinants of salary (Brittingham et al., 1979, p. 95-97):

- highest degree
- postgraduate experience prior to URI
- rank
- academic discipline
- years at URI

They would have included indicators of teaching, scholarship, and service had these been available in quantified form. They deliberately included rank on the assumption that promotions were awarded equitably at URI, an assumption supported by some empirical evidence. Quadratic terms were entered for years at URI and years of prior experience on the basis of their belief that the first five years of experience were more important than the next five. They identified twelve disciplines, three ranks, and distinguished between doctorate and nondoctorate faculty and between males and females. Three dependent variables representing salary were defined: salary was the 1974-75 contracted salary, current salary was the 1974-75 salary less the administrative component, and base salary was the 1974-75 salary less both administrative and equity adjustments (Brittingham et al., 1979, p. 99).

The most significant predictors of salary were rank, PhD, prior experience, and the engineering and business disciplines. All three equations indicated that women were paid less than men, but the difference was not statistically significant in any of the equations. Only within the rank of assistant professor was there a significant sex differential in favor of males. This result was somewhat surprising, since sex differentials usually increase with rank and experience. Examination of the salaries of the most newly hired faculty showed that the sex differential existed for them as well as for the assistant professors.

Since they were unable to include systematic indicators of faculty merit, they collected data on the scholarly productivity of a sample of 40 faculty, distinguishing between the following categories (Brittingham et al., 1979, p. 107):

- books, both sole- and team-authored
- monographs and chapters in books
- refereed journal articles
- nonrefereed journal articles
- newsletter articles
- edited readings or collected works
- grant application authorship
- grant application funded
- regional and national paper presentations
- short stories or poems published
- one-person shows
- reviews and miscellaneous equivalents

They weighted these scholarly outcomes to create a single productivity index with values ranging from 0 to 369. The rather uneven distribution is smoothed by dividing the index into five ranges, which correlated well with rank: Most assistant professors were in the two lowest categories and most full professors were in the two highest. The

urpose of constructing the index was to permit further examination of the regression residuals:

The correlation between scholarship and salary, both actual and predicted, is reassuringly high. Correlation with residual, however, is low, suggesting that the relationship is confounded with rank, degree, and the other variables entered into the prediction model. (Brittingham et al., 1977, p. 108).

In order to explore further the relationship of the productivity index to the independent variables in the model, they constructed a correlation matrix. Interestingly, the correlation between productivity and length of time at URI was low, suggesting that scholarship was reflected in initial rank and subsequent promotions.

The correlations between the scholarship variables, productivity index, and sex were negative, so mean values were examined by sex for each of these variables. The means indicated that male faculty at URI were much more productive than the females; males had a mean productivity index of 95, compared with 28 for females (Brittingham et al., 1979, pp. 110-111). Women outperformed men only in publication of short stories, poems, reviews, and miscellaneous publications. Part of the difference may be explained by the lower percentage of females with doctorates who tended to cluster in fields with lower research performance expectations.

atz

As a dissertation project David Katz analyzed factors important in salary and promotion decisions at the University of Illinois; his purpose was to develop a more rational means of rewarding professors. Interviews with department heads to gain insight into the salary and promotion processes revealed that

Only two of the departments had written policy statements regarding salaries and promotions. . . . salary and promotion processes within departments are usually cloaked in secrecy (Katz, 1973, pp. 469-470).

Although department heads had no difficulty specifying criteria on which faculty were evaluated—"teaching, research, and public service to the university" (Katz, 1973, p. 470)—they could seldom attach weights to those criteria. Heads also generally admitted that their knowledge of the teaching ability of their faculty was limited to "good" or "bad."

Katz collected data for professors in eleven departments: economics, electrical engineering, English, French, history, mathematics, physics, political science, psychology, sociology, and zoology. From these data he constructed variables indicating:

- number of books published
- number of articles published
- top 50% of teachers
- dissertations supervised since 1964
- hours per week spent on public service
- hours per week devoted to committee service
- years since highest degree
- social scientist
- physical or laboratory scientist
- English professor
- undergrad degree from top school
- undergrad degree from average school
- undergrad degree from poor school
- undergrad degree from foreign or unranked school
- graduate degree from bottom group of grad schools
- administrative assignment
- female
- 11-month appointment
- PhD

A regression analysis of salary upon the independent variables yielded an R^2 of .68 and a rather large standard error of \$2946. Katz (1973, p. 471-472) drew several conclusions from the independent variables. Publications were paramount in the reward system, but they showed obvious evidence of diminishing returns: one to two books were

rth \$451/book, while more than two books were worth \$370/book; nilarly, fewer than nine articles were worth \$111/article, and more an 38 articles were worth only \$57/article. Teaching was consequential in the reward system, despite the fact that department ads said they rewarded teaching. However, Katz used student aluations as a source of teaching information, and the department ads said they didn't trust student ratings (Katz, 1973, p. 472). The turns to public serve and committee work were relatively low. Returns re higher to those who came from good grad schools; similarly, coming om one of the low-ranked undergraduate schools was detrimental. cial science professors were paid significantly more than those in the manities, and slightly more than those in the physical and laboratory iences.

Women were paid \$2410 less on the average than men. In order to e if this were due to differential productivity, Katz constructed a oductivity index by taking number of publications times its proper eefficient. Women's productivity indexes were much lower than men's, ut not enough to account for all of the salary differential. ignedificant differences between women and men did not exist for the ther variables.

Katz (1973, p. 476) concluded that his analysis did not support the eward objectives stated by department heads:

In general, university administrators make decisions regarding salaries and promotions in an intuitive manner with seldom any clear understanding of the weights they are attaching to various criteria. Consequently, faculty members may have only vague ideas as to how their salaries and promotions are determined. A symptom of the chaotic process is the almost total lack of written departmental policy statements on salaries and promotions. The high standard error of the

salary model is further proof of the capriciousness of the reward system.

Strauss and Tarr

Strauss and Tarr (1982) used the 1981 Registry of Agricultural economists maintained by the American Agricultural Economics Association and the Illinois Department of Labor to analyze salary patterns of agricultural economists. Although agricultural economists find employment in both the public and private sectors, the majority work for governmental and educational institutions, with over half employed by educational institutions in 1981. In both the public and private sectors, female agricultural economists earned less than their male counterparts. Strauss and Tarr (1982) studied salary differentials in both sectors; only their analysis of agricultural economists in educational institutions is covered here.

Strauss and Tarr (1982, p. 1058) discussed the sequential processes that influence academic salaries. The quality of graduate training probably has an impact upon later productivity. The quality of graduate training also influences the prestige of the first job due to the hierarchical nature of the job market in higher education. "Departments which hire junior faculty try to find the best-trained students; new PhDs by the same token try to maximize the quality of the department in their first job" (Strauss and Tarr, 1982, p. 1058). In the academic setting, research, teaching, public service, and fund raising are the most important indicators of productivity. Strauss and Tarr (1982, p. 1058) maintained that "At any moment in time, presumably the most important determinants of an academician's salary are his publication

activity, rank, and age." Therefore, they concluded, a model of an academician's salary should have the following components: "an employment equation, a productivity and/or academic rank equation, and finally a salary equation" (Strauss and Tarr, 1982, p. 1058):

$$\text{job quality} = f(\text{degree quality, sex, race/ethnicity})$$

$$\text{rank} = g(\text{degree quality, sex, race/ethnicity, experience, sex*experience})$$

$$\text{salary} = h(\text{job quality, rank, sex, age, race/ethnicity})$$

Lacking measures of productivity in their data set, Strauss and Tarr used years of professional experience as a proxy measure; they regarded the absence of publication activity as the major shortcoming of their analysis of academicians' salaries. Sex and race appeared as variables in each equation, and sex also appeared as an interaction variable with experience in the rank equation to determine whether there were systematic differences in the speed of promotion for females.

The information on degree quality and job quality came from Boddy's (1973) study patterned after Roose and Anderson and Cartter but restricted to agricultural economists. The sample for analysis was restricted to the 244 academicians with PhDs and the ranks of assistant, associate, or full professor. The rank variables were specified as multinomial logit equations with the full professor category omitted.

In all three equations, the sex and race/ethnicity variables were not statistically significant. In the job quality equation, only degree quality was statistically significant; however, R^2 was only .0427. In the rank equations, experience was the only significant predictor; even degree quality was insignificant. Finally, in the salary equation, job

uality and rank were significant predictors; this equation yielded an R^2 of .5773.

Strauss and Tarr (1982, p. 1060) concluded that, although descriptive statistics show that women in agricultural economics in educational institutions have significantly lower salaries than men, the examination of salaries by sex for those with PhDs failed to reveal that pattern. Academic rank was the most prominent determinant of salary, and they reasoned that the rank variable probably captured the effects of productivity and longevity on salary.

n Overview

The summaries of the articles just presented illustrate the diversity of forms that faculty salary analyses may take, and also show that certain factors are common to all. The studies by Astin and Bayer, by Siegfried and White, and by Katz were performed early in the 1970s and are often cited in subsequent articles; these studies had wide-ranging impact in many disciplines. The greatest impact can be attributed to Scott, however; because her method was recommended by the American Association of University Professors, it quickly became a standard for university administrators. The remainder of the articles were published later and had more influence on the academic community than elsewhere, with the possible exception of Pezzullo and Rittingham's book, Salary Equity: Detecting Sex Bias in Salaries among College and University Professors, which found its way to many campuses.

All of these studies recognize the importance of some of the economic determinants of faculty salary, particularly the human capital factors of education and experience. All studies either specify

faculty member's highest degree as one of the factors or else control for faculty members with doctorates. All studies have one or more variables indicating experience, with at least one variable measured in years.

Indicators of productivity were included by some authors and ignored by others. Astin and Bayer, Siegfried and White, Katz, and Luckman et al. all included productivity variables in their analyses, generally variables relating to teaching and publication. Brittingham et al. did not have quantifiable productivity variables for all faculty members in their study, but they gathered productivity data on a sample of 40 faculty and analyzed that in conjunction with their regression results. Strauss and Tarr regarded the lack of productivity variables as the most serious limitation of their study. Scott, however, thought productivity variables would add little to the analysis.

Market indicators, too, received different treatment by different authors. Many of the authors included a variable denoting discipline as proxy for market value. Two studies--those of Siegfried and White and of Strauss and Tarr--limited the sample to members of a single discipline. Scott specified that department be included as a decision-making unit and did not mention the department's status as a proxy for market.

Much less concern was shown for institutional level factors in these studies. Only Scott specifically mentioned the decision-making unit. Astin and Bayer included institutional variables, but only at the university level.

All of the studies included demographic variables. All studies included sex, and some included race or minority status as well. For some studies equity was the major focus; for others, sex was included as a variable to test a hypothesis for males and females in addition to the faculty as a whole.

The most poorly defined aspect of these studies is probably the lack of distinction between market forces and decision-making processes; a single indicator may capture and confound the effects of both. Using discipline as an indicator is likely to capture the effect of market forces, but since similar disciplines are grouped by departments in universities, it is also likely to capture the effects of decision-making processes as well. That is, the coefficient of a departmental variable will include the influence of the market value of the disciplines included in the department, but also the market value of that particular department to the university. These two effects will remain confounded in a single variable unless some effort is made to identify the factors which influence decision-making processes and include them in the model.

Summary

This chapter has outlined and described the steps required to design a faculty salary analysis: defining the purpose of the study, specifying the important determinants of salary, quantifying the determinants as variables, and selecting the technique. The techniques of matching, descriptive statistics, and multiple regression were described in some detail.

The effects of antidiscrimination activism and legislation have also been examined in some detail. The assumption behind both activism and the subsequent legislation is that demographic variables are determinants of salary, although illegitimate ones. Emphasis on demographic determinants in federal monitoring and in the courtroom has had a major impact on faculty salary analysis. Many studies focus almost exclusively upon easily measured demographic and human capital determinants at the expense of economic and institutional factors which also affect salaries. Even though demographic and human capital factors may be the most influential ones, to build an analysis around them constitutes a gross oversimplification and works counter to an emphasis on quality in academe.

The studies presented in this chapter serve as examples of how faculty salary analyses are conducted by different groups at different times. These studies serve as the point of departure for the model of ISU's salary structure developed in Chapter 6.

CHAPTER 5

FACULTY SALARIES AT MONTANA STATE UNIVERSITY

Faculty salaries at a public university will reflect not only current economic and institutional forces but historical influences as well. This chapter begins by briefly describing the mission and organization of Montana State University and then describes two historical events that have had major impacts on the faculty salary structure: the sex discrimination lawsuit of 1975-76 and the critical real appropriations made in academic year 1981-82. The chapter then discusses the current salary policies of the university, based upon MSU's Faculty Handbook (1980) and the Master Plan for MSU Compliance with Court Orders Concerning Sex Discrimination (1976). The version of MSU's Faculty Handbook quoted in this thesis was dated April, 1980. An updated version dated July, 1984, was released in June of 1985 while this thesis was in preparation. The 1980 version is applicable to the entire study period, however.

The final section of this chapter reviews specific factors that appear to be significant determinants of faculty salaries at MSU and suggests possible measures for each factor. The next chapter introduces a model for regression analysis based upon these factors and evaluates the appropriateness of that model to the faculty salary structure at MSU.

An Overview of Montana State University

The key to MSU's mission is found in its history, which is summarized briefly below. The university's mission has always been an important factor in its development and its internal priorities. Knowledge of MSU's organizational structure is equally important for understanding the administrative decision-making process. A brief description of MSU's organization provides the necessary background information.

Mission

Montana State University is one of six units in the Montana University System. It was founded on February 16, 1893, as the Agricultural College of the State of Montana under a federal land grant provided by the Morrill Act of 1862. The Morrill Act granted federal lands to the states for:

The endowment, support and maintenance of at least one college, where the leading object shall be, without excluding other scientific and classical studies, and including Military Tactics, to teach such branches of learning as are related to agriculture and mechanical arts in such manner as the legislature of the states may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life (Burlingame, 1968, p. 2).

Schools established under this Act are collectively known as land grant institutions; they share a similar mission in their emphasis on agriculture and engineering, but many, MSU among them, have achieved the status of major universities as well. At present MSU comprises seven colleges: Agriculture, Engineering, Business, Letters and Science, Education, Arts and Architecture, and Nursing.

"The primary responsibility of all six units is to provide quality undergraduate education" (Faculty Handbook, 1980, p. 1-2), and the units are expected to coordinate programs as much as possible. Each university has some unique programs, particularly at the doctoral level, and considerable overlap in undergraduate programs. The state's professional programs in agriculture, nursing, architecture, and medicine are offered at MSU.

In addition to the primary teaching function, research and service are also important parts of MSU's mission. The Agricultural Experimentation (AES) is the biggest single research entity, but MSU has research centers and facilities in every college and maintains an active grants and contracts program. The major service arm of the university is the Cooperative Extension Service (CES), established in 1914, which specializes in helping the people of the state solve home, farm, and community problems. MSU's service is not limited to CES outreach efforts, however; faculty are encouraged to become actively involved in local, regional, and national service.

MSU intends that all faculty have responsibilities in teaching, research, and service. The extent of these responsibilities vary considerably among individuals and among departments, however, because each department weights the components and sets performance expectations for faculty members. Many departments assign considerably less weight to service than to teaching or research (Academic Program Review Committee, 1983).

Administrative Organization

The six units of the Montana University System are governed by a seven-member Board of Regents of Higher Education. The Board appoints a Commissioner of Higher Education, who has broad authority as the executive officer of the Board of Regents and chief administrator of the university system. MSU's highest officer is the president, appointed by the Board on the recommendation of the Search and Screening Committee and the advice of the Commissioner.

MSU has a vice president in charge of each major area of emphasis, teaching, research, and service: the Vice President for Academic Affairs, the Vice President for Research, and the Vice President for Extension and Continuing Education. Academic Affairs is by far the largest area, organized into seven academic colleges, a college of graduate studies, and several service programs. Each of the colleges is governed by a dean and is subdivided into departments. The department constitutes the basic unit of organization, although many departments include faculty from more than one discipline and most encompass several subspecialties as well. The lines of communication run from department head to dean to vice president; there is very little formal political interaction between departments in different colleges.

Historical Events Influencing Faculty Salaries

Many events in MSU's 92-year history have shaped today's faculty salary structure. Two events of the last decade have had such major impacts on faculty salaries that they warrant detailed examination. The first event was losing a sex discrimination suit in 1976, a loss that

required payment of \$355,500 in salary reparations. This money was applied to the salary bases of over half of the female faculty and permanently altered their salary status relative to males at MSU.

The second event was an infusion of over \$300,000 into MSU's faculty salary base in 1982 to raise the salaries of faculty who were falling behind market standards. This adjustment substantially increased salary differentials between high- and low-demand disciplines.

Sex Discrimination Lawsuit

On February 16, 1976, MSU was found guilty of sex discrimination by Judge W. D. Murray in Federal District Court. Four female plaintiffs brought a class action suit against the university after filing charges with the EEOC and receiving "right to sue" letters from the Department of Justice. Two of the plaintiffs specifically charged the university with salary discrimination, and the court upheld the charge for both women as well as for "all female faculty working at MSU in 1976 and the three preceding years" (Master Plan, 1976, p. 1).

Findings of the Court. The major issues before the Court concerned promotion, tenure, salaries, and underutilization of women at MSU. The court recognized that promotion, tenure, and salaries were based on similar criteria which were also similarly vague; with respect to promotions, the Court stated that

The promotional decisions at Montana State University reflect the defendant's implementation of a nonstandardized merit system. There are a great number of variables which those in the promotion review process are allowed to consider. In addition, the various academic departments at the university may weigh these factors differently. Thus those who play a role in the promotion process may apply a number of vague and subjective standards, and there are no safeguards in the

procedure to avert sex discriminatory practices (Federal Supplement, 1976, p. 5).

The Court also noted that females had little input to the promotion and tenure processes: The department head played a primary role in a faculty member's initial promotion or tenure recommendation, which was then reviewed by the dean, the Promotion and Tenure Committee, the Personnel Committee, the president, and finally the Board of Regents. Women were rarely involved in the procedure because they were underrepresented in administrative positions and unrepresented on the relevant committees.

The statistician for the plaintiffs presented descriptive statistical evidence showing that a larger percentage of males reached the ranks of full professor and associate professor than did females with similar education and experience. Women also spent more time at rank than did males with similar credentials. With respect to salary, women received substantially less money than comparable males when department, years of experience, and type of degree were held constant. Rank and tenure were omitted from the plaintiff's analysis because earlier results had suggested that they were sex dependent.

The statistician for the university used a multiple regression analysis to show which variables were the most significant predictors of salary. Although sex was not significant overall, it was significant at certain ranks for certain years. Furthermore, "nursing" was included as a variable, and the Court judged that separating the effects of discipline and sex was impossible in this case because all nurses were female and almost half of the female instructional faculty were nurses. The multiple regression analysis did include the variables that the

art recognized as sex dependent, and on that basis the Court decided that the university's analysis could not contradict the analysis presented by the plaintiffs (Federal Supplement, 1976, p. 10).

The analyses by the plaintiffs and by the university were both heavily oriented toward human capital variables; neither study included qualitative indicators. Recognition of market forces was limited to distinguishing between academic departments. Market conditions and their effects within a given year or field were mentioned by witnesses, but the Court found no evidence that the market should cause differential salaries within a department. The Court ruled that the university's reasons for paying two female plaintiffs less than the comparable males in their department were "merely a pretext for discriminatory treatment" (Federal Supplement, 1976, p. 13). The Court also found for MSU females as a class, stating

The evidence shows discrimination against women as a class by defendants at Montana State University in that females are underutilized as deans, vice presidents, department heads, and as instructional faculty in many departments of the University. Women have also been discriminated against as a class in the areas of promotion, tenure, salary, and appointment to important university committees (Federal Supplement, 1976, p. 16).

The Negotiated Settlement. Rather than attempt to adjudicate a settlement himself, Judge Murray ordered a negotiated settlement (Clark, 1977, p. 233). The negotiation team included the opposing lawyers and an administration representative. The administration representative, a man familiar with faculty concerns, drafted a plan which the negotiation team revised and then used as the basis for subsequent negotiations. His plan, known as the master plan, was only five pages long, yet it

ade satisfactory provisions for correcting the conditions responsible for sex discrimination on campus. It also established a special ad hoc promotion review committee for female faculty and committed the administration to conduct a pair-matching analysis to set retroactive pay for female faculty (Clark, 1977, p. 236). The master plan was published within the university for administrative and faculty input, and it was readily accepted by both parties. In November of 1976 the parties presented the master plan to Judge Murray as an agreement that both sides could support.

Each department had its own standards for pay and promotion, which Judge Murray called unacceptable under the law; he ordered that a single standard be established. The faculty affairs committee was charged with establishing promotion criteria, and another committee was charged to devise a single pay plan providing for merit consideration (Clark, 1977, p. 238).

Back pay equity was determined by a faculty team consisting of two men and two women selected jointly by the administration and the plaintiffs. The criteria used in the pairing process mandated by the master plan included department, rank, hiring date, rank upon hiring, promotions, educational level, date of degree, degrees held, and field (Clark, 1977, p. 239). Perfect pairs were seldom found, so the team established acceptable ranges for matching.

During the course of the equity team's investigations, an interesting fact surfaced: there appeared to be little correlation between rank and salary.

Years of experience at MSU and field were clearly the main indicators of salary level. . . . Rank appeared to be more an alternate form of recognition than a stepping stone to higher pay (Clark, 1977, p. 241).

When the master plan was presented to Judge Murray in November of 1976, the details of the pay settlement were included as part of the package:

One hundred thirty-eight women had been paired; seventy-nine received recommended awards ranging from \$126 to \$14,500—a total of approximately \$355,500 in back pay and adjustments to the current year salary (Clark, 1977, p. 241).

Retroactive promotion for females was another difficult task. According to the master plan, all female faculty members who had not been promoted during the previous three years would automatically be considered for retroactive promotion. The committee sent lists of those being reviewed to the appropriate deans and department heads; they also sent lists of those being reviewed to each faculty member and offered to review any individual not listed, male or female, who requested a review in writing (Clark, 1977, p. 243).

The evidence reviewed for each candidate included a current vita, the department head's evaluation and recommendation, additional information submitted by the candidate, and a separate evaluation and recommendation from the departmental council. The committee also redefined the promotion criteria in the faculty handbook and "tried rigorously to apply the criteria equally across departments, recognizing the differences in job requirements from department to department" (Clark, 1977, p. 244). This committee recommended approximately one-fourth of the reviewees for retroactive promotion.

The New Pay System. Policy recommendations for salary discrimination were addressed by one small section of the master plan, which is presented here in its entirety:

MSU proposes to establish a structured pay system to apply to the academic year 1977-78 for faculty and professionals. This system will attempt to insure equal pay for equal work to all faculty, based on rank and years of service and specific and definable merit, market, and performance criteria which can increase or reduce an individual's pay relative to years of service. Specific salary schedules are, of course, subject to budget limitations and a phase-in period would be required to avoid reducing the salaries of any who may currently fall above the proposed schedules (Master Plan, 1976, p. 5).

The responsibility for developing the structured pay system required by the master plan was assigned to a subcommittee of the University Planning and Budget Review Committee of University Council. Their recommendations are described in detail in the Report of the Ad hoc Sub-Committee on a Merit-Based and Market Differential Salary schedule for Montana State University (McConnen et al., 1977). The report comprises two parts: Part I presents the schedule of reference salaries and evaluation procedures that the committee recommended for the university; Part II presents the variables needed to develop salaries for academic year 1977-78.

The subcommittee made the following statement of purpose in their introduction:

The committee feels the most important issue is concerned with the need to provide reliable information on merit which can justify either reference salary or deviations from the reference salary. If reliable information on merit cannot be presented which will justify a deviation (either above or below the schedule), then that salary deviation from schedule should not be allowed to persist. Deviations from a schedule of reference salaries must depend on merit difference and these merit differences must be justified (McConnen et al., 1977, p. 2).

The reference salaries recommended by the subcommittee were to be based upon "market differentials by discipline, administrative responsibilities, professional experience, terminal degree, and rank" (McConnen et al., 1977, pp. 2-3). The criteria for "acceptable performance" were to be supplied by each department based on the standards of each discipline. Despite Judge Murray's call for a single standard, the subcommittee recognized that performance criteria would have to remain discipline-specific. A faculty member who had performed acceptably could expect to receive the reference salary generated via an equation, table, or graph based on the quantitative characteristics; deviations from the reference salary would be evaluated on the basis of qualitative performance information.

The quantitative criteria listed above reflect the subcommittee's assessment of which factors were important salary determinants at MSU. The equity team had identified years of experience and discipline as the major determinants of salary, the other criteria being influential within a discipline. In a given discipline, faculty at higher ranks are expected to have higher salaries, faculty with terminal degrees are expected to have higher salaries than those without, and department heads are expected to have higher salaries than instructional faculty.

The subcommittee recognized that the market criterion would be controversial; some faculty would regard interdisciplinary market differentials as an equity problem, and others would regard them as essential for hiring and maintaining an effective faculty. They chose the Oklahoma State University's annual salary study as the basis for establishing market differentials by discipline and rank, since that

tudy was based upon salaries at state universities and land grant colleges.

They recognized, too, that differences in faculty effectiveness existed both within and between disciplines. Despite the difficulties inevitably encountered in defining merit criteria and determining individual merit, they believed that "adequate consideration of merit is of crucial importance to an institution concerned with quality" (McConnen et al., 1977, p. 6). Ideally, the combination of reference salaries and merit evaluation could be used to justify any faculty member's salary and provide a rough indication of the salary path an individual could be expected to follow during his or her career at MSU.

The type of the reference salary schedule the subcommittee referred is reproduced from their report as Figure 1 on the next page. The curves represent the expected salaries for faculty meeting performance expectations. The decreasing slope of the salary curves is attributable to diminishing returns to human capital. The breaks in slope represent market differentials for different ranks. In the absence of specific salary rewards for promotion, an individual would be expected to maintain a relatively smooth curve through his or her promotion path, depicted as curve "r s t" on the graph.

The subcommittee maintained that any deviations from the schedule of reference salaries would have to be justified on the basis of merit, and they were therefore particularly concerned with developing a viable merit evaluation plan (McConnen et al., 1977, pp. 14-16). They believed that merit criteria could not be standardized for the university as a whole, but that a general format could be specified and supplemented

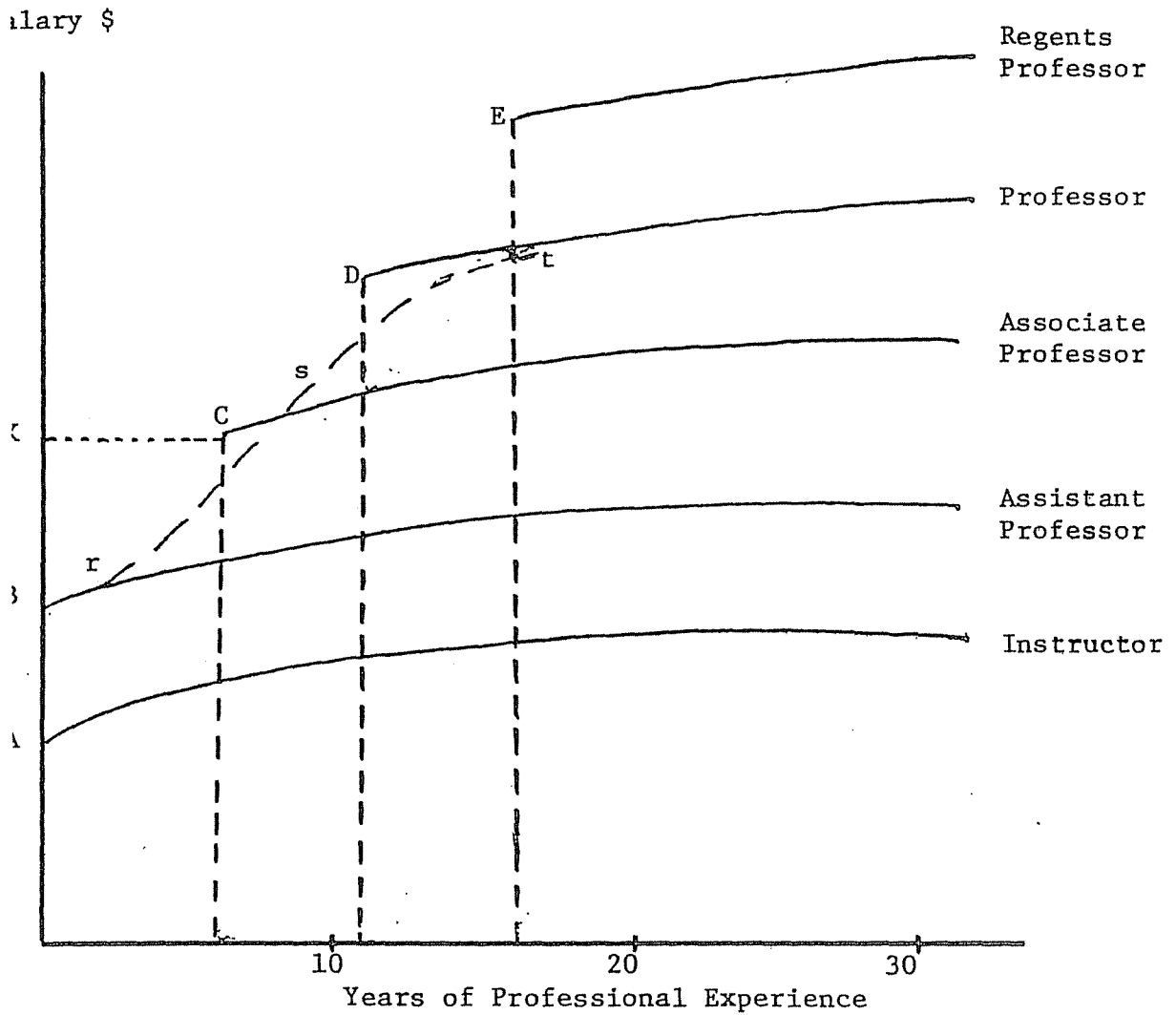


Figure 1. Graphic depiction of the general nature of a reference salary schedule (McConnen et al., 1977, p. 8)

with specific criteria established by each discipline. Individual merit evaluations were to be heavily oriented toward the work that a faculty member was hired to do. However, research and creative activity were to be evaluated for each faculty member because those activities keep faculty current in their fields and help to retard the depreciation of their human capital.

In the second portion of their analysis, McConnen et al. (1977, pp. 1-32) attempted to identify the salary determinants that could be objectively measured; they also tested a few methods for calculating reference salaries. Their objective was not to reify the status quo, but rather to establish a baseline for making policy decisions about salary goals and objectives. They used the following variables in their models (McConnen et al., 1977, pp. 22-23):

K = assistant professor market differential for a specific discipline
 K = rank-dependent market differential for a specific discipline
 OC = possession of doctorate
 ULL = full professor
 SC = associate professor
 ST = assistant professor
 NST = instructor
 DM = department head
 Y = the larger of years since highest degree or years at MSU
 RNK = years in current rank
 BAR(RANK) = national mean AY salary for rank

The first two variables, AK and IK, each represent the ratio of the average salary in a particular discipline and rank to the total average salary in that rank for all disciplines. The dependent salary variables were obtained by dividing each faculty member's salary by the proper ratio. The subcommittee regressed a salary variable on the other indicators to calculate a reference salary for each individual and then determined the deviations between actual salaries and reference

salaries. These deviations were to be further examined in terms of faculty performance.

The subcommittee investigated two types of pay plan models:

segmental models composed of regression lines for each rank describing a continuous transition in salary from rank to rank; dependent variables are AYSAL/AK, AYSAL/IK

difference models attempting to explain difference between AY salaries at MSU and in the OSU study; assumes a salary jump on promotion; dependent variables are $AYSAL - (AK \text{ or } IK) * (SBAR(RANK))$

his strategy yielded a total of four models. Regressing the dependent variables on doctorate, rank, administration, and years of experience resulted in a reasonably good fit, as indicated by R^2 (McConnen et al., 1977, p. 37):

<u>Model</u>	<u>R^2</u>
Segmented AK	.811
Segmented IK	.802
Difference AK	.900
Difference IK	.892

he fit was better for the difference model, which assumed a salary jump associated with promotion rather than a smooth salary transition from rank to rank. This supports the idea that rank within discipline is an important salary predictor even though rank alone is a weak predictor. Further details concerning these models and the regression results can be obtained from the subcommittee's report.

Variations of this suggested model were run a few times to evaluate faculty salaries, but the annual regression was finally cancelled by the university administration because the model had become so complex that the administrators using it no longer fully understood it.

Subsequent Salary Analyses. The Affirmative Action Office continued to monitor faculty salaries for evidence of salary differentials by sex. Matching studies were performed under the auspices of that office during AY79, AY80, and AY81. During each of the next three academic years, the Affirmative Action Office monitored regression analyses of faculty salaries. In AY84 the Salary Review Committee created a technical subcommittee to study the salary structure at MSU and produce a model that could serve the university as a standard for faculty salary analysis. Specifically, the subcommittee was requested to develop a model that would allow the Salary Review Committee to

detect salary differentials at MSU by sex or race
compare MSU faculty salaries with a larger market
compare MSU faculty salaries by department
determine the extent of salary compression at MSU
(Kreighbaum et al., 1984, p. 1)

The subcommittee responded by creating an explanatory model to describe the existing faculty salary structure at MSU. The variables included in their model were (Kreighbaum et al., 1984, pp. 11-12):

AYSAL84 = salary rate in AY dollars for AY84
HIREYRS = number of years since hire by MSU
RANKYRS = number of years spent at current rank
DOCT = doctoral degree as highest degree
MAST = master's degree as highest degree
ADMIN = past dean or department head
FEMALE = female
MINORITY = black, asian, native american, or hispanic
OSUINST = OSU discipline salary averages for instructors
OSUASST = OSU discipline salary averages for assistant professors
OSUASSO = OSU discipline salary averages for associate professors
OSUFULL = OSU discipline salary averages for full professors

The subcommittee calculated that full professors received about 88% of the salaries they would get if paid the average OSU salaries for their ranks and disciplines. Associate professors received 95%, assistant

rofessors 98%, and instructors 102%. Regression analysis roughly corroborated these figures and also revealed that years of experience was negative and significant, years at rank was positive and significant, and both degree variables were insignificant. The coefficient for females was positive and insignificant with a t-value of .6. Averaging the regression residuals by department yielded a scattering of positive and negative mean residuals, some of which were statistically significant.

The subcommittee members were concerned throughout their investigations about the lack of data available for quantifying some of the factors important in the salary allocation process, particularly the criteria used to distribute salary money differentially to colleges and departments, and the performance evaluations for individual faculty. They emphasized that the salary differentials for departments and colleges were based upon an incomplete model. Because the model did not adequately reflect the salary allocation process, the residuals could not be used to determine salary equity for individuals. Additional data might have altered the residuals significantly.

Although the coefficient for females was insignificant, the subcommittee further probed the issue of salary differentials by sex in an appendix to their report (Kreighbaum et al., 1984, pp. 30-35). They divided all females into those affiliated with the college of nursing and those in other colleges, and then repeated the regression analysis:

The coefficient for females in Nursing is positive (\$3,013) and statistically significant at the 5% level, while the coefficient for the other females is negative (-\$808) and significant at the 6% level (Kreighbaum et al., 1984, p. 33).

This modified regression analysis indicated that as a group, the female

faculty in Nursing seemed to be well treated when compared with other female faculty on campus, and even when compared with the faculty as a whole.

Critical Area Adjustments

The second major shock to the university salary structure increased rather than reduced salary differentials. During the late 1970s faculty and administrators in the Montana University System became concerned because faculty salaries in several disciplines had fallen far below market values. Attracting new faculty to Montana was becoming increasingly difficult because of low starting salaries, and administrators feared a "brain drain" of qualified faculty from Montana to higher-paying institutions in other states.

The 1981 legislature responded to this concern by appropriating special funds to bring salaries up to market values:

The amounts shown for critical area faculty salary adjustments are appropriated to the colleges and universities contingent upon approval by the Board of Regents of a salary distribution plan or negotiated agreement for each campus. It is the legislature's intent that the critical area faculty salary adjustment funds be expended in those academic disciplines where difficulty is experienced recruiting or retaining faculty due to external market conditions (House Bill 500, 1981, p. 74).

U received critical area funding of about \$315,000 for academic year 82. The legislature intended the funds to go to instructional faculty and specifically excluded staff from the Agricultural Experiment Station and the Cooperative Extension Service.

The Vice President for Academic Affairs worked with the college presidents to develop a distribution system for the critical area funds. The money was finally allocated to the colleges of business and engineering,

science departments, three agriculture departments, and two education departments. These critical area adjustments were allocated to positions rather than to specific individuals, and the allocation was a part of the base salary associated with each position so that the adjustment remained with the position after the individual resigned or was fired. By concentrating funds in particular academic areas, the critical area adjustments did change the overall salary structure at

Current Salary Policies

Faculty salaries at any given time are the product of a series of institutional decisions and a number of individual decisions. When a faculty member is hired, the starting salary for the position is a figure agreed upon by the academic vice president, the college dean, and the appropriate department head. The chosen candidate may be able to negotiate a slightly higher salary or may accept the starting salary as posted. The starting salary becomes the base against which future increases are calculated, because once hired, a faculty member receives annual salary increases based on the legislative allocation for that year and the recommendations of his or her department head.

When the legislature allocates money to the institution, a certain percentage increase is earmarked to cover all faculty salaries; the legislature does not allocate salary increases to individuals. Allocation of the percentage increase is the responsibility of the academic vice president, who apportions it to the colleges under his jurisdiction. He may give all colleges equal percentage increases, or

may differentiate among them. The college deans then distribute their portion of the money to their departments; they too may give equal differential percentage increases.

Decisions to give differential increases may be based upon department performance or department needs. A college or department might receive an above-average increase for several reasons; two of the most common are superior departmental performance and rising market salaries, particularly when coupled with rising student demand for courses. Similarly, a department with deteriorating performance might receive a below-average increase.

When the money has been distributed to departments, each department head allocates money to individual faculty. Some heads assume full responsibility for all salary decisions, while others rely on the guidance of a departmental committee. The Faculty Handbook (1980, p. 4-4-27) offers the following guidelines for recommending salary increases for individuals:

Salary recommendations for faculty . . . will be based on evaluations of both objective data and qualitative achievements. Although quantitative criteria are easier to assess, any fair and full evaluation of an individual's contribution to the University requires qualitative evaluations as well. It must be understood that at Montana State University, salary compensation will be heavily based on merit; however, all supervisors must be aware that emphasis on quality must not be misused for unlawful discrimination. Quality judgments must accompany each salary recommendation and be justified in writing; those justifications will be subject to review at several stages to insure non-discrimination. Due to the diverse nature of a university, only general criteria for evaluation can be broadly applied; therefore, each department must develop the specific criteria under those general criteria by which their faculty and staff will be judged.

The evaluation criteria for salary recommendations must be consistent with Sections 403 and 404. Additional

appropriate objective criteria are: rank, length of service, professional preparation (both formal and experiential) and teaching or other workloads. Evaluations of the quality of work by peers, seniors and subordinates or students are necessary and appropriate to supplement evaluation by line-level administration.

Sections 403 and 404 referred to in the above paragraph deal with appointment/promotion and the faculty review process, respectively.

Section 403 specifies that when hired, a faculty member must be informed in writing of the department's specific goals and general criteria for promotion as well as his or her specific responsibilities within the department. The faculty member must also be notified in writing of any change in departmental or individual criteria.

In all cases, the criteria shall remain sufficiently flexible to allow for and recognize individual uniqueness and creativity in performance. Criteria must not attempt to make all faculty members perform alike, though commensurate quality shall be expected for eligibility for like promotions (Faculty Handbook, 1980, p. 4-13).

Section 403 (Faculty Handbook, 1980, pp. 4-18 - 4-19) presents guidelines for departments to use for evaluating performance for promotion in the following major areas of responsibility: teaching; research and other creative work; service to department or university, profession, society; personal professional development and development of profession. The Handbook (1980, p. 4-18) stresses the importance of identifying quality work:

The evaluation of the evidence for performance in teaching, research, service and personal development should consider the quality of contributions as evaluated by users or people qualified in the field of contribution. The quality of performance should show continuity over the years of service. In evaluating creativity, originality, scope, richness and depth of creative expression should be considered and not merely the number of creative works.

department's performance criteria for promotion may apply to tenure and salary as well. Some departments vary the criteria slightly in the three areas, and some use the same criteria for all. In any case, quality performance is an important consideration in salary decisions:

Salary increases will be given within rank for meritorious performance which promises to continue. . . . Annual reviews showing non-performance may be used as evidence for salary adjustments . . . (Faculty Handbook, 1980, p. 4-13).

The annual review process, detailed in Section 404, is the major source of information for the department head's salary decisions. Before March 31st of each academic year, every faculty member

will be reviewed by the department head or immediate supervisor to assess the quality and extent of the faculty member's performance during the previous year in light of that faculty member's current rank and role in the department. General evaluations will be made in the areas of teaching, research and creative endeavors, Extension, professional development, and University and public service, with specific emphasis in the evaluation on the written departmental criteria, University goals and the individual's duties (Faculty Handbook, 1980, p. 4-21).

Each faculty member is responsible for providing evidence to substantiate performance and quality of work. The head must give the faculty member a written copy of the evaluation.

Section 405 of the Faculty Handbook describes the procedure for determining annual salary increases. Prior to October of each academic year, the department head and the faculty member agree to a written job description or set of performance expectations. By March 31st of each year, the department head will conduct the annual review just described and evaluate the faculty member's performance in accordance with the expectations and the departmental criteria, "emphasizing merit for the work accomplished" (Faculty Handbook, 1980, p. 4-27). On the basis of

is review the department head will recommend a salary figure for the next contract year, subject to approval by the dean. Once approved by the dean, faculty member receives a copy of his or her performance evaluation and the recommended salary figure; if desired, the department head may adjust the figure at this time. Then all departmental recommendations are forwarded to the dean for review.

The dean's recommendations are sent to the Salary Review Committee, which reviews the salary recommendations "to check for equity in the application of standards by the units and by the University as a whole" (Faculty Handbook, 1980, p. 4-28). Salary recommendations become final after the Salary Review Committee has completed its examination, and the final recommendations are forwarded to the Commissioner of Higher Education and the Board of Regents for their approval.

These university policies, in the context of the general mission of the institution, its organizational structure, and some strong historical influences, constitute the major determinants of faculty salaries at MSU. Quantifying these influences for use in a statistical model is the topic of the final section of this chapter.

Quantifying Faculty Salary Determinants

Because faculty at MSU are not paid according to a rigid schedule formula, considerable variation in salaries exists among and within departments. These salary differentials are the product of interactions over time among the important salary determinants discussed thus far: economic forces, institutional factors, and historical events. Two types of salary determinants are associated with the two historical events

discussed earlier in this chapter: The lawsuit emphasized the role of demographic characteristics as determinants of faculty salary, and the tactical area adjustments reinforced the importance of market forces.

Some determinants have their major influence upon individual salaries, while others operate primarily on groups. All factors interact in a dynamic environment to bring about a unique distribution of individual faculty salaries. This section of the chapter addresses the strength of these salary determinants at MSU and discusses the problems of quantifying each. The outlines developed in Chapters 2, 3, and 4 serve to organize the discussion, though it soon becomes apparent that not all factors can easily be pigeonholed in single categories.

Economic Forces

Chapter 2 introduced and described the major economic factors acting upon faculty salaries in public universities:

- market forces of supply and demand
- wage expectations of faculty
- rewards for productivity
- human capital acquired by individuals

The relative impact of these factors upon faculty salaries varies among institutions. The specific influence of these factors at MSU and suggested measurements for each are discussed below.

Supply and Demand. The general labor market most strongly influences salaries in disciplines where the university must compete with private industry to hire talented individuals; to some extent the academic community is a price taker in those areas.. At MSU, those disciplines are located primarily in the colleges of engineering and business. Because the labor market influence tends to be strongest for

try-level positions, MSU is often forced to offer competitive salaries new assistant professors even at the cost of decreasing the salary differential between junior and senior faculty. As a result, salary impression has become a problem, as documented by the technical subcommittee's report. The university does not rigorously attempt to track the market when distributing annual raises, although adjustments may be made by deans or department heads for faculty whose salaries have fallen far behind market values.

Market salaries can be measured in several ways. The annual Oklahoma State University (OSU) salary study has been used for years by MSU administrators as a rough guide to market salaries in state universities and land-grant colleges. The OSU study presents the average salaries of faculty at participating institutions by rank for each discipline. The AK and IK factors developed by the University Planning and Budget Review subcommittee in 1977 were based on OSU salary data, as were the market variables used by the technical subcommittee of the Salary Review Committee in 1984. These market salaries can be attached to individual faculty of the appropriate rank and discipline, and salaries can be grouped for aggregates of disciplines.

Other possible measures of market values include surveys published by discipline-oriented organizations—for example, professional societies of accountants, engineers, and nurses publish salary data specific to those fields. The major disadvantage of using data from discipline-specific areas is the difficulty of combining them in a consistent, university-wide format. Another possible strategy is to collect discipline-specific market salaries from peer institutions. These

surveys reveal what faculty are paid at comparable schools, but they are inefficiently labor intensive to be impractical on a regular basis. Such data have the additional disadvantage of not necessarily representing the market in which MSU's faculty compete; of the faculty who leave MSU, many accept jobs from institutions outside the peer group.

The allocation of critical area money is the only major market adjustment that has occurred at MSU in recent years. The adjustment is easy to quantify by using the amount of critical area money actually received by individual faculty.

Wage Expectations. Faculty members at MSU expect annual raises. Inflation is a fact of life in the United States, and even though the rate of inflation is currently low, faculty are aware of rising prices and are concerned that their salaries keep pace. They are less aware of the extent to which their salary increases may be real gains--or losses.

Labor expectations fuel inflation, and the Montana legislature is hardly immune to that pressure: The legislature always funds a nominal increase for the Montana University System. The legislature allocates a certain amount of money for faculty salaries based on a funding formula which generally covers the previous year's salaries and includes a nominal percentage increase as well. When the formula is not fully funded, MSU never considers decreasing faculty salaries; instead, the institution takes steps to reduce the number of faculty by leaving vacant positions unfilled. Faculty salaries are never cut in nominal terms; the worst fate that can befall a professor in terms of salary is to receive no increase, a drastic measure occasionally warranted on the grounds of unacceptable performance.

The best indicator of wage expectations is the actual percentage rease in salaries distributed by MSU for any given year. Although ulty expectations may have been higher than the percentage increase eived, the actual percentage is the best proxy in the absence of expectations data.

Marginal Productivity. MSU is following a national trend in higher cation by recognizing and rewarding merit. George Keller (1983, p.) applauds this trend in his book Academic Strategy:

More campuses, especially those that do not have faculty unions and those with a greater dedication to quality—and the two usually go together—are moving swiftly away from across-the-board pay increases to raises based on merit.

ler (1983, p. 137) further maintains that "a good college is a itocracy. It should not be permitted to be a home for the amiable or employment bureau."

MSU's policy is to reward individuals for productivity; the general versity criteria and the requirements for departmental criteria were ribed in detail earlier in the chapter. The literature abounds with gested indicators of the quantity—and sometimes, quality—of a ulty member's productivity in the areas of teaching, research, and vice. Several of these indicators were described in the studies harized in Chapter 4. Unfortunately, this type of information has r been assembled centrally at MSU. The best sources of information erving faculty productivity—vitae and annual reviews—are ntained and stored in academic departments. MSU did not begin to ect generalized individual merit data on a university-wide basis I AY85.

Merit rewards at MSU may not be limited to individuals, however. The presence of several productive individuals in a department imparts an aura of merit to that department even when all members are not highly productive. MSU's periodic administrative reviews of its academic programs offer additional evidence for the concept of "departmental merit." The Role and Scope Report was issued in 1978 following a review of all academic programs, and the Academic Program Review Committee repeated the process in 1982. The committee members charged with evaluating programs based their assessments partially upon individual data and annual reviews, but the program assessments themselves were department oriented.

The Academic Program Review Committee focused on the vigor of teaching, research, and service in each department. They did not make quantitative merit ratings on the programs, nor was this their intent. However, it is possible to divide their departmental assessments into high, average, and low ratings and thereby create an indicator of merit at the departmental level. In the absence of individual merit data, the Academic Program Review Committee's departmental assessments constitute the only systematic merit information available. Since differential percentage increases are allocated to departments, there are very legitimate grounds for using merit information at this level.

Salary is not the only reward for productivity; MSU's chief reward for productivity is probably promotion to a higher rank. Although rank is listed as a salary criterion in both the Faculty Handbook and the master plan, there is no university-wide policy for rewarding promotion; MSU's president believes that salary and promotion should be separate

wards for performance. No written policy either forbids or mandates salary increases at time of promotion, however, so departments reward promotion in different ways. Some set aside a portion of their percentage increase and award higher-than-average increases to their newly promoted faculty, while others give no salary increase upon promotion. The former policy varies, too, with the size of the nominal increase; some departments abandon promotion rewards when the nominal increase is low. Thus, promotion appears to be a greater determinant of salary for some MSU faculty than others.

A dummy variable indicating promotion in a given year is a reasonable proxy for the performance necessary to achieve a higher rank. In the absence of a consistent, university-wide salary reward for promotions, such a proxy can roughly measure the average reward accruing to individuals at time of promotion.

Human Capital: Education and Experience. Human capital investments encompass all activities which increase one's lifetime earnings, particularly at the cost of making a present financial sacrifice. Education is the classic human capital factor, and the one most often studied. Education is also the chief requirement for employment as a faculty member at MSU.

A faculty member's education is evaluated by MSU in terms of the highest individual's academic degree, which is part of the "professional preparation" mentioned in the Faculty Handbook. For most faculty, the criterion is "an appropriate terminal doctor's degree (PhD, EdD, DBA)" (Faculty Handbook, 1980, p. 4-17). In certain professional areas,

arily in the colleges of Arts and Architecture and Nursing, master's degrees are accepted for entry-level positions:

The JD is accepted as a terminal degree for persons teaching law courses. In the studio arts, professional master's degrees (MFA, MAA, MM MArch) are recognized as terminal; . . . The MN, MSN, and MSW are accepted as terminal degrees for entry-level positions (Faculty Handbook, 1980, p. 4-17).

ation is therefore an important factor in setting starting salaries; individuals who have completed the doctorate in a particular area are usually offered higher salaries than their ABD or master's degree counterparts. The prestige of the graduate program is only a minor factor in setting the starting salary.

Although academic degree is a significant determinant of salary at the time of hire, it is usually insignificant thereafter. An individual who completes a doctorate while on the faculty usually receives a pay raise which brings him or her closer to the market value for the appropriate rank and discipline, but the number of faculty affected by this type of increase is quite small. The trend at MSU is toward hiring faculty with doctorates, even in fields where the master's degree has traditionally been terminal.

Dummy variables indicating the levels of academic degrees--bachelor's, master's, and doctorate--are commonly used indicators of faculty education. Alternative indicators of the terminal or non-terminal status of degrees are probably more appropriate for MSU, since a master's degree in a field where the doctorate is regarded as terminal should command a lower salary relative to market than a master's degree in a field where doctorates are rarely awarded.

Experience is another human capital factor; investment in experience yields cumulative knowledge about a job, which theoretically enables a worker to do his or her work faster and better. Experience is rewarded at MSU through the process of annual raises, even though the minimal rewards given for seniority may be so small that they result in real income loss.

Experience may be a factor in setting starting salaries, particularly for candidates who have done related work prior to coming to MSU. Faculty hired for positions beyond the entry level are frequently offered starting salaries commensurate with their previous experience. Some newly hired faculty have enough previous experience to warrant hiring them at the rank of associate or full professor.

Experience is also one of the criteria to be considered in allocating annual raises. Interpreted as seniority, years of experience usually accounts for the percentage increase that faculty in a department receive by virtue of working at MSU for another year. A faculty member's salary is expected to rise over the years relative to entry level salaries in the department. While this is frequently true, it is also true that the gap between the salaries of senior and junior faculty is narrowing in many departments due to the phenomenon of salary compression discussed earlier. In order to hire new faculty at market rates, MSU is often forced to shave the salary increases of their senior faculty. This practice weakens the relationship between salary and seniority. Faculty who have been at rank longer than average are also expected to receive lower raises than those who are promoted "on time"

cause failure to be promoted is perceived as due to lack of professional productivity.

The experience variables in MSU faculty salary studies have additionally been measured in years. Past studies have included variables measuring years at MSU, years at current rank, and years since award of the highest degree. Each of these indicators has advantages in some cases and disadvantages in others. Years at MSU adequately measures years of experience for a faculty member whose first faculty job was at MSU; it is a poor indicator of the academic experience of a faculty member who accepted a senior level position, however. Years since highest degree is a good measure of academic experience only if the individual has actively pursued an academic career since obtaining the degree. Years at current rank is probably the best indicator of experience at a particular level, but it requires the assumption that all faculty are at their proper ranks. A count of an appropriate number of years is the best indicator of prior experience; unfortunately, reliable data concerning faculty members' experience prior to MSU exist only at the departmental level.

Institutional Factors

Chapter 3 discussed three institutional factors that play important roles in explaining faculty salaries at public universities:

- institutional funding
- administrative rules
- power structure

This section addresses the ways each factor influences faculty salaries at MSU and suggests how each might be measured for inclusion in a salary study.

Funding. The Montana legislature meets in biennial sessions to allocate state funds for a two-year period, and the percentage increases in salary for the two years tend to be similar. The legislature relies on a funding formula developed in the office of the legislative fiscal analyst to calculate the amount of salary money needed; the major factors in the formula are MSU's projected enrollment estimates, student faculty ratios, average faculty salary and benefits, and student enrollment by discipline (Office of the Legislative Fiscal Analyst, 1985, pp. 813-815). The legislature can also make special salary appropriations, such as the critical area funds and the equity funds required to settle the lawsuit.

The line item budgets produced by the Montana legislature leave MSU little leeway for creative accounting. Funds from the operating or capital allocations cannot be used to supplement the salary allocation, which must be spent solely on salaries. The line item orientation does not extend to individual faculty, however; MSU is responsible for distributing the legislative salary allocation to individuals.

MSU generates additional revenues through tuition and fees, making student enrollment an important source of funding in two ways. Departments use program growth to justify requests for additional resources. MSU also pursues an active alumni development program, but faculty seldom participate directly in soliciting funds from alumni. Faculty are encouraged to participate in the grants and contracts program, however. During AY84, MSU took in over \$9,000,000 in research grants and contracts.

Of these funding sources, the ones most likely to affect faculty salaries are the nominal increase budgeted by the legislature and the grants and contracts awarded by external agencies. The principal funding variable, the nominal annual raise, has already been discussed under 'Wage Expectations.' Indicators for grants and contracts funding and program growth will be discussed later under 'Departmental Power' because they are more appropriately considered in a departmental context.

Administrative Rules and Customs. The process of distributing the salary increase budgeted by the legislature is governed by a complex combination of explicit policies and implicit priorities, or administrative rules and institutional customs. Many of the rules have been discussed in the section 'Current Salary Policies'; the customs have developed around MSU's organizational structure and the personal characteristics of administrators in authority. The allocation process within the university is one of the two main sources of salary differentiation at MSU, the other being the establishment of starting salaries.

The salary increase funds are first distributed by MSU's academic vice president to the various colleges. Any differential percentage increases he gives reflect his assessment of the needs, performance, and role of each college with respect to the others. Thus, the nominal raise given to faculty by the legislature may be differentiated early in the internal allocation process.

Next, the deans allocate their portions of the funds to the departments under their jurisdiction. Different colleges and different

ns have different methods for distributing money among departments. Sometimes all departments within a college receive the same percentage increase, but more often that increase is distributed differentially. The second step in the salary allocation process may further differentiate the nominal increase.

The allocations to individuals are made by department heads, and there is considerable difference in their methods also. Each department develops its own criteria for evaluating faculty and its own system for distributing salary money. Some departments have autocratic headships; faculty committees are strong in others. Raises are based on percentage increases in some departments, on absolute dollar increases in others. Newly promoted faculty are given above average increases in some departments, average increases in others. Some heads heavily emphasize merit in their salary determinations, while others pay merit scant heed and try to adjust salaries to market levels. The variation in the salary allocation style of department heads is yet another source of differentiation.

Turnover of MSU administrators adds another element of complexity to the process of salary differentiation. Like all bureaucracies, MSU is defined by its hierarchy of positions; the positions are relatively constant, but the incumbents change. The personality and preferences of an incumbent may have considerable impact in defining the policies associated with the position, so a change in incumbents may result in substantial changes in the administrative rules and customs that dictate how things are done. Policies and customs change in departments, too,

senior faculty retire and are replaced by new assistant professors with different preferences and priorities.

Given the amount of flexibility that MSU is allowed in distributing the legislated salary increase to faculty, their raises cannot be described simply as that percentage. The legislated percentage increase is a necessary, but certainly not a sufficient, explainer of individual raises. The MSU model requires several terms to account adequately for the variation introduced by the university's internal allocation process.

Trying to reconstruct from past salary data whether an administrator intentionally gave percentage or absolute dollar raises is an impossible task because any raise can be expressed in either form. In the absence of specific data regarding administrative allocation policy, investigating multi-term functional forms to describe raises is probably a worthwhile pursuit. Such terms add needed complexity to the otherwise simple nominal raise term.

Power Structure. State funding for education has never been excessive in Montana, and MSU must compete with the University of Montana, four state colleges, and two community colleges for the state funds available for higher education. MSU's choice in the face of scarce resources has been to promote excellence in a few programs rather than to bestow uniform mediocrity upon all. The powerful departments are those able to sway resource allocation decisions in their favor.

Generally speaking, the most powerful departments at MSU are those that are closely aligned with the mission of the university. Establishment of a PhD program by the Board of Regents indicates that an area is

received as central to MSU's mission as a land-grant institution and thus deserving of the funding necessary to offer that degree. Doctoral programs require funds to support research activities for both faculty and graduate students, and the desirable low student/faculty ratio for graduate courses helps to ensure that doctoral programs are well afforded. The heavier intellectual demands associated with teaching, advising, and research at the doctoral level tend to be reflected in the salaries of professors in doctoral programs.

Another source of departmental power is program growth, which of course may occur in departments without doctoral programs. Program growth creates internal pressures that force MSU to compete for faculty in the external market, driving up faculty salaries in those programs. Increased student demand for courses in business and engineering at MSU have forced the administration to raise salaries in these areas, to some extent at the expense of salaries in other areas, in order to attract new faculty and retain existing ones.

Salancik and Pfeffer (1974) found grants and contracts revenue to be a major source of departmental power at one university; Frank (1984) found that for another institution, grants revenue was a poor explainer of salary differentials. There is considerable variation in grants and contracts activity on the MSU campus, with some departments maintaining a fairly constant record of activity over time and others involved only sporadically. The relationship of this activity to departmental power and salary allocation is worth testing; grants and contracts revenue normalized for departmental size is probably a suitable indicator.

Dummy variables for departments with PhD programs or growing programs can be used to represent the other two indicators of departmental power. Departmental dummy variables for all departments should be avoided because they confound the external market with the internal power structure. To say that salaries of MSU physicists are above average because they are paid to members of the physics department reveals very little information. The real question to be answered is whether the physicist at MSU receives more money because external market pressures dictate it, because internal priorities recommend it, or a combination of the two. Departmental dummy variables as explainers of faculty salary are useful for determining the salary structure, but not the reasons behind the structure. Using market variables in conjunction with dummy variables indicating doctoral programs and departmental growth is a better way to separate market from priorities.

Demographic Factors

There are a number of personal characteristics that may be used legally to influence faculty salaries in public universities; the most common are:

- race
- sex
- age

Using age as an indicator of discrimination is problematic, however; Herlihy and Posey (1981, p. 5) warn against using it because age discrimination is illegal, while Scott (1977, p. 2) specifically excludes it as a proxy for experience. Of these three factors, sex has been the one most thoroughly studied at MSU.

Race. MSU has a few nonwhite faculty members who are widely scattered across the university. The number has fluctuated between 12 and 13 over the last few years, and this number is questionable because minority status is self-reported at MSU. Some faculty members who appear white claim minority status on the basis of their ancestry, while others who appear nonwhite consider themselves white for similar reasons. Regardless of the "true" number of minority faculty, there are too few self-reported minority faculty on campus to employ statistical studies to check for discrimination; matching studies have been the only alternative.

Sex. As reported earlier in this chapter, MSU was found guilty of discriminating against its female faculty in the mid 1970s. Matching studies were done by the equity team in order to reach a salary settlement, and matching studies were repeated by the Affirmative Action Office during AY79, AY80 and AY81, with equity adjustments made for some faculty.

Females constitute about 20% of the tenured and tenure-track faculty population at MSU, so statistical studies are appropriate for addressing questions of salary differentials by sex. Regression analyses were performed by the subcommittee investigating possible pay plans after the lawsuit. More recently, regression studies were sponsored by the Affirmative Action Office in AY82, AY83, and run by the technical subcommittee of the the Salary Review Committee in AY84. These three analyses all found a positive salary differential in favor of females, though the differences were not statistically significant. The technical subcommittee's regression analysis separating the females

nursing from other female faculty revealed that the positive differential was attributable to salaries paid to nurses. An analysis of the regression residuals by college showed that females tended to have lower residuals than males, significantly lower in some colleges. The number of females involved in half of the colleges was very small, however, and the technical subcommittee warned that the results were inconclusive because the model was incomplete. Consequently, the question of whether salary differentials can be attributed to sex cannot be answered until a more comprehensive model can be analyzed.

Age. Age has not been included as a factor in past salary analyses at MSU, either as a check for salary differentiation or as a proxy for experience. There is growing recognition of the existence of salary compression at MSU, but this compression does not indicate discriminatory practices toward aging faculty; rather, compression reflects market pressures on an institution that lacks salary resources to pay all faculty their full market value. Since MSU competes on the open market primarily for entry level positions, the salaries of junior faculty tend to reflect market values more closely than the salaries of senior faculty (Kreighbaum et al., 1984, p. 22).

Summary

The salary structure at any public university is a product of factors both general and specific--general forces that influence salaries at all institutions, and specific determinants unique to each university. This chapter began by describing those factors unique to

SU. The university's mission and organization provide a context for understanding administrative decision-making processes. Descriptions of the sex discrimination lawsuit and the legislative allocation of critical area funds depict two events in MSU's recent past that have influenced the current distribution of salaries. Formal salary policies now in effect at MSU present the official salary determinants.

The latter portion of the chapter applied the ideas concerning the economic, institutional, and demographic determinants of faculty salaries introduced and developed in previous chapters to MSU's salary situation. Included with this discussion of MSU's salary determinants are suggestions for quantifying the various factors for use in a statistical model.

The thesis thus far has investigated the factors most crucial for understanding the salary structure at MSU. Identifying the important salary factors is a vital first step in creating a model, but—as the studies summarized in Chapter 4 indicate—obtaining the necessary data and creating variables to represent the salary factors are also nontrivial steps in the modeling process. These steps are taken in the next chapter to create a model of MSU's salary structure unlike any developed for past analyses.

CHAPTER 6

MODELING MSU'S FACULTY SALARY STRUCTURE

Economic theory explains salary levels in terms of market forces, wage expectations, human capital factors, and worker productivity. According to theories of organizational behavior, salaries are also influenced by the structure of an institution as it affects decision-making processes. Equal rights legislation emphasizes the importance of demographic characteristics as determinants of salary.

MSU's pragmatic faculty describe a model unwritten in policy manuals but pervasive in conversation: Starting salary, which is a function of market forces, available resources, university priorities, and individual qualifications, sets each faculty member on a de facto schedule for the duration of his or her employment at MSU. A faculty member can break out of the schedule most effectively by accepting a better offer from another school, though occasionally a counteroffer from MSU raises the salary base.

This popular perception of faculty salary allocation constitutes a highly complex model which is well beyond both the scope of this thesis and the available data. This chapter formalizes an ideal model based on that perception using ideas introduced in previous chapters, and then develops a simplified version necessitated by limited data. Construction of the required variables is described, and regression coefficients are predicted for each. Criteria for selecting a sample of faculty are

listed, the regression process is described, and the results of the analysis are presented and discussed.

A Comprehensive Model

By definition, a faculty member's current salary is equal to his or her starting salary plus the sum of all raises and salary adjustments received since time of hire. Thus, salary in year t can be represented in functional form by the following identity:

$$\text{SALARY}_t = \text{SALARY}_h + \sum_{i=h}^t \text{RAISE}_i + \sum_{i=h}^t \text{ADJUSTMENTS}_i$$

where t = current year
 h = year of hire
 i = yearly increment

The identity implies that two major decision processes influence current salary: setting the starting salary, and determining the annual increases.

Before a faculty position is advertised, the academic vice president, college dean, and department head negotiate a starting salary or salary range based upon prevailing market rates for the discipline, university priorities, and starting rank. Sometimes the starting rank is open to negotiation as well. The qualifications of the candidate selected for the position may be used to fix the starting salary in an advertised range.

The two types of annual increases depicted in the salary identity are adjustments and raises. An adjustment is a lump sum given to overcome a salary inequity which has developed over a period of years. The most notable adjustments at MSU have been the critical area funds

and the lawsuit settlements, given for market and equity considerations respectively. Other market and equity adjustments have been distributed to individuals over time using regularly appropriated salary funds.

A raise is the salary increase most faculty receive every year for meritorious performance and/or accumulated experience. The amount of money appropriated for salary increases is the major determinant of the size of the typical faculty member's raise. Once the money reaches MSU, it is differentially allocated through the hierarchy and reaches the departments as a range of percentage increases. The departments have their own rules and customs for determining individual raises. The distribution of raises to faculty throughout MSU is a function of the institutional- and individual-level factors introduced and described in previous chapters, with some factors operating at more than one level.

The salary-setting and raise-determination decision processes involve the formal policies made explicit in the Faculty Handbook and the Master Plan as well as informal arrangements which influence their implementation. The formal salary criteria listed in the Faculty Handbook (1980, p. 4-26 - 4-27) include "rank, length of service, professional preparation (both formal and experiential), and teaching or other workloads"; the Handbook also notes that salary recommendations will be "heavily based on merit." The Master Plan (1976, p. 5) mandates "a structured pay system . . . based on rank and years of service and specific and definable merit, market, and performance criteria which can increase or reduce an individual's pay relative to years of service." These formal policies were discussed in detail in Chapter 5.

The distinction between merit and performance is one of degree. Performance expectations define the work that each faculty member is expected to do, based on his or her academic specialty in the context of departmental performance criteria. Annual performance reviews reveal well the expectations have been met--that is, whether a faculty member's performance is below expectations, meets expectations, or exceeds expectations. Those who exceed performance expectations are considered to have demonstrated merit, and it is the policy of MSU to reward meritorious faculty for their efforts.

MSU's top-down salary allocation process ensures that money will be distributed to groups before individuals. The differential allocation percentage increases to colleges and departments suggests that the formal and informal salary criteria are being applied at all levels of the allocation process, as depicted in Figure 2. The solid arrows represent the normal allocation path; the dotted arrows indicate that feedback may occur in the opposite direction.

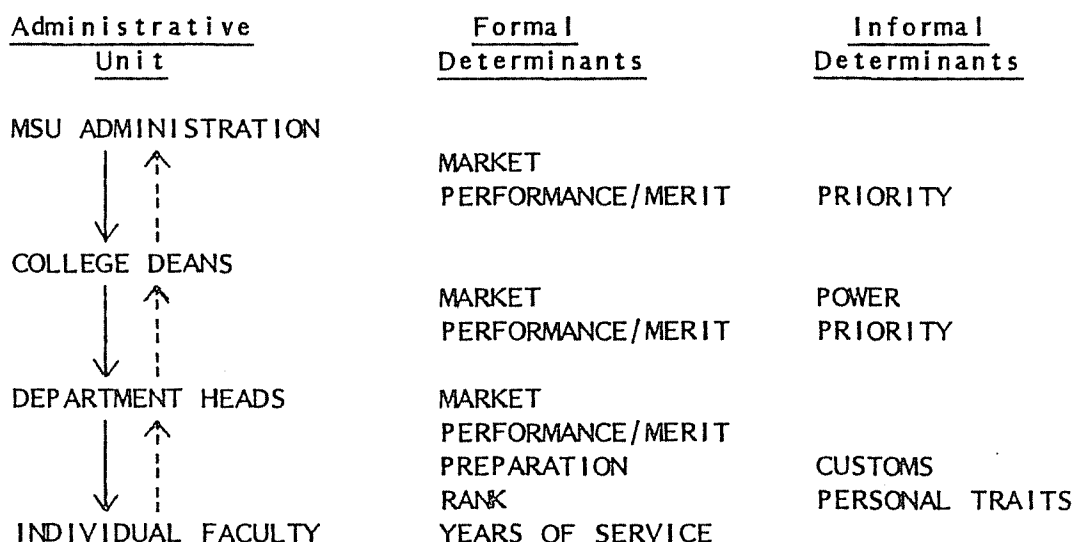


Figure 2. Criteria influencing the allocation of salaries.

Despite the different time frames involved in setting starting salaries and distributing raises and adjustments, the same factors are operative in the decision-making processes that determine each. The major salary determinants in these processes, both formal and informal, are discussed individually below.

Formal Determinants

The formal determinants of salary at MSU are those specifically stated in the Faculty Handbook and the Master Plan. These determinants appear in Figure 2 as market, performance/merit, professional preparation, rank, and years of service. An important determinant occurring outside the hierarchy is the size of the legislative appropriation for annual raises. These formal determinants are discussed below in terms of their influences upon salaries.

Legislative Appropriation. State revenue, state priorities, and the legislative fiscal analyst's funding formula determine the appropriation for salary increases. Percentages appropriated in recent years range from a low of 1.50% in 1985 to a high of 12.41% in 1981. The available revenue depends to some extent upon changes in the consumer price index and even more upon the economy of the state. If state funds are low because of decreased farm income, low mining revenues, declining tourism, or heavy disaster expenditures, the amount of money budgeted for increases in the salaries of public employees may be relatively low. Furthermore, the fiscal analyst's formula may be only partially funded by the legislature at perhaps 97% or 99% of the projected total.

Market. Market is primarily a function of the demand for various academic specialties and is a major criterion for setting starting salaries. Market pressures also may be addressed through salary adjustments made at any level of the administrative hierarchy. The legislature allocated critical area money to the university system solely for the purpose of making market corrections. The central administration may allocate higher percentages of money to colleges where developing market imbalances pose a threat of outside recruitment of MSU faculty. If market pressures are severe in certain departments, a college dean may pass higher increases to those most threatened. A department head is aware of market salaries by rank and discipline and may try to make adjustments among faculty in different academic fields. The academic market always exerts some pressure upon faculty salaries at MSU, but it is sometimes difficult to identify the points in the hierarchy at which market forces are addressed.

Performance/Merit. Academic productivity is traditionally evaluated in the areas of teaching, research, and service. Generally speaking, the larger the aggregate, the more difficult the merit assessment. That is, productivity at the college level is of necessity defined by broad criteria, making merit more difficult to evaluate for an aggregate the size of a college than for departments and individuals, where more definite criteria pertain.

Meritorious performance is often attributed to departments, even when the individuals comprising the departments are not uniformly productive. The feasibility of evaluating the merit of each department in terms of its teaching, research, and service productivity is

denced by the reports of program reviews issued periodically by the university administration. High performance departments presumably give higher percentage allocations than those with lower performance.

The majority of performance assessments are made for individuals, however, by department heads in the context of the annual review. Performance criteria are most explicit at this level, although departments differ in the formality of their definitions. Departments do differ with respect to how rigorously performance expectations are for individuals.

Professional Preparation. The majority of faculty at MSU are hired fill entry-level positions, primarily at the rank of assistant professor. Prime candidates for entry-level positions are recent PhDs or other qualified individuals who have relatively little experience as university faculty. The candidate's academic degree may be a consideration in setting his or her starting salary; a terminal degree in the field often nets a higher salary than a nonterminal degree. The quality of the candidate's graduate program is seldom a salary factor, but is often considered by the committee screening applicants for the position.

Not all faculty are hired for entry-level positions. Every year a number of individuals are hired at the ranks of associate or full professor at salaries commensurate with those ranks, and their starting salaries reflect the experience and reputation they bring to those positions. A faculty member who chooses to take a job at the assistant professor level after several years of experience at another school often receives a starting salary reflecting his or her additional experience.

Professional preparation does not play a strong role in determining faculty member's raise; preparation is more important for determining starting salaries. A faculty member with a nonterminal degree who was hired at a low salary will maintain a low salary if given average percentage increases. However, some individuals who were hired years ago with nonterminal degrees have been tacitly "grandfathered" into the system and receive salaries and raises comparable to those of peers with terminal degrees. Occasionally a faculty member completes a degree while teaching at MSU and receives a salary adjustment in recognition of increased market value.

Rank. Various salary studies, some at MSU, have identified academic rank as a major salary determinant. Much of the strength of association can be attributed to the time frame and performance expectations of the promotion path. To qualify for promotion to associate professor, an assistant professor must "have made a significant contribution to the development of a department, the university, the profession and/or the community at large" and "have demonstrated competence for independent scholarship, research and/or activity" (Faculty Handbook, 1980, p. 4-17). The university expects an assistant professor to spend a minimum of five years at that rank, many spend longer.

To qualify for promotion to full professor, an associate professor must demonstrate in addition to the above achievements "a consistent record of productive, creative or scholastic achievement, . . . significant contributions to his field in both teaching and research, . . . and] strong indications that the output in quality and quantity will

continue" (Faculty Handbook, 1980, pp. 4-17 - 4-18). A minimum of five years are usually needed to meet these criteria.

A faculty member following the standard promotion path will receive average or above-average raises for performance, and the accumulation of years will add to the dollar value of his or her salary. Thus, faculty at higher ranks tend to receive higher raises, particularly when raises are determined as a percentage of current salary.

Years of Service. Faculty salaries increase with length of service at MSU, but this is as likely to result from accumulated annual raises as from explicit efforts to reward years of service. In fact, market pressures work against rewarding seniority when available resources must be channeled toward competitive starting salaries. The actual reward for length of service, independent of performance and market considerations, tends to be pitifully small. Salary compression is a university-wide phenomenon, particularly severe in a few departments.

Informal Determinants

The factors discussed thus far are embedded in established institutional policies. Other factors which influence salary locations originate in relationships and practices that typically evolve in a bureaucratic environment. These relationships and practices are not permanent, but they do tend to resist change. Included in this category are priority, departmental power, departmental salary customs, and personal characteristics.

Priority. University priorities are dictated by the school's land grant mission and institutional goals; they are manifest in the

ferential treatment accorded particular programs. Program priorities be addressed at different levels, ranging from legislative appropriations for new programs to college and departmental decisions about which programs to enhance, which to maintain, and which to reduce or omit. Priority decisions are topics of administrative conversation rather than written memoranda, but priorities become known on campus even in the absence of citable references.

Doctoral programs in the areas of agriculture, engineering, and the physical and biological science are part of MSU's land grant mission. Salaries for faculty in these programs may be higher than salaries in other programs because of the heavier research load and the demands of graduate instruction. Rapid-growth programs also may receive priority treatment as the university attempts to meet instructional demands. The priority may be manifest as salaries for additional faculty rather than increased raises for existing faculty, however.

Departmental Power. A powerful department is able to sway resource allocations in its favor. A department's power may have its origins in tradition, market, merit, or a combination of the three. Departments offering doctoral programs in line with MSU's land grant mission argue that competitive salaries are essential for retaining their graduate faculty, who are responsible for program success. High productivity in a department adds strength to these arguments, since salary increases are MSU's promised reward for meritorious performance. Revenue generated through outside grants and contracts is further evidence of productive work in the department, and such revenue is also financially desirable for MSU.

A department with a growing program is able to pressure the administration to add new positions. Frequently, program growth is not only a local phenomenon. Widespread demand for faculty in growth areas drives up entry level salaries in those fields, and the department convincingly argues that the salaries of continuing faculty must be raised to keep them ahead of those at entry level.

Departmental Salary Customs. In some departments, raises are given as percentage increases; in others, faculty receive raises in absolute dollars. The practice used in a department may arise through faculty consensus or may reflect the preference of the department head. Regardless of origin, the types of increases given to faculty in different departments can contribute to salary differentials among individuals. Departments that determine all raises as percentage increases may develop a wider range of salaries in absolute dollars than departments that give, say, \$500 to average performers and \$1000 to faculty who exceed performance expectations.

Rewarding promotions with a pay increase is another salary practice that varies among departments. Because there is no university-wide policy specifically forbidding salary rewards for promotion, some departments give above-average raises to newly promoted faculty and others do not. Salaries of faculty in departments that reward promotions may be more in line with market standards by rank than salaries in departments where salary and promotion are regarded as separate reward systems. Promotion may be an important salary determinant in some departments but not in others.

Personal Characteristics As numerous studies in the literature and MSU's own history attest, demographic characteristics can also influence salaries, albeit illegally. Sex and race are the attributes most often featured in equity studies, although age is receiving increasing attention. MSU has never boasted enough minority faculty to justify a statistical study, and all studies done following the lawsuit indicate that salary inequities by sex seem to be limited to individuals, or at best, small groups. The salary compression that characterizes senior faculty in many departments is a function of market pressures at the entry level and limited resources rather than age discrimination. In short, discrimination does not appear to be a prevalent problem at MSU.

Other personal characteristics that lead to interpersonal conflicts may influence individual's salaries. A department head may retard an individual's salary advance through personal animosity or in response to pressure from dissatisfied colleagues. The influences of these personal characteristics are virtually impossible to include in a salary model, but they may significantly influence the salaries of particular individuals.

Combined Influences

In summary, then, a faculty member's salary in a given year is determined by a combination of institutional level and individual level factors, some reflecting formal policies and others reflecting informal arrangements. It is certainly not surprising that some of the same factors determining starting salary also influence the increases given thereafter. Combining the formal and informal determinants just discussed yields the following functional description of current salary:

$$\text{Salary}_t = f(\text{APPROPRIATION, MARKET, PRIORITY, PERFORMANCE/MERIT, PREPARATION, RANK, YEARS OF SERVICE, POWER, CUSTOMS, [PERSONAL TRAITS]})$$

where APPROPRIATION = percentage increase given by legislature
 MARKET = standard for discipline and rank
 PRIORITY = program proximity to mission and goals
 PERFORMANCE/MERIT = level of productivity
 TEACHING = graduate and undergraduate instruction
 RESEARCH = research and/or creativity
 SERVICE = local, regional, or national voluntary work
 PREPARATION = education and experience of individuals
 EDUCATION = highest academic degree
 EXPERIENCE = years worked prior to hire
 RANK = academic rank
 YEARS OF SERVICE = years at MSU
 POWER = ability to influence resource allocation decisions
 PHDPROG = program offering the PhD
 GROWTH = steady program growth over time
 GRANTS = grants and contracts revenue
 CUSTOMS = practices characteristic of departments
 PROMOTION = salary increase at promotion
 RAISETYPE = percent increase or dollar raise
 PERSONAL TRAITS = personal or demographic characteristics
 SEX = male or female
 RACE = black, asian, native american, or hispanic
 AGE = age in years
 PERSONALITY = individual traits

A Data Inventory

The model just described would provide a comprehensive look at J's faculty salary structure. Unfortunately, not all of the formation needed to create the variables required for the nprehensive model is available. This section surveys MSU's data to ermine which factors can be quantified and which must be eliminated m the model. The decision to pool cross-section and time-series data also explained.

ta Deficiencies

No written criteria exist for weighting the relative importance of market and performance at the college and department levels, although the differential increases these units receive indicate that some criteria must be employed. Without knowing the criteria there is no basis for constructing variables to represent them. Without well-defined variables, there is no way to statistically simulate the top-down allocation process and trace the flow of salary funds through the administrative hierarchy to individual faculty.

Even if weights could be established for market and performance at the college and department levels, the lack of data available to quantify other factors would preclude running the comprehensive model. There are no data on priorities at any level. Priorities are discussed by administrators but seldom published, and records are not kept of changing priorities over time. The university mission dictates priorities only in part; deans and department heads have priorities for service areas as well.

Performance data exist for individuals, but not in a university-wide form that is comparable across departments. Each department sets its own performance standards, conducts its own reviews, and maintains its own records. Until recently, no attempts were made to gather university-wide performance data on individual faculty. Since merit is an important aspect of MSU's salary reward system, lack of data evaluating performance would be expected to severely compromise the predictive power of a model. Furthermore, the concept of "aggregate performance"—performance at the department or college level—is not

ll defined and makes the construction of aggregate performance iables difficult, though not impossible.

Over the years many market and equity adjustments have been made by academic vice president, deans, and department heads for faculty use salaries were judged to be out of line with those of their peers. Records of these adjustments have not been maintained centrally, never, and such adjustments, when made, are not always differentiated from the annual salary increase. In these cases, it is impossible to distinguish a high raise given for productivity from a market salary adjustment. The assumption that only productive individuals receive market or equity adjustments is probably unwarranted, although it may be true in many cases.

Data for any of the factors are not necessarily available for years prior to AY78. After the lawsuit MSU's Personnel Services constructed a computerized data base to manage information on all employees; generally speaking, data are complete for faculty hired after AY78 and reasonably complete for current employees hired before that time. Some of the data for faculty hired prior to AY78 may be in file folders rather than machine readable form, however. Personnel Services does not recommend trying to reconstruct history with their data.

Finally, no data are available describing customary departmental salary practices. There are no lists revealing which department heads receive percentage increases and which give absolute dollar increases, nor lists of departments where promotions are rewarded with higher salaries. Although the percentage increases received by various units can be constructed from historical data, the same is not true of allocation

ategies because the increase received can be expressed as either a percentage or a dollar figure.

ta Availability

The comprehensive model cannot be analyzed because of insufficient information about how market and performance are weighted at various ministrative levels and insufficient data to construct some of the riables. Fortunately, data needed to analyze a submodel can be thered from a variety of sources: the computerized data base intained by Personnel Services, the aggregate records maintained by stitutional Research, the report produced by the Academic Program view Committee, and the annual OSU salary studies.

Personnel Services' computerized data base contains detailed cords of the employment history of faculty since AY78. Data germane to e model include date of hire, salary rates for each year, degrees arded and dates received, ranks held and dates promoted, and size of itical area adjustment for each individual. Deans in the colleges of rsing and Arts and Architecture have noted which master's degrees they nsider to be terminal.

MSU's Office of Institutional Research maintains a data base of gures aggregated by department by year, dating from AY77 for some data d AY81 for others. Their collection of data includes budgeted laries, full time equivalents for students and faculty, number of jors, and grants and contracts revenue. The Montana State University 84-1986 Bulletin lists the programs offering the PhD degree, and the port of the Academic Program Review Committee (1983) describes the oductivity of each department in the areas of teaching, research, and

service. The OSU national salary survey of state universities and land grant colleges provides annual market salaries by rank and discipline from AY75 to the present.

These sources provide enough data to justify developing a submodel of the comprehensive model. Because much of the data are available for the years encompassing AY80 forward, data can be pooled to create a cross-section time-series model. Cross-section data consist of the observations made across a number of individuals. Time series data consist of the observations made across the same individuals over time. Pooling several years of cross-section data substantially increases the sample size and consequently increases the efficiency of parameter estimates. It also portrays the effects of the cross-section variables over a period of time. The disadvantage of pooling data is that the error term may consist of "time-series related disturbances, cross-section disturbances, and a combination of both" (Pindyck and Rubinfeld, 1981, pp. 253).

A Submodel

The submodel developed for this thesis will test the hypothesis that the widely-held faculty perception of salary allocation is true: that this year's salary is based primarily on last year's salary and the raise allocated by the legislature, with consideration given for productivity, seniority, market, campus priorities, and a few other factors. The emphasis on last year's salary is particularly appropriate since both the legislature and the university rely on incremental budgeting. The submodel can be expressed as the following function:

$$\text{SALARY}_t = f(\text{SALARY}_{t-1}, \text{APPROPRIATION}_t, \text{RAISETYPE}_t, \text{MARKET}_t, \\ \text{CRITAREA}_{\text{AY82}}, \text{FULLPROF}_t, \text{ASSOCPROF}_t, \text{TERMMAST}_t, \\ \text{NTERMMAST}_t, \text{RANKYRS}_t, \text{HIREYRS}_t, \\ \text{PROMOTION}_t, \text{GRANTS}_{t-1}, \text{PHDPROG}, \text{GROWTH}, \\ \text{HITEACHING}, \text{HIRESEARCH}, \text{HISERVICE}, \text{LOTEACHING}, \\ \text{LORESEARCH}, \text{LOSERVICE})$$

where SALARY = AY salary rate
 APPROPRIATION = legislative appropriation
 RAISETYPE = function representing type of salary increase
 MARKET = salary appropriate for rank and discipline
 CRITAREA = critical area adjustment in AY82
 FULLPROF = full professor
 ASSOCPROF = associate professor
 TERMMAST = terminal master's degree
 NTERMMAST = nonterminal master's degree
 RANKYRS = years at current rank
 HIREYRS = years since hire
 PROMOTION = promotion to higher rank
 GRANTS = per capita grants and contracts revenue
 PHDPROG = departmental PhD program
 GROWTH = steady growth of majors
 HITEACHING = high departmental rating for teaching
 HIRESEARCH = high departmental rating for research
 HISERVICE = high departmental rating for service
 LOTEACHING = low departmental rating for teaching
 LORESEARCH = low departmental rating for research
 LOSERVICE = low departmental rating for service

The submodel contains only indicator for market and one for performance, with no indication of how these factors are weighted at different administrative levels. There are no priority variables, just the three indicators of departmental power which are only partial proxies for priority. Alternate functional representations of MARKET and RAISETYPE will be examined during the course of the analysis.

Demographic variables are deliberately omitted from the submodel because of the lack of individual performance data. The efforts made by various committees following the lawsuit apparently resolved the major

pay and promotion inequities, because subsequent salary studies employing different techniques failed to reveal conclusive evidence of systematic salary differentials by sex. Many of these studies also recommended that merit information be included in future studies (Internal memo, "Chronology of Faculty Salary Analyses," MSU Affirmative Action Office). Running yet another salary analysis to check for sex differentials without this vitally important information would be a serious breach of academic responsibility.

Omitting variables from the regression model increases the risk of specification error, however. When a relevant variable is omitted, the estimates for the remaining parameters are biased unless the omitted variable happens to be uncorrelated with all of the included ones. Bias occurs because the coefficients of the variables correlated with the omitted one will partially include its effect (Pindyck and Rubinfeld, 1981, p. 129). The only advantage associated with the biased parameters is that they have smaller variance and thus are more efficient than the unbiased ones (Rao and Miller, 1971, p. 63).

Construction of Variables and Functional Form

The submodel requires both continuous and discrete variables. These were constructed with data from the sources just discussed using the SAS (SAS Institute Inc.) statistical software package. The variables are described by type below, and then presented in the form of an equation suitable for regression analysis.

Continuous Variables. The model required eight continuous variables; formulas for their calculation are given below.

SALARY: Most faculty have AY (academic year) contracts, so salaries are expressed in AY rates. The salaries of faculty with FY (fiscal year) and MT (eighth quarter leave) contracts had to be converted to AY rates in the following manner:

$$AY = FY * 9/11$$

$$AY = MT * 9/10$$

APPROPRIATION: Because records of the salary funds appropriated by the legislature were unavailable, average faculty salaries by year were calculated using July 1 budget figures for salaries and full-time equivalent faculty.

$$\text{average salary} = \frac{\text{instructional faculty dollars}}{\text{instructional FTE}}$$

The average salaries were used to calculate the percentage increases budgeted for faculty salaries each year. These percentage increases were used in the model in lieu of the actual appropriated percentages.

$$\text{APPROPRIATION} = \frac{\text{mean salary}_t - \text{mean salary}_{t-1}}{\text{mean salary}_{t-1}}$$

RAISETYPE: The simplest type of raise that could be distributed to faculty would be to increase every salary by the appropriated percentage increase. This simple percentage raise is calculated as follows:

$$\text{PERRAISE} = \text{SALARY}_{t-1} * \text{APPROPRIATION}$$

Strong evidence exists that the raise function at MSU is more complex. Part of the analysis includes investigating two alternate functional representations, one linear and the other nonlinear.

MARKETDIFF: The OSU rank/discipline salary averages were chosen to represent prevailing salaries in the academic market. The difference

between market salaries in the current year and lagged salaries should indicate how closely MSU is tracking the market. It is calculated as

$$\text{MARKETDIFF}_t = \text{OSUSALARY}_t - \text{SALARY}_{t-1}$$

The predictive power achieved using the rank/discipline salary averages as an explanatory variable was also investigated during the course of the analysis.

CRITAREA: The dollar amount of the critical area adjustments applied to the salaries of individual faculty for AY82. This variable was equal to zero for all other years.

RANKYRS: The number of years an individual faculty member had spent in his or her current rank, calculated as

$$\text{RANKYRS} = \text{current year} - \text{year of last promotion}$$

HIREYRS: The number of years an individual faculty member had spent at MSU, calculated as

$$\text{HIREYRS} = \text{current year} - \text{year of hire}$$

GRANTS: Grants and contracts revenue per capita generated by each department. Expressing grants and contracts revenue in per capita terms corrects for the number of faculty involved in the effort. Total revenue for the year was divided by the number of tenured and tenure-track faculty in the department during the year the revenue was collected.

Dummy variables. The model required thirteen dummy variables, which are defined below.

FULLPROF: 1 = full professor
0 = other rank

ASSOCPROF: 1 = associate professor
0 = other rank

TERMAST: 1 = terminal master's degree
0 = other degree

NTERMAST: 1 = nonterminal master's degree
0 = other degree

PROMOTION: 1 = promotion
0 = no promotion

PHDPROG: 1 = departmental PhD program
0 = no PhD program

GROWTH: 1 = increase of 20 or more majors from AY80 to AY85
0 = increase of fewer than 20 majors from AY80 to AY85

HITEACHING: 1 = high ratings for departmental teaching
0 = teaching ratings not high

HIRESEARCH: 1 = high ratings for departmental research
0 = research ratings not high

HISERVICE: 1 = high ratings for departmental service
0 = service ratings not high

LOTEACHING: 1 = low ratings for departmental teaching
0 = teaching ratings not low

LORESEARCH: 1 = low ratings for departmental research
0 = research ratings not low

LOSEERVICE: 1 = low ratings for departmental service
0 = service ratings not low

Functional Form. These variables were combined in the following manner for regression analysis:

$$\begin{aligned}
 \text{SALARY}_t = & a + b.\text{SALARY}_{t-1} + c.\text{PERRAISE}_t + d.\text{MARKETDIFF}_t \\
 & + e.\text{CRITAREA}_{\text{AY82}} + f.\text{TERMAST}_t + g.\text{NTERMAST}_t \\
 & + h.\text{FULLPROF}_t + j.\text{ASSOCPROF}_t + k.\text{RANKYRS}_t \\
 & + l.\text{HIREFYRS}_t + m.\text{PROMOTION}_t + n.\text{GRANTS}_{t-1} \\
 & + o.\text{PHDPROG} + p.\text{GROWTH} + q.\text{HITEACHING} + r.\text{HIRESEARCH} \\
 & + s.\text{HISERVICE} + t.\text{LOTEACHING} + u.\text{LORESEARCH} \\
 & + v.\text{LOSEERVICE} + \text{ERROR}
 \end{aligned}$$

The error term represents that portion of the variation in salaries that the other variables fail to explain. It is examined as one of the final steps of the analysis. Predictions of the signs and significance of regression coefficients $a-v$ are presented in the next section.

Expected Coefficients

An important part of formulating a hypothesis is predicting how the various factors in a model will influence the dependent variable. If an analyst is unable to establish these expectations, the study is only a fishing expedition, or an exercise in "seeing what happens." The theories from economics and organizational behavior, observations of the salary process at MSU, and results from past salary studies suggest what the signs and significance of the coefficients for each independent variable should be. In some cases the theories and observations conflict, and the results are uncertain. Expectations for each of the coefficients in the thesis model are discussed below.

The lagged value for salary ($SALARY_{t-1}$) should be positive and highly significant—the strongest single predictor of salary. This is suggested by the incremental budgeting strategy employed by both the state legislature and the university, as well as by the small size of annual raises relative to total salary. The term used to represent the annual raises (PERRAISE) should also be positive and significant because the legislature always allocates money for salary increases and the university never reduces nominal faculty salaries.

The variables representing years of experience (RANKYRS and HIREYRS) will have opposite signs; this has been the case in all past

MSU salary regressions containing both terms. The signs and significance of these predictors vary according to the other terms chosen as salary predictors. At least one of the terms will be significant, and both may be. The variable indicating promotion (PROMOTION) would definitely be positive and significant if all departments gave salary increases for promotions. Only some of the departments give such increases, however, so the significance of the coefficient is uncertain. McConnen et al. (1977) found their difference model based on a salary jump at time of promotion gave a better fit than the one that assumed a smooth salary transition, so the sign should be positive.

The equity team found little correlation between rank and salary across departments. Within a department, however, faculty at higher ranks usually receive higher salaries than lower-ranked faculty. Although the salaries of full professors tend to be highest in absolute terms, their salary positions relative to faculty in lower ranks may be much less impressive when other salary determinants are taken into account. The dollar difference between the salaries of full professors and newly hired assistant professors is relatively small in some departments. The study done by the technical subcommittee of the Salary Review Committee showed that the salaries of assistant professors were closest to market values, the salaries of associate professors were slightly further removed, and the salaries of full professors were most severely compressed. The signs for the coefficients of FULLPROF and ASSOCPROF should be negative if ASSTPROF is used as the reference category; the significance of the coefficients is uncertain.

Rather than using a single indicator of terminal degree status for the submodel, two indicators representing the terminal and nonterminal status of master's degrees were created. MSU's policy is to recognize terminal master's degrees in certain fields, so the coefficient for TERMMAST should not be significantly different from zero, the doctoral degree reference category. The sign of the coefficient is uncertain, given its expected proximity to zero. The sign for the coefficient of NTERMMAST, the nonterminal master's degree, should be negative, but the significance of this variable is uncertain because it depends upon the number of nonterminal degree faculty who have not been "grandfathered" into the reward system.

The regression model developed by the technical subcommittee of the Salary Review Committee did not have a lagged salary variable, and in it the OSU rank/discipline market salary variable (OSUSALARY) was a strongly positive predictor of salary. In the submodel it is likely to be highly correlated with the lagged salary variable, so it is included in a term (MARKETDIFF) representing the difference between market salary and lagged salary. This term may be too narrowly defined to capture MSU's efforts to track the academic market, efforts which are diluted by pressures from other salary determinants. Here again, the sign and significance are uncertain. Even if MSU has been making efforts to track the market, salaries may be either moving closer to market values or farther away. The nature of the OSU sample also adds to the uncertainty. Between AY80 and AY85, the number of participating institutions grew from 68 to 76. The definition of 'market salary' may be expected to vary somewhat with the population included in the survey.

The critical area adjustment variable (CRITAREA), on the other hand, should be a strongly positive predictor, since \$315,000 was distributed among only a portion of the faculty. Its coefficient should be 1.00 if the full effects of the critical area money remained with the recipients over time, but less than 1.00 if some of the recipients were given lower than average raises in subsequent years because their salary bases had been increased by the adjustments.

Three variables in the thesis model represent departmental power: PHDPROG, a proxy for proximity to the university's mission; GROWTH, representing market pressures upon a department; and GRANTS, the revenue generated from grants and contracts. The mission proxy (PHDPROG) should have a positive and significant coefficient; MSU has a history of supporting its PhD programs, and salaries for research-oriented, graduate-level teachers tend to be higher than the salaries of their counterparts who teach undergraduate courses. The coefficient for the market pressure variable (GROWTH) should also be positive and significant; a department with a growing number of majors pressures on the university to hire more faculty, usually at entry-level salaries which reflect a national growth trend. Continuing faculty also may be rewarded for carrying heavier teaching loads, or their salaries may be adjusted upward to keep them above the entry-level salaries. The sign of the coefficient for grant revenue (GRANTS) should be positive, but the significance is less certain. The power that accrues to grant recipients may not be manifest as higher salaries, but as control of grant revenue, release time, and other benefits.

The departmental merit variables are the only indicators of performance in the submodel. Although it is MSU's policy to reward productivity in teaching, research, and service, the emphasis appears to have been upon research ever since major changes occurred in MSU's central administration following the lawsuit. Faculty hired before that time periodically complain that they were hired to teach and now cannot be promoted without a research program and a record of professional publications. Research productivity is also easier to monitor than performance in teaching or service. Given these considerations, the coefficient of HIRESEARCH should be positive and significant.

Despite the official emphasis on undergraduate teaching, MSU does not make vigorous efforts to identify and reward good teachers. Faculty interested in competing for the annual teaching awards must fill out application forms, so good teachers who choose not to do the paper work are never considered. Furthermore, the \$500 that accompanies a teaching award does not become part of the recipient's salary base. Nor does MSU have a campus-wide teacher evaluation program. Departments are encouraged to evaluate the teaching effectiveness of their faculty, but monitoring these efforts seems to have low priority. The coefficient for HITEACHING should be positive, but it is probably insignificant.

Service is the most poorly defined category of the three, so broadly defined that it lacks meaning. The Academic Program Review Committee seemed to have difficulty evaluating departmental service for that reason. Their report also notes (Academic Program Review Committee, 1983, pp. 195-196) that "a growing number of departmental administrators are encouraging staff to avoid service responsibilities"

because of low priority and lack of support at MSU. Because service is supposed to be rewarded, the sign for the coefficient of HISERVICE should be positive; it is probably insignificant, however.

The signs and significance of the coefficients for variables indicating low ratings for departmental teaching, research, and service are uncertain. It is unclear whether a lack of effort in these areas is actually punished with below-average raises or is simply not rewarded. If the former is true, the coefficients will be negative and probably significant for some of the variables. Low research productivity is the area most likely to be punished. If low productivity is not a major salary consideration, the signs of the coefficients will be uncertain and insignificant.

Table 2 summarizes the expectations for the variables in the submodel.

A Sample of Faculty

The sample for this analysis consists of all tenured and tenure-track faculty at the ranks of assistant, associate, or full professor, working in instructional departments, who received salaries from MSU for two consecutive years between AY79 and AY85. This interval was chosen because data from Personnel Services, Institutional Research, and the OSU salary study were available and reasonably reliable for this time frame.

All visiting, adjunct, and emeritus faculty were excluded from the analysis. Department heads and other faculty administrators were also excluded because their salaries are determined at different points in

Table 2. Predicted Signs and Significance of Submodel Regression Coefficients.

Variable	Sign	Significance
SALARY _{t-1}	positive	significant
PERRAISE	positive	significant
MARKETDIFF	uncertain	uncertain
CRITAREA	positive	significant
FULLPROF	negative	uncertain
ASSOCPROF	negative	uncertain
TERMMAST	uncertain	uncertain
NTERMMAST	negative	uncertain
RANKYRS	} opposite	one or both
HIREYRS		
PROMO	positive	uncertain
GRANTS _{t-1}	positive	uncertain
PHDPROG	positive	significant
GROWTH	positive	significant
HITEACHING	positive	insignificant
HIRESEARCH	positive	significant
HISERVICE	positive	insignificant
LOTEACHING	uncertain	uncertain
LORESEARCH	uncertain	uncertain
LOSERVICE	uncertain	uncertain

the allocation process than the salaries of instructional faculty. Faculty in the library and the off-campus faculty in the Agricultural Experiment Station were also excluded; their performance expectations differ so much from those for faculty in instructional departments that those areas were not included in the academic program review.

A total of 495 different individuals met the criteria for inclusion in the sample, and many met the criteria several times. For example, the same individual could meet the criteria for AY80-AY81 and again for AY81-AY82. Some faculty met the criteria for all five pairs of years. The data for all faculty who met the selection criteria were pooled in a single file regardless of how many consecutive years they had spent at

MSU. Consequently, a single faculty member may be represented from one to five times in the file; each pair of years represents a different observation. This strategy yielded a total of 1932 observations for analysis.

The greatest advantage offered by pooling the data is the large number of observations available for study. Its greatest disadvantage is the variable representation from different departments. The number of faculty included in the sample from each department by year is shown in Table 3. A large department that was relatively stable during the study period will have several individuals represented five times in the sample; for example, 21 faculty from the Plant and Soil Science Department met the criteria for all years. On the other hand, Theatre Arts, a small and relatively unstable department, has no five-year representatives. In all, 280 of the 495 faculty (56.6%) are included five times. The remainder arrived, departed, or had an administrative appointment during the study period. The sample is termed 'unbalanced' because the number of observations per faculty member differ.

The variable PHDPROG consists of departments with active doctoral programs, evidenced by awards of the PhD degree during the study period. These departments are listed in Table 4; they contributed 610 observations to the sample, or 31.6%. Four other departments were listed in the MSU Bulletin as having doctoral programs during the study period: Agricultural Economics and Economics, Electrical Engineering, Mechanical Engineering, and Veterinary Science. The first three awarded no doctorates during those five years, and Veterinary Science awarded only one. Departments of education were excluded from the variable

Table 3. Faculty Included in the Sample by Department by Year.

Location	80-81	81-82	82-83	83-84	84-85
College of Ag					
Ag Econ & Econ	12	14	15	18	18
Ag & Ind Ed	<3	<3	4	4	5
Plant Pathology	4	4	4	4	4
Animal & Range Sci	12	16	17	16	16
Plant & Soil Sci	21	23	25	25	26
Veterinary Sci	8	8	8	8	9
College of Arts & Arch					
Architecture	3	6	6	7	9
Art	7	5	6	6	8
Theatre Arts	<3	<3	<3	<3	<3
Film & TV	8	7	9	9	8
Music	10	9	10	12	11
College of Business					
Accounting	7	6	7	7	8
Management	7	6	8	13	13
Business Ed	3	3	3	4	3
College of Education					
Health, PE & Rec	10	9	9	10	9
Ed Services	3	4	5	4	3
Elementary Ed	7	7	7	7	6
Secondary Ed	5	5	6	6	6
Home Economics	6	7	10	9	10
College of Engineering					
Chemical Engr	4	3	4	6	5
Civil Engr	13	15	15	14	15
Elec Engr & CS	11	14	16	15	15
Ind & Mgmt Engr	<3	<3	<3	<3	<3
Mechanical Engr	7	9	12	12	9
Agricultural Engr	4	5	5	5	5
College of Letters & Sci					
Microbiology	7	7	8	8	7
Chemistry	16	17	17	17	17
Political Sci	4	4	4	6	6
English	15	16	15	15	18
Earth Sci	7	8	7	7	8
History & Phil	10	11	13	14	14
Mathematical Sci	16	16	18	21	21
Psychology	5	6	7	7	6
Modern Languages	4	5	5	6	5
Physics	12	13	15	14	13
Biology	17	20	21	19	19
Speech Comm	5	6	7	7	7
Sociology	9	10	11	11	10
College of Nursing	29	33	40	43	42

PHDPROG because it is being used as a proxy for MSU's mission, and graduate programs in education are usually regarded as services provided for public school teachers and administrators rather than programs fulfilling the land-grant mission.

Table 4. Departments Included in the Variable PHDPROG.

Department	Observations
Plant Pathology	20
Plant and Soil Science	120
Chemical Engineering	22
Civil Engineering	72
Microbiology	37
Chemistry	84
Mathematical Sciences	92
Physics	67
Biology	96

Departments were included in the variable GROWTH if they exhibited an increase of 20 or more majors during the study period, with no sudden drops or extreme fluctuations. The variable indicates a growth trend over the period, but not necessarily growth every year. The departments included in the variable are listed in Table 5. These departments contributed 645 observations to the sample, or 33.4% of the total. Mathematical Sciences is the only department included in both PHDPROG and GROWTH, accounting for 92 observations, or 4.8%.

Of the 1932 observations, 690 (35.7%) were full professors, 693 (35.9%) were associate professors, and 549 (28.4%) were assistant professors. The average amount of time spent at current rank by the 1932 observations was 5.8 years; their average amount of time since hire

Table 5. Departments Included in the Variable GROWTH.

Department	Observations
Accounting	35
Management	47
Business Education	16
Secondary Education	28
Elec Engr/Computer Science	71
Mechanical Engineering	49
English	79
Mathematical Sciences	92
Film and Television	41
Nursing	187

was 10.9 years. Promotions were awarded to 97 of the faculty, or 5%, during the study period. A total of 304 observations held terminal master's degrees, and 132 had nonterminal master's degrees. The average difference between MSU salary and market salary was \$2,044.

Critical area adjustments were added to the AY82 salaries of 131 faculty in the sample. The average adjustment was \$1,473, and the adjustments ranged from \$200 to \$4,100. Only \$192,900 of the total critical area allocation is accounted for by the study sample; the rest of the money was given to faculty who did not meet the sampling criteria.

Salary increases for the years of the study period were calculated from July 1 budget figures for salaries and full-time equivalent faculty. These calculations represent the increases actually distributed to faculty rather than the amounts allocated by the legislature because the latter figures are not available. The percentage increases used to represent the legislative allocations are presented in Table 6.

Table 6. Annual Percentage Increases in Faculty Salaries.

Years	Percentage Increase
AY80-AY81	7.74%
AY81-AY82	12.41
AY82-AY83	10.20
AY83-AY84	3.08
AY84-AY85	2.73

The variable GRANTS represents per capita revenue from grants and contracts. GRANTS enters the model in the lagged year rather than the current year because it is one of the indicators of departmental power, and power requires some time to develop following receipt of the grant. Grants and contracts revenue per capita is reported by department by year in Table 7, which reveals some interesting patterns of grants receipt. Some departments consistently generate revenues of comparable amounts over time, while others show a much more uneven pattern. Fluctuating patterns are often attributable to sporadic activity by different individuals in a department rather than consistent efforts by a group of committed researchers.

Some grant funds could not be attributed to specific departments because the funds were reported only at the college level. This is true of the departments in the College of Business; the college showed modest grant revenue for all years of the study period, but none of that revenue was apportioned by department. Several other colleges showed grant revenue at both college and department levels.

The indicators of departmental performance in the areas of teaching, research/creativity, and service were based on the most recent

Table 7. Grant Revenue per Capita by Department by Year.

Location	AY80	AY81	AY82	AY83	AY84
College of Ag					
Ag Econ & Econ	7370	6156	2379	4888	7263
Ag & Ind Ed	14231	13589	16831	7903	10343
Plant Pathology	118037	147243	165292	169717	162993
Animal & Range Sci	17149	15640	12274	9732	7526
Plant & Soil Sci	10598	19453	20197	19298	20035
Veterinary Sci	29770	57820	29253	34415	30410
College of Arts & Arch					
Architecture	85	24	16	119	139
Art	277	292	340	55	127
Theatre Arts	35252	0	0	18340	25456
Film & TV	892	101	1034	4210	3922
Music	322	2916	3977	390	159
College of Business					
Accounting	0	0	0	0	0
Management	0	0	0	0	0
Business Ed	0	0	0	0	0
College of Education					
Health, PE & Rec	5494	7971	3633	2152	2735
Ed Services	0	0	5209	10497	10556
Elementary Ed	40665	42711	4252	0	0
Secondary Ed	93	24	57	8	0
Home Economics	4277	1698	2180	1901	2677
College of Engineering					
Chemical Engr	24276	23025	19412	30936	25643
Civil Engr	42119	42415	54783	40526	38142
Elec Engr & CS	1219	3843	1169	2269	5132
Ind & Mgmt Engr	31359	12982	9631	8684	396
Mechanical Engr	18610	27113	19925	14480	14823
Agricultural Engr	4267	1780	675	26630	7223
College of Letters & Sci					
Microbiology	72482	63753	75730	70460	63180
Chemistry	25287	31992	35960	54963	48059
Political Sci	10917	3162	907	5431	772
English	0	48	1946	5021	3510
Earth Sci	3303	5702	3761	627	3246
History & Phil	118	3606	431	176	965
Mathematical Sci	3297	3576	2832	2358	2366
Psychology	0	887	3694	2943	2001
Modern Languages	0	0	0	0	797
Physics	46163	75726	49715	40901	37137
Biology	17711	23753	17210	22384	20806
Speech Comm	3186	4112	166	0	0
Sociology	74421	27345	10491	0	823
College of Nursing	0	0	0	0	0

review of academic programs. The review, conducted in the summer of 1982, was based on information collected from the instructional departments and concentrated on productivity in the most recent year. The committee charged with the review process drew upon many sources of information in order to make their assessments; the review process is described briefly in the appendix.

The Academic Program Review Committee did not produce any quantitative measures of departmental productivity, nor did they intend to. Their report discusses each department's productivity in teaching, research/creativity, and service in some detail, however, and it is possible to base qualitative assessments on those discussions, subjectively rating each department average, above average, or below average in each area. Inevitably, some judgments were easier to make than others. Some departments fell between two categories but had to be assigned to one. The discussions of departmental service were the most difficult to assess; 34 of the 39 departments initially received average or above average rating, but the ratings were subsequently balanced by giving five departments below average rather than average service ratings. The appendix contains quotations from the Report of the Academic Program Review Committee to substantiate all judgments made.

The process of making departmental merit assessments was conducted solely by the author of this thesis; the ratings have not been shared with university administrators and have received no official sanction whatsoever. They are the only subjectively specified variables in the model, but they are also the only performance variables available. This

makes them very important components despite their unofficial and subjective status. The merit assessments are summarized in Table 8.

Because only one program review was conducted during the study period, the same merit assessments had to be used for every year of the period. They should be most accurate for AY80-AY81 and AY81-AY82 and less appropriate for subsequent years, but according to Muffo (1979) productivity and perceptions of productivity change slowly enough that the regression results should not be rendered invalid by the lack of more timely merit information.

Regression Results

Analysis of the submodel required several steps. All regression analyses were performed using PROC REG in the SAS (SAS Institute Inc.) statistical package. Regressing salary on the explanatory variables revealed that several were statistically insignificant, but only the variable representing grants and contracts revenue was dropped from the analysis. Two alternative functions for the raise term were investigated, but neither proved superior to the simple percentage increase term. The consequences of using the OSU salary averages rather than the difference between market and lagged salaries were examined, but the difference term proved slightly more suitable. Finally, the error term was examined for evidence of autocorrelation. These steps of the analysis are explained in detail in this section.

The regression results of the submodel found most satisfactory are presented in Table 9. These results show that last year's salary is the strongest predictor of this year's salary with a high degree of

Table 8. Qualitative Departmental Merit Assessments.

Location	Teaching	Research	Service
College of Ag			
Ag Econ & Econ	high	high	high
Ag & Ind Ed	average	average	high
Plant Pathology	high	high	high
Animal & Range Sci	average	average	low
Plant & Soil Sci	low	average	high
Veterinary Sci	low	average	low
College of Arts & Arch			
Architecture	low	low	average
Art	low	high	low
Theatre Arts	average	average	average
Film & TV	average	low	low
Music	average	average	high
College of Business			
Accounting	average	low	average
Management	average	average	average
Business Ed	average	average	high
College of Education			
Health, PE & Rec	average	average	average
Ed Services	average	low	average
Elementary Ed	high	average	high
Secondary Ed	low	low	average
Home Economics	high	low	average
College of Engineering			
Chemical Engr	average	low	average
Civil Engr	high	high	high
Elec Engr & CS	average	average	high
Ind & Mgmt Engr	low	average	low
Mechanical Engr	low	high	low
Agricultural Engr	average	average	average
College of Letters & Sci			
Microbiology	high	high	high
Chemistry	high	high	low
Political Sci	low	average	average
English	high	average	average
Earth Sci	high	average	average
History & Phil	average	high	average
Mathematical Sci	average	average	low
Psychology	low	low	low
Modern Languages	average	average	average
Physics	high	high	average
Biology	average	average	high
Speech Comm	low	average	average
Sociology	high	average	average
College of Nursing	low	low	high

Table 9. Regression Results--Salary on the Preferred Set of Explanatory Variables.

Variable	Parameter Estimate	Standard Error	T-test HO:B=0	T-test HO:B=1	Variance Inflation
INTERCEPT	176.7357	117.7475	1.501		0
SALARY _{t-1}	1.0069	.0046	218.712	1.500	1.5339
PERRAISE	1.0088	.0233	43.287	.378	1.5030
MARKETDIFF	-.0310	.0151	-2.050		2.0485
CRITAREA	.9096	.0427	21.280	-2.117	1.1709
ASSOCPROF	-155.0970	53.9850	-2.873		2.2220
FULLPROF	-132.3250	82.5744	-1.602		5.1888
RANKYRS	-40.0181	6.3846	-6.268		3.3497
HIREYRS	5.9017	4.7710	1.237		4.4218
PROMOTION	342.9331	107.4268	3.192		1.8240
NTERMMAST	-137.4470	74.2283	-1.852		1.1625
TERMAST	78.4735	68.2058	1.151		2.0444
PHDPROG	168.5167	45.4284	3.709		1.4778
GROWTH	159.6723	44.6188	3.579		1.4675
HITEACHING	66.8788	51.1119	1.308		1.8540
HIRESEARCH	213.5687	53.9132	3.961		1.8480
HISERVICE	-72.1175	47.6869	-1.512		1.8280
LOTEACHING	27.5196	47.0388	.585		1.5482
LORESEARCH	21.0286	55.8860	.376		1.8089
LOSERVICE	-19.0231	53.3190	-.357		1.7017

Adjusted $R^2 = 0.9833$

Root MSE = 763.4765

F-value = 5999.839 (p .0001)

significance, and that the raise term is second only to lagged salary in significance. The coefficients of both are significantly close to 1.0, indicating that both exercise a full impact on salary in the next year. These results suggest that the annual percentage increase has a greater overall effect on salary than any of the other determinants specified by policy and tends to confirm the faculty perception of the salary distribution process. The strength of the raise term is easily explained by the fact that it affects almost all faculty, while the

other formal and informal policy factors serve to differentiate the percentage increase among individuals.

The critical area adjustments ranked third in significance. The coefficient of 0.9096 is significantly different from the expected value of 1.0, indicating that the effects of the money have been diluted by roughly 9%. That is, some recipients of critical area money may have been given below-average raises afterward so that the salaries of nonrecipients could be increased with the money available, and the net effect has been to spread some of the money across the university.

If attempts are being made to track the academic market salaries represented by the OSU standard, the attempts were not particularly successful during the study period. The coefficient for MARKETDIFF is negative and significant, indicating that the difference between OSU averages and MSU salaries has a negative impact on current salary. It is unclear whether MSU salaries are statically below the market, moving toward the market, or moving away from the market. The extent to which different departments have the resources to track the national academic market is also not clear. The technical subcommittee's report (Kreighbaum et al., 1984) suggests that salaries are not equally compressed in all departments.

The coefficient for associate professors is negative and significant at the 5% level, while that for full professors is negative and insignificant. The negative signs indicate that salaries of faculty in these ranks are compressed relative to those of assistant professors, given the simultaneous influence of the other factors in the model. The

coefficient for FULLPROF is not significant because its magnitude is lower and its standard error is larger than that for ASSOCPROF.

This pattern is consistent with the time frame and performance requirements of the promotion path. For productive faculty, the rank of associate professor is a five- or six-year transition between the ranks of assistant and full professor. Professors who remain associates tend to receive average or below average raises; there are certainly no attempts to make their salaries commensurate with those of full professors. As a result, the salaries of associate professors as a group are more tightly defined than those of full professors.

Once a faculty member is promoted to full, he or she will remain at that rank for the duration of employment at MSU, a period that may span more than 20 years. The rank contains individuals who have in effect "retired on the job" and are rewarded accordingly as well as highly productive individuals who have established international reputations and are paid the best salaries MSU offers. Consequently, there is considerably more variation among the salaries of full professors than among the salaries of associates.

The signs are also consistent with a higher level of productivity on the part of assistant professors. As a group, assistant professors are under pressure to produce not only in order to be promoted, but also to receive tenure. Many new assistant professors work to build credible publication records under these combined pressures.

Overall, the raises faculty receive at time of promotion are significant, and average \$343. Because some faculty receive promotion raises and others do not, this figure is probably very misleading. For

example, faculty who receive promotion raises may average \$1000; those who do not average \$0, of course. Only the intercept term has a larger standard error than the variable PROMOTION.

Each year spent at rank has a negative impact on salary, perhaps because the departments that reward promotion commit a significant amount of their salary increases to newly promoted faculty. That practice leaves less for those not promoted and accounts for the fact that accumulating time in rank retards salary advance. The number of years since hire is not significant, given the influence of other salary determinants. The variance inflation factors suggest that HIREYRS is moderately related to RANKYRS and FULLPROF.

The coefficients for the master's degree variables are opposite in sign, but neither is significant. The reward attributable to a terminal master's degree is \$78 higher than the doctorate, which is the reference category and by definition has a value of \$0. The explanation for this apparent anomaly is not obvious from the analysis, but earlier studies suggest that it is due to the relatively favorable salary position of faculty in the College of Nursing, most of whom have terminal master's degrees.

The 'favorable position' is somewhat exaggerated, because a considerable number of nurses are hired as assistant professors only to teach; their chances for promotion are slim because they do almost no research. They are reasonably well paid for assistant professors, but they will always be assistant professors. Other colleges do not maintain such a large reservoir of assistant professors and therefore appear more disadvantaged relative to the market.

The institutional variables at the department level indicate that departmental characteristics do have some influence on faculty salaries. The variables which serve as proxies for mission (PHDPROG) and market pressures (GROWTH) are both positive and significant, indicating that these characteristics have an impact upon the salaries of the appropriate department members. Of the departmental merit indicators, only research productivity (HIRESEARCH) is significantly associated with a positive salary reward. The insignificance of the remaining coefficients also has implications for the reward structure; this possibility is explored further in the next chapter.

Table 10 shows how closely the actual regression coefficients matched the predictions made earlier. According to the table, only two of the sign predictions were wrong: The coefficients of GRANTS and HISERVICE were negative instead of positive. Neither variable was a significant predictor of salary, however.

The predictions for several of the signs were uncertain; of these, MARKETDIFF had a negative sign and was significant; TERMMAST had a positive sign and was insignificant; and the low departmental performance variables--LOTEACHING, LORESEARCH, LOSERVICE--were positive, positive, and negative, respectively; all were insignificant. In addition to these variables, the predicted significance of two others was uncertain; PROMOTION was significant, and NTERMMAST was not. One variable predicted to be significant was not--FULLPROF, probably due to the wide variation in the salaries of full professors.

Table 10. Signs and Significance of Regression Coefficients:
Expected vs Actual.

Variable	Sign		Significance	
	Expect	Actual	Expect	Actual
SALARY _{t-1}	+	+	yes	yes
PERRAISE	+	+	yes	yes
MARKETDIFF	?	-	?	yes
CRITAREA	+	+	yes	yes
ASSOCPROF	-	-	yes	yes
FULLPROF	-	-	yes	no
TERMMAST	?	+	?	no
NTERMMAST	-	-	?	no
RANKYRS	} opp	-	one or	yes
HIREYRS		+	both	no
PROMOTION	+	+	?	yes
GRANTS _{t-1}	+	-	?	no
PHDPROG	+	+	yes	yes
GROWTH	+	+	yes	yes
HITEACHING	+	+	no	no
HIRESEARCH	+	+	yes	yes
HISERVICE	+	-	no	no
LOTEACHING	?	+	?	no
LORESEARCH	?	+	?	no
LOSERVICE	?	-	?	no

Omitting Variables from the Model

Several of the variables in the submodel were not significant predictors of salary. The sign predictions were incorrect for two variables, GRANTS and HISERVICE, but only GRANTS was dropped from the submodel. Table 11 presents the results of the regression analysis that included the variable GRANTS.

What guidelines determine which variables should be retained in a model and which omitted? Wonnacott and Wonnacott (1979, pp. 88-90) address this question and conclude that there is no simple answer. An insignificant t-value does not prove there is no relationship between salary and the independent variable. The theoretical foundations of the

Table 11. Regression Results—Salary on the Full Set of Explanatory Variables.

Variable	Parameter Estimate	Standard Error	T-test HO:B=0	T-test HO:B=1	Variance Inflation
INTERCEPT	167.0331	118.0069	1.415		0
SALARY _{t-1}	1.0072	.0046	218.521	1.555	2.3675
PERRAISE	1.0108	.0234	43.261	.464	1.5112
MARKETDIFF	-.0311	.0151	-2.059		2.0486
CRITAREA	.9112	.0428	21.309	-2.076	1.1720
ASSOCPROF	-154.5680	53.9809	-2.863		2.2221
FULLPROF	-133.8170	82.5750	-1.621		5.1899
RANKYRS	-40.0903	6.3841	-6.280		3.3499
HIREYRS	6.0352	4.7718	1.265		4.4242
PROMOTION	343.4771	107.4161	3.198		1.8241
NTERMMAST	-135.5640	74.2371	-1.826		1.1630
TERMMAST	76.2566	68.2239	1.118		2.0459
GRANTS _{t-1}	-.0013	.0001	-1.190		2.0409
PHDPROG	192.3910	49.6584	3.874		1.7662
GROWTH	150.2542	45.3108	3.316		1.5137
HITEACHING	83.0808	52.8895	1.571		1.9856
HIRESEARCH	226.7217	55.0292	4.120		1.9257
HISERVICE	-66.4743	47.9170	-1.387		1.8461
LOTEACHING	31.1944	47.1350	.662		1.5549
LORESEARCH	22.2228	55.8890	.390		1.8095
LOSERVICE	-14.4559	53.4512	-.270		1.7105
Adjusted R ² = 0.9833					
Root MSE = 763.3935					
F-value = 5701.157 (p .0001)					

model come to the fore at this point in a regression analysis, because a priori beliefs about relationships become the basis for the decision to omit or retain an independent variable.

If strong a priori evidence suggests that a predictor is related to the dependent variable and its sign agrees with the predicted direction, then the variable should be retained to contribute its information to the model rather than to the error term. Removing it may bias the coefficients of any remaining independent variables that are correlated

with it. When a variable not significant at the 5% level is retained, it may be useful to report that the variable was significant at the 10% level, for example, rather than the traditionally accepted 5% level.

If, on the other hand, the sign of the regression coefficient is opposite that predicted, as is the case with GRANTS and HISERVICE, the analyst has grounds for accepting the null hypothesis and dropping the variable from the model. Its exclusion will create a model more parsimonious in parameters that has more degrees of freedom. And since the results completely contradict the a priori evidence, little is lost by consigning it to the error term, since its inclusion in the model appears to have been a mistake.

The theories presented in Chapters 2-4 suggest that all of the variables included in the submodel are predictors of salary. When a variable is shown to be an insignificant predictor, there are at least two possible reasons for the failure. First, the factor may be valid but the measurement wrong. For example, turnover of faculty in a department might be used to measure market opportunities, but might actually be measuring faculty dissatisfaction with departmental politics or other departmental factors instead. Second, the factor may be valid for other schools but not for MSU. For example, the determinants of power in departments may differ among universities. Pfeffer and Salancik (1974) determined that departmental membership on important university committees was a source of departmental power at the University of Illinois. At MSU, the heads of some of the powerful departments appear to discourage their faculty from serving on campus committees.

Two of the variables in the submodel were not significant at the 5% level and had signs opposite the predicted directions. On the basis of a prior beliefs, GRANTS was dropped from the model and HISERVICE retained.

GRANTS was included in the model as one of the measures of departmental power. The bureaucratic model suggests that administrators will reward those who increase the bureau's revenue, and Salancik and Pfeffer (1974) found that grants and contracts revenue was the most significant predictor of departmental power in all their regression equations. There are three potential flaws inherent in using the GRANTS variable as a predictor of salary, however. The first is the assumption that the power accrues to the department rather than the individual. At a major research university where grant-getting activity is the rule rather than the exception, revenues generated may indeed be a source of departmental power. At MSU, where this activity is less pervasive, power may accrue to the individual grant recipient rather than to the department.

The second flaw is the assumption that grant activity is rewarded through normal AY or FY salary increases. At MSU, effective salaries can be increased by permitting "extra compensation" and summer salaries paid from grants. Other possible rewards include control of funds, generous release time, additional graduate students, or increased travel. Grant recipients may be amply rewarded in areas other than salary.

The third flaw is failing to distinguish between grants awarded in laboratory sciences and those awarded in nonlaboratory disciplines. Science grants often include substantial funds for equipment and may

include funds for hiring graduate assistants and additional support staff.

Although there were good reasons for including GRANTS in the submodel to test its importance as a salary determinant, regression analysis shows it is not an important predictor. A priori evidence suggests it was badly defined and reinforces the decision to drop it from the model.

HISERVICE is retained in the model despite the sign reversal. The sign prediction was positive because the Faculty Handbook (1980) lists service as one of the criteria to be considered in salary recommendations. However, the Academic Program Review Committee found service criteria to be vague and service to be the area least emphasized by departments; most departments reported assigning higher weights to teaching and research in faculty performance reviews. Thus, although the sign was predicted to be positive on the basis of official reward policy, the departmental reward systems make the negative sign very understandable. The other reason for retaining HISERVICE in the model is that it is part of a six-variable block--the high and low ratings for research, teaching, and service. Retaining all six variables gives a more complete picture of how these factors affect salary. The fact that the signs of HISERVICE and LOSERVICE are both negative is another argument for retaining HISERVICE. This sign pattern implies that an "average" service load is optimum.

Removing GRANTS from the model had little effect upon the regression results. The stability of the coefficients associated with the remaining variables can be seen by comparing the regression results

presented in Tables 9 and 11. GRANTS was not collinear—or only weakly so—with the other variables.

Selecting the Raise Terms

The functional form of the raise term representing MSU's salary allocation process is hardly obvious. The number of functions that could be tried is practically unlimited, but it was decided to investigate one complex and one simple function. The complex function, based on a Taylor series expansion, yielded nine terms (including lagged salary) to incorporate considerable variation in the types of raises allocated. Salary was regressed on these nine terms to determine the suitability of the Taylor series expansion for representing the raise function. The results appear in Table 12.

The large standard errors associated with the parameter estimates, the low *t*-tests relative to the significance of the percentage raise term, and the high variance inflation factors all indicate that the terms of this function are collinear and thus lack explanatory power (Belsley, Kuh, and Welsch, 1980, pp. 92-93). Although the R^2 is slightly higher for the Taylor series model and the standard error is lower, an *F*-test based on the sum of squares error from this model and the submodel yielded a result of .0569, indicating that the improved predictive power gained from the Taylor series terms is not significant. On these grounds, the Taylor series form of the raise term was abandoned and the simpler alternative examined.

The simpler form contains two terms in addition to the lagged salary variable—one representing a percentage of last year's salary (PERRAISE) and another representing an absolute dollar increase

Table 12. Regression Results--Taylor Series Terms.

Variable	Parameter Estimate	Standard Error	T-test HO:B=0	Variance Inflation
INTERCEPT	5566.0480	2377.6430	2.341	
SALARY _{t-1}	.7513	.2119	3.545	5272.579
APPROP	-1.5338E+05	35013.0000	-4.381	6407.495
APPROP*SALARY _{t-1}	1.9867	1.5597	1.274	7094.215
APPROP ²	1.9410E+06	3.5381E+05	5.486	13927.930
APPROP ² *SALARY _{t-1}	-19.7540	5.5394	-3.566	1920.889
APPROP ³	-5.7699E+06	1.4276E+06	-4.042	3611.193
SALARY _{t-1} ²	6.9688E-06	6.3896E-06	1.091	14343.050
SALARY _{t-1} ³	-8.7567E-11	6.4957E-11	-1.348	2827.916
APPROP*SALARY _{t-1} ²	3.0508E-05	1.9160E-05	1.596	897.161
MARKETDIFF	-.0094	.0151	-.625	2.149
CRITAREA	.9263	.0484	19.130	1.583
ASSOCPROF	-11.5105	57.5039	-.200	2.657
FULLPROF	118.9547	88.9824	1.337	6.349
RANKYRS	-37.6388	6.2510	-6.021	3.384
HIREYRS	4.6623	4.6682	.999	4.461
PROMO	172.5385	107.2412	1.609	1.916
NTERMMAST	-148.6380	72.5647	-2.048	1.171
TERMMAST	7.0156	68.0804	0.103	2.146
PHDPROG	195.1292	44.5277	4.382	1.496
GROWTH	200.7739	44.0962	4.553	1.510
HITEACHING	44.4807	50.0371	.889	1.872
HIRESEARCH	269.3939	53.3718	5.047	1.908
HISERVICE	-59.8095	46.5322	-1.285	1.834
LOTEACHING	16.1683	45.9450	.352	1.556
LORESEARCH	52.2415	54.7689	.954	1.831
LOSERVICE	-35.5094	52.0163	-.683	1.707

Adjusted R² = 0.9842

Root MSE = 743.7335

F-value = 4624.593 (p .0001)

(DOLRAISE). The dollar increase was calculated by averaging the lagged salaries for each year and multiplying those figures by the salary appropriation.

$$\text{PERRAISE} = \text{SALARY}_{t-1} * \text{APPROPRIATION}$$

$$\text{DOLRAISE} = \text{Mean}(\text{SALARY}_{t-1}) * \text{APPROPRIATION}$$

Table 13. Regression Results--Percentage and Dollar Raise Terms.

Variable	Parameter Estimate	Standard Error	T-test	Variance Inflation
INTERCEPT	-551.0530	158.8101	-3.470	0
SALARY _{t-1}	1.0272	.0055	188.059	4.5018
PERRAISE	.4440	.0869	5.107	21.4065
DOLRAISE	.6293	.0934	6.736	20.9889
MARKETDIFF	-.0228	.0150	-1.521	2.0620
CRITAREA	.9513	.0427	22.274	1.1960
ASSOCPROF	-94.1458	54.1308	-1.739	2.2859
FULLPROF	16.0402	84.5516	.190	5.5665
RANKYRS	-37.1494	6.3261	-5.872	3.3649
HIREYRS	4.5712	4.7207	.968	4.4295
PROMOTION	277.5692	106.6438	2.603	1.8393
NTERMMAST	-134.0110	73.3834	-1.826	1.1625
TERMMAST	53.9917	67.5257	.800	2.0504
PHDPROG	178.9426	44.9369	3.982	1.4796
GROWTH	184.0360	44.2579	4.158	1.4773
HITEACHING	54.0930	50.5645	1.070	1.8566
HIRESEARCH	249.2223	53.5604	4.653	1.8662
HISERVICE	-68.9021	47.1453	-1.461	1.8282
LOTEACHING	21.7088	46.5103	.467	1.5488
LORESEARCH	33.2783	55.2785	.602	1.8109
LOSERVICE	-30.5814	52.7387	-.580	1.7035

Adjusted $R^2 = 0.9777$

Root MSE = 883

F-value = 28221 (p .0001)

Regressing salary on the submodel with the dollar raise term included yielded the results presented in Table 13. The results look more reasonable than those associated with the Taylor expansion series terms. The parameter estimates indicate that salary is calculated by taking 102.7% of lagged salary, 44.4% of the percentage raise term, and 62.9% of the dollar raise term. The significance of these two terms is considerably less than that of the percentage raise term alone, however, and the variance inflation factors for the two terms, higher than 20, indicate an unacceptably high degree of collinearity. The finding of

collinearity is not surprising, since both terms are ultimately derived from lagged salary values.

On these grounds, the variable PERRAISE alone was chosen to represent the raise term. The single raise term does not capture the complexity of the raise allocation process, but in the absence of more explicit criteria and detailed data it is the best proxy to use for annual raise. Its t-value is 43.28, and its variance inflation factor is only 1.5.

Selecting the Market Factor

MARKETDIFF, the difference between an individual's rank/discipline salary average in the OSU study and his or her lagged salary, was initially chosen as the market factor for the submodel. Another alternative was to use the OSU rank/discipline salary averages (OSUSALARY) alone to represent the academic market. Table 14 shows the results of regressing salary on the submodel with OSU salaries substituted for the market difference variable.

Comparing Table 14 with Table 9 shows the impact of this substitution on the submodel. The differences between the terms OSUSALARY and MARKETDIFF are revealed in their t-tests and variance inflation factors. OSUSALARY has a slighter level of significance than MARKETDIFF, but this is to be expected because it is not a difference term. The fact that its level of significance is no higher can be explained by its collinearity with lagged salary and FULLPROF. Including OSUSALARY in the model substantially reduces the significance of the lagged salary term. Furthermore, attributing the relatively small market effect on salary to a difference term—a small quantity—has more

Table 14. Regression Results--OSU Rank/Discipline Salary Averages.

Variable	Parameter Estimate	Standard Error	T-test	Variance Inflation
INTERCEPT	-291.4470	150.3159	-1.939	0
SALARY _{t-1}	.9879	.0066	150.347	4.8467
PERRAISE	1.0086	.0227	44.469	1.4342
OSUSALARY	.0361	.0084	4.278	10.6662
CRITAREA	.8707	.0432	20.152	1.2051
ASSOCPROF	-281.8220	60.1714	-4.684	2.7808
FULLPROF	-499.8140	111.2213	-4.494	9.4827
RANKYRS	-36.9686	6.3931	-5.783	3.3833
HIREYRS	5.0246	4.7574	1.056	4.4289
PROMOTION	237.8988	85.8399	2.771	1.1732
NTERMAST	-182.8200	73.6186	-2.450	1.1834
TERMAST	139.9737	68.8752	2.032	2.1001
PHDPROG	179.4824	45.3281	3.960	1.4821
GROWTH	139.0702	44.3806	3.134	1.4625
HITEACHING	73.8897	50.9425	1.450	1.8552
HIRESEARCH	199.6725	53.6503	3.722	1.8435
HISERVICE	-81.8948	47.5248	-1.723	1.8289
LOTEACHING	35.4732	46.8825	.757	1.5493
LORESEARCH	9.3486	55.6976	.168	1.8100
LOSERVICE	-38.0080	53.3252	-.713	1.7145
Adjusted R ² = 0.9834				
Root MSE = 760.6834				
F-value = 6044.721 (p .0001)				

intuitive appeal than attributing it to the large market salary value. The variable MARKETDIFF was therefore chosen as the preferred market factor.

Investigating the Annual Models

Although the submodel was originally designed as a cross-section time-series model, examining the regression results for each pair of years reveals how consistently the submodel explains faculty salaries over time. To determine the annual results, regressions were performed

for all observations from a given pair of years. Salary was regressed on all of the independent variables except raise, since the legislative appropriation is a constant for any given year. Critical area money is applicable only to the AY81-AY82 model; its value is zero for all other years and is therefore omitted from those regressions. Results for the annual models are presented in Table 15. The standard error for each variable appears below its parameter value.

The most notable trend is that lagged salary tends to become increasingly significant over time. This trend is broken only in the years AY81-AY82 when the critical area funds were distributed. The high significance in the last two models, AY83-AY84 and AY84-AY85, may be attributable to the relatively low percentage increases appropriated for raises. Administrators may have decided to pass most of the appropriation directly to faculty rather than selectively weighting a number of salary criteria.

The market factor, significantly negative for AY81-AY82, becomes significantly positive for AY84-AY85. This may indicate that MSU has been forced to pay increasing attention to market salaries in an era of dwindling resources for higher education. The coefficient associated with critical area money is higher for the annual model than the time series model and is not significantly different from 1.0, indicating that the money was apparently diluted over time rather than in the year of allocation.

The magnitude of the coefficients for the rank and degree variables fluctuates considerably, and almost all are insignificant. In concert with other variables in any given pair of years, these factors appear to

Table 15. Regression Results--Annual Models by Year.

Variable	80-81	81-82	82-83	83-84	84-85
INTERCEPT	182.3827 (.457)	1977.3800 (3.611)	140.8786 (.571)	664.1459 (3.136)	-44.4529 (-.207)
SALARY _{t-1}	1.0542 (44.993)	1.0322 (33.678)	1.1201 (95.123)	1.0190 (111.219)	1.0174 (140.812)
MARKETDIFF	.0341 (.531)	-.1659 (-2.229)	-.0074 (-.370)	.0460 (1.444)	.5133 (2.578)
CRITAREA	-----	.9488 (11.409)	-----	-----	-----
ASSOCPROF	-51.9961 (-.365)	-199.5970 (-1.007)	-118.5970 (-1.206)	43.7026 (.503)	-155.7000 (-2.068)
FULLPROF	8.6304 (.037)	313.3049 (.987)	-95.3281 (-.605)	21.4594 (.150)	-176.3900 (-1.170)
RANKYRS	-31.7719 (-2.028)	-77.9510 (-3.474)	-27.7148 (-2.438)	-22.8208 (-2.190)	-27.3399 (-3.756)
HIREYRS	-2.8892 (-.266)	36.4241 (2.268)	-11.4457 (-1.368)	-3.1321 (-.407)	5.3856 (.928)
PROMOTION	-57.4390 (-.154)	1128.8260 (2.140)	202.9496 (.954)	-46.9923 (-.193)	329.9961 (2.872)
NTERMMAST	-43.9865 (-.267)	-462.3620 (-1.842)	-140.5810 (-1.022)	-90.7020 (-.779)	2.9285 (.033)
TERMMAST	123.0503 (.762)	211.7280 (0.885)	-63.8103 (0.512)	-102.7960 (-.948)	90.2942 (1.121)
PHDPROG	262.4204 (2.481)	193.5190 (1.211)	178.3393 (2.190)	205.8991 (2.852)	74.8030 (1.429)
GROWTH	185.2447 (1.777)	645.6728 (4.198)	71.1128 (.862)	151.8222 (2.054)	-56.3425 (-1.070)
HITEACHING	41.5744 (.354)	-68.2620 (-.391)	109.8863 (1.193)	4.7877 (.058)	186.5098 (3.145)
HIRESEARCH	530.2855 (4.274)	735.4804 (3.931)	38.1418 (.384)	125.6985 (1.405)	-80.0056 (-1.248)

Table 15, continued.

Variable	80-81	81-82	82-83	83-84	84-85
HISERVICE	34.9600 (.308)	83.4539 (.501)	-192.4900 (-2.231)	-103.1050 (-1.377)	-80.4899 (-1.502)
LOTEACHING	48.2172 (.444)	317.4323 (1.965)	-85.5008 (-1.026)	-127.5150 (-1.710)	-21.5681 (-.395)
LORESEARCH	69.7124 (.544)	344.8895 (1.783)	37.5008 (0.373)	-129.5010 (1.463)	-60.4473 (-.925)
LOSERVICE	-9.7530 (-.079)	-177.4240 (-.968)	-21.7186 (-.227)	34.1767 (.402)	47.6830 (.776)
Adjusted R ²	.9657	.9471	.9873	.9905	.9953
Root MSE	726.4611	1113.4260	620.1778	565.5411	407.1920
F-value	550.4800	359.2740	1828.5780	2562.2350	5163.0530
# of Cases	333	361	401	420	417
APPROPRIATION	7.74%	12.41%	10.20%	3.08%	2.73%

have relatively little impact on salary. Years at current rank is consistently significant in all years, however. Years since hire tends to be negative and is insignificant in all years except for the year in which critical area funds were distributed. Promotion is significant in only two of the years; its sign and significance undoubtedly depend on which departments were promoting faculty and how much money they had at their disposal.

The department-level variables are held constant over the study period. Program growth and doctoral degree production were given values for a five-year timespan rather than annually, because annual fluctuations in these attributes should have less impact on departmental trends over time. The variable PHDPROG is always positive and

is significant in three of the five years. GROWTH is positive in four of the five years and significant in two. These results, coupled with the significance of both variables in the time series model, generally support the hypothesis that departmental power influences faculty salaries.

The values of the departmental merit variables are also constant over the study period due to lack of data rather than a priori indication that departmental merit is constant. While there is considerable evidence that departmental productivity and reputation are slow to change (Muffo, 1979), the Report of the Academic Program Review Committee may have spurred some departments to greater endeavors.

Generally speaking, the results associated with the departmental merit variables are disappointing. Research productivity is significant for the first two years of the study and insignificant thereafter. Did the productivity of departments change, or did MSU's reward structure change? This question cannot be answered without additional data. HITEACHING is significantly positive for the last year of the model, and HISERVICE significantly negative for the third year. There is a strong possibility that the variables representing high productivity ratings may be serving as proxies for other factors, particularly for the years following the program review. The variables representing low ratings in each of the three areas are never significant.

Examining the Error Structure

Cross-section time-series models frequently exhibit correlations in the error term. Errors may be correlated across time as well as across individual units, and autocorrelation (combined influences across both

cross-section and time-series units) may also exist. The error components model accounts for each type of correlation and is the procedure of choice for accommodating potential correlations among errors. The model is presented by Pindyck and Rubinfeld (1981, p. 256) as the following equation:

$$e_{it} = u_i + v_t + w_{it}$$

where $u_i \sim N(0, \sigma_u^2)$ = cross-section error component

$v_t \sim N(0, \sigma_v^2)$ = time-series error component

$w_{it} \sim N(0, \sigma_w^2)$ = combined error component

Unfortunately, the error components equation is quite difficult to use with the faculty salary submodel because the data are not balanced. The error components model requires that all variables have values for each individual for each time period. The faculty sample consists of data representing 495 different individuals, but complete cross-section time-series data are available for only 280 (56.6%) of them. The model could have been run using only those observations, but such an approach shifts the emphasis of the model to the salary structure of long-term faculty rather than all faculty.

The remaining 215 faculty either arrived during the study period, left the university, or had an administrative appointment for at least one year. The missing observations could have been to achieve balance, but the estimation option was rejected in this study for several reasons. First, a large number of estimates would be required. A balanced data set for 495 faculty would contain 2475 observations; the unbalanced data set used for the study contains only 1932. Balancing

the data set would have required making 543 estimates, or 21.9% of the 2475 observations.

Estimating nonadministrative salaries for temporary administrators would have been possible, although difficult in cases where the administrative component of the salary was not made explicit. Estimating values for arriving and departing faculty is more problematic, because those values would have to be based in part on values associated with their long-term peers. Making such estimates would essentially convert the arriving and departing faculty to long-timers, and the dynamics of the salary structure associated with entry and exit would be lost. The salary structure of long-term faculty is certainly an intriguing problem, but it is a different problem than the one proposed for study in this thesis. The dynamics of faculty arrivals and departures are an essential part of a university's faculty salary structure, and it was elected to include arriving and departing faculty to capture the influence of those dynamics.

Using an unbalanced data set requires that the error term be examined by less direct means. Two useful approaches are examining the residuals for patterns of dependency and calculating the covariance of the error terms. Table 16 presents the mean residual (\$) and the number of individuals in each department (#) for each year. Few departments have consistently high or low mean residuals. Most of the values are not significantly different from zero. Overall, the residuals appear to be independent and randomly distributed.

Table 16. Regression Residuals from the Pooled Model by Department by Year.

Location	80-81		81-82		82-83		83-84		84-85		5-Year	
	\$	#	\$	#	\$	#	\$	#	\$	#	\$	#
AGRICULTURE												
Ag Econ & Econ	-195	12	-276	14	-14	15	-125	18	-39	18	-151	77
Ag & Ind Ed	31	2	387	2	103	4	-34	4	86	5	95	17
Plant Pathology	1438	4	-613	4	-105	4	-251	4	-29	4	57	20
Animal & Range Sci	156	12	534	16	77	17	-29	16	-41	16	97	77
Plant & Soil Sci	25	21	-208	23	-76	25	-69	25	41	26	-32	120
Veterinary Sci	-207	8	-716	8	88	8	-78	8	-263	9	-229	41
ARTS & ARCHITECTURE												
Architecture	64	3	-90	6	18	6	-300	7	-109	9	-165	31
Art	-229	7	-92	5	-284	6	46	6	-50	8	-123	32
Theatre Arts	880	1	---	---	---	---	-291	2	366	1	94	4
Film & TV	-108	8	-792	7	-168	9	-63	9	-79	8	-158	41
Music	-20	10	-209	9	180	10	392	12	25	11	102	52
BUSINESS												
Accounting	-92	7	149	6	-312	7	10	7	68	8	-84	35
Management	238	7	261	6	-14	8	-59	13	119	13	75	47
Business Ed	150	3	-509	3	132	3	-174	4	-28	3	-131	16
EDUCATION												
Health, PE & Rec	63	10	-181	9	139	9	-138	10	82	9	-4	47
Ed Services	28	3	-317	4	-80	5	80	4	80	3	14	19
Elementary Ed	4	7	41	7	-6	7	286	7	-10	6	71	34
Secondary Ed	-423	5	-1383	5	-168	6	15	6	86	6	-278	28
Home Economics	-17	6	-824	7	332	10	140	9	-29	10	42	-30
ENGINEERING												
Chemical Engr	-72	4	-505	3	28	4	100	6	-151	5	-164	22
Civil Engr	-540	13	-214	15	10	15	81	14	-235	15	-177	72
Elec Engr & CS	55	11	17	14	-24	16	173	15	78	15	70	71
Ind & Mgmt Engr	306	2	361	2	-51	2	255	2	5	2	153	10
Mechanical Engr	-145	7	-656	9	38	12	2	12	43	9	-163	49
Agricultural Engr	147	4	680	5	114	5	-69	5	-139	5	160	24
LETTERS & SCIENCE												
Microbiology	364	7	362	7	98	8	114	8	-25	7	187	37
Chemistry	226	16	313	17	-40	17	-111	17	339	17	190	84
Political Sci	-113	4	-315	4	-246	4	370	6	-14	6	-16	24
English	55	15	-415	16	-128	15	-158	15	-128	18	-120	79
Earth Sci	98	7	585	8	-137	7	-49	7	-164	8	40	37
History & Phil	11	10	20	11	-73	13	-163	14	-50	14	0	62
Mathematical Sci	-112	16	194	16	173	18	96	21	-110	21	23	92
Psychology	171	5	-9	6	-227	7	104	7	34	6	24	31

Table 16, continued.

Location	80-81		81-82		82-83		83-84		84-85		5-Year	
	\$	#	\$	#	\$	#	\$	#	\$	#	\$	#
Modern Languages	37	4	288	5	68	5	343	6	-8	5	163	25
Physics	-4	12	602	16	172	15	364	14	-40	13	184	67
Biology	-194	17	-340	20	-178	21	-271	19	30	19	-189	96
Speech Comm	359	5	702	6	408	7	142	7	68	7	311	32
Sociology	-440	9	129	10	-236	11	-231	11	325	10	-99	51
NURSING	99	29	628	33	79	40	-9	43	27	42	140	187

The second strategy for evaluating the error term is by calculating the covariance of lagged terms. The covariance, ρ , is calculated using the following formula:

$$\rho_s = \frac{\sum e_t e_{t-s}}{\sqrt{\sum e_t^2} \sqrt{\sum e_{t-s}^2}}$$

where t = current year
 s = magnitude of lag

Covariance analysis yielded the following results:

$$\begin{aligned}\rho_1 &= .0294 \\ \rho_2 &= -.0469 \\ \rho_3 &= -.0270 \\ \rho_4 &= -.0174\end{aligned}$$

These covariances are not significantly different from zero and imply that the residuals are not autocorrelated. These results, in conjunction with the mean residuals, indicate that the regression assumption concerning autocorrelation of the error term was not violated in this analysis.

The Differenced Submodel

One of the required assumptions of the regression model is that the independent variables be unrelated among observations. This

assumption may be violated by the submodel because of the strong role of lagged salary. Autoregressive processes often characterize both the error and the dependent variable in such models. If autocorrelation is present only in the error term, the estimates achieved through ordinary least squares regression analysis will be unbiased and consistent. If autocorrelation exists only in the dependent variable, the estimates will be biased and consistent. If autocorrelation exists in both, then the estimates will be both biased and inconsistent (Wonnacott and Wonnacott, 1979, pp. 230-233).

Regressing the set of explanatory variables on the difference between salary and its lagged value circumvents the problem of an autocorrelated dependent variable. However, constructing a difference model requires assuming that other influences are not incorporated in the lagged variable. A clean lag is evidenced by a parameter estimate of 1.00 when salary is regressed on its lagged value and the other explanatory variables.

This study was not originally set up as a difference model because, although a priori evidence supported the assumption that the coefficients of lagged salary and the raise term would be 1.00, part of the hypothesis being tested was that they actually were. Although the coefficients were not precisely 1.00, they were not significantly different from 1.00. With this support for the hypothesis, unbiased and consistent parameter estimates for the submodel can be ensured by analyzing it as a difference model. The dependent variable for the difference model is thus

$$\text{SALARY} - \text{SALARY}_{t-1} - \text{PERRAISE}$$

Table 17. Regression Results--Differenced Version of Submodel.

Variable	Parameter Estimate	Standard Error	T-test	Variance Inflation
INTERCEPT	325.4575	57.7298	5.638	0
MARKETDIFF	-.0346	.0142	-2.427	1.8214
CRITAREA	.9074	.0409	22.197	1.0707
ASSOCPROF	-125.1080	49.8003	-2.512	1.8907
FULLPROF	-59.9245	65.9511	-.909	3.3095
RANKYRS	-37.9915	6.2338	-6.094	3.1929
HIREYRS	5.0558	4.7335	1.068	4.3520
PROMOTION	344.8090	104.6613	3.295	1.7311
NTERMAST	-141.1980	74.1899	-1.903	1.1611
TERMAST	57.5390	66.7425	.862	1.9574
PHDPROG	171.0786	45.3719	3.771	1.4739
GROWTH	176.9603	43.0978	4.106	1.3690
HITEACHING	59.7237	50.8914	1.174	1.8378
HIRESEARCH	236.3054	51.7114	4.570	1.6999
HISERVICE	-68.2781	47.6180	-1.434	1.8225
LOTEACHING	23.8277	46.9753	.507	1.5439
LORESEARCH	32.4424	55.3411	.586	1.7736
LOSERVICE	-26.5152	53.0875	-.499	1.6867
Adjusted $R^2 = 0.2687$				
Root MSE = 763.5257				
F-value = 42.729 (p .0001)				

The regression results are presented in Table 17. Comparing these results with those from the submodel (Table 9) reveal small differences in the magnitudes of coefficients and t-values, but no major discrepancies. The small differences indicate that the submodel and its differenced version are not identical; some of the discrepancies can be traced to the fact that the coefficients for lagged salary and the raise term were not exactly 1.00. One possible explanation for this is that the type of raise a particular individual receives is probably correlated over time. However, such influences do not significantly change the results of the analysis.

Summary

This chapter developed a comprehensive model based on the theories presented in Chapters 2-4 and empirical evidence offered by other salary analyses. Examination of the available data revealed that the comprehensive model could not be run because too many elements were missing--criteria which defined decision-making processes and data needed to create variables. Enough useful data were available to create a submodel for testing, however. The submodel was presented and construction of variables was discussed. The sample was defined for a five-year test period, the sample was described using basic descriptive statistics, and regression coefficients for each of the variables were predicted.

When salary was regressed on the set of independent variables, the majority of predictions were substantiated but a few were not. On the basis of regression results and a priori beliefs, the variable measuring grants and contracts revenue was dropped from the submodel. Subsequent analysis showed that its removal had little effect on the remaining terms.

Analysis included examining two alternative functional expressions for a raise term and rejecting both due to multicollinearity problems and little improvement in predictive power. The raise term used in the submodel was simply the percentage increase received from the legislature times lagged salary. Another phase of the analysis involved choosing a market factor; the difference between market value and lagged salary was the representation selected.

The error structure of the model was investigated by examining mean residuals by department and the covariances of the error terms. The investigation revealed no serial autocorrelation of the errors. Finally, the submodel was presented in its differenced version; this form was justified by the 1.00 coefficients of lagged salary and raise in the original analysis.

The final chapter of this thesis evaluates the model and offers suggestions for future research.

CHAPTER 7

CONCLUSIONS

After an intensive look at the minutiae of a statistical analysis, it is instructive to step back from the tables, the numbers, the details, and to view the results from a holistic perspective. This final chapter looks at the current faculty salary analysis in the context of other MSU salary analyses, both past and future.

Learning from the Past

Past salary analyses at MSU have been oriented toward sex equity, an understandable emphasis for an institution once found guilty of sex discrimination. Many of these studies have been based primarily upon human capital factors and embody some rather simplistic assumptions concerning other salary determinants. The procedure usually followed has been to regress salary on indicators of highest degree, years of experience, academic rank, and departmental affiliation; performance records of faculty whose salaries were significantly below predicted values were then examined to determine whether the low salaries were attributable to low productivity.

Faculty salary differentials have always existed at MSU, and they will probably continue unless the university adopts a lockstep pay scale. In fact, differentials are not necessarily undesirable; rewarding productivity results in a positive differential for

meritorious performers. Problems arise only when salary differentials cannot be explained or justified, because courts tend to interpret unexplained sex-related differentials as evidence of discrimination. But if evidence can be brought forward to substantiate a salary differential based on an established university policy, such as merit, then the university's position is much more defensible. Thus, from a legal standpoint, it behooves university administrators to understand the factors that drive faculty salary decisions and to make university policies as explicit as possible.

Past studies emphasizing human capital and sex equity have shed little light on the mix of factors that influence salary allocation decisions; of course, that was never the express purpose of those studies. But with their narrow focus upon certain types of factors, the studies made it easy to overlook other potentially important and nondiscriminatory salary determinants. Departmental affiliation, the only institutional variable in these equity models, stands proxy for several other factors, including market, priority, performance criteria, and political power. Confounding the influences of these factors in a single variable yields at best an indefensible rank ordering of departments, an uninterpretable expression of the status quo. Two studies did use separate market indicators instead of departmental affiliation, but did not incorporate any institutional salary determinants.

The consequences of the equity studies with respect to faculty merit were potentially far more serious, however. In an institution where merit is a salary determinant by official policy, merit should be

incorporated directly into a salary analysis rather than being tacked on as an afterthought. Salary should be regressed on all relevant determinants to reveal their simultaneous influence, for omitting relevant variables from a model may bias the remaining parameter estimates. Predicting faculty salaries with potentially biased parameters and evaluating only the outliers in terms of productivity leaves much to be desired as a method of addressing salary equity.

Looking at the Present

The current study differed from past analyses by attempting to identify the important determinants of faculty salaries rather than assess salary equity. The most significant departures from past models were the inclusion of variables to test reasons for salary differentiation at the department level, and the inclusion of crude merit indicators to reveal whether merit really influences salary. Lack of adequate data plagued this study as much as its predecessors. For example, the only merit data available were written descriptions of teaching, research, and service by department. But variables were created using the information available to investigate whether the factors warranted further study.

This study tried to combine policies and pragmatism in a model that accurately reflected MSU's salary allocation process. University policies specify a number of criteria for differentiating individual salaries but are silent about how the criteria are applied as salary money is allocated through the administrative hierarchy. Pragmatism suggests that incremental budgeting by both the legislature and MSU will

make last year's salary a major determinant of this year's salary. The question is the extent to which policy factors influence the distribution of the annual raise. The typical human capital models show that most of the included factors are significantly related to salary when considered over the employment history of an individual.

The procedure followed in this study was to examine theories of wage determination and institutional behavior to identify the major determinants of faculty salaries, examine salary studies in the literature to see how well the test criteria substantiated the theories, and then to study MSU's salary structure in terms of the suggested criteria. Theory showed that there were salary determinants at different hierarchical levels, and that a mixture of economic and institutional factors were necessary to model the salary structure.

Why create a model incorporating such a variety of factors when the model created by Scott (1977), containing only human capital and departmental affiliation was sanctioned by the AAUP? The best reason for clarifying faculty salary structure is that the law permits wage differentiation but not wage discrimination. MSU administrators frequently make decisions that differentiate between faculty, but these decisions are apparently rarely discriminatory.

Administrators differentiate individuals' salaries on the basis of market and merit as well as the traditional human capital factors. The Equal Pay Act specifically mentions merit as an acceptable basis for wage differentials, and market has been upheld several times by the courts as another suitable basis for differentiating wages. In fact, the Equal Pay Act permits differentiation on the basis of "any factor

unrelated to gender," and Title VII extends this coverage to race, color, religion, and national origin. According to the doctrine of disparate impact, salary practices cannot impact the sexes differently; but in fact, differentiating by market negatively impacts women because they tend to specialize in lower-paid disciplines. Effectively, then, the law permits paying women less if there are reasons other than gender for the differential.

Consequently, a university should study its faculty salary structure to learn how differentials arise. If the university defines rational criteria for making differential allocations and can prove it is following them, these criteria should constitute a sound defense of salary differentials as well as a realistic basis for planning and budgeting. If, on the other hand, the university differentiates salaries in ways that are not explicit and its practices only weakly approximate its written policies, any differentials that happened to differ significantly for males and females could easily be judged discriminatory.

Formal theories provide a useful framework for examining problems because they isolate the important generalities from the mundane specifics. Theories of wage determination identify supply and demand, wage expectations, marginal productivity, and human capital factors as major influences on salaries. At MSU, these translate roughly into the salary determinants of market, performance, education, and experience. Theories of institutional organization identify the funding, the administrative rules and customs, and the power structure of a university as important salary determinants. At MSU, these are realized

in the legislative appropriation, administrative hierarchy, departmental power, official salary policies, and departmental salary customs.

The model developed for this thesis was designed to include all of these factors at the appropriate administrative levels. Unfortunately, the necessary data were not available to run a comprehensive analysis of the entire structure. The submodel derived from the comprehensive one did incorporate both economic and institutional variables as formal and informal determinants of faculty salaries. It focused on the annual incremental effect of salary determinants by testing the hypothesis that lagged salary and annual raise would explain most of current salary. Regression analysis substantiates the strong influence that last year's salary has in determining this year's. The coefficients for both lagged salary and percentage raise were not significantly different from 1.00, showing that the strength of these factors overwhelm the impact of the formal and informal determinants on an annual basis.

Regressing salary on the chosen set of variables revealed that some of the informal determinants have greater explanatory power than some of the formal ones. The informal determinants included two potential indicators of departmental power. A variable indicating an active doctoral program was used to represent a department's proximity to MSU's land-grant mission, and a variable indicating program growth represented pressure to add faculty in high-demand areas. These variables also served as crude proxies for institutional priorities, and both were statistically significant, although not strongly so. Another informal determinant indicating promotion to a higher academic rank was also statistically significant.

When regressed in conjunction with these informal determinants, some of the standard formal determinants had considerably less explanatory power than they typically have in static human capital models. The indicators of terminal and nonterminal master's degrees were insignificant, perhaps because they are considered at time of hire and seldom afterwards. Academic rank was significant in a negative direction, with lower coefficients for full and associate professors than for assistant professors. This suggests internal salary compression and external market pressures to hire assistant professors at relatively high entry-level salaries. These coefficients do not suggest that academic rank itself is specifically rewarded, however. Nor are years of experience, according to the negative and significant coefficient associated with years at current rank. The coefficient of the variable indicating years since hire was not significant. Of the departmental merit variables, only the one indicating high research productivity was positive and significant.

What are the implications of these results for MSU? Since this analysis indicates that some of the unofficial determinants of salary are statistically significant, perhaps some of these criteria should be made more official. The estimated regression coefficients paint a picture of an institution trying to balance scarce resources, investing differentially in programs central to MSU's mission and programs for which there is increasing student demand. Differentiating salaries for these reasons is surely no less defensible than differentiating them on market grounds. Making such policies explicit has the advantage of letting faculty know what to expect from the administration in terms of

salaries, and also provides the university with a better legal defense. A more comprehensive policy statement would be to the university's advantage in a salary-related discrimination suit.

On the other hand, the coefficients associated with the departmental merit variables are somewhat disturbing. Only the coefficient for the variable indicating high research productivity was significantly positive, yet the Faculty Handbook does not state that productivity in teaching or service will be rewarded less than productivity in research. The results associated with these variables are hardly conclusive, however, because the indicators were established subjectively and had to cover the entire five-year period. Nevertheless, the results are suggestive enough to warrant further study.

Planning for the Future

The topic of faculty salary differentials is a fascinating one, and this analysis has barely scratched the surface. It has scratched the surface in a different way than previous analyses, though, by taking a cross-section time-series approach to the problem rather than a static approach based on a single year of data, and by incorporating both formal and informal salary determinants. This study has both strengths and weaknesses; ideally, the strengths should be retained future studies and attempts should be made to overcome the weaknesses.

One of the strengths of this model includes using variables at two levels of decision making: the department level and the individual level. Salary allocation history shows that differentiation occurs at

aggregate levels, and these decision criteria should be incorporated into university policy and included in salary models. A second strength of this model is focusing on the attributes of departments that might influence salary decisions rather than relying entirely upon departmental affiliation. Using dummy variables to represent departmental affiliation confounds the market, performance, and power components to the extent that these influences cannot be separately understood. A third strength is addressing the issue of lagged dependency to assess its impact on salary determinants. Combined insights from dynamic and static models give a more comprehensive picture of MSU's salary structure than either type alone. A final strength is incorporating both formal and informal salary determinants in a single model.

The model is not without weaknesses, however; its greatest weakness lies in the data used to create the variables. In particular, the merit data used in the analysis could be vastly improved. It is certainly true that some departments have a larger number strong performers than others; this constitutes the basis for calling some departments "strong" and others "weak." Nevertheless, almost every department has superior performers, average performers, and poor performers. Lumping all these people in a single departmental merit variable is a poor substitute for performance data on individuals. Furthermore, the Report of the Academic Program Review Committee may not accurately reflect administrators' opinions of departmental merit, and those opinions are what count in salary allocation decisions. The impact of merit on salary cannot be firmly established until more satisfactory data are available.

The model also needs better specification of the criteria used to allocate salaries at the college and department levels. Theory and studies done at other schools offer only rough guidelines to factors that may be important at MSU. The variables in the current study attempt to measure some of these influences, but more study and careful quantification are needed to ensure that they accurately measure the intended factors.

Although the submodel incorporated a number of factors at different levels, not all factors can be analyzed easily in a single-equation model. There are two possible solutions to this problem: one is to develop a well-specified set of simultaneous equations that can estimate different factors at different levels; another is to design separate models which address different aspects of the total salary picture. The factors influencing starting salaries and annual increases were combined in this model, although the two decision processes are not identical. Separate analyses of starting salaries and salary increases might help to clarify the points at which different factors exert their greatest influence.

This salary analysis has brought together a collection of variables never before studied in a single model at MSU. The reasons for including each variable are firmly grounded in theory, policy, empirical evidence, or a combination of the three. The dynamic modeling approach is also unique among MSU salary analyses. Because of numerous weaknesses in the study, the results are not conclusive. But they are suggestive enough to warrant pursuing further the issues raised by this analysis.

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APPENDIX

APPENDIX

The 1982 Academic Program Review

The qualitative departmental merit assessments described in Chapter 6 are based on information presented in the Report of the Academic Program Review Committee (1983). The committee was charged to review all academic programs as directed by the Montana University System Policy and Procedures Manual, Section 303.3. A review done four years previously resulted in release of the 1978 Role and Scope Report. For the 1982 review, all departments and programs were evaluated in terms of their overall vigor, their roles at MSU, and their roles in the Montana University System. The President stated in his charge to the committee that

The purpose is to provide a data base for future planning that is unbiased and penetrating. . . . Whether we face growth or contraction in the future, the review will serve as a key guide in making decisions as to program initiations or terminations, program enhancements or restrictions and all future planning and budgeting. (Academic Program Review Committee, 1983, p. xi)

The committee, chaired by the Vice President for Academic Affairs, was composed of representatives elected by the colleges—one for each college with the exception of Letters and Science, which had one representative from Letters and one from Science. The chair of the Graduate Studies Committee and the chair of the Undergraduate Studies Committee served as ex-officio members.

Committee members reviewed data submitted by the Office of Institutional Research and the Office of the Registrar. They examined quarterly Faculty Activity Forms, promotion and tenure reports, annual reviews, and individual vitae. They requested a Departmental Self-assessment from each department and conducted surveys of graduate students and graduating seniors. The committee also interviewed each department head and dean. In order to streamline the evaluation process, the Academic Program Review Committee divided into three subcommittees to focus upon the instruction, research/creativity, and service components of each program. All subcommittees evaluated the performance of departments relative to the 1978 Role and Scope Report with respect to the following criteria (Academic Program Review Committee, 1983, pp. xiii-xix).

Instruction:

- enrollment trends of graduate and undergraduate students
- degree production, including graduates
- student credit hour trends
- department service course loads
- staffing data
- results of Senior Survey
- results of Graduate Survey
- grading data
- placement/continuing data on graduates
- special instructional achievements

Research:

- number and scope of publications produced
- number and specific nature of contributions at professional meetings
- number and specific nature of exhibitions and performances
- number and specific nature of faculty research/creativity awards for outstanding achievements
- number, specific nature, funding source, and dollar amount of research/creativity grants, contracts, and patents

- Department Self-assessment statement evaluating research/creativity productivity
- departmental assessment setting forth the research/creative program of the department for the future

Service:

- amount and quality of responsibility and participation
- Initiative beyond unsolicited assignments
- membership in professional organizations
- continuing education activities or workshops
- consulting services, guest lectures, public service in own field
- counseling
- helping students beyond own department
- faculty governance and administration in general
- leadership

Not all data were available for each department, and not all data were consistent between departments, but the subcommittees studied the data available and produced reviews of each department's productivity in the areas of instruction, research/creativity, and service.

Qualitative Assessments

Although many of the evaluative criteria apply to individuals, the 1982 Academic Program Review focused upon the strengths and weaknesses of each department as a whole. Their report, therefore, seems an appropriate source of departmental merit assessments. The committee provided no quantitative rankings of departmental merit, nor did they intend to. Nevertheless, the written assessments of departmental productivity presented in the Report are generally clear enough to permit simple qualitative merit ratings of above average, average, and below average in instruction, research/creativity, and service.

The fact that such ratings are possible does not mean that assigning merit assessments was a simple task. The biggest problem lay

in determining the bounds for 'average.' Merit direction was never in doubt, but distance from average became problematic in several instances. That is, there was never a question of whether a department should receive 'above average' or 'below average' in an area; when a question arose, it was whether a department should receive 'above average' or 'average', or in other cases, 'average' or 'below average'. In these instances the judgments had to be subjective.

This subjective element in the departmental merit assessments would be a serious problem if the purpose of this thesis were to measure the magnitude of the influence of departmental merit upon salary. Fortunately, this is not the case. The objective is to determine whether administrative perception of departmental merit is a significant determinant of salary. The qualitative assessments offered here should be sufficient for that purpose.

Generally speaking, a department received an above average merit rating in a category if the committee thought the department was outstanding or highly commendable, and a below average rating if they detected serious problems. The rating was average if positive comments were offset by negative ones, or if there was a lack of substantive information. One of the members of the committee commented that departments were given ample opportunity to supply evidence of good teaching, research, and service; in his opinion, a lack of evidence probably did indicate a true lack of commendable activity.

Obviously, the merit assessments are to some extent a function of departmental records and reports submitted to the Committee. Basing merit assessments upon such information is appropriate because this same

sort of information can be used to make a case to a dean for increasing departmental salaries.

The merit ratings of instruction made for this thesis weight student evaluations and teaching awards more heavily than enrollment trends and administrative policies. Enrollment trends often reflect market demand for particular areas of specialty rather than quality of instruction, and administrative policies may reflect attempts to improve the curriculum or cope with inadequate resources. Staffing patterns and departmental organization do indicate how well a department is administered, however, and do influence the instructional program a department offers.

Ratings were easiest to construct for research/creativity. The committee frequently offered definitive opinions about the quality of a department's research/creativity, probably because many of their criteria were fairly quantitative in nature. The committee did not seem to be reluctant to state which programs they felt were strong in research.

The criteria for departmental service were the most nebulous, and little information was available for many departments. Therefore, ratings in the area of service are probably the least satisfactory. A department received an above average rating if the faculty were heavily involved in service, were involved at all levels, and the committee felt the service load was fairly evenly distributed. A below average rating most often reflected an imbalance of service involvement in the department.

Merit assessments for instruction, research/creativity, and service were made for the 39 academic departments staffed by two or more tenure

track faculty; the results the merit assessments for each department appear in Table 8 of Chapter 6. The table can be summarized as follows:

	<u>Instruction</u>	<u>Research</u>	<u>Service</u>
above average	11	9	12
average	17	21	18
below average	11	9	9

It must be stressed that these merit assessments were not made with the intent of judging departments or individuals within departments. Rather, this exercise was an attempt to tap the perceptions of a committee of knowledgeable faculty members concerning departmental merit as set forth in an official university report. The report may not reflect the "true" merit situation, but the same may be said of the salary allocations made to departments.

The following pages contain quotations and summaries from the Report of the Academic Program Review Committee. This summary information is included to provide the rationale behind the merit ratings. Departmental merit is, of course, a function of many things. Some departments simply have had greater changes to achieve and a momentum built upon many years of administrative support. Fairness in opportunities to achieve is not the issue here, however. The issue is the influence of administrators' perception of departmental merit upon the allocation of departmental salaries.

College of Agriculture

Agricultural Economics and Economics

Instruction: above average
 "solid evidence of instructional achievement"

seven teaching awards in three years
 four outstanding master's thesis awards in five years
 "upper division enrollment needs to be controlled"
 "large proportion of student credit hours generated by nontenurable faculty"

Research/Creativity: above average

"one of MSU's strong research programs"
 "considerable national visibility"
 "master's theses are of high quality"
 "grant activity is relatively modest, but the department is now moving strongly in this direction"

Service: above average

"outstanding"
 "service to teachers in the state has also been noteworthy"
 "large amount of service rendered by the department"
 "service load is distributed fairly evenly"
 "involved in all levels of service"

Agricultural and Industrial Education

Instruction: average

"creditable"
 "considerable outreach instruction"
 "no serious concerns"

Research/Creativity: average

"activities directed toward statewide and popular audiences"
 doctoral faculty "should publish in peer refereed journals and other peer-reviewed outlet"
 some grants and contracts activity

Service: above average

"all staff members show an extensive involvement in service"
 "department . . . is commended for continuing the qualitative service efforts"
 extensive in-service credit and noncredit courses on and off campus

Animal and Range Science

Instruction: average

commended for "activities and awards"
 seniors rated Animal Science average and Range Science significantly above average
 "problem in student advising"
 "grades in this department are significantly higher than the university mean"—department should "examine the grading practices"

Research/Creativity: average

"strong program of applied research"

"should expand and focus its basic research program"

"many faculty have limited [publication] records"

"more publication in mainline journals and more participation in national/regional professional development are encouraged"

Service: below average

"unique service contributions"

"service load distribution is uneven"

"some staff appear to have few service activities"

"few references of involvement in university governance or national/international service functions"

Plant and Soil ScienceInstruction: below average

"little evidence was supplied to the Committee concerning instruction"

poor distribution of teaching loads--department should "investigate thoroughly"

Senior Survey and Graduate Student Survey gave the department low ratings

"department has not been able to respond to a number of recommendations from the 1978 Role and Scope Report"

Research/Creativity: average

"large and complex research mission"

"considerable support from the Agricultural Experiment Station and outside sources"

"graduate program is currently large and productive"

"a number of faculty are not very productive in terms of peer-reviewed research; others are quite productive"

"many qualified people, some of whom need redirection toward research"

Service: above average

"department offers unique service"

"staff are broadly involved in service...distribution is not even"

"department is involved at all levels, departmental through international, in appropriate service roles"

"1978 Role and Scope Report commended the department . . . commendation still appears to be in order"

Plant PathologyInstruction: above average

"quality of instruction is not questioned"

"primarily a research and graduate education department"

- "results from the Graduate Student Survey are favorable"
- "class sizes are small and teaching loads are not a problem"

Research/Creativity: above average

- "one of MSU's strong research departments"
- "all of its faculty are highly productive; several have international reputations"
- "impressively balances" publications for different audiences
- "grants activity is impressive"
- "maintains a large international role"

Service: above average

- "active service involvement"
- "staff service load seems appropriately distributed"
- "staff involvement seems to cover the spectrum"
- "all faculty appear heavily involved in service"

Veterinary Science

Instruction: below average

- Committee received "no information . . . about the quality of instruction or about how instruction is evaluated and rewarded within the department"
- "student credit hour production has declined"
- "advisors . . . commended for their efforts"
- "number of prevet advisees...has declined"
- "number of M.S. students...has declined"--seem to be "in a holding pattern waiting to get into a DVM program"
- programs appear to be dwindling . . . "the graduate programs should be evaluated with the intent of deciding whether they should be redirected or eliminated"

Research/Creativity: average

- "department strives to balance basic and applied research"
- "only some faculty are active in procuring grants and contracts, and in conducting research"
- "few theses have resulted in peer-reviewed publications coauthored by students and faculty"
- "during the last four years the present department head has made strong efforts to increase [research] productivity"

Service: below average

- "service function is predominantly maintained by a minority of the staff members who carry an extreme burden"
- "service has not been addressed on staff vitas"
- "no standard for evaluating service"

College of Arts and ArchitectureArchitectureInstruction: below average

Senior survey rated the department "poorer than the university average on all questions; on most questions the rating was significantly poorer than average"

"lower-than-average GPA"

"high attrition rate of the program...may well be the result of an open admissions policy to the program"

"high rate of employment of graduates...appears to be indicative of the competency of the program"

Research/Creativity: below average

"paucity of research" in 1978--"this comment still seems appropriate"

"few publications, especially during recent years"

"most faculty seem to devote their efforts to consultation and 'practice'"

department "needs an overall program to define and encourage professional achievement"

Service: average

"service load ... is fairly well-distributed"

"it is apparent from Faculty Activity Forms that [staff involvement] is adequate, although somewhat limited"

"no reference to service is made...in the Self-assessment"

ArtInstruction: below average

"Committee has been given no evidence indicating the quality of instruction"

"Senior Survey rated their faculty poorer than the MSU mean on all questions and, in particular, were critical of the school in regard to the quality of instruction and advising"

low enrollment in art history option—should be eliminated

Research/Creativity: above average

"a majority of the studio artists now seem quite active, and a number have national reputations"

"the faculty is commended for this meritorious effort"

Service: below average

"faculty members share a heavy load of service on the many internal committees within the School of Art"

"some staff members appear excessively loaded while others have few if any such responsibilities"

"little evidence of providing leadership to the public school art communities"

"service involvement appears to be extremely heavy at the School of Art level"—moderate at the state, professional, and national levels; and minimal at the university level"

Film and Television

Instruction: average

"lack of balance in the teaching loads within the department"

"little evidence regarding the quality of instruction was made available to the Committee"

the department should study instructional problems "on the basis of real needs rather than desires and seniority"

Research/Creativity: below average

department weighting for research/creativity is only 10%

"creative activity in the department appears to be limited"

"lack of an adequate program for evaluating faculty performance"

department should "initiate a formal program to facilitate research and creative productivity"

Service: below average

"pressed for service . . . beyond available limits of staff and facilities"

"some faculty maintain an extensive service commitment while others have little involvement in service activities"

"extensive service commitment at the departmental level is evident . . . seems to be a need for stronger emphasis on the state, regional, and national levels"

Music

Instruction: average

department should "consider reducing the current teaching loads of faculty"

accredited—"must be commended for its success in this effort"

"well developed evaluation scheme for instruction was reported"

the "reported evaluation of student advising is to be commended"

"Senior Survey rated the department about average"

serious grade inflation—departmental mean of 3.6 vs MSU 2.8

"successful in placing its graduates...has a fine reputation"

Research/Creativity: average

"good . . . at the state and local levels, fair regionally, and very limited nationally"

"growing regional visibility"

"greater emphasis needs to be placed upon peer-reviewed professional achievement regionally and nationally"

"department apparently permits some faculty to omit creativity from their job descriptions"

Service: above average

"department has committed itself strongly to service at all levels--often without adequate funding and necessitating extensive time commitment"

"load seems fairly well distributed among department members"

Theatre Arts

Instruction: average

"Senior Survey gives high marks in some areas, poorer rankings in others

theatre administration option "lacks both coursework and majors to support its continued existence"

"grade distribution for the department is high"

Research/Creativity: average

"creative activity within this department is primarily local"

"quality of the productions and their acceptance in the community have clearly increased over the past several years"

"effort needs to be made to obtain regional/national visibility through peer-reviewed or juried work"

"faculty devotes a great deal of effort and energy to [productions], and they are commended for this"

Service: average

"excessive service obligation on all staff members"

"service functions seem to be as well distributed as possible"

"fairly well represented at most service levels"

College of Business

Accounting and Finance

Instruction: average

"pass rate of MSU accounting students on the CPA exam is four times the national average . . . fine record of placement of students"

rate of success suggests an overemphasis on the success rate on the CPA examination . . . there is evidence that accounting seniors leave the campus shortly after the administration of the CPA exam"

"exceptionally low GPA in basic accounting courses"

Research/Creativity: below average

"no evidence of faculty grants and contracts"

"needs further emphasis"

"only three faculty seem very active in research"

"department head seems to place little priority upon or give much direction to research/creativity"

Service: average

"provides unique service"

"service load is fairly well distributed among the full time faculty"

"department now seems to be providing an acceptable degree of service through the university, state, and community levels"

department needs to "increase participation in service activities at national/regional levels"

Business, Office and Distributive Education

Instruction: average

"Committee commends the department for its continuing activity in the development and use of instructional technologies"

"heavy teaching loads"

"Committee is favorably impressed with the department self-assessment"

average ratings from students on Senior Survey

Research/Creativity: average

1978 Role and Scope Report "applauded this department for its superior efforts in service to the profession. Generally speaking this still applies"

"a number of the faculty are impressively engaged in nontraditional [nonpublishing] activity"

"department needs to prioritize research/publication beyond the 15% weighting it is given"

doctoral faculty "should be producing more publications"

"little publication seems to result from graduate student research"

Service: above average

"staff is extensively involved"

"all members appear overloaded"

"Committee feels that service is an area of high achievement"

Management and Marketing

Instruction: average

"faculty and facilities strained...because of the unusually large number of majors"

"in spite of the large classes, the faculty seem active and strongly motivated"

average to below average ratings on the Senior Survey

Research/Creativity: average

"increased research/creative activity" since 1978

"research-oriented leadership"
 the Committee "expects a growing record of achievement" in the future
 seed money from Office of the Vice President for Research
 department needs to "strengthen the efforts to increase research/creativity"

Service: average

"service participation by staff members in this department has increased [since 1978] and to an appropriate level"
 "service load seems fairly well distributed"
 faculty should be encouraged "to participate in more than one level of service"

College of Education

Educational Services

Instruction: average

department should "ascertain whether [grad student] activities are educationally appropriate"
 "excessive graduate advising loads"
 "majority of staff members...hold part-time or adjunct status"
 "there are too few [faculty] with majority appointments to effectively handle the large and diverse graduate programs offered"
 "in general, evaluations of instruction . . . are good to excellent"
 "little hard evidence was presented to substantiate what has been accomplished" since 1978

Research/Creativity: below average

"increased amount of grant activity, although most of it is nonresearch oriented"
 "progress [since 1978] is being made in research productivity. . . primarily through the hiring of newer faculty in recent years"
 department has been "only slightly successful in improving the productivity of senior faculty"
 "activity in the faculty/student copublishing area is increasing but . . . has not been as productive as it should be"

Service: average

"particularly heavy university service load falls upon the full time staff members"
 "departmental participation in service is apparent at all levels from moderate to extensive degrees"
 "faculty activities in the area of service are perceived to have improved and increased since 1978"

Elementary EducationInstruction: above average

"enviable leadership image" throughout the state

"above average performance in instruction"

"above average ratings by senior and graduate students"

"high placement of graduates"

"higher than average grades"

"1978 Role and Scope Report cautioned for the need to insure a rigorous dissertation process"

"library science option . . . seems understaffed"

Research/Creativity: average

"grant achievement impressive although most is nonresearch"

"departmental publication record is based mainly on the efforts of a few people"

Committee commended "attempts to improve research productivity" and urges them to "continue attempts to improve" good progress since 1978

Service: above average

"diverse and unique services"

"service load fairly well distributed"

"extensive service contributions"

"department is commended for its service contributions"

Health, Physical Education, and RecreationInstruction: average

Senior Survey rated teaching "at or better than MSU mean but felt that advising could be improved"

"grade distributions tend to be very high"

"graduate program is being strengthened by moving toward thesis-related research"

"additional help is needed to properly implement the recreation option"

Research/Creativity: average

"a number of faculty continue to be relatively unproductive"

"Committee finds much to commend as well"

"blend of basic and applied research"

"one half of the faculty have doctorates, which is minimally acceptable for such a program"

"the Committee sees genuine improvement since 1978, and the promise of more to follow"

Service: average

"service requests often are excessive"

"service load seems fairly well distributed"

"department head has urged all faculty members to be more discriminating in judging the quality and quantity of service"
 "minimal involvement at the national/regional levels"

Home Economics

Instruction: above average

"Senior Survey of majors rated their department and faculty better than the mean on all eight questions"
 "data from the Academic Vice President's form indicate faculty performance above the university average"
 "grading is above university average"
 "department is commended for significant achievements in the instructional area"

Research/Creativity: below average

"a much stronger departmental commitment to research production should be evidenced"
 "only four of sixteen faculty have ongoing research activities"
 department weighting "clearly deemphasizes creativity and research productivity"

Service: average

"service load is fairly well distributed"
 "membership on search committees is extremely demanding of faculty time"
 "active in terms of department, university, professional, community, and state service activities [with] fewer references . . . to regional and national level activity"

Secondary Education

Instruction: below average

"large number of fractional FTEs is seen as problematic in terms of staff unity and departmental effectiveness"
 "strong evidence to recommend a review of the course offerings . . . inefficient use of instructional faculty"
 "high [grade point] averages not satisfactorily defended"
 "graduate student enrollment poses a serious problem to the continued success of the department; it was deemed too high in 1978 and has been permitted to increase since then"

Research/Creativity: below average

"graduate program should yield more publications"
 "low prioritization of and productivity in research/creativity. . . the essential point made in 1978 seems still generally valid"
 "while some improvement has been made since 1978, the department continues to place a low priority on research/creativity"
 "a modest research program...is essential to the health and growth of the department"

Service: average

"faculty participation in a wide variety of service activities is apparent"

department "does seem sufficiently involved at all levels"

"full-time members of the department seem to have excessive department and college service obligations"

"some newer staff members have not become active in service activities"

College of EngineeringAgricultural EngineeringInstruction: average

"commended for receiving a six-year renewal of its accreditation"

Self-assessment "did not address either the methods of evaluating or rewarding quality instruction"

good student reviews—average to above average

no teaching awards cited

"Committee is concerned about the viability of the Master of Science program"

Research/Creativity: average

"strongly focused toward professional service and . . . applied research"

"most of the departmental publications are not peer-reviewed. . . the department does not feel that it has done as well as it should have...and is attempting to improve"

Service: average

"two or three members handle most of the load"

"heavily involved at college and university levels . . . some state, regional, and national activity apparent"

"department's hosting of the 1983 national meeting of the American Society of Agricultural Engineers is commendable"

Chemical EngineeringInstruction: average

"highest national student/faculty ratio of any Chemical Engineering department"

"department has performed well under unusually burdensome circumstances . . . has demonstrated concern for quality of instruction"

"department head is aware of shortcomings and intends to take corrective measures"

"Committee shares the concern of the department head for the quality and motivation of its graduate students"
mixed student reviews--average to above average

Research/Creativity: below average

"only three of the five faculty were active in research last year"
"severe shortcomings"
"considerable grant activity . . . considerable patent production"
"chief need is to place a higher priority upon research, especially that leading to refereed publications"
"commended for its self-stated goals"
"the main thrust is toward [applied research]"

Service: average

"some staff members have extensive records of service activities, but the service function does not appear to be equitably distributed"
"extensively involved at the departmental and professional levels with moderate to minimal involvement at the college, university, and state levels"--"encourage more active service involvement at these levels"
did not address 1978 suggestion to provide "continuing education to chemical engineers in Montana"

Civil Engineering

Instruction: above average

"growing rapidly"...high student/faculty ratio
"commended for receiving six-year accreditation renewals, . . . success in placing its graduates, . . . efforts to improve the quality of instruction"
student reviews generally above average
"graduate program appears to be healthy" but "no PhD degrees have been granted" in three years
Committee concerned "that two individuals pursuing PhDs at MSU have been hired as tenure-track instructors"

Research/Creativity: above average

"mixture of basic and applied investigations having state and regional emphasis"
grant funding from "federal and state agencies and the EES" . . .
"total grant and contract expenditures on research have increased 27% since 1976-77"
"most faculty are professionally active...some have earned regional, national, and international reputations"
"notable research activities"

Service: above average

"a campus leader in the development and offering of continuing education courses on campus and throughout Montana"
"department has provided noteworthy service"

"department provides service at all levels . . . not evenly distributed across the faculty"

Electrical Engineering/Computer Science

Instruction: average

"tremendous growth" primarily due to interest in computer science
student evaluations near the mean

"department head feels that instructional and advising loads are excessive"

department should "evaluated its graduate programs in light of low doctoral enrollment in EE"

Research/Creativity: average

"there is considerable effort to improve research productivity; ... nevertheless, the overall record of publishing in refereed journals is quite poor"

"concern that too many MSU graduates have been hired in tenure-track positions"

"department has faculty who were active in research early in their careers but who have now stopped publishing"

"several members of the staff have published in the refereed proceedings of the national MHD symposiums"

Service: above average

"strong and active service commitment"

"wide array of advising and consulting functions"

"active in the establishment of professional societies throughout the state"

"service functions fairly well distributed"

"extensive activity at all levels of service is apparent"

Industrial and Management Engineering

Instruction: below average

"department needs additional faculty assistance and needs to stabilize its staffing pattern to include more permanent faculty"

"no standardized method or form used to evaluate quality instruction"

poor student reviews by 21 majors

"Committee believes that the department should immediately begin monitoring and emphasizing quality instruction"

Research/Creativity: average

"applied" research

"active in presentations of papers at professional meetings and in publication of proceedings; however, the publication record in peer-reviewed journals is minimal"

"active in grant area with appreciable success"

Service: below average

"few references to service activities were noted on Faculty Activity Forms and vitas"

"service load is unevenly distributed, with some staff providing little or no service to the university, community, or beyond"

Mechanical EngineeringInstruction: below average

below average student reviews

the Committee questions the viability of the PhD program

"graduate students expressed concern" about several department policies

"EES research duties need to be segregated from instruction"

"excessive instructional load assigned to the 'materials' faculty member"

"Committee does not share the department head's attitude that student evaluations are worthless"

Research/Creativity: above average

"department carries on an active research program and generates an impressive volume of grant-funded activity"

"focus tends toward applied research"

"department has done well, but the Committee feels that greater emphasis on peer-reviewed journal articles is in order"

"most of the faculty have active research programs...a large amount of EES funding helps to release faculty time for research"

Service: below average

"except for a few staff members, most faculty were either minimally involved in service and outreach programs or failed to report their functions"

"department participates in all levels of service--involvement is most active at the professional and less at university and state levels"

College of Letters and ScienceBiologyInstruction: average

"faculty instructional loads appear light"

"data suggest that faculty today devote less time to teaching and advising than they did five years ago"

Senior Survey gave average to below average ratings

"several direct efforts to improve the quality of teaching are reported in the Self-assessment"

"as recommended in the 1978 Role and Scope Report, the department has restructured its degrees"

Research/Creativity: average

severely criticized in 1978; "significant progress has been made since that time"

"research productivity has increased from about .33 to 1 publication per faculty per year"

department should "increase research productivity, emphasizing peer-reviewed publications"

"grant acquisitions have more than doubled"

"the new faculty are impressive researchers"

"many of the senior faculty...remain relatively unproductive"

"heterogeneity of programs...makes overall planning and coordination difficult"

Service: above average

"service functions seem fairly well distributed"

"an involvement in all levels of service appears to be addressed on faculty vitas to a commendable degree"

ChemistryInstruction: above average

"strong undergraduate and graduate programs"

"commended for its efforts to improve instruction"

"claims of quality instruction are supported by the Senior Survey"

"dissatisfaction with the graduate program"

"graduate enrollment is increasing" and "the department is commended" for its efforts in this area

"each faculty member must be able to produce evidence of excellent teaching to be considered for an average raise or better"

Research: above average

"this is one of MSU's most active research departments"

"grant activity is approaching \$1 million/year...most...on basic research grants"

"department head emphasizes and rewards research productivity"

"quality of student research is good, as is the faculty/student publication record"

"biochemistry is somewhat less productive in research than the chemistry program"

Service: below average

"demanding service course load"

"service function seems not be equitably distributed"

"some senior staff members who had previously been involved in a number of service activities now seem far less active"

"few if any service activities for many staff members"

"departmental involvement at all levels is noted"

"many staff members seem restricted to a limited service base"

Earth SciencesInstruction: above average

"commended for responding to 'changing conditions'"

"department rates better than the university average in virtually all categories of the AVP's evaluation form"

good ratings from Senior Survey and Graduate Survey

Research/Creativity: average

"this is the only science department not offering a PhD, and this affects research output"

"main emphasis is upon applied research and upon Montana and regional work...probably appropriate for a small department with relatively little institutional support"

"generally a respectable productivity in the department, although several of the faculty have not produced many refereed publications"

"grants and contracts activity of the faculty is modest"

"department head is encouraging research and creative activity"

Service: average

"service involvement was not equitably distributed among staff, but ... rested with a few senior staff members"

"involvement is noted to an acceptable degree in the various levels of service"

EnglishInstruction: above average

"Self-assessment expressed a strong interest and concern for quality of instruction"

"department scores are well above average on the AVP form"

"better than the MSU mean on the Senior Survey"

"efforts of the English department to improve the quality of teaching are most commendable"

several awards and instructional grants

Research/Creativity: average

"research/creativity is on the rise"

"department's main showpiece--the FIPSE grant and MSU Thinking Skills and Writing Project--are especially to be commended"

"publication records of many of the veteran faculty are quite lean; some literally have no refereed publications"

Service: average

"female faculty are excessively involved in search committees"

"service function seems to be fairly well distributed"

"all levels of service" but "department has been particularly active at the university level and fewer service activities are noted at the state, regional, and national levels"

"improvement is evident since the [1978] report"

department should "increase the number of faculty involved in sharing expertise with English teachers"

History and Philosophy

Instruction: average

"department should be commended for its recent visibility"

"absence of some Faculty Activity Forms which has restricted the making of any greater detailed instructional evaluation"--no evidence of good results provided

excellent results from Senior Survey--but only two respondents

Research/Creativity: above average

"research/creativity record...is quite impressive"

"a number of the senior faculty have demonstrable national/regional reputations"

five new faculty "are all active scholars"

department needs to "develop a more active program of publishing in philosophy"

"two faculty members in religious studies are both active in publication"

several grants and awards

Service: average

"broad service involvement"

"load appears fairly evenly distributed"

"it appears that faculty are involved sufficiently at almost all levels" yet "incomplete Faculty Activity Forms made accurate assessment of actual service activities difficult"

"a more active role in sharing staff expertise with public schools is needed"

Mathematical Sciences

Instruction: average

"heaviest service course load in the university"

"department did not submit any Faculty Activity Forms"

"evidence of efforts to maintain quality and uniformity of instruction and of efforts to streamline the instructional process"

mixed reviews from Senior Survey--generally average

Research/Creativity: average

the 1978 study was critical--since then, the department has moved forward impressively toward broad-based research productivity"

"newer faculty have been hired in large measure for their research potential"

"several faculty have built impressive records"

"several veteran faculty have been reorienting themselves"

Service: below average

- "extensive and demanding service course obligation"
- "Statistical Center has been extremely active"
- "service activities were not equitably distributed"
- "most faculty reported few if any service functions"
- "staff involvement is laudatory at the regional and national professional levels"
- "involvement and communication with school districts have somewhat lessened in recent years"

MicrobiologyInstruction: above average

- "the Committee has had some difficulty in documenting [the] assertion...that the degree programs are strong" due to "lack of Faculty Activity Forms"
- "definite efforts to improve the quality of its programs," including "deliberately reducing the number of [graduate] students"
- Senior Survey results "are among the best in the university"
- teaching awards, workshops, grants

Research/Creativity: above average

- "clearly one of MSU's strong research departments, impressive in all aspects of its research program"
- "nearly all of its faculty are quite productive"
- "several members of the department have national and international reputations"
- "as of 1980-81, the department annual grant achievement stood at roughly \$500,000"

Service: above average

- "perusal of vitas revealed that the service load is fairly well distributed...with most staff involved at all levels of service"
- "in 1978 the department was commended for its service function and is commended again"
- the department "acted on the 1978 recommendations"
- "amount of effort devoted to promoting continuing education for the health professions and the service aspects of fungi research in the nation are commendable"

Modern LanguagesInstruction: average

- "Committee commends the department for its improvements" since 1978
- "better than average" senior survey results
- limited staff—heavy teaching loads

"college and university must further clarify the role and scope of this department"

Research/Creativity: average

"the leadership has seemed to emphasize and foster research much more effectively than it had been prior to 1978"

"most faculty are at least modestly active in research"

"grants and contracts activity is minimal"

Service: average

"service loads are equitably distributed among the faculty"

"department is represented at all levels of service" although "the predominant service function is...at the university level"

"the department has improved its balance of activities" since 1978

Physics

Instruction: above average

"obvious research emphasis in the department is matched with an equal emphasis on instruction"

increase in majors and enrollments have led to "instructional overloading"

many awards "attest to the excellence of the faculty"

"Committee believes that the quality of instruction in the large physics service courses is high"

senior survey rated department "better than or significantly better than average on all items"

graduate students perceived problems with the graduate program

Research/Creativity: above average

"physics is one of MSU's strong research departments--by many indices the best"

"the faculty are productive researchers; many have international reputations"

"impressive record of basic and applied research and extramural funding"

Service: average

"service which does not have a strong component of either instruction or research is being strongly discouraged"

"faculty still remain active at the state, national, and international levels but have largely withdrawn from committee work on campus"

"vitas verify that faculty...have largely withdrawn from university-wide service activities"

Political Science

Instruction: below average

"The Committee believes that this department has the potential to

become one of the most vigorous and visible disciplines on campus but that this potential remains largely unrealized"
 "curriculum still needs evaluation and revision"
 "most of the recommendations of the 1978 report were not addressed...or have gone unheeded"
 did not do senior survey; department reports good evaluations with own forms
 "graduate program continues to experience problems"
 "responses to graduate survey expressed dissatisfaction with the program"
 "relatively light teaching load"

Research/Creativity: average

"faculty vitas reveals that the research and publication record of the department is creditable but could be improved"
 "MPA program produces substantial research findings, but these are not resulting in publications"
 "the department has garnered a small number of grants"

Service: average

"service involvement is extensive at the departmental and state levels, but is only moderate at the university, regionals, and national levels"

Psychology

Instruction: below average

"teaching load appears to be relatively light"
 senior survey rated the department "significantly poorer than the university average on every item, and the overall results are the poorest in the university"...indicate that the department has a serious problem"
 graduate students "rated the department mostly in the good category"
 "the Committee has further concerns about the quality of the educational experience in psychology classes"
 Psychology 103 has a "poor reputation on campus"; department should "improve the quality of instruction in Psy 103"
 "faculty evaluation scheme seems designed to reward activity rather than quality"

Research/Creativity: below average

"potential has not been fully realized"
 "only a few individuals are productive researchers"
 "most of the senior faculty have not sustained research careers"
 "research activity and productivity has been rising steadily over the past three years"
 "department does appear to be aware and concerned about the lack of research productivity and is attempting to improve"

Service: below average

"most faculty reported few service activities"

"service involvement is most active at the department and professional levels...effort at the college, university, community, and state levels is minimal"

"1978 Role and Scope Report called for more 'outside-the-classroom service' but demonstrable progress has not occurred"

SociologyInstruction: above average

"department commended for its response to the 1978 Role and Scope Report"

"senior survey rated the department significantly better than the university average"

"student/faculty ratio...is higher than the university average, [but] it does not seem to be a burden on the department"

Research/Creativity: average

"grant activity is quite respectable and broadly based"

"generally the faculty is active in conducting research and in publishing; however...there is a general tendency to publish in local and regional journals"

"increased publishing in national peer-reviewed journals is both possible and necessary"

Service: average

unique aspects of service, some "extremely effective"

"service function appears to be fairly well distributed"

"representation at all levels of service was noted on faculty vitas...[especially at] the state and regional levels"

"faculty service involvement was seen as 'respectable' in 1978"

"female faculty members appear to be overburdened with service involvements on search committees"

SpeechInstruction: below average

"evaluation...seems to be based on the quantity of activity rather than the quality"

"the 20 respondents to the Senior Survey rated the department poorer than or near the university average on all items"

"very large service role"

Research/Creativity: average

"progress in the research/creativity area" since 1978

"department currently generates a number of refereed publications and convention presentations"

"two faculty are quite productive...nonetheless, the overall departmental achievement remains relatively modest in research/publication and grant activity"

"department should place greater emphasis upon publication in scholarly journals and should more tightly define and emphasize its research goals"

Service: average

departmental review process "seems to inappropriately discourage staff involvement in service"

"staff are all active in workshop presentations and consultation"

"a few staff members have been extremely active and have demonstrated exemplary service involvement"

"all levels of service, [especially] departmental, university, and professional levels"

Nursing

Instruction: below average

"maximum eight-year accreditation and instructional development grants testify to faculty quality competence, and current professional standing"

"Committee is concerned about the number of faculty holding MSU degrees"... "commends the efforts of the dean to rectify this situation"

"wide variation in teaching loads"

overwhelmingly on several surveys students rated the department poorer than average on all but a few items--school should "examine the causes for student perceptions of below average instructional effectiveness"

Research/Creativity: below average

"research productivity is still sparse, but it is increasing and is being administratively developed"

Service: above average

"burdensome service and advising requirement placed on the Bozeman faculty"

"most senior staff members have extensive records at all levels of service, and junior staff members are receiving encouragement"

"all recommendations from the 1978 Role and Scope Report were addressed"

"school has increased its activity in providing expertise to sparsely populated areas and in delivery of health services to MSU staff and families of students"