AIR Professional File

Association for Institutional Research
Enhancing knowledge. Expanding networks.
Professional Development, Informational Resources & Networking

Number 103, Spring 2007

Using a Market Ratio Factor in Faculty Salary Equity Studies

Andrew L. Luna
Director of Institutional Research and Planning
University of West Georgia

Multiple regression procedures are commonly used to investigate gender equity within faculty salaries (Ramsay, 1979; Finkelstein & Levin, 1990), even though the models and methods used vary significantly from study to study (Becker & Toutkoushian, 2003). Within this broad area of research, many have tried to explain the relationship between faculty salaries and internal and external factors that may cause variance within those salaries (McLaughlin, et al, 1978; Barbezat, 2002).

Researchers have used a myriad of models to account for the economic, statistical, and legal components of salary (Moore, 1993; Snyder, et al, 1994), and, while the courts sometime disagree as to what statistical method or process should be used (Luna, 2006), they have agreed that statistical analysis used in faculty salary equity studies are needed and useful (Lempert, 1985). Professionals who are involved in faculty salary equity studies agree that variable selection is one of the most important factors to consider when performing a regression analysis (Becker & Toutkoushian, 2003; Haignere, 2002; Balzer, et al., 1996). However, the choice of which variables to use in the model has undergone the same rigorous and intense debate as the methods themselves (Hengstler & McLaughlin, 1985).

According to Fisher (1980), the wrong predictors can either overestimate or underestimate a regression model, and could lead to a violation of the basic assumptions of the analysis. Other literature is quite specific as to which variables to use and which not to consider when conducting a regression analysis on faculty salary. For a more indepth discussion of variable selection in a faculty salary analysis, one should consult: Toutkoushian, (2003); Toutkoushian, (2002); Boudreau, et al., (1977); Balzer, et al., (1996); Webster, (1995); Snyder, et al., (1994); Bohannon, (1988); and McLaughlin, et al., (1978). While many factors are used to explain variations in salary, one of the most controversial is the impact with which the open academic market may determine how faculty are paid.

Market and discipline identifiers are two related factors which shaped the debate of faculty salary equity studies for many years. Botsch & Folsom (1989) found that market factors significantly affect faculty salaries, and Snyder, et al. (1991) state that market conditions set the salary a faculty member is willing to be paid and whether he or she decides to accept a new position at another institution. Balzer, et al., (1996) used a market ratio to determine discipline, while Haignere (2002) suggests using dummy variables for separate disciplines. Likewise, some research found a strong positive relationship between salaries and the ratio of men to women in highly competitive disciplines, suggesting that the type of field one chooses has a significant impact on salaries (Nettles, et al., (2000); Smart, (1991)). Many, however, are somewhat cautious in the use of market factors or discipline separation in salary equity studies (Webster, (1995); Nichols-Casebolt, (1993); Braskamp, et al., (1978)).

Whether or not market/discipline factors should be used in faculty salary equity studies, it is clear that market factors do affect the way in which faculty are paid. For example, *The Chronicle of Higher Education* reported that, because of a shortage of Ph.D.s in business related fields, some institutions are offering six-figure salaries to first-time faculty (Mangan, 2001). Furthermore, according to Botsch & Folsom (1989), the practice of paying faculty based in part on external market factors is an accepted practice.

So why are the faculty salaries in particular disciplines more receptive toward market fluctuations than others?

According to Youn, 1989; Owen, 2001; and Jones, 2003; market variability can be explained by both external and internal factors affecting higher education:

1. Current enrollment levels among Ph.D.s are increasing, but discipline choice follows market trends.
2. Faculty salaries are higher in disciplines that traditionally pay higher salaries within the private sector.
3. The returns on the investment of higher education (i.e. human capital) differ among fields or disciplines.
4. Surpluses of or demands in new faculty follow different economic cycles depending on external needs and the type of field or discipline.
5. The perceived quality/prestige of the degree, field, or institution where the degree was earned affects marketability.
6. Highly productive departments seek out and are willing to pay for highly productive faculty.
7. Faculty demand is both internal and external based on institutional need and market demands.

Historically, faculty salaries are greater in high-technology fields, business, economics, and law, and tend to be lower in liberal arts and education (Bowen & Schuster, 1986; Buchanan & Tollison, 1981). Research also suggested that market fluctuations tend to have a greater effect on the salaries of new faculty (Bellas, 1997). This finding may also explain an increase in faculty salary compression (i.e. junior faculty being paid salaries that are closer to senior faculty) over the years (Snyder, et, al., 1992).

According to Bellas (1997), England (1992), Michael, et al. (1989), Feldberg (1984), and Staub (1987), some of the salary disparity within disciplines may be caused by cultural biases that devalue the work of women and, therefore, cause the intentional devaluation of the discipline as more women enter into it. Staub (1987) suggested that this salary decrease became more evident as women increased to 30 percent within a particular discipline. Furthermore, Reskin & Roos (1990), Roos & Jones (1993), and Thurow (1975), suggest that, as these lower paying disciplines become less desirable to men, more women are hired to fill vacancies. Ten-year trend data from *The Digest of Education Statistics* (1987, 1992, 1998), however; tend to refute these claims. As shown in Table 1, the percentage of women within seven selected disciplines was reported for each year. The market ratio, as used here and throughout the rest of this study, is defined as the ratio of the discipline salary average to the aggregate salary average of all disciplines.

The table indicates that from 1987 to 1998 there were increases greater than 30 percent of women faculty in Engineering, Natural Sciences, Social Sciences, and Humanities. The market ratio, however, which measures the strength of a particular discipline's salary to all salaries, increased within each one of these disciplines except Humanities, which indicated no change.

While a burgeoning literature has developed on the subject of market factors affecting faculty salaries, the judiciary has also taken the opportunity to address how external market factors contribute to variations of faculty pay within different disciplines (Luna, 2006). In *Presseisen v. Swarthmore College* (1977), the court agreed with the defendant's expert witness who testified that, among other things, the plaintiff's regression analysis was unreliable because it did not account for different academic departments. The court recognized that, while the regression analysis allowed for different intersects, it did not allow for the possibility of different slopes caused by different rates of changes of salaries from different

Table 1
Salary and Market Ratio Difference by Selected Disciplines*

	1987			1992			1998			Percent	Percent Increase
Dicipline	Percent Female	Average Salary	Market Ratio	Percent Female	Average Salary	Market Ratio	Percent Female	Average Salary	Market Ratio	Increase Female	Market Ratio
Business	28	$39,200	1.02	31	$45,200	1.01	35	$52,200	1.01	25.00%	-0.27%
Education	45	$36,800	0.95	51	$40,500	0.91	58	$46,700	0.91	28.89%	-4.96%
Engineering	2	$44,300	1.15	6	$52,200	1.17	9	$60,300	1.17	350.00%	1.95%
Fine Arts	26	$33,900	0.88	33	$37,800	0.85	33	$43,700	0.85	26.92%	-3.45%
Humanities	33	$36,800	0.95	41	$42,400	0.95	44	$49,000	0.95	33.33%	0.00%
Natural Sciences	17	$41,000	1.06	20	$47,800	1.07	25	$55,200	1.07	47.06%	0.84%
Social Sciences	22	$38,000	0.99	28	$46,200	1.04	32	$53,400	1.04	45.45%	5.25%
Aggregate Average		$38,571			$44,586			$51,500			

* NOTE: Market Ratio is the ratio of an individual disipline's average salary to the unweighted average salary of all diciplines.
Source: National Center for Educational Statistics

departments. Likewise, in *Wilkins v. University of Houston* (1981), the court ruled against the plaintiff because her regression model did not include a factor for discipline or market.

In its decision in *Coser v. Collvier* (1984), the Second Circuit found that the plaintiffs' regression analysis was not as conclusive as the defendant's because the institution's regression analysis compared faculty to each of Stony Brook's departments, while the plaintiff's study aggregated faculty into broader groups by fields of degree and used inconsistent aggregations. In contrast, the Second Circuit in *Lavin-McEleney v. Marist College* (2001) noted that both parties compared faculty salaries across divisions and not individual departments, although another expert witness for the institution claimed that the statistical difference in female salaries was caused by a "masked variable," the distinction between departments within each division.

In *Ende v. Board of Regents of Regency University* (1985), various male faculty filed an Equal Pay Act claim against the university because the formula used by the institution to remedy confirmed salary disparities in women was unfair to male faculty. While the Seventh Circuit affirmed the lower court's decision against the male faculty, they noted a weakness in the equity adjustment formula. According to the court, faculty members of any rank commanded less salary in some departments than in others because of marketplace factors. The court said "…the University does not need to pay as much to attract and retain someone in the Department of Elementary Education as in the College of Business (p 180)."

While the Second Circuit remanded *Sobel v. Yeshiva University* (1988) back to the lower court, it noted that the district court found the plaintiff's regression to be inadequate because it did not account for the disparities in salaries between faculty members in the higher paid clinical departments and those of the lower paid "pre-clinical" departments. While the higher court ordered the district court to use *Bazemore v. Friday* (1986) in determining the probative value of the plaintiff's regression model, the question as to whether or not academic departments should be accounted for remained for the lower court to decide.

While past courts failed to address all of the questions raised by departmental or market variables used in faculty salary equity cases, parties on both sides have successfully used them in their regression models with very little contention. As future cases seek to more narrowly define comparable worth factors via the Equal Pay Act, the need for the court to further address departmental and market differentials will become increasingly apparent.

Given that both the literature and the courts recognized that external market factors influence faculty salaries within higher education, several approaches were considered to include salary difference among academic disciplines. Creating a set of dummy variables to represent each academic department is one method commonly used in gender equity studies. This approach consumes a large number of degrees of freedom and tends to limit the statistical power of the model. An alternative to this method is to create fewer dummy variables by distinguishing disciplines between their 2-digit Classification of Instructional Programs (CIP) code and not the 4- or 6-digit CIP code. Another method is to use a market ratio to account for salary variability among the different disciplines (Balzer, 1996; Raymond, et al., 1988; and Simpson & Rosenthal, 1982). This method uses national data, rather than institutional or system-wide data, to account for national market demands and to offset the effects of outliers caused by individual institutions having more senior faculty in lower paying disciplines and greater junior faculty who are in higher paying disciplines at a given institution.

Methodology

This study used two multiple regression analyses to develop an explanatory model to determine which model might best explain faculty salaries. The central purpose of this study was to determine if using a single market ratio variable (market model) was a stronger predictor for faculty salaries than the use of k-1 dummy variables representing the various disciplines (dummy model).

A total of 20 out of 21 four-year institutions from a southeastern state system were used in the study. The system's only medical college was excluded because of the potential of skewness of medical faculty salaries to other faculty salaries. These 20 institutions represented three research universities, two regional universities, 13 state universities, and two state colleges.

Only regular, full-time tenured or tenure track faculty were used in this study (n = 5,441). The method of not using part-time or non-tenure track faculty is supported in other studies. Chronister, et al., (1994) found that the job of full-time faculty is significantly different from part-time faculty in terms of teaching, research, and service. Braskamp et al., (1978) found that only full-time faculty should be used in equity studies because too many extraneous factors will enter into the analysis and provide inconclusive information about why faculty receive different salaries. Furthermore, according to Snyder et al., (1994), including part-time and temporary faculty presents special problems to the regression analysis and so they are often left out of salary equity models.

The disciplines used for the analysis were determined by their two-digit CIP codes as defined in the College and University Professional Association (CUPA) National Faculty Salary Survey (2002) for non-collective bargaining schools. If a CIP code was present within the 20 institutions, but not present in the CUPA study, the faculty

from that particular CIP code were omitted from this study because an adequate market ratio could not be determined.

Predictor variables defined below represent a conceptual framework of how gender, rank, type of institution, years in rank, years since last degree, whether or not the faculty member earned a terminal degree, market ratio, and academic discipline should influence faculty salary.

Academic-Year Salary (SALARY). This study used all nine-month academic salaries for professors, associate professors, and assistant professors. This figure excluded stipends received by faculty, and adjusted for faculty who were on 12-month contracts to 9-month equivalents (salary*.818).

Gender (FEMALE). A dummy code was used where female = 1 and male = 0. By coding female as one, the effect of the parameter estimate will relate directly to this gender class. For instance, if the female coefficient = -110.00, the interpretation of the model is that females on average are receiving $110.00 less than males, holding all other variables equal.

Rank (RANK). This study looked at the rank of select tenured or tenure track faculty. It was hypothesized that faculty holding a higher rank would receive a higher salary than those holding a lower rank. Because a higher rank relates to a higher level of attainment, this variable was converted to ordinal data where Professor = 3, Associate Professor = 2, and Assistant Professor = 1.

Type of Institution (INST_TYPE). This study observed faculty salaries of four-year institutions within the state system. These institutions are classified by level of research interest as well as how selective they are with their entrance requirements. This variable was converted to ordinal data where State College = 1, State University = 2, Regional University = 3, and Research University = 4. It was hypothesized that faculty from a more selective, research-centered institution are compensated at a higher level than faculty from institutions with a more regional mission.

Years in Rank (RANK YRS). Years in rank indicates the total number of years of full-time faculty appointment with a particular institution in the current rank held by the faculty member. It was hypothesized that faculty who have been at their current rank longer will be compensated at a higher level than faculty who recently moved upward in rank.

Years at Institution (INST_YRS). The number of years that the faculty member has been affiliated with his or her current institution. It was hypothesized that faculty who stay at an institution for a longer period of time are compensated at a higher level than newly entering faculty.

Years Since Last Degree (DEG YRS). Years since last degree indicates the total number of years since the faculty member's last degree was obtained. It was hypothesized that faculty who have held their degree for a longer period of time have greater experience than new degree recipients and, therefore, are compensated at a higher level.

Terminal Degree (Terminal). It was hypothesized that faculty who possess the terminal degree in their field would be compensated to a greater extent than faculty without a terminal degree. For this study, doctorates, professional degrees, and Masters of Fine Arts (MFA) degrees are considered terminal.

Market Ratio (Market). The market factor was calculated by taking the ratio of the average national salary for a given discipline to the average national salary for all disciplines combined. Because the institutions used in this study do not have collective bargaining, average national salaries from non-collective bargaining schools were used from the CUPA National Faculty Salary Survey (2002). The ratio indicates how the discipline compares to the national average, in which case the ratio will be one. For example, a market factor of .94 for biology indicates that national average salaries for this discipline are 94 percent of the national average for all disciplines combined. A market factor of 1.10 for chemistry indicates that the national average salaries for this discipline are 10 percent higher than the combined national average for all disciplines.

Department. Department is indicated by individual dummy variables identified by the first two digits of the CIP code. The department dummy variable codes faculty within that discipline equal to 1, while faculty who are not in that discipline are equal to 0. While there were 25 unique CIP codes represented among the faculty, only *k-1* were used to account for the problem of multicollinearity if all dummy codes were used. While creating a dummy code for each discipline is commonly used, this approach consumes a large number of degrees of freedom. The dummy codes used in this study were agriculture (AGRI), architecture (ARCH), communication (COMM), computer sciences (COMP), education (ED), engineering (ENG), law (LAW), English (ENGL), library (LIB), natural sciences (NS), math (MATH), multi-discipline studies (MULTI), recreation (REC), fine arts (ARTS), social sciences (SS), medicine (MED), and business (BUS). The FOREIGN LANGUAGES variable was omitted from this study to create k-1 variables and because its market ratio is close to 1.

Limitations

No faculty salary equity model explains all of the variance in faculty salaries. This is in part because of random causes of variation as well as the under-specification of the model. There is an abundant literature that discusses the use of faculty productivity in salary equity studies and significant court cases have decided that faculty productivity should be used. Because this

study concerns faculty salaries from 20 different institutions representing three significantly different levels of research interest and entrance requirements, it would be difficult, if not impossible, to create a standard measure of faculty productivity. While the omission of the productivity component will affect the explanatory strength of the model, this study's major purpose is to test the strength of the MARKET variable to the strength of individual discipline dummy variables.

Some disciplines and their faculties were removed from the study because these CIP codes were not included in the CUPA National Faculty Salary Survey (2002).The disciplines that were removed represented a small number of faculty (n=254 or 4 percent of the total used in the study), and represented a significantly small number of institutions. Furthermore, although CIP codes were used in this study with both the MARKET variable as well as the individual discipline dummy variables, the 2-digit, or simplest form of the code was used in defining the dummy variables. While this method limited the variability within the family of disciplines (i.e. 130000 = all Education disciplines), it was chosen to limit over-specification of the model and to reduce error that would occur from the lack of consistent standards of classifying disciplines at the 4-digit level.

Results

Descriptive Statistics

Before the regression analysis was computed, a simple frequency distribution was constructed to partial out market ratio ranges by gender. Again, the market ratio is computed by dividing the average national salary for a given discipline by the aggregate national average salary for all disciplines. A market ratio equaling 1 signifies that the salary for the discipline in question is equal to the average of all salaries for all disciplines combined. Extending this average out to five percent in both directions was done to compensate for those disciplines that have salary averages close but not equal to the national average. Therefore, a market ratio of .95 to 1.05 was classified as "Average Market;" a ratio of less than .95 was classified as "Lower Market;" and a ratio of greater than 1.05 was classified as "Higher Market."

The results of this distribution are found in Table 2a. In this study (n = 5,441), 56.32 percent of the female faculty are teaching within disciplines that have a below average market ratio, while 28.64 percent of the male faculty are teaching within these same disciplines. To the contrary, 35.81 percent of the male faculty are teaching within disciplines that have above average market ratio, while 16.30 percent of the female faculty are teaching within these disciplines. The percentage of males and females teaching in average paying disciplines is 35.55 percent and 27.39 percent respectively.

Combining categories, one can see that 83.71 percent of the total female faculty are teaching in disciplines that, according to the market ratio, have average to below average salaries while 71.36 percent of the total male faculty are teaching in disciplines that have average to above average salaries. This distribution tends to support the literature that the marketability of a discipline is not only reflected in the variability of faculty salaries, but there may be a disproportionate percentage of female faculty who choose to earn their terminal degrees in the lower paying disciplines.

To determine if this gender distribution by market ratio range is significant, a two-sample Chi-Square was used. This type of test is used to compare two or more groups on a nominal variable with two or more categories. The Chi-Square analysis tests whether the observed or actual values are comparable to the expected values. A chart indicating both the observed and expected values of the gender dispersion by market ratio range is displayed in Table 2b. For the two-sample model, the expected frequencies are computed based on the percentages in the row and column totals. Of the 5,441 faculty members in the study, 2,095 (39 percent), are in disciplines that are considered in the lower market range. If the null hypothesis is true, then one would expect that this percentage would be the same for both male and female faculty. Therefore, the expected frequency for female faculty within the lower market disciplines is 0.39 * 1,939 = 746.59, and the expected frequency for male faculty within the lower

Table 2a
Gender Dispersion by Market Ratio Range*

	Lower Market		Average Market		Higher Market		
Gender	Number	Percent	Number	Percent	Number	Percent	Total
F	1,092	56.32	531	27.39	316	16.30	1,939
M	1,003	28.64	1,245	35.55	1,254	35.81	3,502
	2,095		1,776		1,570		5,441

* NOTE: Lower Market = < .95; Average Market = .95 - 1.05; Higher Market = > 1.05

Table 2b
Gender Dispersion and Expected Value by Market Ratio Range*

	Lower Market		Average Market		Higher Market		Column
	Observed	Expected	Observed	Expected	Observed	Expected	Total
Female	1,092	746.59	531	632.91	316	559.50	1,939
Male	1,003	1,348.41	1,245	1,143.09	1,254	1,010.50	3,502
Row Total	2,095	38.50%	1,776	32.64%	1,570	28.85%	5,441

* NOTE: Lower Market = < .95; Average Market = .95 - 1.05; Higher Market = > 1.05

market disciplines is 0.39 * 3,502 = 1348.41. The Chi-Square statistic is the sum of the squared differences between the observed and expected values within each cell. In this study, the value of the Chi-Square is 438.43 and is significant at the .05 level. To determine which of the categories are major contributors, a standardized residual is computed which is defined as follows:

$$R = \frac{O - E}{\sqrt{E}}$$

Where:
R = the standardized residual
O = the observed frequency for a particular cell
E = the expected frequency for a particular cell

If the standardized residual is greater than 2.00 (in absolute value), one can conclude that the cell or category is a major contributor to the significant Chi-Square value. The standardized residuals are computed on Table 2c and, because each of the residuals are greater than 2.00, they all are major contributors to the Chi-Square value. Therefore, the results of this test indicate that there is a significantly higher frequency of males in the higher paying disciplines and a significantly higher number of females in the lower paying disciplines. Likewise, there is a significantly lower number of males in the lower paying disciplines, and a significantly lower number of females in the higher paying disciplines.

While this test supports the literature that females tend to earn degrees in the lower paying disciplines while males tend to earn degrees in the higher paying disciplines, how much influence does the market supply/demand within a discipline have over salaries when other factors such as rank, type of institution, years at institution, and years since last degree are taken into account. Furthermore, if discipline is a significant contributor to salary, will a single market ratio variable create a statistically stronger model than the use of dummy variables to differentiate the different disciplines?

Regression Analysis – Dummy Model

Multiple regression is used to account for the variance in a dependent variable (salary), based on linear combinations of interval, ordinal, or categorical independent variables. Two typical Ordinary Least Squares (OLS) regression models were used to test how all of the predictor variables described above related to faculty salary. The only difference between the two models

Table 2c
Calculation of x^2 for Data in Table 1a

Observed (O)	Expected (E)	O - E	$(O - E)^2$	$(O - E)^2/E$	R*
1,092	746.59	345.41	119,308.07	159.80	12.64
1,003	1,348.41	-345.41	119,308.07	88.48	9.41
531	632.91	-101.91	10,385.65	16.41	4.05
1,245	1,143.09	101.91	10,385.65	9.09	3.01
316	559.50	-243.5	59,292.25	105.97	10.29
1,254	1,010.50	243.5	59,292.25	58.68	7.66
5,441	5,441.00	0		438.43 = x^2	

* NOTE: R = represents the standardized residual and is the square root of $(O - E)^2/E$.
Any value greater than 2.00 is significant.

was that the first model used 17 dummy variables to offer a categorical differentiation between disciplines, while the second model used the single market ratio variable. To detect and eliminate the possible distortions that may be caused by multicollinearity, variance inflation factors (VIFs) were also calculated for each variable. The variables with high VIFs were closely examined to determine their relationship with the other predictor variables, and offending variables were dropped based upon the explanatory power of the R^2 measure after controlling for the degrees of freedom.

Results from the first or dummy model indicated a statistically significant relation between the linear forms of the predictor variables and salary. The value of the *F statistic*, 434.91 is the ratio of the model mean square divided by the error mean square. For the general multiple regression model, it is used to test the composite hypothesis that all coefficients except the intercept are zero. For all practical purposes, the higher the *F statistic*, the better overall fit of the model. The *p value* of <.0001 indicates that there is less than a .0001 chance of obtaining an *F value* this large or larger if $b_i = 0$. Therefore, there is reasonable evidence to assume that $b_i \neq 0$, and at least some of the independent variables contribute to the variation of faculty salary. The *R-Square* statistic is considered a measure of practical significance and indicates that 66 percent of the change in faculty salary can be attributed to change in one or more of the predictor variables. The standard deviation of unexplained salaries is $13,612.

Table 3
Parameter Estimates of the Dummy Model

Variable	DF	Parameter Estimate	Standard Error	t value	Pr > |t|
Intercept	1	a	1457.662	a	<.0001
Agriculture	1	-921.2006	2091.475	-0.44	0.6596
Architecture	1	7479.587	2053.053	3.64	0.0003
Communication	1	4188.313	1776.94	2.36	0.0185
Computer Science	1	27567	1427.508	19.31	<.0001
Education	1	3899.621	1123.617	3.47	0.0005
Engineering	1	21607	1217.843	17.74	<.0001
Social Sciences	1	4735.808	1086.461	4.36	<.0001
Law	1	34006	1776.083	19.15	<.0001
English	1	2242.478	1217.231	1.84	0.0655
Library	1	-3359.547	4446.298	-0.76	0.4499
Natural Sciences	1	4607.15	1122.576	4.10	<.0001
Math	1	6475.56	1262.633	5.13	<.0001
Multi-Disciplinary	1	10397	3363.005	3.09	0.002
Recreation	1	1648.78	2679.999	0.62	0.5384
Arts	1	-1469.117	1290.162	-1.14	0.2549
Medicine	1	10132	1259.785	8.04	<.0001
Business	1	31113	1180.688	26.35	<.0001
Female	1	-359.2509	427.4975	-0.84	0.4007
Terminal	1	3919.113	729.5198	5.37	<.0001
Rank	1	11948	343.0575	34.83	<.0001
Institution Type	1	7668.27	205.5488	37.31	<.0001
Years in Rank	1	183.711	22.95558	8.00	<.0001
Years in Institution	1	-372.9743	32.77469	-11.38	<.0001
Years since Degree	1	530.441	33.6272	15.77	<.0001

a. Omitted to limit calculation of the expected value of an individual salary

The *t statistics* within the parameter estimates on Table 3 are used for testing hypotheses about the individual parameters. For instance, the *t value* for INST_TYPE is 37.31, and indicates the strongest significant relationship to faculty salary. Likewise, RANK, with a *t value* of 34.83 is also a strong and significant predictor in this model. Among the dummy discipline variables, BUSINESS, COMPUTER SCIENCE, LAW and ENGINEERING are strong predictors of faculty salary, indicating that these disciplines pay faculty higher average salaries than the other disciplines within the model.

The values in the Parameter Estimates, shown in Table 3, are the estimated coefficients and indicate the average amount salary will change when the independent variable increases one unit and the other independents are held constant. For example, faculty who worked for a higher level of institution earned an average salary of $7,668 more than faculty who worked for the next lower level of institution, holding all other variables constant. In other words, faculty from more prestigious research universities earned greater salaries on average than faculty who worked in state universities or colleges. The parameter estimate for RANK indicated that faculty members earned an average of $11,948 more salary than faculty of the next lower rank, holding all other variables constant. In this model, the FEMALE variable indicated that, on average, female faculty were paid $359 less than male faculty when all other variables are held constant. The *t value* for the FEMALE variable is somewhat small, and, according to the *p value*, is an insignificant contributor to the model at the .05 level. In the dummy model, 18 out of 24 variables show significant contribution (at the .05 level) to the model based upon the *p values*.

Variance Inflation Factors were computed to confirm the appropriateness of each predictor variable to the preliminary model. The VIFs for all predictor variables were less than 10, indicating minimal multicollinearity problems for each predictor, although some of the discipline dummy variables had VIFs close to 10. All of the borderline VIFs came from dummy discipline variables. While these borderline variables indicated that they were statistically significant contributors to the overall model, they had lower *t values* than other variables and many indicated they might contribute to multicollinearity within the model. For these reasons, these variables were dropped from the final iteration.

For the final iteration of the dummy model, variables that did not contribute significantly to the preliminary model, or that were highly correlated with other independent variables were removed. The results of the final model indicated a higher *F value* of 894.3, although the *R-Square* is slightly lower at .6230. While the larger

F value of the final model indicates a better fit, the lower *R-Square* could be attributed to a deflationary reaction when some of the discipline dummy variables were removed because of multicollinearity along with the variables that did not contribute significantly to the model. Therefore, the final model indicated, through the *R-Square* statistic, that 62 percent of the change in faculty salary could be attributed to change in COMPUTER SCIENCE, LAW, ENGINEERING, BUSINESS, TERMINAL, RANK, INST_TYPE, RANK_YRS, INST_YRS, and DEG_YRS. The FEMALE variable in the final iteration of the dummy model indicated that, on average, female faculty received $58 less than their male counterparts when all other variables were held constant, and was insignificant at the .05 level.

Regression Analysis – Market Model

Results from the second or market model indicated a statistically significant relation between the linear forms of the predictor variables and salary and is displayed in Table 4. The value of the *F statistic*, 1148.76, is significantly higher than the dummy model. From this information alone, one can tell that the single market ratio variable may be a better fit than multiple dummy variables representing departments. Again, for the general multiple regression model, the *F statistic* is used to test the composite hypothesis that all coefficients except the intercept are zero, and the higher the F statistic, the better overall fit of the model. The *p value* of <.0001 indicates that there is less than a .0001 chance of obtaining an *F value* this large or larger if $b_i = 0$. Therefore, there is strong evidence to assume that, and at least some of the independent variables contribute to the variation of faculty salary. The *R-Square* statistic is .63, which is comparable to the .66 in the dummy model, but is probably attributed to a deflationary reaction of decreasing the number of overall variables in the model. It is important to note that *R-Square* will continue to increase as variables are added, even if the additional variables do not contribute significantly to the model. However, using an F test resulted in an F statistic of 1148.8 . The *R-Square* of the market model is not substantially different than the dummy model and indicates that 64 percent of the change in faculty salary can be attributed to change in one or more of the predictor variables. The standard deviation of unexplained salaries is $14,174.

The *t statistics* within the parameter estimates of the market model on Table 4 are similar to the dummy model. For instance, the *t value* for RANK (35.77) and INST_TYPE (31.49) indicate strong, significant relationships to faculty salary. With a *t value* of 47.21, however, the MARKET variable clearly is the largest contributor to the model and may support the premise that a single, continuous variable measuring the effect of market value on a discipline is as effective as a 14 dichotomous discipline dummy variable and is much more efficient and politically less confusing.

The values in the Parameter Estimates, shown in Table 4**,** are the estimated coefficients and indicate the average amount salary will be expected to change when the independent variable increases one unit and the other independents are held constant. For example, faculty who worked for a higher level of institution earned an average salary of $6,578 more than faculty who worked for the next lower level of institution, holding all other variables constant. The parameter estimate for RANK indicated that faculty members earned an average of $12,624 more salary than faculty of the next lowest rank, holding all other variables constant. In this model, the FEMALE variable indicated that, on average, female faculty earned $449 more than male faculty when all other variables are held constant. As in the dummy model, the *t value* for the FEMALE variable is somewhat small, and is insignificant at the .05 level as indicated by the *p value*. Variance Inflation Factors were computed to confirm the appropriateness of each predictor variable to the preliminary model. The VIFs for all of the predictor variables were less than 10, indicating minimal and insignificant multicollinearity problems for each predictor.

Therefore, the market model indicated, through the R^2 statistic, that 63 percent of the change in faculty salary could be attributed to change in MARKET, TERMINAL, RANK, INST_TYPE, RANK_YRS, INST_YRS, and DEG_YRS. The FEMALE variable in the market model indicated that, on average, female faculty received $449 more than their male counterparts when all other variables were held constant. Again, as with the dummy model, the FEMALE variable is not statistically significant at the .05 level in the market model.

Table 4
Parameter Estimates of the Market Model

Variable	DF	Parameter Estimate	Standard Error	t value	Pr > |t|
Intercept	1	a	1405.736	a	<.0001
Market	1	50945	1079.16	47.21	<.0001
Female	1	449.29271	426.8112	1.05	0.2925
Terminal	1	612.07321	716.7781	0.85	0.3932
Rank	1	12624	352.953	35.77	<.0001
Institution Type	1	6577.7458	208.9133	31.49	<.0001
Years in Rank	1	193.31929	23.83185	8.11	<.0001
Years at Institution	1	-370.5379	33.86093	-10.94	<.0001
Years since Degree	1	443.75267	34.79946	12.75	<.0001

a. Omitted to limit calculation of the expected value of an individual salary

Conclusion

While gender equity continues to be an important issue on college campuses, it becomes increasingly more important to define the relationship of both internal and external factors of faculty salary variability in order to effectively detect gender discrimination. While court

cases continue to show that gender discrimination does exist, this study, supported by previous studies, indicates that the field in which the faculty member is employed is both a valid measure and a significant contributor to faculty salary variability. Furthermore, this study supports the use of a single, continuous measure that differentiates between academic disciplines over the use of multiple categorical (dummy) variables.

This study also supports other research that suggests female faculty are still choosing to earn their degrees in fields with a lower market demand, which causes them to earn lower salaries. While the dummy model indicated that women's average salaries are somewhat less than male faculty, the market model indicates that women's average salaries are slightly above the average salaries for males. It is important to note that the FEMALE coefficient for both models was an insignificant contributor at the .05 level and that the coefficient indicates the average dollar increase or decline in female salaries with all other variables held constant in the model. While this coefficient may support that gender inequity may not be a systemic problem within this group of institutions, further analysis on individual institutions or faculty members will need to be performed to identify significant deviations from the mean. Such studies could also incorporate a performance measure, which is problematic for studies involving varying levels of institutions with dissimilar roles, scopes, and missions.

Although organizations such as the American Association of University Professors (AAUP) are trying to ensure that all faculty salaries are more market neutral (Haignere, 2002), the affect of outside market factors on faculty salaries continues to influence the number of new faculty who are available to teach within a particular discipline, and the degree to which faculty salaries relate to salaries of similar career tracks outside of academe. There is evidence that a significantly larger number of females are choosing the higher market disciplines than in the past, and that females who entered the uncharted waters of male-dominated, higher paying disciplines many years ago are seeing the rewards of discipline choice. As evidenced in this study and others, there are still significantly less female faculty than males in the higher paying disciplines.

Bibliography

Balzer, W., Boudreau, N., Hutchinson, P., Ryan, A.M., Thorsteinson, T., Sullivan, J., Yonker, R., & Snavely, D., (1996). Critical modeling principles when testing for gender equity in faculty salary. *Research in Higher Education*, *37* (6), 633-658.

Barbezat, D.A. (2002). History of pay equity studies. In R. K. Toutkoushian (Ed.), *Conducting salary-equity studies: Alternative approaches to research*. (pp. 9-39). San Francisco: Jossey-Bass.

Bazemore v. Friday, 487 U.S. 385 (1986).

Becker, W. E., & Toutkoushian, R. K. (2003). Measuring gender bias in the salaries of tenured faculty members. In R. K. Toutkoushian (Ed.), *Unresolved issues in conducting salary-equity studies.* (pp. 5-20). San Francisco: Jossey-Bass.

Bellas, M. L. (1997). Disciplinary differences in faculty salaries: Does gender bias play a role? *Journal of Higher Education,* 68 (3) 299-321.

Bohannon, T.R. (1989). Applying regression analysis to problems in institutional research. In B. Yancy (ed.) *Applying statistics in institutional research*, (pp. 43-60). San Francisco: Jossey-Bass.

Botsch, R. E. & Folsom, D. (1989). Market inequity: Incorporating this critical element into faculty salary plans. *CUPA Journal, 40* (1), 37-47.

Boudreau, N., Sullivan, J., Balzer, W., Ryan, A.M., Yonker, R., Thorsteinson, T., & Hutchinson, P. (1997). Should faculty rank be included as a predictor variable in studies of gender equity in university faculty salary studies? *Research in Higher Education*, *38* (3) 297-312.

Bowen, H. R., & Schuster, J. H. (1986). *American professors: A national resources imperiled*. New York: Oxford University Press.

Braskamp, L. A., Muffo, J. A., & Langston, I. W., III. (1978). Determining salary equity: Politics, procedures, and problems. *Journal of Higher Education*. *49*, 231-246.

Buchanan, J. M., & Tollison, R. D. (1981). The homogenization of heterogeneous inputs*. American Economic Review. 71* (1), 28-38.

Cartter, A. M. (1976). *Ph.D.s and the Academic Labor Market*, New York: McGraw-Hill

Chronister, J. L., Ganeneder, B. M., Harper, E., & Baldwin, R. G. (1977). *Full-time non-tenure-track faculty: Gender differences*. NEA Higher Education Research Center Update. 3 (5) 6.

Coser v. Collvier, 739 F.2d 746 (1984).

Ende v. Board of Regents of Regency University, 757 F.2d 176 (1985).

England, P. (1992). *Comparable worth: Theories and evidence*. New York: Aldine de Gruyter.

Feldberg, R. (1984). Comparable worth: Toward theory and practice in the United States. *Sigus: Journal of women in culture and society*. *10* (2), 311-328.

Finkelstein, M.O. & Levin, B. (1990) *Statistics for lawyers*. New York: Springer-Verlag.

Fisher, F. M. (1980). Multiple regression in legal proceedings. *Columbia Law Review*, 80, 702-736.

Freeman, R. B. (1975). Supply and salary adjustments to the changing science manpower market: Physics, 1948-73. *American Economic Review*, *65*, 27-39.

Hengstler, D., & McLaughlin, G. (1985). Statistical issues and concerns in court cases. In W. Rosenthal & B. Yancey (eds.) *The use of data in discrimination cases* (pp. 65-82). San Francisco: Jossey-Bass.

Haignere, L. (2002). *Paychecks: A guide to conducing salary-equity studies for higher education*. Washington, D.C.: American Association of University Professors.

Jones, E. (2002). Beyond supply and demand: Assessing the Ph.D. job market. *Occupational Outlook Quarterly. 46* (4), 22-33.

Lavin-McEleney v. Marist College, 239 F3d. 476 (2001).

Lempert, R. (1985). Symposium on law and economics: Statistics in the courtroom. *Columbia Law Review, 85*, 1098-1116.

Luna, A. L. (2006). Faculty salary equity studies: Combining statistics with the law. *The Journal of Higher Education*, *77* (2), 193-224.

Mangan, K. S. (2001). A shortage of business professors leads to 6-figure salaries for new Ph.D.'s. *Chronicle of Higher Education*. *47* (34) A12-A13.

McLaughlin, G.W., Smart, J.C., & Montgomery, J.R. (1978). Factors which comprise salary. *Research in Higher Education*, *8*, 67-82.

Michael, R. T., Hartmann, H. I., & O'Farrell, B. (Eds). (1989). *Pay equity: Empirical inquiries*. Washington, D.C.: National Academy Press.

Moore, N. (1983). Faculty salary equity: Issues in regression model selection. *Research in Higher Education, 34* (1) 107-126.

National Center for Educational Statistics (1987, 1992, 1998). *The digest of educational statistics*. Washington, D.C. U.S. Department of Education.

Nettles, M., Perna, L., Bradburn, E., & Zimbler, L. (2000). *Salary, promotion, and tenure status of minority and women faculty in U.S. colleges and universities*. Washington, D.C. U.S. Department of Education, National Center for Educational Statistics.

Nichols-Casebolt, A. M. (1993). Competing with the market: Salary adjustments and faculty input. *Research in Higher Education, 34* (5), 583-601.

Owen, J. D. (1972). Toward a public employment wage theory: Some econometric evidence on teacher quality. *Industrial and Labor Relations Review*, *25* (2) 213-222

Presseisen v. Swarthmore College, 422 F.Supp. 593 (1977).

Ramsay, G.A. (1979). A generalized multiple regression model for predicting college faculty salaries and estimating sex bias. In T.R. Pezzullo and B.E. Brittingham (eds.*), Salary equity: Detecting sex bias in salaries among college and university professors,* pp. 37-53. Lexington, MA: Lexington Books.

Raymond, R. D., Sesnowitz, M. L., & Williams, D. R. (1988). Does sex still matter? New evidence from the 1980's. *Economic Inquiry*. *26*, 43-58.

Reskin, B. F., & Roos, P. A. (1990). *Job queues, gender queues*. Philadelphia: Temple University Press.

Roos, P. A., & Jones, K. W. (1993). Shifting gender boundaries: Women's inroads into academic sociology. *Work and Occupations. 20 (4*), 395-428.

Simpson, W. A., & Rosenthal, W. H. (1982). The role of institutional research in a sex discrimination suit. *Research in Higher Education. 16*, 3-16.

Smart, J. (1991). Gender equity in academic rank and salary. *Review of Higher Education, 14 (4),* 511-526.

Snyder, J.P., Hyer, P.B., & McLaughlin, G.W.(1994). Faculty salary equity: Issues and options. *Research in Higher Education*, *35 (1)* 1-19.

Sobel v. Yeshiva University, 839 F.2d. 18 (1988).

Staub, A. K. (1987). *An analysis of the relationship between salary and women's participation in faculty disciplines*. Unpublished doctoral dissertation, University of Alabama, Tuscaloosa, Alabama.

Thurow, L. (1975). *Generating inequality*. New York: Basic Books.

Toutkoushian, R. K. (Ed.) (2002). *Conducting Salary-equity studies: Alternative approaches to research*. San Francisco: Jossey-Bass.

Toutkoushian, R. K. (Ed.) (2003). *Unresolved issues in conducting salary-equity studies*. San Francisco: Jossey-Bass.

Webster, A.L. (1995). Demographic factors affecting faculty salary. *Educational and Psychological Measurement,* 55 (5), 728-735.

Wilkins v. University of Houston, 654 F.2d. 388 (1981).

Youn, T. I. K. (1989). Studies of academic markets and careers: An historical review. In Brenemen, D. W. & Youn, T. I. K. (eds.), *Academic markets and careers*, pp 8-27. New York, NY: Falmer Press.

THE AIR PROFESSIONAL FILE—1978-2006

A list of titles for the issues printed to date follows. Most issues are "out of print," but microfiche or photocopies are available through ERIC. Photocopies are also available from the AIR Executive Office, 222 Stone Building, Florida State University, Tallahassee, FL 32306-4462, $3.00 each, prepaid, which covers the costs of postage and handling. Please do not contact the editor for reprints of previously published Professional File issues.

Organizing for Institutional Research (J.W. Ridge; 6 pp; No. 1)
Dealing with Information Systems: The Institutional Researcher's Problems and Prospects (L.E. Saunders; 4 pp; No. 2)
Formula Budgeting and the Financing of Public Higher Education: Panacea or Nemesis for the 1980s? (F.M. Gross; 6 pp; No. 3)
Methodology and Limitations of Ohio Enrollment Projections (G.A. Kraetsch; 8 pp; No. 4)
Conducting Data Exchange Programs (A.M. Bloom & J.A. Montgomery; 4 pp; No. 5)
Choosing a Computer Language for Institutional Research (D. Strenglein; 4 pp; No. 6)
Cost Studies in Higher Education (S.R. Hample; 4 pp; No. 7)
Institutional Research and External Agency Reporting Responsibility (G. Davis; 4 pp; No. 8)
Coping with Curricular Change in Academe (G.S. Melchiori; 4 pp; No. 9)
Computing and Office Automation—Changing Variables (E.M. Staman; 6 pp; No. 10)
Resource Allocation in U.K. Universities (B.J.R. Taylor; 8 pp; No. 11)
Career Development in Institutional Research (M.D. Johnson; 5 pp; No 12)
The Institutional Research Director: Professional Development and Career Path (W.P. Fenstemacher; 6pp; No. 13)
A Methodological Approach to Selective Cutbacks (C.A. Belanger & L. Tremblay; 7 pp; No. 14)
Effective Use of Models in the Decision Process: Theory Grounded in Three Case Studies (M. Mayo & R.E. Kallio; 8 pp; No. 15)
Triage and the Art of Institutional Research (D.M. Norris; 6 pp; No. 16)
The Use of Computational Diagrams and Nomograms in Higher Education (R.K. Brandenburg & W.A. Simpson; 8 pp; No. 17)
Decision Support Systems for Academic Administration (L.J. Moore & A.G. Greenwood; 9 pp; No. 18)
The Cost Basis for Resource Allocation for Sandwich Courses (B.J.R. Taylor; 7 pp; No. 19)
Assessing Faculty Salary Equity (C.A. Allard; 7 pp; No. 20)
Effective Writing: Go Tell It on the Mountain (C.W. Ruggiero, C.F. Elton, C.J. Mullins & J.G. Smoot; 7 pp; No. 21)
Preparing for Self-Study (F.C. Johnson & M.E. Christal; 7 pp; No. 22)
Concepts of Cost and Cost Analysis for Higher Education (P.T. Brinkman & R.H. Allen; 8 pp; No. 23)
The Calculation and Presentation of Management Information from Comparative Budget Analysis (B.J.R. Taylor; 10 pp; No. 24)
The Anatomy of an Academic Program Review (R.L. Harpel; 6 pp; No. 25)
The Role of Program Review in Strategic Planning (R.J. Barak; 7 pp; No. 26)
The Adult Learner: Four Aspects (Ed. J.A. Lucas; 7 pp; No. 27)
Building a Student Flow Model (W.A. Simpson; 7 pp; No. 28)
Evaluating Remedial Education Programs (T.H. Bers; 8 pp; No. 29)
Developing a Faculty Information System at Carnegie Mellon University (D.L. Gibson & C. Golden; 7 pp; No. 30)
Designing an Information Center: An Analysis of Markets and Delivery Systems (R. Matross; 7 pp; No. 31)
Linking Learning Style Theory with Retention Research: The TRAILS Project (D.H. Kalsbeek; 7 pp; No. 32)
Data Integrity: Why Aren't the Data Accurate? (F.J. Gose; 7 pp; No. 33)
Electronic Mail and Networks: New Tools for Institutional Research and University Planning (D.A. Updegrove, J.A. Muffo & J.A. Dunn, Jr.; 7pp; No. 34)
Case Studies as a Supplement to Quantitative Research: Evaluation of an Intervention Program for High Risk Students (M. Peglow-Hoch & R.D. Walleri; 8 pp; No. 35)
Interpreting and Presenting Data to Management (C.A. Clagett; 5 pp; No. 36)
The Role of Institutional Research in Implementing Institutional Effectiveness or Outcomes Assessment (J.O. Nichols; 6 pp; No. 37)
Phenomenological Interviewing in the Conduct of Institutional Research: An Argument and an Illustration (L.C. Attinasi, Jr.; 8pp; No. 38)
Beginning to Understand Why Older Students Drop Out of College (C. Farabaugh-Dorkins; 12 pp; No. 39)
A Responsive High School Feedback System (P.B. Duby; 8 pp; No. 40)
Listening to Your Alumni: One Way to Assess Academic Outcomes (J. Pettit; 12 pp; No. 41)
Accountability in Continuing Education Measuring Noncredit Student Outcomes (C.A. Clagett & D.D. McConochie; 6pp; No. 42)
Focus Group Interviews: Applications for Institutional Research (D.L. Brodigan; 6 pp; No. 43)
An Interactive Model for Studying Student Retention (R.H. Glover & J. Wilcox; 12 pp; No. 44)
Increasing Admitted Student Yield Using a Political Targeting Model and Discriminant Analysis: An Institutional Research Admissions Partnership (R.F. Urban; 6 pp; No. 45)
Using Total Quality to Better Manage an Institutional Research Office (M.A. Heverly; 6 pp; No. 46)
Critique of a Method For Surveying Employers (T. Banta, R.H. Phillippi & W. Lyons; 8 pp; No. 47)
Plan-Do-Check-Act and the Management of Institutional Research (G.W. McLaughlin & J.K. Snyder; 10 pp; No. 48)
Strategic Planning and Organizational Change: Implications for Institutional Researchers (K.A. Corak & D.P. Wharton; 10 pp; No. 49)
Academic and Librarian Faculty: Birds of a Different Feather in Compensation Policy? (M.E. Zeglen & E.J. Schmidt; 10 pp; No. 50)
Setting Up a Key Success Index Report: A How-To Manual (M.M. Sapp; 8 pp; No. 51)
Involving Faculty in the Assessment of General Education: A Case Study (D.G. Underwood & R.H. Nowaczyk; 6 pp; No. 52)

THE AIR PROFESSIONAL FILE—1978-2006

Using a Total Quality Management Team to Improve Student Information Publications (J.L. Frost & G.L. Beach; 8 pp; No. 53)
Evaluating the College Mission through Assessing Institutional Outcomes (C.J. Myers & P.J. Silvers; 9 pp; No. 54)
Community College Students' Persistence and Goal Attainment: A Five-year Longitudinal Study (K.A. Conklin; 9 pp; No. 55)
What Does an Academic Department Chairperson Need to Know Anyway? (M.K. Kinnick; 11 pp; No. 56)
Cost of Living and Taxation Adjustments in Salary Comparisons (M.E. Zeglen & G. Tesfagiorgis; 14 pp; No. 57)
The Virtual Office: An Organizational Paradigm for Institutional Research in the 90's (R. Matross; 8 pp; No. 58)
Student Satisfaction Surveys: Measurement and Utilization Issues (L. Sanders & S. Chan; 9 pp; No. 59)
The Error Of Our Ways; Using TQM Tactics to Combat Institutional Issues Research Bloopers (M.E. Zeglin; 18 pp; No. 60)
How Enrollment Ends; Analyzing the Correlates of Student Graduation, Transfer, and Dropout with a Competing Risks Model (S.L. Ronco; 14 pp; No. 61)
Setting a Census Date to Optimize Enrollment, Retention, and Tuition Revenue Projects (V. Borden, K. Burton, S. Keucher, F. Vossburg-Conaway; 12 pp; No. 62)
Alternative Methods For Validating Admissions and Course Placement Criteria (J. Noble & R. Sawyer; 12 pp; No. 63)
Admissions Standards for Undergraduate Transfer Students: A Policy Analysis (J. Saupe & S. Long; 12 pp; No. 64)
IR for IR–Indispensable Resources for Institutional Researchers: An Analysis of AIR Publications Topics Since 1974 (J. Volkwein & V. Volkwein; 12 pp; No. 65)
Progress Made on a Plan to Integrate Planning, Budgeting, Assessment and Quality Principles to Achieve Institutional Improvement (S. Griffith, S. Day, J. Scott, R. Smallwood; 12 pp; No. 66)
The Local Economic Impact of Higher Education: An Overview of Methods and Practice (K. Stokes & P. Coomes; 16 pp; No. 67)
Developmental Education Outcomes at Minnesota Community Colleges (C. Schoenecker, J. Evens & L. Bollman: 16 pp; No. 68)
Studying Faculty Flows Using an Interactive Spreadsheet Model (W. Kelly; 16 pp; No. 69)
Using the National Datasets for Faculty Studies (J. Milam; 20 pp; No. 70)
Tracking Institutional leavers: An Application (S. DesJardins, H. Pontiff; 14 pp; No. 71)
Predicting Freshman Success Based on High School Record and Other Measures (D. Eno, G. W. McLaughlin, P. Sheldon & P. Brozovsky; 12 pp; No. 72)
A New Focus for Institutional Researchers: Developing and Using a Student Decision Support System (J. Frost, M. Wang & M. Dalrymple; 12 pp; No. 73)
The Role of Academic Process in Student Achievement: An Application of Structural Equations Modeling and Cluster Analysis to Community College Longitudinal Data[1] (K. Boughan, 21 pp; No. 74)
A Collaborative Role for Industry Assessing Student Learning (F. McMartin; 12 pp; No. 75)
Efficiency and Effectiveness in Graduate Education: A Case Analysis (M. Kehrhahn, N.L. Travers & B.G. Sheckley; No.76)
ABCs of Higher Education-Getting Back to the Basics: An Activity-Based Costing Approach to Planning and Financial Decision Making (K. S. Cox, L. G. Smith & R.G. Downey; 12 pp; No. 77)
Using Predictive Modeling to Target Student Recruitment: Theory and Practice (E. Thomas, G. Reznik & W. Dawes; 12 pp; No. 78)
Assessing the Impact of Curricular and Instructional Reform - A Model for Examining Gateway Courses[1] (S.J. Andrade; 16 pp; No. 79)
Surviving and Benefitting from an Institutional Research Program Review (W.E. Knight; 7 pp; No. 80)
A Comment on Interpreting Odds-Ratios when Logistic Regression Coefficients are Negative (S.L. DesJardins; 7 pp; No. 81)
Including Transfer-Out Behavior in Retention Models: Using NSC EnrollmentSearch Data (S.R. Porter; 16 pp; No. 82)
Assessing the Performance of Public Research Universities Using NSF/NCES Data and Data Envelopment Analysis Technique (H. Zheng & A. Stewart; 24 pp; No. 83)
Finding the 'Start Line' with an Institutional Effectiveness Inventory[1] (S. Ronco & S. Brown; 12 pp; No. 84)
Toward a Comprehensive Model of Influences Upon Time to Bachelor's Degree Attainment (W. Knight; 18 pp; No. 85)
Using Logistic Regression to Guide Enrollment Management at a Public Regional University (D. Berge & D. Hendel; 14 pp; No. 86)
A Micro Economic Model to Assess the Economic Impact of Universities: A Case Example (R. Parsons & A. Griffiths; 24 pp; No. 87)
Methodology for Developing an Institutional Data Warehouse (D. Wierschem, R. McBroom & J. McMillen; 12 pp; No. 88)
The Role of Institutional Research in Space Planning (C.E. Watt, B.A. Johnston. R.E. Chrestman & T.B. Higerd; 10 pp; No. 89)
What Works Best? Collecting Alumni Data with Multiple Technologies (S. R. Porter & P.D. Umback; 10 pp; No. 90)
Caveat Emptor: Is There a Relationship between Part-Time Faculty Utilization and Student Learning Outcomes and Retention? (T. Schibik & C. Harrington; 10 pp; No. 91)
Ridge Regression as an Alternative to Ordinary Least Squares: Improving Prediction Accuracy and the Interpretation of Beta Weights (D. A. Walker; 12 pp; No. 92)
Cross-Validation of Persistence Models for Incoming Freshmen (M. T. Harmston; 14 pp; No. 93)
Tracking Community College Transfers Using National Student Clearinghouse Data (R.M. Romano and M. Wisniewski; 14 pp; No. 94)
Assessing Students' Perceptions of Campus Community: A Focus Group Approach (D.X. Cheng; 11 pp; No. 95)
Expanding Students' Voice in Assessment through Senior Survey Research (A.M. Delaney; 20 pp; No. 96)
Making Measurement Meaningful (Carpenter-Hubin, J. & Hornsby, E.E., 14 pp; No. 97)
Strategies and Tools Used to Collect and Report Strategic Plan Data (Blankert, J., Lucas, C. & Frost, J.; 14 pp; No. 98)
Factors Related to Persistence of Freshmen, Freshman Transfers, and Nonfreshman Transfer Students (Perkhounkova, Y, Noble, J & McLaughlin, G.; 12 pp; No. 99)
Does it Matter Who's in the Classroom? Effect of Instructor Type on Student Retention, Achievement and Satisfaction (Ronco, S. & Cahill, J.; 16 pp; No. 100)
Weighting Omissions and Best Practices When Using Large-Scale Data in Educational Research (Hahs-Vaughn, D.L.; 12 pp; No. 101)
Essential Steps for Web Surveys: A Guide to Designing, Administering and Utilizing Web Surveys for University Decision-Making (Cheskis-Gold,, R., Shepard-Rabadam, E., Loescher, R., & Carroll, B.; 16 pp:, No. 102)

The AIR Professional File is intended as a presentation of papers which synthesize and interpret issues, operations, and research of interest in the field of institutional research. Authors are responsible for material presented. The *AIR Professional File* is published by the Association for Institutional Research.

Editor:
Dr. Gerald W. McLaughlin
Director of Planning and
Institutional Research
DePaul University
1 East Jackson, Suite 1501
Chicago, IL 60604-2216
Phone: 312/362-8403
Fax: 312/362-5918
gmclaugh@depaul.edu

Associate Editor:
Ms. Debbie Dailey
Associate Director of Planning and
Institutional Research
Georgetown University
303 Maguire Hall, 37th & O St NW
Washington, DC 20057
Phone: 202/687-7717
Fax: 202/687-3935
daileyd@georgetown.edu

Managing Editor:
Dr. Terrence R. Russell
Executive Director
Association for Institutional Research
1435 E. Piedmont Drive
Suite 211
Tallahassee, FL 32308
Phone: 850/385-4155
Fax: 850/385-5180
air@airweb2.org

Authors interested in having their manuscripts considered for the *Professional File* are encouraged to send four copies of each manuscript to the editor, Dr. Gerald McLaughlin. Manuscripts are accepted any time of the year as long as they are not under consideration at another journal or similar publication. The suggested maximum length of a manuscript is 5,000 words (approximately 20 double-spaced pages), including tables, charts and references. Please follow the style guidelines of the *Publications Manual of the American Psychological Association, 4th Edition.*