

2004 AIR RESEARCH GRANT PROPOSAL

**Using NSOPF:99 to Examine the Effects of Gender, Race, and Family Status
on the Careers of Faculty**

Grant Amount Requested: \$30,000

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Using NSOPF:99 to Examine the Effects of Gender, Race, and Family Status on the Careers of Faculty

Project Summary

This research project will use data from the 1999 National Survey of Postsecondary Faculty (NSOPF:99) to examine the differences in labor market experiences of faculty by gender, race/ethnicity, and family status. The primary objectives of the research are to (1) update the earnings differences among faculty based on their gender, race, and family status; (2) examine the employment differences among faculty by gender, race, and family status; and (3) derive a new method for measuring changes in pay disparities between groups over time. These studies will utilize multiple and logistic regression analysis to determine how selected characteristics affect labor market outcomes for faculty, and then test hypotheses concerning possible differences by gender, race, and family status.

This research will provide a more current view of the status of faculty regarding equity in earnings and employment, and enhance the understanding of how labor market differences between groups of workers can be measured and interpreted. One particular innovation of this work is the focus on the connections between gender, race, and family status, and their impact on labor market outcomes for faculty. The results will be of interest to higher education faculty who study the academic labor market, administrators who oversee the labor market conditions of their institutions, and the institutional research community, who are usually charged with the responsibility for conducting equity studies on their campus. Because institutions are required by law to provide an equitable workplaces for all faculty, this work has direct policy relevance for how institutions can measure and ultimately prevent labor market discrimination for faculty.

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Project Description

Statement of Problem and Variables

The Equal Pay Act of 1964 and subsequent legislation led to numerous studies to investigate whether pay equity existed between specific groups of faculty, with most studies focusing on the earnings differentials between male and female faculty. Among the most prominent national studies of gender equity in academe are the work by Bayer (1973), Bayer and Astin (1975), Tuckman and Tuckman (1976), Barbezat (1987, 1989, 1991), Smart (1991), Ransom and Megdal (1993), Bellas (1993), Ashraf (1996), Toutkoushian (1998a, 1998b, 1999), and Perna (2001, 2002). Virtually all studies on this topic proceed by measuring the wage gap between men and women, and then isolate the portion of this gap that cannot be attributed to differences in worker characteristics that should affect salary. This latter portion is referred to as the unexplained wage gap, and has been used as a measure of the salary differential between comparable men and women.

Investigations into the treatment of women in the academic labor market have been fueled in part by national data that have consistently shown female faculty earning less than male faculty on average. Data for the 2002-03 academic year, for example, reveal that in the aggregate female full professors earn 11.2% less than male full professors, female associate professors earn 6.9% less than male associate professors, and female assistant professors earn 7.6% less than male assistant professors (Ehrenberg, 2003). Comparisons of the wage gap between men and women in academe suggest that these differences have persisted over time.

Multiple regression analysis is typically the method of choice among analysts to measure the unexplained wage gap, although alternative techniques such as hierarchical linear modeling also have promise (Loeb, 2003). The basic approach is to estimate a wage equation of the form

$$(1) \quad \ln Y_i = X'_i \beta + F_i \delta + \varepsilon_i$$

where $\ln Y$ = salary measured in logarithms, X' = set of personal and institutional characteristics thought to influence faculty pay, F = dummy variable equal to 1 for females and 0 for males, β and δ are coefficients to be estimated using multiple regression analysis, and ε = random error term. In this formulation, the coefficient δ represents the unexplained wage gap. Multiple equation methods such as the methods developed by Oaxaca (1973) and Neumark (1988) have also been used, where separate earnings equations are estimated for the two groups under consideration and the wage gap between them is decomposed as follows:

$$(2) \quad \ln \bar{Y}_M - \ln \bar{Y}_F = [(\bar{X}_M - \bar{X}_F)' B_N] + [\bar{X}'_M (B_M - B_N) - \bar{X}'_F (B_F - B_N)]$$

where all variables are defined as before, and subscripts M and F denote males and females, respectively, and the coefficients β_N is the assumed no-discrimination wage structure. The quantity shown in the second set of square brackets in equation (2) represents the unexplained wage gap. See Toutkoushian and Hoffman (2002) for a comparison of the single- and multiple-equation methods for measuring the unexplained wage gap, and the advantages and disadvantages of using each in different situations.

To the dismay of observers of higher education, empirical studies have consistently found that women are still paid less than men in academe even after controlling for a wide range of personal and institutional characteristics thought to influence pay. Studies by Barbezat (1991)

and Toutkoushian (1998a) have further shown that the unexplained wage gap between men and women has not decreased during the 1980s and early 1990s. If true, then this suggests that the policies in place at institutions of higher education have not been effective at bringing about gender equity in pay and that new policies are needed to improve the status of women, and better approaches should be developed for measuring pay equity.

While gender has received the most attention from analysts, policymakers are also concerned about ensuring that employment practices in academe are equitable with regard to a faculty member's race/ethnicity and family status. Few studies have been conducted of pay differentials by race/ethnicity in postsecondary education due to datasets having insufficient numbers of minority faculty for deriving statistical measurements of the unexplained wage gap (see Barbezat, 2002, for a review of the literature). The NSOPF provides the best opportunity for analysts to investigate labor market differences for faculty by race/ethnicity due to the oversampling of faculty in underrepresented groups. Likewise, most work to date has focused on the earnings differences among faculty while ignoring other important aspects of their careers that can affect compensation. These would include whether an individual can find full-time employment in academe, the type of institution where the faculty member is employed, and his/her academic rank.

Proposal of Work

This project will rely primarily on the NSOPF:99, as well as the NSOPF:93, to conduct three studies relating to the measurement of pay and employment differences for faculty by gender, race, and family status. NSOPF:99 is well-suited to this analysis. It is a nationally representative sample of faculty and instructional staff, including those employed both full- and

part-time by their institutions. The target population for the survey was anyone who was designated as faculty (regardless of whether or not their responsibilities included instruction) and anyone who had instructional responsibilities. NSOPF:99 excludes private for-profit institutions and graduate teaching assistants from its sampling universe.

NSOPF:99 relied on a two-stage stratified, clustered probability design to select the sample. The first-stage sampling frame (institution universe) consisted of the 3,396 postsecondary institutions in IPEDS that were public or private not-for-profit Title IV participating institutions and provided formal degree programs of at least two years' duration. The institutions were stratified based on a modification of the Carnegie Foundation's classification system. There were 960 institutions included in the study. The second-stage sampling frame was derived from lists provided by the sampled institutions. Faculty were grouped into five strata based on their demographic characteristics including (a) Hispanic faculty; (b) African American faculty; (c) Asian and Pacific Islander faculty; (d) full-time female faculty who were not Hispanic, African American, Asian or Pacific Islander; and (e) all other faculty. A sixth stratum was created for faculty missing demographic data. This sampling approach is particularly useful for the three projects described in this proposal because it provides for sufficient numbers of faculty within underrepresented race/ethnicity categories. In addition, within each institution and stratum, faculty members were sorted by academic program area or discipline. The initial sample consisted of about 28,600 faculty and instructional staff. However, a subsample of 19,813 individuals was later drawn for follow-up. There were approximately 18,000 respondents to the survey. The weighted response rate was 83%.

The first phase of this research project will begin by using the NSOPF:99 to estimate a

series of earnings equations for faculty. There are a number of variables that will be created for faculty that will be useful in multiple studies described in this proposal. The experience variables will include years of seniority, years teaching in higher education institutions, and age. Variables will be created for a faculty member's current academic rank, the faculty member's institution classification according to the 1994 Carnegie classification scheme (Research, Doctorate, Comprehensive, and Liberal Arts) and the institution's public/private status. Turning to educational attainment, four variables will be created for the level of highest degree attained (doctorate, professional, masters, other). The research variables used in the analyses will include counts for career articles in peer-reviewed journals, career books, career chapters, and career patents. Control variables will also be created for geographical region (10 regions) and academic discipline (41 disciplines). Other personal variables to be created include the number of months of a faculty member's length of appointment and whether he/she is a chairperson. All of these variables have been used in previous national studies of faculty compensation, and can be derived through the NSOPF:99.

The main demographic variables in this study relate to gender, race, and family status. A dummy variable for gender will be created (1 if female, 0 otherwise). Five groups will be created for race/ethnicity, including Hispanic, non-Hispanic white, non-Hispanic black, non-Hispanic Asian, and all other race/ethnicity. Finally, three variables will be created for current marital status (married, separated/divorced/cohabitating, and single) and one variable for the number of dependents in the family.

The analysis will begin with the specification of single-equation models of faculty compensation of the form:

$$(3) \quad \ln Y_i = X'_i \beta + F_i \delta + R_i \gamma + M_i \alpha + \varepsilon_i$$

where all variables are defined as before plus R = multiple race/ethnicity categories and M = multiple family status variables (marital status and number of children). This particular analysis will be restricted to full-time faculty employed in four-year institutions. Preliminary analyses of the NSOPF:99 reveal that approximately 6,000 faculty will meet the qualifications for inclusion in this part of the analysis. The control variables used in X' will include the factors described above and may be refined based on an updated comparison to published studies on salary equity. To examine the interrelationships among factors, equation (3) will be expanded to include the interactions of race, gender and family status variables. This can potentially result in 40 interaction terms ($2 \times 5 \times 4$), which can be accommodated by the salary model given the number of observations for the model. More parsimonious models will be derived following refinement of the model and initial analyses. F-tests will also be used to determine if collective groups of interactions help to explain some of the variation in faculty salaries after accounting for the other controls in the model. The data will be weighted prior to analysis in order to take into account the sampling design used by NCES.

A similar approach will be used in the second phase of this project to examine other labor market outcomes for faculty, including their current rank, the type of institution in which they are employed, and whether they are employed full-time in academe. Due to the dichotomous nature of these variables, an alternative statistical technique known as logistic regression analysis will be used to estimate the parameters of the model. The models will include controls for many of the same factors used in the salary model, and gender, race, and family status will be interacted with each other to study the possible connections between these attributes. The

samples used in these particular studies will be broader than in the salary study since the objective is to look at career choices and patterns among faculty. For example, the study of whether faculty are employed full-time will naturally include both full-time and part-time faculty, while the models focusing on the type of institution will include faculty in both 2-year and 4-year institutions. A similar strategy was used by Toutkoushian and Bellas (2003) to examine this issue using the NSOPF:93.

The third phase of this research project will derive a new method for examining changes in pay equity across studies. As noted earlier, the multiple regression approach decomposes the total wage gap into the explained and unexplained portions. This project will seek to find a way to compare these estimates and as a result better understand how findings change over time. To illustrate, suppose that the total wage gaps for periods 1 and 2 in the two-equation method developed by Oaxaca (1973) is decomposed as follows:

$$(4) \quad (\bar{Y}_{m1} - \bar{Y}_{f1}) = b_{m1}(\bar{X}_{m1} - \bar{X}_{f1}) + \bar{X}_{f1}(b_{m1} - b_{f1})$$

$$(5) \quad (\bar{Y}_{m2} - \bar{Y}_{f2}) = b_{m2}(\bar{X}_{m2} - \bar{X}_{f2}) + \bar{X}_{f2}(b_{m2} - b_{f2})$$

Subtracting (5) from (4) and then adding and subtracting $b_{m2}\bar{X}_{m1}$ and $b_{m2}\bar{X}_{f1}$ and rearranging terms yields an expression for the change in the total wage gap between periods 1 and 2:

$$\Delta TWG = [b_{m2}(\bar{X}_{m2} - \bar{X}_{m1}) - b_{m2}(\bar{X}_{f2} - \bar{X}_{f1})] + [\bar{X}_{m1}(b_{m2} - b_{m1}) - \bar{X}_{f1}(b_{m2} - b_{m1})] + [UWG_2 - UWG_1]$$

The quantity in the first set of brackets represents the portion of the change in the total wage gap that is due to changes in the X's for males and females, when weighted by their respective coefficients in period 2. This study would explore the multiple ways in which this

decomposition can be accomplished, and then apply these methods to data from the NSOPF:93 and NSOPF:99 surveys.

This research would make significant contributions to the literature on equity for faculty in pay and employment in academe, and would be a natural extension of the work that I have published to date on this same topic. I have used the NSOPF:93 data to conduct studies on pay and employment equity for faculty by gender, race/ethnicity and marital status and have published these studies in the journals The Review of Higher Education, Economics of Education Review, The Journal of Higher Education, and The Quarterly Review of Economics and Finance. I have also published similar studies using data from individual institutions in the journals Research in Higher Education, The Review of Higher Education, and Economics of Education Review. Finally, I recently edited two volumes for the series New Directions for Institutional Research on various aspects of conducting studies of pay equity by gender and race/ethnicity in higher education. Taken together, these studies represent a body of knowledge centered around the measurement and analysis of equity in higher education. The fact that available evidence suggests that salaries inequities are still present in academe highlights the importance of continuing to analyze the pay and employment practices in higher education and finding ways to isolate disparities and design policies to correct them.

Innovative Aspects of Project

There are a number of gaps in the current literature on equity in academe. First, most studies focus on one personal characteristic in isolation without considering that the interaction of features may be equally important. One exception is Toutkoushian (1998b), who used the NSOPF:93 data to estimate wage equations for faculty by the combinations of gender and

race/ethnicity. He found that there were instances of pay gaps across racial/ethnic categories, but these gaps were significantly different by gender. His results also showed that while there was a positive return on marriage for faculty, this effect was concentrated solely on men. Nonetheless, this study did not explore all of the potentially important interactions between gender, race, and family status, and their impacts on earnings and other labor market outcomes.

A second limitation of the literature is that most of the attention of analysts has been on the earnings of faculty without regard to other important employment outcomes. Few studies, for example, have focused on whether there are rank differences among faculty by gender, much less race/ethnicity or family status and how they interact (see Toutkoushian, 1999). Other important employment outcome variables to consider would include whether the individual is able to secure full-time employment in academe, employment at research-intensive institutions, and/or private institutions with higher pay. Statistical models typically control for these differences, and as a result, interpret pay differences due to these factors as “justifiable.” Yet if faculty have unequal access to these job characteristics, then the level of pay disparity may be understated as a result.

Finally, a systematic approach does not exist for monitoring changes in employment equity across time. Typically, analysts use data from new national surveys to develop their own salary models and then try to compare their results to previous work. These results are difficult to compare, however, due to differences across studies in model specification and sample selection. Barbezat (1989, 1991) attempted to rectify this situation by advocating for using the same salary model specification in different surveys. However, this can be difficult to do in practice due to changes in survey instruments. Furthermore, this approach does not yield

information about why changes have occurred across time. All that is observed and analyzed are the unexplained wage gaps resulting from the various studies. If the unexplained wage gap has increased over time, then the key question of interest to researchers and higher education observers is: Why has the status of women changed?

This research project is innovative in that it aims to fill these three gaps in the literature by estimating a series of equations aimed at determining whether there are differences in salaries and employment opportunities for faculty by gender, race, and family status. Unlike previous research, however, the present study will carefully examine the interactions of these individual characteristics to learn more about the nature of employment differences for faculty. Secondly, this work will also consider employment variables other than pay, such as a faculty member's rank, the type of institution where he/she is employed, and whether the faculty member is employed full-time in academe. The final phase of this project will involve the development of new approaches for using NSOPF surveys to measure changes in equity across time and isolate changes. Together, this work will provide the education community with a more complete view of the current status of the profession with regard to equity in employment.

Policy Relevance

This project promises to have significant policy implications for the higher education community. Institutions of higher education are under intense pressure to find ways of demonstrating that they provide equitable working conditions for their employees. The finding of a persistent significant pay gap between male and female faculty, however, suggest to many that current policies are not working. As a result, this work has direct policy relevance for how institutions can measure and ultimately prevent labor market discrimination for faculty. The

results from the studies on the interactions of gender, race, and family status have the promise to help education leaders better understand the nature of pay differences across faculty, and thus create policies and procedures for ensuring that any differences in pay at their institutions are not attributed to personal characteristics such as gender, race, and family status that have no bearing on faculty productivity. In addition, the third research project will provide education leaders with a new procedure to decompose and understand the changing nature of pay differentials within academe.

Dissemination Plan

The dissemination plan for this project will center around the preparation of three research papers that will be suitable for publication in peer-reviewed journals or edited volumes on the topic of labor market issues for faculty. These papers will be produced sequentially and then submitted for presentation at annual conferences for the Association for Institutional Research (AIR) and the Association for the Study of Higher Education (ASHE). Following feedback from these presentations and from other colleagues, the papers will be revised and submitted to peer-reviewed journals in the field of higher education/institutional research/economics for publication consideration. The dissemination plan is summarized below:

<u>Date</u>	<u>Description of Activity</u>
December 2004	Complete first draft of paper #1 on effects of gender, race, and family effects on faculty pay
May 2005	Present paper #1 at the annual meetings of the Association for Institutional Research, San Diego, CA

June 2005	Complete first draft of paper #2 on new approach to analyze changes in the unexplained wage gap across time
August 2005	Revise paper #1 and submit for publication consideration to <u>The Review of Higher Education</u>
November 2005	Present paper #2 at the annual meetings of the Association for the Study of Higher Education, Philadelphia, PA
March 2006	Complete first draft of paper #3 on effects of gender, race, and family effects on other labor market outcomes for faculty.
June 2006	Present paper #2 at the annual meetings of the Association for Institutional Research, submit for publication consideration in <u>Research in Higher Education</u>
November 2006	Present paper #3 at the annual meetings of the Association for the Study of Higher Education
February 2007	Revise paper #3 and submit for publication consideration in <u>Economics of Education Review</u>

Audience for Project

The results from this project will be of interest to a number of different groups. Higher education faculty who study the academic labor market would certainly be interested in the methodological aspects of this work and the subsequent findings. Another interested group would include campus administrators who are responsible for ensuring that their institutions provide labor market conditions that are equitable for all faculty. The techniques developed in

this research project for measuring salary equity, for example, would be useful to administrators in their efforts to examine the state of salary equity on their campuses. Likewise, the institutional research community would find this project particularly valuable given that they are usually asked to provide analytical support to their institutions when conducting studies of salary equity. By introducing them to new techniques, institutional researchers will be able to respond more effectively to these requests and help their campuses design better policies that will promote equity across their faculty.

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Biographical Sketch

Principal Investigator: ROBERT KEVIN TOUTKOUSHIAN

Robert K. Toutkoushian is an Associate Professor in the Department of Educational Leadership and Policy Studies at Indiana University, where he teaches courses in education finance and the economics of education. He earned a Ph.D. in economics from Indiana University in 1991. Prior to his current academic position, Dr. Toutkoushian worked in the field of institutional research for thirteen years. From 1990 to 1996, he served as a Research Associate in the Office of Planning and Analysis at the University of Minnesota. In this capacity, Dr. Toutkoushian conducted a number of studies relating to faculty compensation and was responsible for the analytical work at the campus to examine pay policies and gender equity at the institution. From 1996 to June 2003, he served as the Executive Director for the Office of Policy Analysis at the University System of New Hampshire. Dr. Toutkoushian continued to conduct research into the compensation and employment practices of faculty, with a particular focus on inequities by gender, race/ethnicity, family status, and age.

Dr. Toutkoushian has conducted a significant amount of research on the topic of pay equity for faculty by gender, race, and family status. Since 1994, he has published nine articles in peer-reviewed journals and two articles in edited volumes on topics relating to pay and employment equity for faculty and staff in academe. In addition, he recently edited two volumes for the series *New Directions for Institutional Research* on issues related to conducting salary equity studies in higher education. The following is a list of these publications:

Publications by R. K. Toutkoushian Relating to Pay and Employment Equity in Academe:

Toutkoushian, R. (Ed.). (2003). Unresolved Issues in Conducting Salary-Equity Studies. New Directions for Institutional Research, no. 117. San Francisco: Jossey-Bass.

Becker, W., & Toutkoushian, R. (2003). Measuring gender bias in the salaries of tenured faculty members. In R. Toutkoushian (Ed.), Unresolved Issues in Conducting Salary-Equity Studies (pp. 5-20). New Directions for Institutional Research, no. 117. San Francisco: Jossey-Bass.

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Dr. Toutkoushian has had considerable experience with analyzing the national datasets on faculty produced by NCES. It is worth noting that five of the publications listed above utilized data from the NSOPF:93 survey. Dr. Toutkoushian is very familiar with the NSOPF survey instrument, and currently serves on a review panel to provide feedback to NCES on future versions of the survey. He has an understanding of the sampling design used by NCES in collecting the data and has published results using weighted data from the NSOPF:93. Dr. Toutkoushian has a current license for the restricted dataset version of NSOPF:99 and has

conducted some preliminary investigations into pay equity by gender using the data.

In addition to his research contributions, Dr. Toutkoushian has been active on this topic in other ways in the profession. He has taught professional development workshops on conducting salary equity studies for institutional researchers at national and regional conferences, and has served as a consultant to several institutions that have performed salary equity studies on their campuses.

Budget

A. Salaries and Wages

Principal Investigator: .15 FTE academic year @ \$79,275/year	\$11,891
<u>Graduate Assistant: .25 FTE academic year @ \$29,820/year</u>	<u>\$ 7,455</u>

Total Salaries and Wages	\$19,346
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B. Fringe Benefits

Principal Investigator @ 33.27%	\$ 3,956
<u>Graduate Health Insurance @ \$957 x .5</u>	<u>\$ 479</u>

Total Fringe Benefits	\$ 4,439
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C. Supplies

<u>Consumable Office Supplies</u>	<u>\$ 219</u>
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Total Supplies	\$ 219
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D. Travel

Travel to Two Conferences for Principal Investigator	\$ 4,000
<u>Travel to One Conference for Graduate Assistant</u>	<u>\$ 2,000</u>

Total Travel	\$ 6,000
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Total Project Costs (A+B+C+D)	\$30,000
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Budget Justification

A. Personnel

The principal investigator will receive salary and wages equal to 15% of his annual salary. This would enable him to receive a one-course reduction in teaching load for the fall semester of 2004 so that he could devote time to conducting the research described in this

proposal. The additional time needed to complete these research projects would be taken from his standard allotment of time and thus subsidized by Indiana University. The grant would also be used to pay the salary and wages for a quarter time (.25 FTE) graduate student from the Department of Educational Leadership and Policy Studies to work with Dr. Toutkoushian on these projects. The salary and wages are based on the average annual rate for a graduate student at Indiana University in the current year. The graduate student would be responsible for conducting literature reviews, creating variables, and performing preliminary analyses in support of these projects, and would devote ten hours per week to the project during the 2004-05 academic year.

B. Fringe Benefits

The fringe benefits are based on the rate of 33.27% of salary. This rate is set by the Indiana University Board of Trustees, and has been increased by 1% in anticipation of the actual rate that will prevail in the 2004-05 academic year. The only fringe benefits required by Indiana University to be covered by the grant for the graduate assistant on this project would be for one-half (.50) year of health insurance.

C. Supplies

The supplies budget would cover the costs of consumable office supplies including paper, postage, computer supplies, and telephone charges.

D. Travel

The travel budget would cover the cost for the principal investigator to present the findings from the first and second phases of this project at the AIR Forum in San Diego in May 2005, and the AIR Forum in May/June 2006. The budget would also allow for the graduate

assistant to present the findings from the first phase of this project at the AIR Forum in San Diego in May 2005. Below is a detailed breakout of the anticipated cost of attending the AIR Forum in 2005 and 2006:

Conference: Association for Institutional Research (AIR) Forum, May 2005

Location: San Diego, CA

Attendees: Robert K. Toutkoushian and Graduate Assistant

Anticipated Cost: \$2,000 per person or \$4,000 total

Breakdown per person:

Transportation = \$500

Hotel accommodations = \$800

Membership and conference fees = \$415

Meals and miscellaneous expenses = \$285

Conference: Association for Institutional Research (AIR) Forum, May/June 2006

Attendee: Robert K. Toutkoushian

Anticipated Cost: \$2,000 per person

Breakdown per person:

Transportation = \$500

Hotel accommodations = \$800

Membership and conference fees = \$415

Meals and miscellaneous expenses = \$285

The transportation costs include parking, airfare and ground transportation to/from the airport.

Hotel accommodations assume a six-day stay at the conference.

Current and Pending Support

The project described here currently receives no financial support from other agencies. The principal investigator for this project currently receives an annual grant to support research on education finance issues for the state of Indiana (project title: “Extending Indiana’s Capacity for School Finance Analysis”). The grant provides for funding to cover 7.5% of the principal investigator’s time, with the work being conducted during the summer each year.

Facilities, Equipment and Other Resources

The principal investigator has all of the facilities, equipment and resources necessary to complete the studies described in this proposal. All of these will be supplied by Indiana University. Indiana University will also assume responsibility for the indirect costs associated with this project.