Proposal Details

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Project Description I

Title:

<!--[if gte mso 9]--> College Graduates' Persistence in STEM Career Paths: Influential Factors, Major-Based Comparisons, and Gender-Related Differences

Statement of the research problem and national importance:

The primary interest of this project is to study the labor supply in science, technology, engineering, and mathematics (STEM) fields from the perspective of college graduates' choosing an occupation that is consistent with their academic training. Scholarly endeavors to understand the occupational choices and career outcomes can be found in educational, sociological, and economic research. However, inconsistent terminology and classifications have been used to define occupational choices and/or career outcomes. For example, "occupational outcome" was classified into five categories by Keane and Wolpin (1997): white-collar occupation, blue-collar occupation, joining the military, staying at home, and returning to school. Ehrenberg (1991) took a different approach and had four options: enroll in graduate school, enroll in a first-professional degree program, pursue foreign study, or work fulltime. What makes this project unique is its focus on the consistency between the academic training and occupational choice of college graduates, an aspect of occupational progress that has largely been unattended.

To be specific, the career outcome is defined as how closely a college graduate's job was related to the undergraduate field of study, in combination with the work status (fulltime, part-time, attending graduate program, and unemployed). Factors that have potential influence on the career outcomes will be examined, and in-depth comparisons will be made between college graduates who majored in STEM disciplines and their non-STEM counterparts, and between men and women in STEM fields. The goal is to understand the persistence of STEM students during their post-college stage, and to further study the underlying causes for the insufficient labor supply and for gender disparity in the STEM workforce. Upon completion, this project will make available a more accurate estimate of labor supply in the STEM fields, and propose policy changes if interventions are deemed necessary.

The importance of this project can be evaluated from the following dynamics. At the national level, the rapid development and increasing popularity of technology require a workforce "strong in science and engineering … in order to keep the nation at the forefront of the 'new economy'" (Staniec, 2004, p. 549). Although statistics show that the enrollment of students in STEM disciplines has increased, it is far from meeting the goal to double the number of STEM graduates by 2015 (Reid, 2008; Whalen & Shelley, 2010). Not only has the lack of persistence of students in STEM majors during college been a documented problem (e.g., Austin & Austin, 1993; Griffith, 2010), but attrition takes place after students graduate from college and choose a career path inconsistent with their college major (Joy, 2010). Unfortunately, having a career path different from one's college major has largely been neglected in research on career outcomes. Using the data from a nationally representative, longitudinal survey of college graduates, this project is designed to examine student transition from college to their chosen career paths and to breach the knowledge gap regarding what factors affect their persistence in STEM careers.

Second, this project is intended to address the national attention to the underrepresentation of women in the STEM fields. Although a large number of studies have confirmed labor-market segregation and wage differences between genders (Joy, 2000; Oaxaca, 1973; Toutkoushian & Conely, 2005; Umbach, 2007), limited understanding of the specific reasons that lead to the attrition of women in the STEM workforce makes it difficult to place the focus where it should be in order to keep women persistent in their career development (Griffith, 2010). Given that more women than men drop out of the STEM fields at each stage of education and career development (Joy, 2000; Sonnert & Holton, 1995), this project will examine gender disparity in the STEM workforce from a longitudinal perspective with special attention to the critical transition from college to the labor force.

Finally, this project may provide timely information to the current debate of immigration reform at the national level. Not only do non-U.S. citizens account for a great share of STEM doctoral degree recipients (Perna, 2004), their entry into the skilled labor force is considered critical to the national economic and strategic interest with the claimed shortages of domestic labor supply in STEM fields (Jorgenson & Wessner 2007; Sana, 2010). Taking advantage of a nationally representative sample of college graduates, this project may help the estimate of the actual size of domestic STEM supply by extending the inquiry from bachelor's degree recipients to their career choices over a decade after graduation.

Ultimately, the research findings are expected to benefit policy making by identifying feasible interventions for the nation to fully realize the potential productivity in STEM fields in order to meet its great need for a skilled workforce.

Review the literature and establish a theoretical grounding for the research:

During the last few decades, economists, sociologists, and educational researchers have examined the occupational choices and career outcomes of college graduates from different theoretical perspectives as well as by considering a variety of variables (Behrman et al., 1998; Griffith, 2010; Seibert et al., 2001; Stoecker & Pascarella, 1991; Whalen & Shelley, 2010). As observed by Goyette and Mullne (2006), career-related inquiries branch out into three directions: 1) gender and race imbalance in the selection of fields of study; 2) factors influencing entry into STEM fields; and 3) occupational outcomes for college students.

Gender and Race Imbalance. **Underrepresentation of women in STEM has remained a troublesome reality in college and graduate school enrollment. Although national statistics show that women account for over 55% of bachelor's degree recipients, they are still the minority in STEM fields (Joy, 2000; Staniec, 2004). The underrepresentation of women is already apparent at the time college students declare a major. Further, studies have found that the attrition of women from STEM majors is significantly higher than that of men (Griffith, 2010; Whalen & Shelley, 2010). Academic performance, socio-psychological variables, and institution characteristics have been identified as important factors influencing the persistence of women in STEM disciplines. Gender-related difference was also found in the first post-college job, implying that the "leaky pipe" continues at the post-college stage (Joy, 2000).**

Factors Influencing Major Selection. **Considerable attention has been focused on the gendered patterns of choosing college majors and the factors predicting the selection of science majors (Jacobs, 1986&1995; Simpson, 2001). Gender, race/ethnicity, academic ability, labor market returns, and family background are found to bear a significant relationship with the choice of college majors (Goyette & Mullne, 2006).**

Occupational Outcomes. **Among different occupational outcomes, a stronger attention has been focused on graduate school enrollment (Ethington & Smart, 1986; Perna, 2004; Zhang, 2005). One study indicated that men are more likely than women to pursue graduate education (Joy, 2000). Career aspirations, and career attainment are among a variety of variables also examined (Smart, 1988; Stoecker & Pascarella, 1991).When making a career decision, individuals take into consideration many factors, including "financial reward, autonomy, recognition, intellectual stimulation, flexibility, creative expression, and sense of social purpose" (Mullen et al., 2003, p. 146; Stolzenberg, 1994).**

It is worth mentioning that, although career outcomes can be measured from various perspectives, economic theory places wage as the central role in allocating human resources in the labor market (Flyer, 1997). Individual earning power has been the most frequently used indicator of labor market returns and the focus of numerous studies of career outcomes in economics and education (Flyer, 1997; Smart, 1988; Staniec, 2004; Goyette & Mullen, 2006).

Theoretical Perspectives**. Two theoretical premises permeate the sociological and educational studies of career attainment: the meritocratic theory and the social reproduction theory (Mullen et al. 2006; Smart, 1988). Meritocratic theorists claim that academic ability and educational performance are the principal determinant of individual success, whereas the social reproduction theorists view social original as the primary determinant of individual success and the educational system as a site of class reproduction that perpetuates social inequity. Extant research suggests merits to each perspective. In economics, though, human capital theory is the dominant framework in understanding the career patterns of college graduates and gender-based labor-market segregation and salary differences (Keane & Wolpin, 1997).**

Theoretical Grounding of the Project. **Extant literature lays the foundation for the intended inquires into the career choices of STEM students; nonetheless, this project needs to overcome two challenges: 1) There is a wide spectrum of variables to be considered, including demographic characteristics, family background, human capital, academic attainment, institutional variables, and career aspirations; and 2) Several theoretical views are available, including meritocratic, social reproduction, and human capital theories, but none can "provide an accurate portrayal of the attainment process" (Smart, 1988, p.55) .**

These challenges lead the principal investigator (PI) to a theoretical framework that appears to be more comprehensive and allows consideration of a wide range of variables: An expanded econometric theoretical framework introduced by Perna (2004). It "assumes that individuals make decisions by weighting the monetary and nonmonetary costs against the monetary and nonmonetary benefits for all possible alternatives and then selecting the alternative that maximizes utility with respect to individual preferences, tastes, and expectations" (Perna, 2004, p.489). Relying on the argument that individuals most likely have to make decisions based on imperfect information (Ehrenberg, 1991), Perna used social and cultural capital as appropriate proxies for "individual preferences, tastes, and expectations" in order to quantify the nonmonetary variables.

The importance of social and cultural capital in academic and career attainment has been well documented. Cultural capital can be interpreted as an individual's family background and parent-related factors to define one's class status (Perna, 2004). It has been empirically connected with students' academic mastery (Goyette & Mullne, 2006), social experience and career attainment (Stoecker & Pascarella, 1991), students' pursuit of graduate education (Ethington & Smart, 1986), accumulation of social capital (Bourdieu & Passeron, 1977&1979), facilitating upward mobility (Lamont & Lareau, 1988), and making choices on college major (Goyette & Mullne, 2006).

Social capital refers to one's social networks and connections that an individual builds upon her/his relationships with others through social interactions or social structures (Morrow, 1999). The significance of social capital in career success has been verified empirically (Coleman, 1988; Seibert et al., 2001). Students' social environment and connection to the institution are factors contributing to personal gains, persistence in STEM majors, continuation to graduate education, and career attainment (Griffith, 2010; Pascarella & Terenzini, 2005; Stoecker & Pascarella, 1991).

This final choice of theoretical framework has the following advantages. First, by modeling career outcomes in connection with social and cultural capital, it allows simultaneous manifestation of meritocratic theory and social reproduction theory. Second, by including both "monetary and nonmonetary" factors, it adds an economic view to the sociological variables. Finally, this framework can be slightly modified to have the costs and benefits arranged in a longitudinal and sequential fashion, showing the career destination as the result of a career path, along which an individual moves over time, as suggested by microeconomic models of career choices (Behrman et al., 1998).

Describe the research method that will be used:

Three specific research questions will be addressed in this project and will be answered using different statistical methods. As discussed in detail below, the selection of variables and analytical procedures emphasizes the heterogeneous characteristics of the populations in their education and career decision-making process.

Question 1. Are there observed differences in the career outcomes between college graduates who majored in STEM vs. non-STEM disciplines? Between women vs. men in STEM fields?

For this question, descriptive analysis will be the primary approach in order to understand the differences in the career outcomes of college graduates by groups (STEM vs. non-STEM majors; women vs. men) and their differences in potentially influential factors, including demographic factors, family background, academic performance, institutional variables, career aspirations, and career attainments. When repeated measures are available, comparisons will be made using data from 1994, 1997, and 2003.

Question 2: What factors influence the career choices of college graduates? How do their influences differ for individuals in STEM and non-STEM fields?

To answer this question, multinomial logit models will be used. The dependent variable, career outcome, has seven categories: full-time job closely related to college major; part-time job closely related to college major; full-time job somewhat related to college major; part-time job somewhat related to college major; full-time job not related to college major; part-time job not related to college major; and unemployed. The independent variables are in the following seven blocks:

1) Demographic characteristics, among which, age when received bachelor's degree may be used as an indicator of nonmonetary cost for college education because those who received their degree at older age may have a shorter time horizon to realize an increase in lifetime earnings (Perna, 2004).
2) Family backgrounds that are proxy measures of cultural capital;
3) Academic performances that are considered as initial stock of human capital;
4) Institutional variables that are proxy measures of social capital;
5) Monetary costs and benefits;
6) Career aspirations that are factors extracted from 14 items on future job choices; and
7) Career attainments that are proxy measures of nonmonetary benefits.

Those variables are selected in accordance with the research objective to evaluate individual career outcomes using the theoretical framework that considers the monetary and nonmonetary costs, the monetary and nonmonetary benefits, and social and cultural capital.

The analysis will be conducted separately for STEM and non-STEM graduates. In addition, identical model structure will be used for the 1994, 1997, and 2003 data times since career-related variables were measured repeatedly in those years. The models of identical structure over times permit a longitudinal view of career progress, and separate models for STEM and non-STEM graduates will reveal differences in career choices across major fields and the sources of the differences.

With literature showing that different considerations may lead to an individual's decision to pursue graduate education (Griffith, 2010; Pascarella & Terenzini, 2005; Stoecker & Pascarella, 1991), a separate multinomial logit model will be constructed for individuals who were enrolled for or have completed a graduate degree. Using data collected in 2003, the graduate major will be compared with individuals' bachelor degree major to see if one continued in the STEM fields for the graduate training. Thus, the dependent variable has four values:

both undergraduate and graduate programs in STEM fields; both undergraduate and graduate programs in non-STEM fields; having a undergraduate degree in non-STEM fields, but graduate program in STEM fields; and finally, having a undergraduate degree in STEM, but graduate program in non-STEM fields. The independent variables will include the first six blocks from the above career outcome models. In addition, the major field of the undergraduate degree will be used to indicate nonmonetary costs because it has been considered as a proxy for foregone earning and other labor market opportunity in studies of the same data set (e.g., Perna, 2004). Other cost-related measures are employer benefit for graduate studies and availability of assistantships.

Multinomial Logit Models. The multinomial logit model, a special case of the general log-linear model, is chosen as the statistical model based on the categorical nature of the dependent variable. Having one category of the dependent variable as the reference group, multinomial logit models estimate the log-odds of other single outcome categories occurring relative to the reference group. Multinomial logit models have been used frequently in sociological, educational, and economic studies (e.g., Flyer, 1997; Perna, 2004; Staniec, 2004), thus, further discussion of this statistical approach is omitted.

Question 3: Are there significant differences in the career outcomes for men and women in STEM fields? What are the determinants of these differences?

Sophisticated analysis is needed in order 1) to identify the career-related differences between genders within STEM fields, 2) to identify the underlying factors of the observed differences, and 3) to provide a longitudinal perspective on the gender-based patterns, if any. Therefore, *multi-group structural equation modeling* becomes the most appropriate statistical procedure. Based on findings of extant studies on occupational outcomes, a structural model is proposed in which the determinants of career attainment are depicted along with their causal relationships (see the attached file). A unique hypothesis in this model is the temporal effects of career choice and career attainment from 1994, 1997 to 2003. If confirmed, the model suggests the transition from college to labor force to be a critical point of an individual's career development, which mediates the impacts of academic performance, family background, and undergraduate experience on future career attainments. This model will be constructed separately for women and men, so that between-genders comparisons can be made not only regarding the causal effects between the factors, but also the longitudinal career progress over time. Note that Kline (2004) may serve as an informative source on multi-group structural equation modeling and further discussion on this procedure is omitted due to space limitation.

If sufficient samples are available, a multinomial logit model will be used to study gender differences in STEM students' pursuit of a graduate degree, as previously discussed in Question 2. Models of identical structure will be constructed for women and men separately, so that comparisons can be made and potential gender-related patterns may be identified.

Uploaded Appendix Document(s):

- **The structural model of career attainment**

Project Description II

Will you use NCES target dataset? Yes

Please check all NCES datasets that apply
- Baccalaureate and Beyond Longitudinal Study (B&B)

Explain why each dataset best serves this research. Include a variable list for each dataset used.
This project will use the restricted-use data, Baccalaureate and Beyond Longitudinal Study (B&B: 93/97/03), a survey sponsored by the NCES that tracks students' education and work experiences after they received a bachelor's degree during the 1992-93 academic year. The 1993 B&B cohorts are a representative sample of graduating seniors in all majors, and are followed up by surveys in 1994, 1997, and 2003. In this data, information is available on individuals' demographic and family backgrounds, undergraduate institution characteristics, undergraduate experience, expectations regarding graduate study and work, workforce participation, and entry into and persistence through graduate school programs. The B&B data best serve this project because variables are available so that evaluation of individual career outcomes can be made using the

proposed theoretical framework that emphasizes the monetary and nonmonetary costs/benefits and social and cultural capital of college graduates.

In addition to bachelor degree major and how closely related the current job is with the undergraduate major, other major variables include:
1) Gender, race/ethnicity, and citizenship (1992), and age at bachelor's degree;
2) Parents' highest education, family income, and father/mother not born in U.S.;
3) SAT scores, cumulative undergraduate GPA, and GPA in all math courses taken;
4) Carnegie classification of undergraduate institution, average SAT of entering students, cohort graduation rate, and institution selectivity;
5) Direct monetary contribution from parents (1992–93), adjusted total cost less total aid (1992–93), and annual income at work;
6) Fourteen items on future job choices;
7) Number of hours worked/week, job challenge, overall satisfaction, satisfaction with job security, and with promotion.

Will you use NSF target dataset? No

Explain why each dataset best serves this research. Include a variable list for each dataset used.

Will you address the NPEC focus topic? Yes

If yes, please briefly describe:
Completing an undergraduate degree is the first step to a successful career. This project goes beyond the traditional focus on graduate rates as the measure of institutional effectiveness and student success. Instead, the institutional effectiveness is examined from the perspective of how effectively higher education institutions prepare students for a rewarding career. In addition, student success is studied as how sufficiently their academic training in college contributed to their career development. It is unclear how practical it would be for institutions to collect job-related information regularly from students. However, this project serves the purpose to argue that the career-related perspective on measuring institutional effectiveness and student success may need more scholarly attention than what it has now, especially when the labor market and choice of occupation for college graduates becomes significantly more important with the continued growth of participation rate in higher education (Flyer, 1997; Mullen et al., 2003).

Project Description III

Provide a timeline of key project activities:

Time line	Activities
Jan 15 – Apr 1, 2011	Apply for the restricted-use B&B data from the NCES
Apr 15 – Apr 30, 2011	Prepare a paper proposal for the Association for Studies in Higher Education (ASHE) 2011 annual conference
May 1 – Jun 30, 2011	B & B data preparation and pre-process
Jul 1 – Jul 14, 2011	Descriptive analysis (Research question 1)
July 15 – Jul 31, 2011	Prepare a paper proposal for the American Educational Research Association (AERA) 2012 annual conference
Aug 1 – Oct 10, 2011	Use multilevel logit models to answer Research question 2.

Oct 1 – Nov 4, 2011	Prepare a manuscript to submit the findings for journal publication
Nov 5 – Nov 8, 2011	Submit 1st manuscript and the draft ASHE annual conference paper for review and approval by NCES
Nov 17 – 19, 2011	Present the ASHE conference paper at Charlotte, NC
Nov 20 – Nov 30, 2011	Revise and submit the 1st manuscript for journal publication
Dec 1 – Dec 18, 2011	Prepare the AIR-grant mid-year progress report
Jan 1 – Feb 29, 2012	Use multi-group structural equation modeling to study gender differences in the career paths of STEM graduates (Research question 3)
Mar 1 – Mar 31, 2012	Prepare a 2nd manuscript to submit the findings for journal publication
Apr 1 – Apr 3, 2012	Submit the 2nd manuscript and the draft AERA annual conference paper for review and approval by NCES
Apr 4 – Apr 30, 2012	Revise and submit the 2nd manuscript for publication
Apr 14 –Apr 17, 2012	Present AERA conference paper at Vancouver, Canada
May 1 – May 14, 2012	Prepare for the AIR annual forum Presentation
May 15 – May 31, 2012	Prepare the AIR Grant Final Report
Jun 2 – Jun 6, 2012	Present cumulative findings at the AIR annual forum in New Orleans, LA
June 7 – June 30, 2012	Prepare a 3rd manuscript to submit for journal publication

List deliverables such as research reports, books, and presentations that will be developed from this research initiative:

The PI plans to have conference presentations and journal articles as deliverables resulted from the proposed project. Given the research scope and depth of the project, the major results will be organized into deliverables at three conferences.

Tentatively, based on the findings of research questions 1 and 2, the first conference paper will be:
1) Career outcomes of STEM and non-STEM college graduates: Persistence in majored-field and influential factors in career choices

Based on the findings of research questions 1 and 3, the second conference paper will be:
2) Gender-related patterns in the career paths of college graduates in STEM fields? Understanding the persistence and career choices of men and women from a longitudinal perspective

Based on the findings related to graduate school enrollment in research questions 1, 2, and 3, the third conference paper will be:
3) Graduate school enrollment: Examining the decision making through major-based comparisons and gender-related differences

The three conference papers will be revised based on feedback at the presentations and finalized into three manuscripts for journal publication. The three journal articles mostly like will have the same titles:
1) Career outcomes of STEM and non-STEM college graduates: Persistence in majored-field and influential factors in career choices
2) Gender-related patterns in the career paths of college graduates in STEM fields? Understanding the persistence and career choices of men and women from a longitudinal perspective

3) Graduate school enrollment: Examining the decision making through major-based comparisons and gender-related differences

Describe how you will disseminate the results of this research:

This project is proposed with educational scholars and educational policy makers as the primary audiences. Plans for dissemination are created in order to reach these audiences. Thus, scholarly-oriented outlets will be the major dissemination choices, including presentations at the annual conferences of educational professions and publications in peer-reviewed higher education journals.

Specifically, results of this project will be disseminated at three conference presentations:
1) The Association for Studies in Higher Education (ASHE) 2011 annual conference at Charlotte, NC (estimated travel cost: $1,400);
2) The American Educational Research Association (AERA) 2012 annual conference at Vancouver, Canada (estimated travel cost: $1,700); and
3) The Association for Institutional Research (AIR) 2012 Annual Forum at New Orleans, LA (estimated travel cost: $1,500).

In addition, at least three manuscripts will be prepared to report the findings of this project and submitted for journal publication. The possible journal outlets include, but are not limited to, *Research in Higher Education, Journal of Higher Education,* and *Review of Higher Education*.

Provide a reference list of sources cited:

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In order to meet the word limits, some of the references had to be removed from the proposal text.

IRB Statement

Statement of Institutional Review Board approval or exemption:

To conduct the proposed project, the PI will use an existing secondary data set, Baccalaureate and Beyond (B&B), provided by the NCES through a restricted-use data license. According to the guidelines on human subject research by the University of Memphis, a project that uses existing data will require a "Request for Exemption" from the Institutional Review Board (IRB) within the Office of Research Support Services. The PI submitted the required IRB documents for a "Request for Exemption" on January 3rd, 2011. The regular process takes approximately four weeks before a response can be heard from the IRB. Thus, the PI expect the IRB review to be completed by early February 2011, which allows sufficient time to move forward with the project upon receipt of the data from NCES.

Statement of Use of Restricted Datasets

The proposed research will use the restricted-use data of the Baccalaureate and Beyond Longitudinal Study (B&B: 93/97/03). B&B is one of the national surveys sponsored by the National Center for Educational Statistics (NCES). In order to protect personally identifiable information, researchers are required to apply for a restricted-use data license in order to access and use non-public survey data. The PI has successfully obtained a license on the National Study of Postsecondary Faculty (NSOPF), also restricted-use data provided by the NCES, and is aware of the renewed application requirements through sessions at the 2010 AIR National Summer Data Policy Institute. Thus, the University of Memphis and the PI fully understand the compliance

issues as set forth by the IES Data Security Office within the NCES regarding the use of restricted datasets. The PI, on behalf of the University of Memphis, will submit a formal application in January 2011 for the restricted-use data license via the electronic application system at http://nces.ed.gov/statprog/instruct.asp to provide information on data requirements, a research plan, a security plan, affidavits of nondisclosure, and other required documents as detailed in the NCES restricted use data guideline.

The PI is fully aware of and will comply with the requirement that that all materials prepared for publication based on the restricted-use data must be submitted to the Data Security Office at the NCES for review and approval prior to disclosure to non-Licensed persons.

Biographical Sketch

Yonghong Xu's Biography Sketch

The PI, Dr. Yonghong Jade Xu, is an associate professor at the University of Memphis. She received her M.A. in Educational Psychology in 1999, M.S. in Management Information Systems in 2001, and Ph.D. in Educational Psychology in 2003 from the University of Arizona. Her academic expertise is in educational statistics and quantitative research methodology. Having started in 2004, Dr. Xu has been a fulltime faculty member in the Educational Research program at the University of Memphis and teaches graduate courses on introductory and advanced statistical methods and research methodology.

Dr. Xu maintains an active research agenda in two areas. Her primary research interest is to investigate factors influencing the compensation, turnover, and work life quality of university faculty; particularly women faculty in male-dominated fields, including science, technology, engineering, and mathematics (STEM). In this area, large-scale national surveys have been the primary data sources and her research using the National Study of Postsecondary Faculty (NSOPF) has resulted in ten publications. Of these publications, two of the sole-authored articles "*Gender disparity in STEM disciplines: A study of faculty attrition and turnover intentions*," and "*Faculty turnover: Discipline-specific attention is warranted*," were published in *Research in Higher Education*, one of the three leading higher education research journals. She has also successfully completed research projects in STEM disciplines supported by external and internal funding sources. One of her research projects was funded by the AERA Grants Program, in which she investigated the work conditions of women faculty in male-dominated fields and benchmarked the progress, if any, from 1993 to 2004. In 2007, Dr. Xu conducted a mixed-methods study funded by an internal grant at the University of Memphis to examine the gender differences in the informal professional networks of faculty in STEM disciplines.

The second research interest of Dr. Xu is to examine the applicability and effectiveness of various statistical techniques in analyzing data of different structures. Her dissertation compared the prediction accuracy of linear multiple regression with Bayesian Belief Networks (a nonparametric application of Bayesian statistics) using a national data set. A section of the findings was initially presented as a conference paper at the AERA and recognized with the honor of Distinguished Paper Award. After joining the University of Memphis, she has had several publications on this topic and also used Bayesian networks as the analytical approach in several research articles.

Dr. Xu has accumulated years of experience in analyzing large-scale data sets, as well as experimental and quasi-experimental data in education and related disciplines. In addition to using large-scale national data in her own research endeavors, she often helps colleagues and students with their projects using national databases, such as the Longitudinal Study of the Vocational Rehabilitation Services Program and the national database of the Head Start programs. She is proficient with SAS and SPSS programming for data analysis. Having taught a course on structural equation modeling for four years, she has accumulated sufficient experience in writing SIMPLIS syntax using LISREL. She also uses Access, and Excel, as well as other database software (e.g., Oracle database management system) to manage and manipulate large-scale datasets.

Dr. Xu's inquiry into the underrepresentation of women faculty in STEM disciplines made her realized that the root of gender imbalance in science and technology goes far beyond the academic professions. Thus, she has committed to extending her research into the career choices of college graduates. She attended the AIR National Summer Data Policy Institute in summer 2010 to get acquainted with the national data sources and has become interested in and gained knowledge about the B&B survey. Having spent months on an extensive literature review on occupational outcome and career patterns of college students, Dr. Xu presents her research plan and ideas in this proposal and is confident in its quality, importance, and feasibility.

Dr. Xu has fourteen articles published in referred journals, two invited chapters, four manuscripts currently under review, and sixteen peer-reviewed presentations at national conferences.

Budget Requirements

Yonghong Xu' Budget

Personnel-Time on Project
% (FTE) Academic Year: 20.00
% (FTE) Summer: 71.00

Personnel-Salary & Benefits
Academic Year: $ 80369.38
Summer: $ 26790.24

Graduate Research Assistant's Budget

Personnel-Time on Project
% (FTE) Academic Year: 0.00
% (FTE) Summer: 0.00

Personnel-Salary & Benefits
Academic Year: $ 0.00
Summer: $ 0.00

Total Salary and Wages: $35094.95

Travel: $1500.00
Other travel related expenses: $3100.00
Other research expenses: $305.05
Total Request: $40000.00

Funding History

The PI has no prior, current or pending external support for the proposed research. The PI has never received research funding from AIR. The PI has successfully completed research projects supported by one external source in 2006 and one internal source in 2007 as listed below:

Xu, Y. (2006). *Understanding the work experience of women faculty in nontraditional fields: Bayesian modeling of the 1993, 1999, and 2004 NSOPF Data.* Funded by the AERA Grants Program, sponsored jointly by the National Science Foundation and the National Center for Education Statistics. Feb 2007- Jan 2008, $19,995.

Xu, Y. (2007). *Professional networking and career development for women faculty in male-dominated disciplines.* Funded by the Faculty Research Grants Program, University of Memphis. July 2007 - June 2008. $6,500.