ASSOCIATION FOR INSTITUTIONAL RESEARCH
2009 DISSERTATION GRANT APPLICATION

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Title of Proposal

Moving Toward A Truer Picture: Factors Affecting Undergraduate Degree Completion and Time-to-Degree

Statement of the research problem and national importance

The purpose of this study is to identify the factors affecting undergraduates' 4-year degree completion and time-to-degree. American higher education institutions are facing challenges to ensure their stakeholders that they are worth the tax appropriations and

ever-increasing tuition(Huisman & Currie, 2004). This accountability pressure forces colleges and universities to prove their effectiveness and efficiency. A readily apparent example of federal government concern with this problem is the existence of the IPEDS Graduation Rate Survey (GRS) (Knight & Arnold, 2000).

U.S. colleges and universities are failing to graduate a greater number of students than ever before. According to the GRS and other research, in spite of considerable growth in access degree completion rate has changed little (Adelman, 2006; Horn, Berger, & Caroll, 2004). For the last three decades, the percentage of high school graduates entering college immediately after high school has increased more than 25 percent, from 45.9 percent in 1974 to 71.5 percent in 2004 (NCES: Digest of Education Statistics). In contrast, the 6-year graduation rate remains at 66-67 percent for 1972, 1982, and 1992 high school graduates who enrolled at a 4-year college (Adelman, 2004, 2006; Horn, 2006). In addition to this, the percentage of students who are still enrolled (persisters) has been increased from 13.3% to 17.2%, which indicate an increase in the percentage of students who are taking longer time in their efforts to complete a degree.

What gives young adults a substantial benefit of college is not simply access to higher education, but a degree. Adelman (2006) argued that degree attainment is the true goal for stakeholders. Although students experience cognitive and psychosocial changes during the college years (Pascarella & Terenzini, 2005), the labor market rewards a college degree far more than college attendance alone (Adelman, 2004; Cabrera, Burkum, & Nasa, 2005; DesJardins, Ahlburg, & McCall, 2002 ; Kim, 2007; Lotkowski, Robbins, & Noeth, 2004). For example, the income difference between college completers and high school graduates contrasts strikingly with the comparison between high school graduates and college dropouts (Kim, 2007). Considering the median annual income in 2004, a year-round, full-time male worker with a bachelor's degree who is more than 24 years old earned $57,220, while college dropouts earned, $41, 895, and high school graduates, $35,725 (Snyder, Tan, & Hoffman, 2006). On top of this income difference, college graduates appear to live healthier lives, their spouses are more educated, and their children do better in school (DesJardins, Kim, & Rzonca, 2002-2003; Pascarella & Terenzini, 2005).

Perceiving that economic opportunity and social benefit in the U.S. is increasingly based on postsecondary education, citizens are now accepting the degree completion to be a necessity for success. Consequently, they, including state legislatures, believe graduation rate is a reasonable measure of accountability, and criticize colleges for students' failure to complete a degree or failure to complete in a timely manner (Adelman, 1999; DesJardins et al., 2002 ; Knight & Arnold, 2000).

Reflecting this recognition, graduation rate is being used as a critical measure of performance in higher education institutions. At the national level, the biennial series of the report Measuring Up since 2000 has adopted degree completion as one of its critical criteria for

assessing each state's performance (Callan, 2006). Some states, such as Florida, Louisiana, Ohio, and South Carolina also adopted graduation rate as a criterion for evaluating institutional performance (Knight & Arnold, 2000). Other states have considered various plans, such as restricting financial aid beyond the fourth year and increasing tuition for students who take more than the required number of credits needed to graduate (DesJardins et al., 2002-2003). Further, higher education governing boards including those of Oregon and Texas have proposed policies to address increased time-to-degree (Knight & Arnold, 2000).

Higher education policies such as linking funding to performance and penalizing students who take more credits than required must be based on reliable research. It seems that graduation rate and time-to-degree are widely agreed upon as reliable measures, however, some argue that six years is too short a time period for many students (Callan, 2008) and others question whether lengthened time-to-degree is the fault of malingering students or of institution themselves (Knight & Arnold, 2000). Measuring Up 2008 also points out that more research needs to be done on time-to-degree (Callan, 2008). The research questions addressed in this study, factors affecting 4-year undergraduate degree completion and time-to-degree, is therefore timely and the results are expected to shed light on the related policy and practice.

Review the literature and establish a theoretical grounding for the research

Research findings on degree completion and time-to-degree often conflict because of the difference in unit of analysis; institutional or system level. A national study disclosed that only 43 percent of all college students remained at the first institution at which they initially enrolled and around 60 percent of undergraduates have attended more than two institutions in the 1990s (Adelman, 2006). With this complexity of students' enrollment patterns, most studies conducted at the institutional level limit their analyses to a subset of admitted students who are first-time, full-time, degree-seeking, fall-semester enrollees (DesJardins, Ahlburg, & McCall, 1998; Knight & Arnold, 2000 ; Lee, Huesman, Brown, Kellog, & Radcliffe, 2007). However, the lack of recognition that dropping out does not necessarily mean failure and that the unit of analysis is not the entire higher education system are often criticized (Adelman, 1999; Cabrera et al., 2005). Research findings on the factors affecting degree completion and time-to-degree are analyzed by the following categories; pre-college characteristics, college performance, college experiences, and financial aid. Pre-college characteristics are of great interest to policy makers. Findings on this imply that female students and Asian students are doing a better job in attaining a bachelor's degree than their male or black and Hispanic counterparts (Adelman, 2004; DesJardins et al., 2002-2003; Horn, 2006; Titus, 2006a, 2006b). However, Adelman's finding conflicts with this; minority status had no effect on degree completion once collegiate performance is considered (Adelman, 2006).

Another conflicting finding is about students' academic preparedness; introducing the concept of academic resources made up of high school curriculum, test scores, class rank and GPA, Adelman argued that the intensity and quality of high school curriculum are the most powerful predictor of degree completion (Adelman, 2006). However, the impact of the academic resource variable decrease by 36 percent once an actual academic performance variable (GPA) is added (DesJardins, McCall, Ahlburg, & Moye, 2002). DesJardins et al. (2002) argued that what students do with academic resources while they stay in higher education is more important than the academic resources that students bring with them to college. These studies do agree on the positive association between SES and degree completion (Adelman, 1999, 2006; Cabrera et al., 2005; Kim, 2007; Noxel & Katunich, 1998; Titus, 2006a, 2006b).

While most during college factors are associated with the rate of degree completion across all students, academic performance in college (GPA), is the single most significant determinant of degree attainment (Adelman, 2004, 2006; Lee et al., 2007; Titus, 2006a, 2006b). Findings on remedial course attendance conflict among studies (Adelman, 1999, 2006; DesJardins et al., 2002 ; Huesman, Brown, Lee, Kellogg, & Radcliffe, 2007). Adelman (2006) concluded that remediation did not make a strategic difference in degree completion, whereas Huesman et al. (2007) identified its negative association with degree completion.

Students' college enrollment patterns have significant impacts on degree completion. Among those patterns continuous enrollment is the most powerful variable in explaining degree completion and time to degree (Adelman, 2006; Cabrera et al., 2005; Pascarella, 1985). Transfer from a community college to a four-year college and transfer from one four-year college to another have a positive impact on degree attainment (Adelman, 2006; Cabrera et al., 2005; Pascarella, 1985). One of the most hazardous characteristics that has negative impacts on degree completion is withdrawing from a class without any penalty and repeating it (Adelman, 2006; Cabrera et al., 2005; DesJardins et al., 2002; Lee et al., 2007).

Financial aid is one of the most important variables in higher education research. The chance of completing a college degree is negatively associated with unmet financial need and working more than 10 hours per week (DesJardins et al., 2002; Titus, 2006a, 2006b). Findings on financial aid indicate that loans and grants are positively related to graduation (Kim, 2007; Titus, 2006a, 2006b), and their effect declines as time passes (Cabrera et al., 2005; DesJardins et al., 2002).

As its guiding theory, this study adopts the 'Degree Commitment Model' advanced by Noxel et, al. (Noxel & Katunich, 1998). Integrating external influences outside of higher education institutions into the scope of degree completion process, this paper posits that higher education institutions are open systems. Based on investment theory from sociology, the theory overcomes the limits of other theories such as Tinto's interactionalist theory and Bean's student attrition model; the former is criticized for viewing higher education

institution as a closed system, while the latter is criticized for its incorrect assumption that satisfaction is directly related to persistence. Social scientists have strived to understand why some relationships persist over time whereas others wither and die (Rusbult, Martz, & Agnew, 1998). One conventional approach to this topic was to identify determinants and consequences of positive affect, such as satisfaction. This approach, however, fails to explain why some unhappy relationships persist, why some satisfying relationships end, and how some relationships persist in spite of fluctuations in satisfaction (Farrell & Rusbult, 1981; Rusbult et al., 1998). Understanding that satisfaction and persistence are two separate issues, researchers found the answer to the complex configuration of persistence to be the concept of commitment, on which the Investment Model is based (Rusbult et al., 1998). In the model, job satisfaction is a simple function of cost and reward, whereas job commitment is a function of rewards, costs, investments, and alternatives (Farrell & Rusbult, 1981; Noxel & Katunich, 1998; Rusbult et al., 1998). Following the model degree completion is positively related to job rewards, satisfaction, and investment and is negatively related to costs and alternative value (Farrell & Rusbult, 1981).

Different from other theories, the Degree Commitment Model explains why high achieving students transfer to another institution. Another novel contribution of this model is that it enables the construction of a continuous dependent variable, such as number of terms or years enrolled or earned credit hours per elapsed semesters for the use of statistical analysis.

Describe the research method that will be used

The research questions addressed in this study are as follows: 1) what are the factors related to undergraduate students' degree completion? and 2) what are the variables that impact time to degree completion? The existing research on these topics has applied various statistical methods such as logistic regression, structural equasional modeling, hierarchical linear modeling, and the event history model (Adelman, 1999, 2006; DesJardins et al., 2002; Kim, 2007; Knight & Arnold, 2000 ; Titus, 2006a, 2006b).

A well designed landmark study on factors affecting degree completion was conducted by Clifford Adelman (2006); The Toolbox Revisited. To answer his question, Adelman adopted a logistic regression model and used the most recently completed of the national grade-cohort longitudinal studies conducted by the National Center for Education statistics (NCES); NELS: 88/2000. This study received considerable attention in higher education circles (Hebel, 2000), however it left the question of time-to-degree unanswered. Another notable study was done by S.L. DesJardins; Adding a Timing Light to The Tool Box (DesJardins et al., 2002). DesJardins (2002) tried to add the temporal dimension of predictors focusing on the longitudinal nature of the postsecondary transcript file of the High School and Beyond/Sophomore Cohort longitudinal study (NCES CD

#98-135), which Adelman used for his old version of toolbox study; Answers in The Toolbox (Adelman, 1999). Replicating DesJardins research using updated version of data and new analytic techniques would offer useful information to policy makers and higher education institutions.

Applying the Zero-Inflated Negative Binomial regression model (Greene, 2003; Long and Freese, 2006; Long, 1997), this study tries to address the research questions of degree completion and time-to-degree simultaneously. For the analysis, this study uses NELS: 88/2000, the same data that Adelman used. This fairly new statistical model is a continuation of a previous study we completed at the single institution level (Lee et al., 2007). We found out that some predictors positively related to degree completion are negatively related to time-to-degree.

The number of terms for which a student enrolls in pursuit of their degree can be expressed in the form of a count. However, in order for a student to have a value for the number of semesters to degree, they must actually complete their degree program. There are, therefore, two processes at work, one which determines whether a student completes a degree, and a second which determines how long it takes a student to complete their degree. While some factors may indeed influence both processes, there is no a priori reason to expect both processes to be driven by identical sets of forces (Lee et al., 2007).

The Zero Inflated Negative Binomial (ZINB) model simultaneously estimates two equations. The first is a logistic regression equation predicting whether a student falls in the "zero" category, meaning they did not complete a degree. The second equation is a Negative Binomial equation of the number of semesters enrolled for those students who did complete a degree. We use the same independent variables in each equation, but the model allows us to capture the separate impact of the variables on each dependent variable (Long, 1997).

The ZINB model is a variation of the Poisson regression model which is the most basic model for count outcomes and has the defining characteristic that the conditional mean of the outcome is equal to the conditional variance (Long & Freese, 2006);

$Pr(y|u) = exp(-u)u^Y/Y!$, for y= 0, 1, 2, ….

Where 'u' is the expected number of times that an event has occurred per unit of time and 'y' is observed count. Following Adelman's study in 2006, this study limits the amount of time for degree completion to 8.5 years.

The Poisson model assumes equidispersion that means the equality of the mean and the variance. In practice, count variables often have a variance greater than the mean, which is called overdispersion. This overdispersion causes the under estimation of standard error and wrongly rejects H0 when we should not. This overdispersion is highly likely to exist in time-to-degree research since most of students graduate in 4-6 years of their entry to higher education and with many of '0' counts, meaning no student can graduate before the end of the first semester in college. This overdispersion is acconted for in the ZINB model;

Pr(yi=0|Xi, Zi) = F(Zir) + [1-F(Zir)]exp(-exp[Xi ß])
Pr(yi|Xi, Zi) =
[1- F(Zir)] * exp(-exp[Xi ß])exp(Xi ß)yi /yi!
for yi >0
Where F is either the normal or the logistic cumulative distributive function and Xiß means the vector of predictors and coefficients. As the equation shows, the ZINB model assumes that the population consists of two groups; group one has the probability yi=0, which means students who commenced higher education but failed to complete, and group two yi indicates observed number of semesters that students took before they graduated; one equation estimates the factors affecting degree completion and the other estimates time-to-degree.

This study uses the STATA version-10 statistics package. The package requires two separate sets of predictors for the ZINB model; one set of variables that affects time-to-degree (STATA command "Zip") and the other one that predicts the membership in the zero (yi=0) group (STATA command "Zinb"). This study constructs two identical sets of predictors and follow the variables put in the model: Test score (SAT/ACT), Class rank, Anticipation, SES, Race, Gender, Parenthood, Selectiveness, No delay, Low credit, First year grade, First year remediation, First year college math, Work study, Multiple schools, Enrollment pattern, Summer credit, Cumulative college math, Number of withdrawals, and No-credit repeat (Adelman, 2006: p. 78-79).

Will you use a NCES target dataset?

Yes

Will you use a NSF target dataset?

No

Please select the datasets that you intend to use:

NCES-National_Education_Longitudinal_Study_of_1988_(NELS:88)

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

The data being used for this research is from the national grade-cohort longitudinal studies conducted by the National Center for Education statistics (NCES); NELS: 88/2000. The reason why I want to use NELS: 88/2000 is because it strongly fits well with my research question of factors affecting degree completion and time to degree. The subjects participating in the study were tracked five times; in

1988, 1990, 1992, 1994, and 2000. From these five waves of follow up, it is possible to gather information about students' high school experience as well as background information. What's the most attractive part of NELS: 88/2000 is that subjects were allowed a long enough time to acquire their undergraduate degree; 8.5 years. Aside from this data, postsecondary transcripts collected from higher education institutions are rich and reliable sources of information. This study intends to fill the gap in the two existing well-designed research studies; Toolbox Revisited (Adelman, 2006) and Adding a Timing Light to The Toolbox (DesJardin et al., 2002). This study is expected to fill the gap what Adelman left, factors affecting time-to-degree, and reaffirm his findings on degree completion as well as update what DesJardins found on time-to-degree. The list of variables that is used for this study is as follows: Test score (SAT), class rank, anticipation, SES, Race, Gender, Parenthood, Selectiveness, No delay, Low credit, First year grade, First year remediation, First year college math, Work study, Multiple schools, Enrollment patter, Summer credit, Cumulative college math, Number of withdrawal and no-credit repeat.

Will you address the NPEC focus topic?

Yes

If yes, please briefly describe:

This study analyzes the factors affecting undergraduate students' degree completion and time-to-degree. To answer the question, the empirical model of this study includes predictors of NPEC focus such as enrollment pattern, course taking behavior, and transferring behavior and their impacts on students' degree attainment and time-to-degree.

Provide a timeline of key project activities:

□ April 1, 2009-April 15, 2009: Finalize research model (variable set)
□ April 16, 2009-April 26, 2009: Select core variable sets and complete tentative descriptive analysis
□ April 30, 2009: Submit 2009 ASHE conference proposal
□ May 1,2009-July 20, 2009: Constructing and cleaning the data set.
□ July 20, 2009: Submit conference paper proposal to the annual conference of AERA
□ July 20, 2009-October 1, 2009: Explore BPS data for possible variable extraction and merging it to the master data
□ October 1, 2009-December 30, 2009: Finalize the data analysis
□ January 1, 2010-March 1, 2010: Write up the results
□ March 2, 2010-April 10, 2010: Finalize the report and prepare for presentation materials

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

□ Make a presentation at the 2010 AIR Forum
□ Make a presentation at the 2009 at ASHE conference
□ Make a presentation at the 2010 annual meeting of American Educational Research Association (AERA)
□ Submit the manuscript to Research in Higher Education
□ Submit the manuscript to Journal of Higher Education

Describe how you will disseminate the results of this research:

I plan to disseminate the findings of this study through national conferences and publications. In order to obtain preliminary feedback and suggestions, proposals for presentations will be submitted to appropriate conferences such as the annual meeting of the American Educational Research Association (AERA), Association for Institutional Research (AIR) and the Association for study of Higher Education (ASHE). I have conducted similar research at the single-institutional level, and I have a good deal of experience presenting my research at AIR, ASHE, and the annual CSRDE (Consortium for Student Retention Data Exchange) conference. In addition, I will seek to publish the findings of this dissertation in scholarly peer reviewed journals such as Research in Higher Education and the Review of Higher Education.

Provide a reference list of sources cited:

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Statement of Institutional Review Board approval or exemption

As soon as I am notified about the dissertation grant application decision, I'll contact IRB office at the University of Minnesota and process proper requirement that I have to follow. I'll also contact NCES for proper action.

Statement of Use of Restricted Datasets

Currently, I have the license that allows me to access the restrict-use data including NELS: 88/2000, which will be used to address the research questions of this study. I can also access B&B, HS&B, BPS, and NSOP, too.

Biographical Sketch

I am currently a doctoral candidate in the Higher Education Program at the Department of Educational Policy and Administration, University of Minnesota-Twin Cities campus (UMN). After receiving a bachelor's degree in Education, I earned a Master of Education degree in Educational Administration from Seoul National University in South Korea. As part of my Ph.D. program, I have taken core courses such as economics of education, cost-benefit analysis, evaluation studies, public policy in higher education, college students today, and many others. In addition to the core courses, I also took many methodology courses including hierarchical linear and non-linear modeling, multivariate analysis, longitudinal data analysis, advanced social statistics, and structural equation modeling. Through these courses I have learned how to identify, design, and answer my research questions using appropriate research methodologies.

In addition to this doctoral-level coursework, I have had the opportunity to be involved in various research projects. Working as a research associate at the Office of Institutional Research at the UMN, I have been fortunate to have access to institutional level data as well as NCES data (IPEDS). My job is to analyze them for institutional policy purposes. I also had the chance to participate in the 2008 National Summer Data Policy Institute on the National Center for Education Statistics (NCES) and National Science Foundation (NSF) databases, June 8-15, 2008. From the institute I learned how the experts in NCES designed research, what was the purpose of each longitudinal study, and how to use the data. I also learned how to utilize the NCES web-site for my research; IPEDS, the Peer Group Analysis System, and DAS to name a few.

My additional professional experience includes conference presentations and journal publications. As an illustration, I co-presented with a colleague for the 2008 Association for the Study of Higher Education (ASHE) conference using U.S. News and World Report and IPEDS data to analyze the factors affecting the changes in ranking of private and public national universities. The paper featured in the Chronicle of Higher Education; Most Colleges Chase Prestige on a Treadmill, Researchers Find, By Peter Schmit, November 21, 2008. The manuscript was submitted for publication at Research in Higher Education and is under review. In addition to this, I have the license to the NCES restricted-use data and currently I am helping one of the faculty members in my department conduct research using the data.

At the institutional level, I collaborated with my colleagues at the Office of Institutional Research to identify the impact of recreational facility use on student achievement measured by retention and graduation. The findings were presented at the annual conference of

the Consortium for Student Data Exchange (CSRDE), and received the best research award. The manuscript is accepted for publication by the peer-reviewed NASPA journal and is in press.

The study proposed for the AIR dissertation grant has originated from my work on the 2007 ASHE conference paper. The original purpose of the project was to identify factors affecting time-to-degree adopting the Event History Model technique. However, the assumption of proportional hazard ratio was violated; therefore, the research adopted the Zero-Inflated Negative Binomial Model (ZINB) to answer the question. After finishing the research project, I realized that the method is efficient because it informs us of factors affecting group membership (whether students graduate or not) and factors affecting the amount of time taken to complete a degree (time-to-degree) simultaneously. Another strong point of the proposed study is that it can fill the gap in existing research and reaffirm research findings by others.

For the analysis of the proposed research, I need to get more accustomed to NELS: 88/2000 data. Since I already have gone through the research process using the ZINB model, what I need to do is to find a possible way to integrate other data sources (ex. Beginning Postsecondary Students) to tell a more meaningful story for policy implications.

Budget	
Salary/Stipend: 16800	**Tuition & fees**: 500
Travel: 800	**Other travel related expenses**: 0
Other research expenses: 1900	**Total Request**: 20000

Statement of Prior, Current, and Pending Funding

I currently receive university funding in the form of a administrative fellow that covers part of my tuition and provides a monthly stipend. However, this support is expected to end by May, 2009.