EXPLORING THE DETERMINANTS OF TIME-TO-DEGREE IN PUBLIC 4-YEAR COLLEGES

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Abstract

The study examines the factors that impact the students who attained a bachelor's degree in four-years in a public four-year college. The study focuses on students' pre-college preparation, financial aids, academic performance, work-study time arrangement, and intention of completing a bachelor degree at the entering institution. The sample subjects are the 1996 and 1997 first-time full-time cohort members who also participated CIRP Freshmen Survey. The study found that gender, number of credit hours by graduation, and graduation GPA had significant impact on the 4-year degree. In addition, students who received grant(s) and borrowed student loan(s) in the first college year completed their degree sooner. Logistic analysis was implemented and possible non-linear effect from financial aid variables were tested. The discussion focuses on both the role of student and institution for speeding up college degree.

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Introduction

As an important policy issue and performance indicator, time-to-degree has been getting increasing attention in recent years. In colleges and universities, faculty and student affairs officers consider the degree attainment as the success of their work with students (Astin & Oseguera, 2002). To administrators, timely graduation certainly helps to release the pressures of the draining resources for allowing the institutions to accommodate the new entering class while the prospect of enrollment growth continues. A time-to-degree study conducted at UC Berkeley (Nerad, 1991) and the investigation of pending student growth referred as Tidal Wave II (Hunter, 2000) convey such concerns. For students, who constantly weigh their investment of paying the 'opportunity costs' of college education against the economic benefits that may accrue from a bachelor's degree (Tinto, 1987), earlier graduation means lower opportunity cost and earlier realization of the investment return.

Timely graduation is also considered as a key social asset. The society will be better off with more college-educated citizen by collecting more tax revenues, spending less on social welfare, and dealing with fewer crimes. College graduates' spouses are often well educated too. Their children usually do better in schools and are less likely to get in troubles with the police (Jencks & Edlin, 1995; Murphy & Welch, 1993). As reported by U.S. Census Bureau, an educated population is more likely to take its civic responsibilities, such as voting and volunteering (2000b).

Despite the obvious reward and social benefits, however, timely graduation from U.S. colleges and universities is far from certain (DeBrock, Hendricks, & Koenker, 1996). Students who matriculate to higher education institutions do not always graduate (Bradford & Farris, 1991). In public four-year colleges nationwide, less than a quarter of the college students, on average, graduated within four years, and a little over half (51.9%) obtained a bachelor degree in six years (Astin & Oseguera, 2002). Among all beginners at four-year institutions in 1995-96, 51% completed a bachelor's degree at the first institution attended within six-years (Berkner & Knepper, 2002). Unhappy with the lower productivity in higher education, Virginia state legislature tried to tie institutional funding to the graduation rate (Hebel, 1999). Colleges and universities, on the other hand, consider the graduation rate as one of the institutional effectiveness measures or one of the key performance indicators.

The lower graduation rate and prolonged degree completion have disappointed many, from policy makers to student's parents. As part of the effort to make change, we have to understand why some students graduated and sooner, while others did not. This study intends to exam the students who can timely attain their bachelor degree from a public 4-year college with respect to their college preparation, academic performance, time management, financial support, and demographics. This paper is the second episode of the time-to-degree study. The emphasis of the study turns to the impact of student financial aids to the timely degree attainment.

Previous studies have found that financial aids promote persistence in general (Heller, 1997; St. John, 1994) as the aids equalize the opportunities between affluent and low-income students by reducing the burden of meeting financial cost through discounted tuition (Cabrera, Nora, & Castaneda, 1992). Aids awarded early in the students' college years may have a larger impact because its present discounted value will be larger than aids awarded later (DesJardins,

Ahlburg, and McCall, 2002). DesJardins et. al. (2002) also pointed out that earlier studies aggregated financial aid across time and type, and such approach can be suboptimal. The preferable approach to study financial aid is to disaggregate it to its distinct components because 'the types of packages students received vary by the student's year in college' (St John and Starkey, 1995, p.173). More over, different aid forms imply different "contracts" between the student and the institution and these contracts may affect students' behavior over and above the pecuniary effect of the aids (DesJardins, Ahlburg, and McCall, 2002).

Student loan is one of the five financial choices that related to student success (King, 2002). The other four choices are type of institution, attendance status, housing arrangement, and employment. The amount of student loans can be a burden to many both during the college years and after graduation. In 1996, the medium national student loan amount is $6,239, which is equivalent to 40% of the poverty thresholds for a family of four in the same year (U.S. Census, 1997). Studies have found that student loans can also be a driving force to help persistence controlling the attendance and weekly working hours. As Cuccaro-Alamin, S. and Caroll, C. D. found in the NPSAS93, among the students who worked regularly, the student loan borrowers were more likely to attend exclusively full time than the ones who did not borrow (1998). Students who combined borrowing with part time work were more likely to persist than those who worked part time but did not borrow (King, 2002). Students who borrowed and worked more than part time may drop to less than a full time course load due to the time constraint. In such cases, working longer hour to support a lifestyle may decrease the likelihood of graduation, prolong the time-to-degree, and delay the grasp of earning power. On the other hand research suggests that students who devoted most of their time to the studies are most likely to persist (Pascarella and Terenzili, 1991).

Using a first-time, full-time, and degree-seeking freshman cohort population, this study focus on the group of students who are considered as having no persistence risk (Berkner & Knepper, 2002) but the best chance to graduate in four years at the first institution attended. The purpose of the study is to identify the factors that are significantly related to the degree completion within four years in a public 4-year college in the Northeast region. Equipped with the information of types of financial aids for every year in which a student is enrolled, this study takes the approach by including measures of grants, loans, scholarships, and work-study to examine the impact on the time-to-degree.

Measurement and Methodology

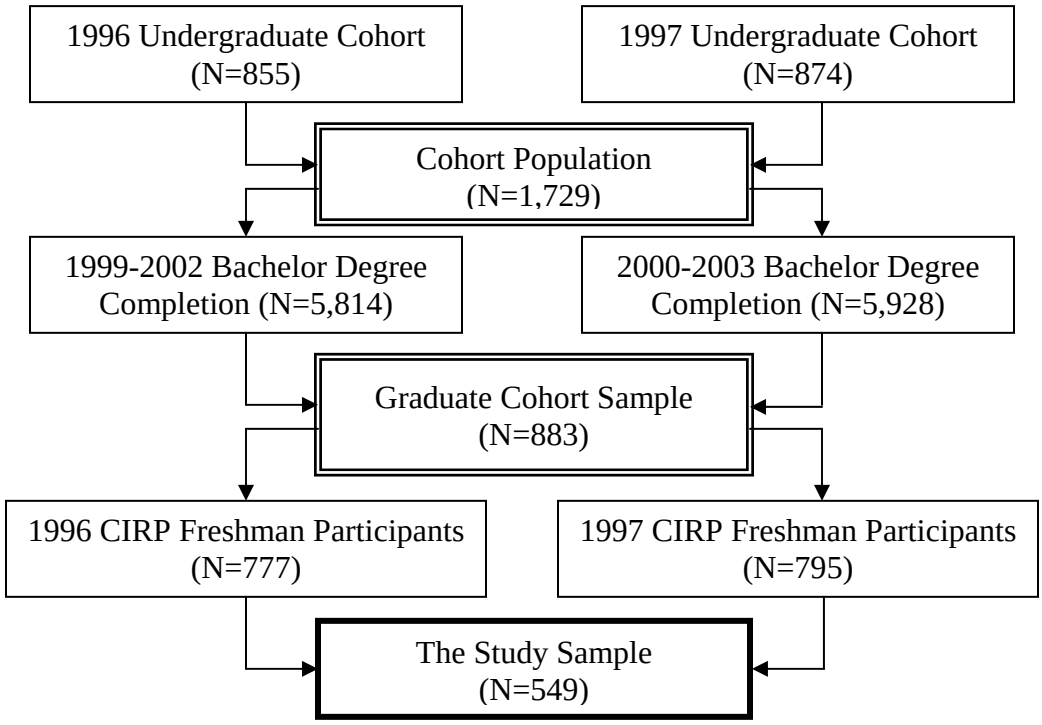
Data Sources and Sample

The sample of the study was generated from two years' data files, the 1996 and 1997 freshman cohorts, to ensure a sizable sample. The two cohorts are the most recent entering classes from which the six-year graduate data are available. The subjects were the first-time undergraduate students who entered the college in fall 1996 or 1997 and they registered full-time for the first semester. To serve the purpose of this study, the cohort population was categorized further in three different tiers. Chart 1 below illustrates the process of the sampling.

The size of joint cohort population was 1,729. A descriptive analysis was performed to confirm that 1996 and 1997 cohorts were alike regarding the major demographic variables. To examine the graduation status and the time length to obtain a bachelor degree, the cohort sample was then merged with the degree completion database. The cohort subjects from either 1996 or 1997 classes who graduated no later than the end of the sixth year from the college were selected to form a graduate cohort sample of 883. The 6-year graduation rate for this group is 51.2%,

which is aligned with the national study of college completion (Astin & Oseguera, 2002) and that of at the first institution attended (Berkner & Knepper, 2002).

Chart 1 Sampling Procedure and Sample Formation



The college in the study has participated the CIRP Freshman Survey since 1960s. All the cohort members were expected to response to the survey at the freshman orientation. This study selected some unique variables, such as time management in higher school, college expectation, etc. from the CIRP Survey. The inclusion expanded the scope and enriched the depth of the study and allowed us to assess the impact of the subject's attitude and competency to the time-to-degree. As shown on Chart 1, the graduate cohort sample was merged with the 1996 and 1997 CIRP Freshman Survey data. The study sample ended up with 549 subjects. The reduction of the sample size is due to the limited availability of the social security numbers on CIRP data files, which is the key of data merge.

To sum up, the study sample was made up by the subjects who (1) entered the College in either 1996 or 1997 as a full-time and first-time undergraduate student, and (2) graduated within six years from the College, and (3) participated CIRP Survey in the College Freshman Orientation. As a subset of graduate cohorts, the study sample has more females (61% vs. 58.6%) and Caucasians (93.4% vs. 92.7%), about the same GPA by graduation (2.96 vs. 2.95 at 0-4 scale), and a few less of credit hours for a bachelor degree (123.0 vs. 126.8).

Measurement

Time-to-degree is defined by the number of academic years enrolled between the time of entering college and of the degree completion. The count of academic year refers to the enrollment in the consecutive fall and spring semesters.

Social security number merged students' financial aids information to the cohort data file. The aids variables were then re-coded into numerical subtotals of *grants* (sum of federal, state,

and/or institutional grants), *student loans* (all types), *scholarships* (all types), *work-study*, and *family contribution*. For each aids type, only the actually expended amount, instead of the amount offered, was used in the study. *Student income* is the disposable amount a student owns, such as previous savings or off campus job earning. *Student's total budget*, includes institutional charges for tuition, fees, and on-campus room and board for full time/full-year student, as well as institution's estimated expenses such as books and supplies, transportation, and entertainment. The study also created variable *unmet need*, which equals a student's need subtract all types of aids.

Sample Description

Since the study involved multiple data files ranging from cohort, financial aid information, to degree completion, a consolidation of the variable categories was performed along the sample description. The sample descriptions are at two levels: (1) graduate cohort (N=883), and (2) study sample (N=549).

Graduate Cohort Level. Table 1 illustrates the time length of graduation by cohort, gender and ethnicity. Among the 883 who graduated from both 1996 and 1997 cohorts, close to 50% (429) obtained their Baccalaureate degree by the end of fourth college year. Another 40% plus completed their undergraduate programs within five years. There is a little difference between the graduation rates of 1996 and 1997 cohorts. The number of females by the time-to-degree was higher (58.7%) than that of their male counterparts. The number of females who graduated by four years was more than doubled of the males (290 vs. 139). As for the graduation by ethnicity, white clearly dominated each of the time length categories.

Table 1. Graduation Status, Gender, and Ethnicity by Time-To-Degree

	Graduate by 4-year	Graduate by 5-year	Graduate by 6-year
Graduated 1996 Cohort	215 (24.3%)	190 (21.5%)	40 (4.5%)
Graduated 1997 Cohort	214 (24.2%)	176 (19.9%)	48 (5.4%)
Gender			
Female	290 (32.8%)	198 (22.4%)	30 (3.4%)
Male	139 (15.7%)	168 (19.0%)	58 (6.6%)
Ethnicity			
White	407 (46.1%)	335 (37.9%)	77 (8.7%)
Black	9 (1.0%)	11 (1.3%)	9 (1.0%)
Hispanic	7 (0.8%)	5 (0.6%)	2 (0.2%)
Asian	3 (0.3%)	3 (0.3%)	0 (0.0%)
Ame. Ind.	3 (0.3%)	1 (0.1%)	0 (0.0%)
Total	429 (48.6%)	366 (41.4%)	88 (10.0%)

The average family income for the graduate cohort is $55,643 while the median income is $55,241. A little over 5% of the graduate cohort members had family income less than the 1996 poverty threshold of $16,036 for a family of four ($16,400 in 1997). The family income indicated that fewer students may qualify for the grants than the student loans (Table 2). Also reported in Table 2, grants and loans made significant contribution to the degree completion length, so did the amount of first year total budget to the graduation lengths. Close to three quarters of students took loans in the first college year and the average amount is $4,298. Work-study also helped to get graduated sooner but only one in five were work-study students. A

small proportion of the freshmen received scholarship among 1996 and 1997 cohorts. The first year average unmet need was about 10.8% of the mean total budget, and it added variation to the length of graduation. In addition to the first year financial aids, the study extracted up to five years' cumulative aids data for those who pursuied their bachelor degree. Still, the total budget, grants, and loans were found that had significant influence to the number of years to degree.

Table 2. First Year Financial Aids by Time-To-Degree, (Graduated Cohort, N=883)

					Recipients Graduate by (%)			
	N	%	Mean($)	Median($)	4-year	5-year	6-year	χ^2
Total Budget	751	85.1	10,768	10,941	48.2	42.3	9.5	79.34***
Family Contrib.	558	63.2	6,843	5,263	48.8	42.5	8.8	
Student Saving	499	56.5	1,541	857	49.5	40.3	10.2	
Grants	487	55.2	2,788	2,343	46.6	42.9	10.5	23.79**
Loans	629	71.2	4,298	3,753	48.0	42.6	9.4	27.05**
Work-study	196	22.2	1,401	1,400	50.5	39.3	10.2	19.88***
Scholarships	71	8.0	110	0	47.8	42.3	9.8	
Unmet Need	754	85.4	1,160	819	48.6	41.5	10.0	15.54*

* p<.05, ** p<.01, *** p<.001

Study Sample Level. At this level, the sample size was smaller (N=549), but the number of variables increased due to the incorporation of CIRP data. The study sample showed that 98% of the subjects were in-state students paying the in-state tuition. The average family income was $58,492, a 5% higher than the graduate cohort group. The father's mean education level was 'some college'. The subjects spent an average 3-5 hours studying and 6-10 hours on paid work

Chart 2 Measurements of Selected CIRP Variables

High school GPA	1=D, 2=C, 3=C+, 4=B-, 5=B, 6=B+, 7=A-, 8=A
Father education level	1=grammar school, 2=some high school, 3=high school graduation 4=postsecondary other than college, 5=some college 6=college degree, 7=some graduate school, 8=graduate degree
Weekly hour of study	1=0; 2=<1; 3=1-2; 4=3-5; 5=6-10; 6=11-15; 7=16-20
Weekly hour of work	1=0; 2=<1; 3=1-2; 4=3-5; 5=6-10; 6=11-15; 7=16-20
Extra time to graduate	1=no chance, 2=little, 3=some, 4=very good chance
Temporary dropout	1=no chance, 2=little, 3=some, 4=very good chance
Math ability	1=lowest 10%, 2=below average, 3=average, 4=above average, 5=highest 10%
Self-confidence	1=lowest 10%, 2=below average, 3=average, 4=above average, 5=highest 10%

per week during the last year in high schools. About 85% of the subjects reported to have some or good chance to work for pay while in college. Over 70% of them considered bachelor degree as the highest degree to pursue, and another 23% planned to seek a master degree. About half of the subjects thought that there was *no chance* or *little chance* that they needed extra time to get graduated. Only about four percent claimed that they might temporarily drop out of the school.

Chart 2 details the measurement of CIRP Freshman Survey variables. Though the information was collected at the pre-college freshmen orientation, the inclusion of CIRP data adds a quite different batch of data to the study.

Table 3 introduces more aggregated sample description about pre-college academic performance by the time of completing bachelor degree. There were more A-students who graduated within four years than that in five or more years. So did B-students. The average SAT

Table 3. Study Sample Description by Time-To-Degree

	Graduate by 4-year	Graduate by 5-year	Graduate by 6-year
High School Average			
A	13.7%	5.1%	0.9%
B	33.7%	31.9%	6.7%
C	2.0%	4.6%	0.9%
# of Years Studying English			
One or less	25.7%	20.8%	4.7%
Between 2-4	23.0%	20.9%	3.3%
Five and more	0.9%	0.7%	0.6%
# of Years Studying Math			
One or less	26.4%	20.0%	4.9%
Between 2-4	21.9%	24.4%	3.5%
Five and more	1.1%	0.7%	0.2%
Get Bachelor's Degree			
No or little chance	1.1%	1.7%	0.7%
Some or good chance	48.3%	39.5%	7.6%

score (math and verbal) for the sample was 1,025. Regarding the number of years that the subjects studied either English and/or mathematics, there was no statistical significant difference among the groups with various graduation lengths. The self-rated traits on math ability and writing ability (not in Table 4) indicates low correlation between the number of years spent on studying both subjects and the time-to-degree. Approximately half of the subjects thought that they might obtain their bachelor degree in 4-years and another 40% said that they could make it within 5 years.

The description of financial aids for the study sample is reported in Table 4 below. Like the graduate cohort reported in Table 2, grants, loans, and work-study were found significantly related with the degree completion length. The subjects who either received grant, loan, or work-study stipend eventually obtained their bachelor degrees, but took varied number of years. Unlike the graduated cohort, amount of unmet need did not differentiate the time to degree.

Table 4. First Year Financial Aids by Time-To-Degree, (Study Sample, N=549)

					Recipients Graduate by (%)			
	N	%	Mean($)	Median($)	4-year	5-year	6-year	χ^2
Total Budget	479	87.2	11,282	12,000	49.1	42.8	8.1	53.01***
Family Contrib.	361	65.8	5,820	5,786	49.6	42.4	8.0	
Student Saving	323	58.8	1,115	525	50.5	42.1	7.4	
Grants	264	48.1	1,143	213	47.7	42.4	9.9	21.43**
Loans	392	71.4	4,357	5,306	47.7	43.4	8.9	28.53**
Work-study	79	14.4	1,403	1,400	59.5	29.1	11.4	15.10***
Unmet Need	482	87.8	1,278	815	49.8	41.6	8.6	

* p<.05, ** p<.01, *** p<.001

Analysis and Results

Descriptive Analysis

Additional descriptive analyses were carried out to the study sample to further explore the variables that might have significant impact on the time-to-degree and thus should be selected into model test. The analyses focused on the number of matriculated semesters, the competency of timely graduation, and borrowing for college and weekly work hour.

The number of semesters from the matriculation through the graduation was examined and reported in Table 5. The measurement of the variable is the count of the consecutive enrolled fall and spring semesters. Many subjects (45.6%) spent eight semesters after matriculation completing their bachelor degrees in four years, and 37% plus spent nine or ten semesters before graduation. The excessive lengths are more likely caused by either part-time attendance, temporarily stop out, or repeating failed course(s). For the 28 subjects who studied eight semesters after matriculation but graduated by five years, they were more likely being non-matriculated for a couple of semesters. So were the 12 in the 6-year graduation group. If the summer semester(s) or the semester(s) prior to matriculation were included in the calculation, the number of enrolled semesters would have been greater.

Table 5. Number of Matriculated Semesters in Degree Program

	Graduate by 4-year***	by 5-year***	by 6-year***
6 Semesters	7 (1.3%)	0	0
7 Semesters	15 (2.7%)	0	0
8 Semesters	249 (45.6%)	28 (5.1%)	0
9 Semesters	0	107 (19.6%)	0
10 Semesters	0	93 (17.0%)	12 (2.2%)
11 Semesters	0	0	23 (4.2%)
12 Semesters	0	0	12 (2.2%)

* p<.05, ** p<.01, *** p<.001

The study is particularly interested in exploring whether borrowing for college ends up with fewer hours working and more hours of studying per week that eventually shorten the graduation length. Reported in Table 6, more than half of the borrowers in the study sample held loans amount between $5,000 and $10,000 regardless the number of hours for work and study. For the students who graduated within four years, 47% worked more than 15 hours per week during their last year in the high school and 38% studied no more than two hours weekly. The

Table 6. Student Loans vs. Weekly Hours for Study and Work

	<=$3,000	<=$5,000	<=$10,000	>$10,000	4-Yr Degree
Weekly Work					
Less than 5 hr	3.9%	4.8%	14.8%	2.1%	27.6%
5-14 hr	3.9%	4.7%	15.9%	1.3%	25.4%
More than 15 hr	9.6%	8.3%	26.6%	3.9%	47.0%
Weekly Study					
Less than 2 hr	6.8%	7.6%	23.7%	2.9%	38.0%
3-5 hr	6.8%	6.0%	19.3%	2.6%	34.8%
More than 6 hr	4.2%	4.4%	14.3%	1.8%	27.2%

implication is that at the College in the study borrowing did not lead to the expected consequences of working fewer hours and studying more hours when pursuing a life style. This finding echoes King's conclusion that students who combined borrowing with part time work were more likely to persist (2002). The results on Table 6 also implies that more hours of working set the life on the fast track that the students were motivated in pursuing the degree completion at the mean time. Though the subjects did not spend seemly sufficient time in study during the last year in high school, they might have determined to throw out the slackness when entering college in order for the timely graduation.

A series of self-rated traits from CIRP, such as *academic ability*, *drive to achieve*, *mathematical ability*, *writing ability*, and *intellectual self-confidence* were also studied (Table 7). The *academic ability* was found significantly related to the graduation by four- or five-year graduation. More subjects who reported an average level of academic ability graduated in four years than in five years. For variables *drive to achieve*, and *math* and *writing ability*, subjects

Table 7. Self-rated Traits by Time-To-Degree

	Graduate by 4-year	by 5-year	by 6-year
Academic ability	**	**	
Average	130 (23.7%)	145 (26.5%)	24 (4.4%)
Above average	119 (21.7%)	70 (12.8%)	17 (3.1%)
Highest 10%	21 (3.8%)	8 (1.5%)	3 (0.6%)
Drive to achieve			
Average	102 (18.6%)	97 (17.7%)	13 (2.4%)
Above average	124 (22.6%)	88 (16.1%)	18 (3.3%)
Highest 10%	43 (7.9%)	40 (7.3%)	13 (2.4%)
Mathematical ability			
Average	111 (20.3%)	101 (18.4%)	21 (3.8%)
Above average	60 (11.0%)	54 (9.9%)	12 (2.2%)
Highest 10%	18 (3.3%)	8 (1.5%)	6 (1.1%)
Writing ability			
Average	142 (26.0%)	113 (20.7%)	27 (4.9%)
Above average	79 (14.4%)	64 (11.7%)	6 (1.1%)
Highest 10%	15 (2.7%)	20 (3.7%)	5 (0.9%)
Self confidence	**	**	*
Average	137 (25.1%)	128 (23.4%)	20 (3.7%)
Above average	90 (16.5%)	49 (9.0%)	15 (2.7%)
Highest 10%	18 (3.3%)	25 (4.6%)	10 (1.8%)

p<.05, ** p<.01, *** p<.001

who held average or above average levels graduated in fewer years than those at the average level. A look at *Intellectual self-confidence* showed that it has a significant relationship with the time-to-degree. More subjects at an average self-confidence level graduated by four years than those reported at the two above average levels. It is interesting to note that many of those rated themselves with the highest 10% self-confidence did not win the competition of the 4-year graduation.

Model Test

The descriptive analyses in the previous section demonstrated the variables that differentiated the time length of degree completion. The test of a statistic model in this section intends to identify the significant factors that effect the timely graduation. Due to the dichotomous nature of the dependent variable, *graduated by four years* or *longer than four years*, logistic regression model was chosen. The degree completion length was coded as 1 for those who graduated by four years, and 0 otherwise. To include appropriate independent variables (INDs) from the ones used in the descriptive analyses, a Pearson correlation analysis was performed. Variables that have higher than .25 correlation coefficients, such as *family income* vs. *family contribution*, *high school GPA* vs. *cumulative GPA by graduation*, were eliminated from entering the model to prevent co-linearity. The study then borrowed the technique of best model selection from regular regression analysis to scrutinize the relationships between each of the IND candidates and the dependent variable, *degree completion by four years or not*, for choosing a set of predictors with the lowest Mallow's C(p) and highest R-square. Before the selected INDs were entered into the logistic model, categorical variables were recoded into dummies. Further adjustments of INDs selection were made and variable transformations were performed on numerical INDs during the process of the model testing. The test results are reported on Table 8.

The test of model 1 focused on the non-financial variables. *Intent to get a bachelor degree* was recoded as a dummy variable with *having some or good chance to graduate at the college* as 1 and no chance as 0. Having little chance was left out as a reference category. As reported in Table 8, females are more likely to graduate within 4-years than males. The odds ratio [odds ratio = exp (b_i)] for a female subject to complete a bachelor's degree in Four years is almost doubled comparing to a non-female. *Number of credit hours by graduation* is negatively associated with the length of degree completion, i.e. the fewer the credit hours the better the chance to get graduated in 4-years. At the College in the study, a regular first time freshman is required to complete 120 credit hours for a bachelor degree. If a student did not take course(s) in summer but plan to graduate within 4 years, s/he must take at least five courses per consecutive fall and spring semesters and do well for all the course works to prevent re-taking any failed ones. This scenario also explains the significant and positive impact by the *cumulative GPA by graduation*. The chances for a student with good GPA to complete a bachelor degree within four years is more than ten times higher (odds ratio = 13.3) than those who did not have good GPA by graduation.

Model 2 includes four of the first-year financial aid variables plus *student saving*. In addition to the same significant factors as those in model 1, *scholarship* is the only type of financial aids showing a positive impact on the time length for degree. The first year scholarship recipients, though only a small proportion of the cohorts, might be those who have well prepared for the college. The significance of receiving scholarship at the freshmen year may mean more than the pecuniary effects and such effect permeates during all the college year.

Noticing the extremely small coefficients for the financial aids variables (implying the odds ratios are very close to 1), the study took extra steps to exam the possibility of non-linear impact of the financial variables on the time-to-degree. As the literature shown that aids awarded early in college years may have large impact than aids awarded later (DesJardins, Ahlburg, and McCall, 2002), we assume the impact of financial aids is at a slow-down increasing rate on the time-to-degree. This implies that some of the financial aids may have non-linear effect and the appropriate format to describe the aids is logarithm. All four financial aid variables plus *student saving* were transformed and tested. *Student work-study* was removed from this model due to

the large proportion of missing value (85%, also see Table 4). *Scholarship* was also eliminated because its distribution is not normal (median= $0 and s.d. = $405). *Intent to get a bachelor degree* was not included into model 3 since it did not show any significant impact on the timely graduation in the previous two models.

Table 8. Coefficients for Various Logistic Models of the Log Odds of 4-Year Degree

	Models (n=549 for model 1-3, n=883 for model 4)				
Variables	Model 1	Model 2	Model 3	Odds Ratio	Model 4
Intercept	9.6356***	9.5584***	-0.4403		-1.2296
Female	0.6491**	0.7250**	0.9071*	2.48	1.0482***
Credit hour by graduation	-0.1488***	-0.1590***	-0.1736***	0.84	-0.1504***
Intent to bachelor degree	0.0221	0.1579			
GPA by graduation	2.9645***	3.1977***	3.3302***	27.94	2.5937***
Student saving		0.00006			
Grant (Fed, State, Inst.)		0.00006			
Student loans		0.00004			
Scholarship		0.00332**			
Student work-study		0.00050			
Log(Student saving)			-0.1515	0.86	-0.1453
Log(Grant)			0.5075*	1.66	0.2695
Log(Loan)			1.1746*	3.24	1.3369***
Model χ^2	206.49***	207.37***	86.95***		112.82***
d.f.	3	9	6		6

p < .05*, p < .01**, p < .001***

Three types of financial aids, *grant, student loans, and student saving* in logarithm were re-entered in model 3. The test of model 3 (Table 8) showed that variables *female*, *credit hour by graduation*, and *GPA by graduation* retained their significant impact on the *graduate by four years*. In addition, both grant(s) recipients and loan borrowers are more likely to complete their bachelor degree with no more than four years than those who were not the recipients of the aids. The grant support from federal, state, or institutional levels released the financial burden from the students' shoulders so as to help them graduate sooner. The chances for the grant recipients to finish their degree program by the end of 4th year are 1.7 times higher than those non-recipients. Coincident with the descriptive analysis reported on Table 6, student loan borrowers were the ones who managed to get their degrees in fewer years. Those students were more likely to have perceived the mounting opportunity cost from delaying future income if prolong the bachelor degree completion. Their motivation to gain the earning power through the most cost effective means shortened their time-to-degree.

Model 3 is the model the study identifies the impact on the timely degree completion with the study sample. While reviewing the test model 3, we noticed the absence of CIRP variables. So what are the impacts to the time-to-degree if model 3 is tested in the graduate cohort sample level (n=883)? The findings were reported under model 4 in Table 8. Not surprisingly, all the significant factors remain and at higher significance levels.

Discussion and Implication

In summary, all model 1, 2, and 3 have significant model chi-square at 0.001 level and

each model identified factors that contributed to the four-year degree completion. A first time freshman student graduated from the college within four years was more likely a female, had a much better chance of completing a bachelor program with fewer credit hours, graduated with higher cumulative GPA, and who received grant(s) and borrowed student loan(s) in the first college year.

It is not out of expectation that the study found GPA a positive contributor to the four-year bachelor degree. Though not being included in the model test, *high school GPA* is highly correlated with the *GPA by graduation* in the study. The implication is that a student's preparation for the post-secondary education may be highly associated with his/her academic performance in college. With this finding, the study has to stand challenges, such as grades inflation may help achieving the better GPA by graduation, or measuring college preparation is limited to the GPA and SATs. We have to leave grades inflation to another study. For college preparation, literature has accumulated evidences that lack of sufficient preparation in high school (Adelman, 1999; Cabrera, Nora, & Castaneda, 1993; Pascarella & Terezini, 1991) would likely to cause failure in college persistence and graduation, including not being able to timely graduate. Despite the fact that SAT scores and the high school GPA is used extensively by the college as a selectivity criterion, studying high school performance in depth is a sure way to measure the post-secondary preparation and predict the college performance. The proposed new SAT test is another positive approach to watch for. It not only helps improving the measurement of high school performance but also, more importantly, pushes the reform of the high school curriculum to send better-prepared students to college.

Also found in the study that female students were more likely to graduate sooner than the male counterparts. Females account for 59% of the cohort subjects, but 68% of those who graduated did so by the end of fourth year. Because ability and socioeconomic status made women likely to be over-represented in the fields of education, social work and social sciences, the weight of evidence is clear (for example, Jacobs, 1986; Polachek, 1978). Since the College in the study is a liberal art school that enrolls an average of 58% female students each year, it is not surprising to find that the higher rates of persistence and four-year degree are represented by female majority. The gender impact on the timely graduation may also be explained by the female's determination of career development and the change of social-economic status quo that a college degree may bring.

Being a student loan borrower positively contributes to the four-year graduation. Also indicated in the descriptive analysis, the study subjects who borrowed and worked at least 15 hours per week in their first college year were more likely to graduate sooner. To the student loan borrowers, working for pay may be a way of proven financial independence and living with style. The conversation with the just graduated students reveal that even though working for pay leaves few hours per week spending on the study, they were prepared to meet the challenge. They may not be the top notched students, but were much matured and determined to be successful in college. The motivation is the core in the whole degree pursuing process. While the fewer hours spent on study each week may not be a positive factor, we think of the time-to-degree as a comprehensive target that is tied up with many other factors such as college goal, performance expectation, availability of the courses, meeting the degree program requirement, studying habit, etc. Therefore, the college counseling staff, advisement personnel, and the faculty should pay more attention to this indicator, particularly for those working with first year students.

From a student's point of view, the sooner s/he completes the degree, the less the opportunity cost s/he pays. However, the time-to-degree is a complex matter that related to various external factors such as job market, financial needs, etc. On the other hand, many researchers have argued that those who fail to graduate may merely have made an economic choice: "Each student must determine if the value of completing the degree makes persistence rational" (DeBrock et al., 1996, p.520; DesJardins, Ahlburg, & McCall, 2002). For many students, time-to-degree stands for the self-esteem and actualization. To college, time-to-degree is more a performance indicator and a goal of the college strategic planning. It involves carefully evaluating institutional policies and building up cooperation among faculty, staff, administrators and students. No effort is too much for this subject.

Future Study

The logistic models revealed the largely shrunk sample size in the model testing process and it is one of the major causes for the reduction of model chi-square (207.76 for model 2 vs. 86.95 for model 3). The concern is the status of financial aids data that not all the subjects received same type of financial aids. Nonetheless any missing variable resulted in the removing of the entire record from the process. It would be interesting to identify different statistic procedure that is more suitable for truncated data environment, such as PROC TOBIT in SAS.

Finally, the positive effect of student loan on time-to-degree raises a few follow-up questions. Is this effect institutional specific? Does loan type make difference? Making a profile for the students who borrow and work for pay seems appealing. It will also be interested to investigate why we did not see the impact of grants as expected. Inclusion of attitudinal variables such as *intent to graduate at the same college*, *need extra semester to graduate*, etc. from the freshman year, instead of using pre-college data, is another approach to exam the impact of financial aids on time-to-degree in future study.

Reference

Adelman, C. (1999). Answers in the Tool Box: Academic Intensity, Attendance Patterns, and Bachelor's Degree Attainment. Jessup, MD: Education Publications Center, US Department of Education.

Astin, A. W.& Oseguera, L. (2002). Degree Attainment Rates at American Colleges and Universities. Los Angeles: Higher Education research Institute, UCLA.

Berkner, L., & Knepper, P. (2002). Descriptive Summary of 1995-96 Beginning Postsecondary Students: Six Years Later. Institute of Education Sciences, U.S. Department of Education, NCES 2003-151.

Bradford, C., & Garris, E. (1991). Survey on Retention at Higher Education Institutions: Higher Education Surveys Report. Rockville, MD: Westat.

Cabrera, A. F., A. Nora, and M. B. Castaneda (1993). College persistence: structural equations modeling test of an integrated model of student retention. Journal of Higher Education, 64:123-139.

Cabrera, A. F., A. Nora, and M. B. Castaneda (1992). The role of finances in the persistence process: a structural model. Research in Higher Education, 33(5):571-593.

Debrock, L., Hendr.icks, W., & Koenker, R. (1996). The economics of persistence: Graduation rates of athletes as labor market choice. Journal of Human Resources, 31, 513-539.

DesJardins, S., Ahlburg, D., & McCall, P. (2002). A Temporal investigation of factors related to timely degree completion. The Journal of Higher Education, 73(5), 555-581.

Hebel, S. (1999, May 28). Virginia Board wants to link state aid to colleges to their performance in key areas. The Chronicle of Higher Education, A33.

Heller, D. E. (1997). Student price response in higher education: An update to Leslie and Brinkman. Journal of Higher Education, 68, 624-659.

Hunter, L. (2000). Considering enrollment in the construction equation Tidal Wave II may not be driving campus construction but will impact the approach to these efforts. Retrieved from http://www.berkeley.edu/news/extras/ renew/2000/fall_tidal.hrml.

Jacobs, J. (1986). The sex-aggregation of fields of study: Trends during the college years. Journal of Higher Education, 57, 134-154.

Jencks, C. & Edlin, K. (1995). Do poor women have a right to best children? The American Prospect, 20, 43-52.

King, J. E., (2002). Crucial Choices – How Students' Financial Decisions Affect their Academic Success. American Council on Education, Center for Policy Analysis.

Murphy, K. & Welch, F. (1993). Inequality and relative wages. American Economic review, 83, 104-109.

Nerad, M. (1991). Graduate education at the University of Califonia and factors affect time-to-degree. Retrieved from www.graddiv.ucsb.edu/academic/advice/importance.shtml

Pascarella, E. T., and P. T. Terenzini (1991). How College Affects Students – Findings and Insights from Twenty Years of Research. San Francisco: Jossey-Bass Publishers.

Polachek, S. (1978). Sex difference in college major. Industrial and Labor Relations Review, 31, 498-508.

St. John, E. P. (1994). Assessing tuition and student aid strategies: Using price response measures to simulate pricing alternatives. Research in Higher education, 35, 301-334.

St. John, E. P. & Starkey, J. B. (1995). An alternative to net price: Assessing the influence of prices and subsidies on within-year persistence. Journal of Higher Education, 64, 676-695.

Tinto, V. (1987). Leaving College: Rethinking the Causes and Cures of Student Attrition. Chicago: University of Chicago Press.

U.S. Census Bureau (2000a). Educational attainment in the United States. Current Population Reports. Retrieved from http://www.census.gov/prod/2000pubs/p20-528.pdf

U.S. Census Bureau (2000b). Voting and registration in the election of November 1998. Current Population Reports. Retrieved from http://www.census.gov/prod/2000pubs/p20-523.pdf

U.S. Department of Health and Services (1997). Prior HHS Poverty Guidelines and *Federal Register* References. References http://aspe.hhs.gov/poverty/figures-fed-reg.shtml