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Suzanne K. Hayes
University of Nebraska at Kearney

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STUDENT EMPLOYMENT AND THE ECONOMIC COST OF DELAYED COLLEGE GRADUATION

Suzanne K. Hayes, University of Nebraska at Kearney

This paper presents a model to estimate the economic cost of extended time-to-degree. This first look at delayed graduation costs considers student employment, tuition levels, expected salary upon graduation, interest rates, and the opportunity costs of professional advancement and retirement contributions. The results indicate that a one-year delay in graduation significantly impacts the future financial position of a student. It is estimated that students graduating in five years, rather than four years, will assume an average total economic cost between $94,921 and $114,589. Simulation results are reported and show a total economic cost range of $49,109 to $163,974.

The United States enters a new decade with increased emphasis on college student graduation rates. The current administration announced a goal of achieving the highest proportion of college graduates in the world by 2020. There is also a call for research to identify barriers that may prevent students from completing their degree (Obama, 2009). The success of an economy is a function of the nation's human capital; education is a vital investment in the productive capacity of a nation. Higher education institutions strive to create an environment where all aspects of student education are addressed. Comprehensive student development efforts must consider the impact of employment on student outcomes.

Student employment is an increasingly important factor in the collegiate experience. The percentage of working college students has risen sharply from 67% in 1986 to close to 80% in the 2003/04 school year. On average, students are working approximately 30 hours per week (King, 2006). Prior studies report that student employment is linked to delayed graduation (Canabel, 1998; Ehrenberg & Sherman, 1987; Hall, 1999; Pinto, Parente, & Palmer, 2001; Riggert, Boyle, Petrosko, Ash, & Rude-Parkins, 2006; Stern & Nakata, 1991; Sugarman & Kelly, 1997; Volkwein & Lorang, 1996).

According to the National Center for Education Statistics (NCES) just 35% of the college graduates in 1999 earned their undergraduate degree within four years of matriculation, compared to 53% for the class of 1977. The five-year graduation rate is also slipping. The NCES reported a five-year graduation rate of only 52.3% for the class of 1999, well below the 1977 five-year rate of 74% (U.S. Department of Education, 1993; U.S. Department of Education, 2007). Recent time to graduation initiatives by university administrators and legislators in individual states (Florida, Illinois, Kansas, Kentucky, Montana, North Carolina, Oregon, South Dakota, and Virginia) highlight the importance of delayed graduation (Sugarman & Kelly, 1997).The trend of increasing time-to-degree is costly for the institution, the government, and the individual student.

The work decision is complex. Students are making short-term decisions regarding the quantity of work hours per week without full knowledge of the potential long-term effects of their decisions. This study shows that if the work decision leads to delayed graduation, employment has significant long-term effects on the financial position of the student. Rational decision-making dictates a careful examination of the expected costs and expected benefits. Prior research focuses on the impact of work on academic achievement, persistence, campus engagement, and time-to-degree. This is the first study to address student employment and the economic costs of delayed graduation. The paper describes a model to estimate the long-term economic cost to a student contemplating delayed graduation. Results of this study provide valuable information to university administrators, student development personnel, faculty advisors, students, and parents.

LITERATURE REVIEW

Characteristics of Student Employment

Student employment is prevalent across income levels, geographic locations, and institution types. The number of students employed during college has risen over the last four decades. Baffoe-Bonnie and Golden (2007) reported that approximately 80% of undergraduates work while attending college and many of those students are working long hours each week. The researchers found that 75% of working undergraduates spent over 25 hours per week on the job. Additionally, King (2006) reported that 23% of full-time students work 35 or more hours each week. Individuals who identify themselves as "students who work" reported an average of 25 work hours per week. Those attending college that identified themselves as "employees who study" averaged 39 hours per week at work (Riggert, et al., 2006).

Clearly, for the majority of students, employment plays a significant role in the undergraduate experience. It is interesting to note that upper-income students are just as likely to work as those students with a lower-income status. However, the primary reason cited for employment varies by income and dependency classification. Among all dependent students who work, the primary reason for working is to pay tuition, fees, or living expenses (55.8% of those surveyed). The second most frequently reported reason for employment

was to earn spending money (32.3%). For dependent students with family incomes of $90,000 or more, the percentage of students working for tuition, fees, or living expenses declines slightly to 41%. The most frequently cited reason (44.4%) for employment among higher income dependent students was to earn spending money. The majority of independent students consider themselves "employees who study" and view payment of tuition, fees, and living expenses as the primary reason for work (King, 2006).

Pinto et al. (2001) and King (2002) cite increasing levels of student credit card debt as a possible contributing factor to student employment. Additionally, King (2006) found that parental expectations play an important role in work decisions for college students.

Effects of Student Employment

Student Employment and Academic Success

Mixed results have been published regarding the relationship of work and academic success. Research conclusions are dependent on several factors including the quantity of work hours and the location of employment. Pike, Kuh, and Massa-McKinley (2008) found that working more than 20 hours per week (both on campus and off-campus) negatively impacted student grades. Similar results regarding the adverse consequences of relatively high number of work hours have been published by Baffoe-Bonnie and Golden (2007), Furr and Elling (2000), Hood, Craig, and Ferguson (1992), King (2006), and Orszag, Orszag, and Whitmore (2001). However, other studies failed to find significant evidence of diminished academic outcomes among working students (Pascarella, Bohr, Nora, Desler, & Zusman, 1994; Pascarella, Edison, Nora, Hagedorn, & Terenzini,1998). Researchers also noted that moderate levels of student employment show positive effects on academic performance. (Baffoe-Bonnie, et al., 2007; Hood, et al., 1992; Orszag, et al., 2001).

The literature indicates that the impact of employment on grades depends on whether the student is employed on-campus or off-campus. Pike et al. (2008) showed a positive relationship between part-time employment on campus and grades. The authors also reported on Astin's study which produced similar results. Another study based on data from 18 colleges and universities indicated that students working part-time on campus achieved higher grades than: students working off-campus, students not working, and students working more than 20 hours per week (Kuh, Cruce, Shoup, Kinzie & Gonyea, 2007). Tuttle, McKinney, and Rago (2005), in a review of working college student research, concluded that on-campus employment positively impacts student performance and satisfaction; however, there are relatively few on-campus opportunities available to students. Additionally, Cuccaro-Alamin and Choy reported that 91% of all working students are employed off-campus (as cited by Tuttle et al., 2005).

Student Employment and Persistence

The effects of student employment on persistence appear to depend on both the number of work hours and the location. According to Leppel (2002) the number of student work hours negatively impacts persistence to degree. Similarly, Ehrenberg and Sherman (1987) found that weekly work hours, completed off-campus, in excess of 20 hours increased the student drop-out rate. Their results also indicated that only off-campus work hours negatively affected student persistence.

In separate works, Astin and Tinto concluded that working part time on campus improved persistence; similar results are discussed by McCormick, Moore, and Kuh (as cited in Kuh, 2009). King (2002), with no distinction between on-campus and off-campus employment, reported that students who are employed on a part-time basis exhibit higher persistence rates when compared with students who did not work. The body of literature indicates that moderate levels of on-campus work experiences positively impact student persistence through increased engagement and commitment.

Student Employment and Time to Degree

The literature consistently reports a relationship between student employment and delayed graduation. In a study of why full-time undergraduate students take longer than four years to graduate, Volkwein and Lorang (1996) studied the behavior of "extender" students, a group of full-time students that take longer than four years to graduate. The authors identified light course loads as the primary reason for delayed graduation. Furthermore, the primary reasons extender students completed less than 15 credit hours per semester were as follows: students wanted more time to enjoy college life, students enrolled for lighter course loads to protect their GPA, and individuals needed more time for work and family obligations. Knight (2002) also reported that the average number of semester credit hours is a strong predictor of degree completion time. In a review of student employment research, Riggert, et.al. (2006) reported that students are more likely to decrease the number of credit hours instead of workloads to maintain a desired GPA, thereby increasing the time required for graduation.

Canabel (1998) examined student employment and showed that students manage employment by extending the time to graduation. Stern and Nakata (1991) also indicated that working increases the time to graduation. Hall (1999) states, "the major impediment to graduating in four years is work-related" (p. 21).

Quantitative Estimates of Additional Semesters

Prior reports on the quantitative effects of delayed graduation are incomplete and fail to consider important factors relevant to the true economic cost of increasing time-to-degree (TTD). An author of career and higher education books noted that since the average full-time worker earns an average annual salary of $44,598 and a college graduate

earns an average of $67,766 per year, the cost to the student is $23,168 for each year of delayed graduation (Asher, 2009). This analysis assumes the student is working full-time while attending college at a salary of $44,598 and considers only the salary differential. According to Hall (1999), the state of Texas estimated the cost of a four year degree at $41,636 and the cost of a degree completed in six years is $60,264. This reported six year graduation cost is based solely on an annual charge for tuition. Both of these reported calculations are based only on a single factor (either foregone salary or annual tuition) and ignore important additional cost estimation factors such as student earnings based on weekly work hours, taxes, time value of money, and foregone professional advancement and savings accumulations.

King (2002) provides an example of two students and the anticipated cost difference when one student graduates one year later due to excessive work hours. The author considers employment compensation for both students and begins to incorporate a loan expense for a student who borrows money in lieu of working and graduates one year earlier. However, the example fails to provide consistent treatment for the entire five year period. Also, issues of taxes, time value of interest payments over an appropriate loan repayment period, and opportunity costs of employment and professional opportunities are not considered.

Adventures in Education (2010) provides an online calculator for students to estimate the net financial effect of the tradeoff between working less/borrowing more/graduating earlier and working more/borrowing less/graduating later. However, the calculator neglects to consider loan interest/costs, contains inconsistencies with regard to books, summer earnings, income taxes, and ignores time value of money and the savings opportunities associated with employment.

Summary

Student employment is pervasive and its effects have been noted on academic performance, persistence, and time to degree. The literature indicates a strong link between student employment and delayed graduation. Previous efforts to address the economic consequences of work hour and credit hour decisions have been minimal. This paper proceeds with a description of the model designed to estimate the economic cost of delayed graduation.

MODEL

Description

The model provides estimates of the economic cost incurred by students who delay graduation for one year. Mathematically, the expected economic cost of delayed graduation (ECDG) equals:

$$ECDG = [\,(GRAD + \sum_{n=1}^{4} IA(1 + ST)^n\,) - (\,IA + \sum_{n=1}^{4} IA(1 + ST)^n\,)\,] + \text{OCPA} \qquad \text{Equation (1)}$$

where the opportunity cost of professional advancement (OCPA) is given by:where the opportunity cost of professional advancement (OCPA) is given by:

$$OCPA = \sum_{n=2}^{43} ((SAL_n - SAL_{n-1}) / (1 + LT)^{n-1}) \qquad \text{Equation (2)}$$

and where the income available for living expenses (IA) from working during college and the income available for living expenses earned during year five (GRAD) are:

$$IA = W - TUI - T \qquad \text{Equation (3)}$$

$$GRAD = SAL - T \qquad \text{Equation (4)}$$

The variables are defined as follows:

W = annual wages for working student
TUI = annual tuition
T = taxes
SAL = annual salary for graduated student
ST = short term interest rate
LT = long term interest rate

The model first calculates the difference in the financial position at the end of year five between a student that graduates in four years and a student that graduates one year later in five years. This calculation is represented by adding the future value of the income available for living expenses (IA) from working during college together with the income available for living expenses earned during year five (GRAD) for the four-year plan student. This value is reduced by the future value of the income available for living expenses for the working five-year plan student. Next, the opportunity cost of professional advancement (OCPA) is added to the difference in financial position at the end of year five to arrive at the expected economic cost of a one-year delay in graduation.

It is critical to evaluate the economic impact of delayed graduation with consideration of time value of money. All cash flows should be calculated at the end of year five. To arrive at the future value of an amount, the present value received is compounded forward with an interest rate. Thus, wages during years one through four are compounded forward to the end of the fifth year and added to the current earnings during year five. The appropriate compound rate is the interest rate students could expect to earn on short-term investments lasting less than one year. It is likely that students' savings would be placed out on interest in either a savings account or a short-term certificate of deposit. As noted in Equations 1 and 2, the future value of the difference between the students' financial position is added to the present value of the loss in income over the workers' careers due to entering the workforce one year later (OCPA). Since money has time value, funds received at some future date must be discounted back to the point of analysis. The appropriate discount rate for the opportunity cost of professional advancement, OCPA, is a long term interest rate due to the expected length of the newly graduated student's career.

An additional opportunity cost associated with delayed graduation is the loss of retirement savings due to entering the workforce one year later (losing the first year of savings) and the persistent lag in salary progression that impacts the dollar value of the annual percentage contributions. The present value of the delayed graduate's opportunity cost of reduced retirement contributions, at the end of year five, (OCRC) is given by:

$$OCRC = X(SAL_1) + \left(\sum_{n=2}^{43} \left(X(SAL_N) - X(SAL_{n-1})\right) / (1 + LT)^{n-1}\right) \quad \text{Equation (5)}$$

Where

X = annual salary percentage for retirement contributions
SAL = annual salary for graduated student
LT = long term interest rate

The total opportunity cost (TCDG) of a one year delay in time to graduation is quantified by adding the opportunity cost of reduced retirement contributions to the expected economic cost of delayed graduation. The TCDG is given by:

$$TCDG = ECDG + OCRC \quad \text{Equation (6)}$$

The model is based on the following assumptions:

1. Collegiate room and board is equal to rent, food, and utility expenses for the graduated student.
2. Students work full time during the summer break from classes. Students are assumed to earn the federal minimum wage rate of $7.25 (Department of Labor, 2010).
3. The graduated student completes 15 credit hours each semester and the delayed student completes 12 credit hours each semester. Tuition/fees for public colleges and universities is based on a charge per credit hour; full-time students attending private institutions remit a tuition charge independent of the number of hours completed.
4. While attending college, both students are considered dependents for tax purposes.
5. Due to differences among state tax laws, only federal income taxes are considered.
6. The annual salary percentage for retirement contributions, X, is assumed to be 5% and is fixed for the study.

Variable Specification

The model simulations begin with the creation of a base case scenario. The input values for the initial scenario and subsequent ranges for the variables are based on published research and reported mean and median information. Due to the wide disparity of average tuition levels between public and private institutions, a base case is created for each

institution type. The following sections delineate the base case starting values and corresponding range for each variable.

Number of Work Hours

Based on the student employment literature, it appears that the negative effects linked to student employment are manifested when students work approximately 20 or more hours per week. Therefore, the number of work hours for the student who does not delay graduation is estimated to be 20 hours per week or less, with the delayed student working 20 hours or more each week. It is hypothesized that a student who graduates in four years will be employed between 10 and 20 hours per week. It is anticipated that the five-year plan student is working between 20 and 35 hours each week. The base case scenario inputs are 15 and 30 hours for the four-year graduate and the five-year graduate, respectively.

Tuition

According to the National Center for Education Statistics (NCES), the average undergraduate tuition and fees for public colleges and universities (4 year) for the 2007-08 academic year was $5,950. The mean tuition and fees for all private four-year colleges and universities was $21,588; the average for private four-year universities was reported to be $30,393. Additionally, the overall average tuition/fees for both public and private colleges and universities was listed at $11,459 (NCES, 2008). Based on these statistics, the public college base case scenario tuition is $6,000 with a simulation range of values of $4,000 to $8,000. The private college base case tuition is $22,000 with a simulation range of $15,000 to 31,000.

Short Term Interest Rate: Public Institution Analysis

The short term interest rate is the return the student worker can be expected to earn on short-term deposits. This rate only affects the earning power of the student wages during college. It is likely that undergraduate workers are able to save portions of their summer earnings and perhaps portions of their earnings during the academic year, but it is also recognized that much of the earnings will be utilized as time passes for school and living related expenses. At the time of this writing, six-month certificate of deposits (CDs) are yielding approximately 1%. Due to the relatively low magnitude of student worker wages, the impact of the short term rate on the overall conclusions of the paper is relatively small. Indeed, the base case scenario ECDG changes by less than $200 when modifying the short term rate by .5%. Therefore, the short-term interest rate is fixed at 1% for the period of study.

Short Term Interest Rate: Private Institution Analysis

Over the range of private school tuition studied, the student worker is unable to earn total wages high enough to pay tuition. The model is formulated to calculate the income available (IA) to fund living expenses (room and board, books, supplies, etc.) and considers the financing of living expenses a decision separate from the tuition/work decision. Based on the federal minimum wage and number of weeks available for work, the IA becomes negative with private school tuition. Consequently, the short-term interest rate functions as compound rate on a negative amount of funds, or a short-term loan interest rate. Since the use of money must have a cost, whether the student or parents forego the use of their money for tuition, a conservative short-term rate of 6% is assumed for the private institution analyses.

Long Term Interest Rate

Gopalakrishnan & Sugrue (1995) studied 150 firms and found that the average long-term discount rate utilized for the calculation of pension liabilities was 8.6%. The percentage is consistent with the long term rate of return assumed by the average Standard and Poor's 500 member that sponsors a pension plan (Boselovic, 2008). A similar rate is applied in a 2009 report on actuarial assumptions (Murphy, 2009). Therefore, the base case scenarios are based on an 8.6% interest rate.

Ibbotson and Sinquefield report average annual returns for asset classes The 81 year averages are as follows: long-term government bonds, 5.8%; long-term corporate bonds, 6.2%; large-company stocks, 12.3%; and small-company stocks, 17.1% (Ross, Westerfield, & Jordan, 2010). Given that retirement funds are diversified and hold a mix of securities, a conservative range of 6.1% to 10.1% is employed in this study.

Salary

The National Association of Colleges and Employers (NACE) Summer Salary Survey reports an average starting salary for undergraduate students of $49,307 (NACE, 2009). In accordance with this survey, an average salary of $49,000 serves as an initial value for the base case simulations.

Depending on a student's chosen career path, beginning salaries show considerable variation. Therefore, it is important to conduct model simulations using a wide range of salary figures. Based on nationwide statistics of new college graduate median salary offers published by NACE (2009) and Payscale (2010), this study features a salary simulation range of $30,000 to $70,000.

Salary Progression Rate

An assumed rate of salary progression is the sum of inflation, productivity, and merit components. In a study of actuarial assumptions, Murphy (2009) noted a range of salary progression rates of 4% to 7%. Gopalakrishnan & Sugrue (1995) reported a range of 3% to 8.5% with an average rate of increase of 6%. Consistent with the prior research, a salary progression rate of 6% is utilized in this study.

RESULTS AND DISCUSSION

Base Case Scenario: Public and Private

The figures for the base case represent the most likely, or median, values for the inputs. These are summarized in Table 1.

The results from this study indicate that students who delay graduation for just one year are significantly impacting their future financial position. The expected economic cost of a one-year delay in graduation, for a student who graduates from a public college or university in 5 years, is $88,649. Combining the expected economic cost with the potential loss of retirement funds the total opportunity cost of delaying graduation for one year is estimated at $94,921.

TABLE 1

Base Case Inputs

Variable	Public Institutions	Private Institutions
Number of Work Hours	15 hours (4 year plan)	15 hours (4 year plan)
	30 hours (5 year plan)	30 hours (5 year plan)
Tuition	$6,000	$22,000
Short Term Interest Rate	1%	6%
Long Term Interest Rate	8.6%	8.6%
Salary	$49,000	$49,000
Salary Progression Rate	6%	6%

The model calculates the expected economic cost of a one-year delay in graduation from a private school to be $108,318. As expected, the penalty is far greater for students enrolled in private colleges and universities. This cost together with the potential loss of retirement funds brings the total opportunity cost of delayed private school graduation to $114,589.

The two base case analyses indicate that students should carefully consider any actions that may lead to delayed graduation. The average cost to the student is estimated to be within a band of plus or minus 15% of $100,000.

Simulations

The following tables illustrate the impact of changing one input variable on the outcomes of the expected economic cost of delayed graduation (ECDG) and the total opportunity cost of delayed graduation (TCDG). Table 2 shows the financial consequences of changing the quantity of work hours per week for students attending a public college or university. Table 3 reports the results for private college students.

TABLE 2

Impact of Weekly Work Hours During College on the Cost of Delayed Graduation: Public Institutions

Work Hours: 4 Year Plan Student	ECDG	TCDG
10	$83,699	$89,970
15*	$88,649	$94,921
20	$93,600	$99,871
Work Hours: 5 Year Plan Student	ECDG	TCDG
25	$94,807	$101,078
30*	$88,649	$94,921
35	$82,587	$88,858

*Base Case Scenario

TABLE 3

Impact of Weekly Work Hours During College on the Cost of Delayed Graduation: Private Institutions

Work Hours: 4 Year Plan Student	ECDG	TCDG
10	$102,720	$108,992
15*	$108,318	$114,589
20	$113,916	$120,187
Work Hours: 5 Year Plan Student	**ECDG**	**TCDG**
25	$115,123	$121,394
30*	$108,318	$114,589
35	$101,619	$107,890

*Base Case Scenario

The difference between the two reported columns ECDG and TCDG is OCRC, the present value of the delayed graduate's opportunity cost of reduced retirement contributions (see Equation 6). Consequently, the two columns will differ by a constant amount for all scenarios where both salary and the long-term interest rate are held constant. The cost of delayed graduation estimates vary modestly over the range of specified work hours. As shown in panel two of Table 2 and Table 3, the five-year plan student worker who increases the quantity of hours from 25 to 35 each week over the five year period will reduce the cost of delayed graduation by $12,220 and $13,504 for public colleges and private colleges, respectively. Tables 4 and 5 highlight the role of tuition in the calculation of the financial penalty for increased time to degree. As tuition rises the income available for living expenses declines for both types of students. However, due to the fifth year tuition payment, the overall decline in IA is greater for the five-year plan student. Therefore, holding all other variables constant, as tuition rates rise the delayed graduation cost also increases.

TABLE 4

Impact of Tuition on the Cost of Delayed Graduation: Public Institutions

Tuition	ECDG	TCDG
$5,000	$88,584	$94,856
$6,000*	$88,649	$94,921
$7,000	$88,714	$94,985
$8,000	$88,779	$95,050

*Base Case Scenario

TABLE 5

Impact of Tuition on the Cost of Delayed Graduation: Private Institutions

Tuition	ECDG	TCDG
$15,000	$101,318	$107,589
$19,000	$105,318	$111,589
$23,000	$109,318	$115,589
$27,000	$113,318	$119,589
$31,000	$117,318	$123,589

As shown in Table 4, for every $1,000 increase in public university tuition, the expected economic cost of delayed graduation increases $65. The cost pattern displayed in Table 5 occurs when the tuition level rises above student earnings during school. Since both types of students are unable to cover the full private college tuition, based on 15 and 30 hour work weeks, each dollar of tuition increase flows through as a dollar of additional penalty for both students during years one through four. During the fifth year, the delayed student assumes the full tuition increase without an interest effect.

The long term discount rate significantly impacts the cost of extended graduation across the range of inputs. The average rate (base rate) and range of interest rates assumed by actuaries are shown in Table 6 and Table 7 with the corresponding costs of delayed graduation.

TABLE 6

Impact of the Long Term Interest Rate on the Cost of Delayed Graduation: Public Institutions

Rate	ECDG	TCDG
6.1%	$130,599	$138,906
6.6%	$119,858	$127,641
7.1%	$110,474	$117,799
7.6%	$102,249	$109,176
8.1%	$95,021	$101,599
8.6%*	$88,649	$94,921
9.1%	$83,016	$89,018
9.6%	$78,022	$83,786
10.10%	$73,580	$79,135

*Base Case Scenario

TABLE 7

Impact of the Long Term Interest Rate on the Cost of Delayed Graduation: Private Institutions

Rate	ECDG	TCDG
6.1%	$150,268	$158,575
6.6%	$139,527	$147,310
7.1%	$130,142	$137,468
7.6%	$121,918	$128,845
8.1%	$114,690	$121,267
8.6%*	$108,318	$114,589
9.1%	$102,685	$108,687
9.6%	$97,690	$103,455
10.10%	$93,249	$98,803

*Base Case Scenario

Over the 4% range of interest rates studied, the expected cost of delayed graduation changes by $57,019. Note that although the absolute level of the costs ECDG and TCDG differ between public and private colleges, the dollar effect of an interest rate change is constant between the two institution types. The long-term interest rate change is more pronounced in TCDG due to the fact that TCDG contains both salary progression and retirement contribution effects while ECDG reflects only salary progression differences.

It is expected that as the interest rate increases the ECDG and TCDG will decline. The economic cost and total cost are sensitive to the magnitude of the LT input value. A change in LT affects the opportunity costs of: professional advancement (OCPA) and retirement contributions (OCRC). Since the opportunity costs are in present value terms, as the LT discount rate increases the present value amounts decrease and lead to an overall decline in the expected cost of delayed graduation calculated at year five. Given a one-half percentage change in the long-term interest rate, the TCDG change ranges from $4,652 to $11,265. As the interest rate moves up or down one-half percent from the

base case, the resulting percentage change in TCDG varies between 5.2% and 7.0%.

Tables 8 and 9 report the estimated cost of delayed graduation across a range of anticipated salary levels for students enrolled in public and private institutions, respectively.

TABLE 8

Impact of Salary on the Cost of Delayed Graduation: Public Institutions

Salary	ECDG	TCDG
$30,000	$45,270	$49,109
$35,000	$56,888	$61,367
$40,000	$68,506	$73,626
$45,000	$79,755	$85,514
$50,000	$90,873	$97,272
$55,000	$101,991	$109,031
$60,000	$113,110	$120,789
$65,000	$124,228	$132,547
$70,000	$135,347	$144,305

TABLE 9

Impact of Salary on the Cost of Delayed Graduation: Private Institutions

Salary	ECDG	TCDG
$30,000	$64,938	$68,778
$35,000	$76,557	$81,036
$40,000	$88,175	$93,294
$45,000	$99,423	$105,183
$50,000	$110,542	$116,941
$55,000	$121,660	$128,699
$60,000	$132,778	$140,458
$65,000	$143,897	$152,216
$70,000	$155,015	$163,974

The results show that as the expected salary increases the financial cost to the delayed graduate increases. As salary levels rise, the five-year plan student is assessed a larger cost through the postponement of the first year earnings, the persistent lag in salary progression, and the lag in retirement contributions. Note that salary level is independent of tuition. Therefore, the total economic cost of a $5,000 salary increase to the delayed graduate from both public and private institutions is equivalent and ranges from $11,758 to $12,258. The overall impact of expected salary on the cost of delayed graduation is significant; over the $40,000 salary ranged studied the ECDG increases over $90,000.

Scenario Analysis

The traditional scenario analysis technique compares three cases: base case, worst case, and best case. The base case analysis is based on the set of inputs that are most likely to occur, the average values. The prior simulations results are constructed from the base case where a single input value was allowed to vary at a time. In this study, the worst case occurs when each variable assumes the most costly value at the same time. Conversely, the best case materializes when each variable achieves the lowest cost level at the same time. A detailed list of inputs for the best and worst case is provided in the Appendix. The base case variable levels are delineated earlier in this paper.

The public college base case scenario results in an estimated economic cost of delayed graduation of $88,649 and a total opportunity cost of delayed graduation equal to $94,921. The private college base case results are $108,318 and $114,589 for ECDG and TCDG, respectively. The worst case scenario combines high salary expectations with high tuition and a low LT rate. The estimate of the highest cost of a one-year delay in graduation amounts to $236,346 for ECDG and $248,214 for TCDG. The lowest cost case

combines low salary, low tuition, a high number of work hours for the fifth year student, and a high discount rate. Based on the range of inputs studied, the lower bound of the expected cost of delayed graduation is a modest $25,485 (ECDG) and $28,910 (TCDG). Although it is unlikely that all variables would simultaneously occur at either the best or worst level, there may be some situations where the cost estimation significantly varies from the most likely case (base case). In particular, in the current economic climate that carries relatively low interest rates, it is foreseeable that some students anticipating a relatively high salary attending private school may be subject to delayed graduation penalties in the range of $240,000.

Extensions

Statistics indicate an upward trend in the time to graduation. It is increasingly more common for students to extend to six years for degree completion. Consistent with the increasing TTD, universities now report a six-year graduation rate. An extension of this model is to accommodate an analysis of the estimated cost of a one-year delay from five years to six years. Due to the similarity of the findings, only the base case is reported. The estimated economic cost of delayed graduation for a public university student contemplating graduating in six years rather than five years is $85,564. The corresponding TCDG is $91,785. It is estimated that private college students, increasing their time-to-degree from five years to six years, will assume an estimated cost of delayed graduation of $105,636 and a total opportunity cost of delayed graduation of $111,857. This problem framework only differs with regard to cash flow timing where the one-year lag is pushed one year out to the end of year six. It is important to note that while the one year delayed graduation cost estimates at year six are slightly lower than the analyses conducted for the fifth year graduate (due to compounding effects), the cost difference is significantly larger for a two-year lag from graduation in four years versus six years. Indeed, a two-year increase in time-to-degree is estimated to cost approximately $141,000 for public college students and up to $186,000 for private university students (base case analyses TCDG).

Historically, delayed college graduation referred to a situation where a student graduated in five years instead of the previously accepted four years. Whether the appropriate comparison is still four-years versus five-years, five-years versus six-years or even four years versus six years is up for discussion. However, the extensions to varying time periods consistently show significant costs due to extending the time-to-degree.

CONCLUSIONS

Education is an investment; the investment outcome is improved when decision-makers maximize the quality of their information set. Volkwein and Lorang (1996) wrote that students are unharmed by extended graduation and "appear not to be negatively impacted by taking longer to graduate" (p. 63). This paper extends the current body of literature and provides valuable information to students making short-term decisions of weekly work hours and enrolled credit hours without relevant information regarding the significant long-term potential costs associated with delayed graduation. It is recognized in the literature that increasing time to degree is costly to both governments and higher educational institutions. However, the costs to students and families have not been well addressed. To the best of the author's knowledge, this paper is the first research project to study the costs of delayed graduation that are assumed by the student.

The results of the model presented herein illustrate the substantial financial implications associated with delayed graduation. The study also highlights the factors that have a relatively large impact on the costs, such as expected salary upon graduation and the long-term interest rate. The simulation results vary from a low TCDG of $49,109 to a high TCDG of $163,974. These values occur at the lowest expected salary for public university students and the highest expected salary for private university students, respectively. Although this range is relatively large, the base case analyses provide a starting point for students. Students can utilize this model as a decision-making tool. Current and prospective students are able to approximate their expected salary range and have information regarding tuition, expected work hours and interest rates. The contribution of this research is based on the identification and quantification of previously unrecognized effects of increasing time-to-degree.

Prior research has shown that relatively high levels of student work decrease the number of enrolled credit hours and that enrolled credit hours is a predictor of time-to-degree. The results of this paper show that students who delay graduation in favor of increased work hours are not making a long-term cost effective choice. A student that requires a relatively high number of work hours to pay tuition represents an exception to this conclusion. The student may be unable or unwilling to borrow a sufficient amount, either due to financial factors or risk aversion. Some students may face the choice of increasing work hours, resulting in a delayed graduation, or being unable to complete their degree due to a lack of financing. In these cases, the lifetime benefit to completing a college degree would likely outweigh the cost of extended time-to-degree.

The time-to-degree problem is multi-dimensional. Decision factors for the credit hour choice that leads to higher TTD will likely vary among individual students. However, if students are aware of the future financial impact of increasing time-to-degree it is likely that decisions regarding money and time management, work hours, and credit hours will be considered more thoughtfully. It is important to inform students of the consequences of their decisions on TTD. University-wide educational programs and developmental advising are two avenues to explain the

potential costs outlined herein. The framework of this study can be extended to decisions beyond work hours that impact time to graduation. For example, a student considering a change of major or adding a double major should assess the expected benefits versus the expected costs of the decision. Although non-quantitative factors are also important, an awareness of the financial implications improves the decision-making process.

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Suzanne K. Hayes is an Assistant Professor of Finance at the University of Nebraska at Kearney. She received her PhD in Finance from the University of Texas-Dallas. Her research has been published in the *Journal of Portfolio Management*, *Journal of Financial Services Professionals*, *Journal of Academic Leadership*, *Journal of Online Learning and Teaching*, and others. Her research interests include investments and personal finance.

APPENDIX

Worst Case Inputs

Variable	Input
Number of Work Hours	20 hours: 4 year plan
	25 hours: 5 year plan
Tuition	$31,000
Short Term Interest Rate	6%
Long Term Interest Rate	6.1%
Salary	$70,000

Best Case Inputs

Variable	Input
Number of Work Hours	10 hours: 4 year plan
	35 hours: 5 year plan
Tuition	$5,000
Short Term Interest Rate	1%
Long Term Interest Rate	10.1%
Salary	$30,000