For-Profit and Traditional Colleges: Institutional Control, Financial Aid Allocation, and Net Costs

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Abstract

I examine differences in the competitive behavior between for-profit and traditional universities by modeling how these institutions allocate financial aid packages and set net cost according to differing objective functions. I test the implications of the model using data from the 2003-2004 and 2007-2008 waves of the National Postsecondary Student Aid Survey. I use a hurdle model and correct for self-selection of students into institutions to estimate differences in pricing behavior. For-profit universities annually offer $819.69 less in institutional aid, while their students take on $1,978.45 more in unsubsidized student loans and pay a higher net cost of $3,713.58.

Keywords: For-Profit Higher Education, Student Financial Aid, Price Discrimination.

JEL Classification Numbers: I22, I28, H52.

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1 Introduction

While a changing economy requires more college graduates to meet increasingly specialized job requirements, it is doubtful that America's traditional colleges and universities can keep up with demand. Decreased state support, reduced donations from alumni, and declining endowments during the recent Recession of 2008 have curtailed university expansion and faculty hiring while at the same time enrollments at colleges and universities have increased significantly. Given the current economic climate, the emerging for-profit higher education sector could accommodate an increased number of students who cannot be served by capacity constrained colleges and universities.

Policymakers and education experts have long debated the implications of the growth of the for-profit education sector. Some argue that for-profit schools are more flexible for working and non-traditional students who might otherwise not obtain any higher education (Christensen and Eyring 2011, pp. 351). While others, including President Barack Obama, criticize the for-profit sector for high tuition prices, allegedly low quality of education, and deceptive recruiting practices especially among military veterans (Helderman 2012).

Despite the debate surrounding for-profit colleges, little theoretical or empirical research exists that analyzes this sector. Existing research focuses mainly on labor market outcomes of for-profit students[1]. Becker's (1964) model of human capital investment predicts that students will not only consider the potential benefits of education, but costs as well. This study focuses on the differences in net costs between the for-profit and traditional sectors charged to the student as a result of price discrimination[2] via financial

[1]The results from these studies are mixed. Deming, Goldin, and Katz (2012) find that graduates from for-profit universities default on student loans at higher rates, are less likely to find employment, and earn less than comparable students. Cellini and Chaudhary (2012) and Lang and Weinstein (2012) however, find that for-profit students earn incomes comparable to community college graduates.

[2]Price discrimination is defined in the industrial organization literature as charging different consumers different prices for the same good based on observable characteristics

aid[3] allocation.

To better understand the market for higher education, I model how for-profit and traditional universities compete for students using financial aid in a two stage game. In the first stage, a university's governing board (e.g. board of trustees, state legislature, or board of regents, etc.) sets a "sticker price" tuition that all students must pay regardless of personal characteristics or welfare concerns. In the second stage, an admissions or scholarship committee receives the "sticker" tuition and allocates financial aid given the student's academic and personal characteristics in accordance with the university's objective function. I assume that for-profit universities maximize profits while traditional universities maximize social welfare given a budget constraint. The model predicts that as a university exhibits a higher degree of profit maximizing behavior, the net cost that the student pays increases while the amount of financial aid decreases. This result implies that students at for-profit universities will pay more out of pocket then their peers at a traditional private or public institutions. Also, as the student's price elasticity of demand increases, for-profit universities will increase the amount of financial aid to compete against traditional institutions.

I then test the predictions from the theoretical model using data from the 2003-2004 and 2007-2008 waves of the National Postsecondary Student Aid Study (NPSAS). The NPSAS contains a nationally representative sample of students attending Title IV eligible institutions across sectors. I consider how universities allocate various types of financial aid including institutional aid, Pell Grants, and student loans conditional on a given student's personal and academic characteristics. There are two empirical issues, that I overcome in my estimations. First, I use a polychotomous discrete choice selectivity model proposed by Lee (1983) to correct for the self-selection of students into types of institutions. Second, I

[3]Financial aid allocation is an important question within the economics of higher education because student aid affects a number of education outcomes including the decision to matriculate into college (Leslie and Brinkman 1987; Van der Klaauw 2003) and persistence to graduation (Bettinger 2004).

combine the self-selection result with a hurdle model proposed by Cragg (1971) to correct for the large number of students who receive no financial aid. I find that students at for-profit universities receive $819.69 less in institutional aid, $572.44 more in subsidized student loans, and $1,978.45 in unsubsidized student loans than comparable students at a private, non-profit university. These results imply that students at for-profit universities pay $3,713.58 annually out of pocket than if they would have attended a traditional university.

Previous studies regarding for-profit universities focus primarily on how financial aid programs contribute to the growth of for-profit universities and generally use institution instead of student level data. Cellini (2010) and Cellini and Goldin (2012) find that increasing amounts of federal aid encourages for-profit universities to enter the market since these funds can be used at any Title IV institution. Cellini (2009) finds however that as funding for community colleges increases, many students substituted away from for-profit universities.

Turner (2012), however, does use student level data from the NPSAS to compare financial aid allocation using a regression kink method. The author uses this technique to compare students slightly below and above the Pell Grant eligibility cutoff and compares how different types of institutions alter the amount of institutional aid that Pell Grant recipients receive to increase revenues. She finds that for-profit universities' strategic behavior is no different from non-selective traditional universities, which is intuitive because the Federal Government only considers financial need, not institutional control when allocating Pell Grants. However, this result may not hold for other types of aid such as institutionally funded grants. Also these results only apply to Pell Grant recipients and not all students. This study differs because I not only examine Pell Grants but how student loans, institutional need, and net costs differ between the two sectors.

The remainder of the paper is organized as follows. Section 2 describes both the

history and growth of the for-profit higher education sector. Section 3 presents the theoretical model that describes differences in financial aid and price discrimination. Section 4 describes the data. Section 5 presents the empirical models, Section 6 discusses the empirical results, and Section 7 concludes.

2 For-Profit Higher Education

2.1 Brief History of For-Profit Higher Education

For-profit higher education is not new and has historically not been as controversial as in recent decades. The first example of higher education in the United States was the College at Henrico that was founded in 1617 in the colony of Virginia. In Europe, for-profit higher education has existed since 1494 to teach double column bookkeeping (Kinser 2006, pp. 13). For-profit colleges generally were confined to teaching technical and business subjects while liberal arts, medicine, and the sciences were generally reserved for more prestigious, non-profit universities.

One of the largest expansions of role of the federal government funding higher education occurred in 1862 when Congress passed the Morill Land Grant College Act (Thelin, 2004, pp. 104). While Congress had previously assisted states to create colleges, this bill allocated federal lands to fund one college per Representative in the state's delegation. Along with classical languages and philosophy (the prevailing subjects of the day), the curriculum at these new colleges focused on agricultural and mechanical education.

With the introduction of agricultural and mechanical curriculum into higher education, other subjects began to appear on campus as well. In 1881, the departments of history, government, and economics at the University of Pennsylvania petitioned to join the College of Liberal Arts and were rejected. These departments, along with other subjects,

formed the Wharton School of Business which provided the first undergraduate business education on a university campus. In 1908, Harvard created the Graduate School of Business and introduced a new degree called the Master of Business Administration (Watson, 2001, pp. 79).

This change in the curriculum in the traditional sector of higher education and the passage of new compulsory secondary schooling laws meant that students could receive similar training from a for-profit colleges but now coupled with the prestige of attending a prestigious private or public university such as Harvard (Kisner 2006, pp. 20). In response, for-profit universities adjusted their curriculum, making it more practical and focused on recruiting students among industrial, manufacturing, and cosmetology vocations.

The for-profit sector has re-surged during the last twenty years. Among the most well-known for-profit institutions is the University of Phoenix (UOP). Founded in 1976 by John Sperling, UOP avoided many of the traditional aspects of higher education including the academic school year, academic rank and tenure, and the need for students to relocate to a physical campus. These adjustments (particularly the lack of the traditional academic calendar) were appealing to many working professionals because it allowed them to more easily balance work and family commitments with academic pursuits. Also by hiring primarily professionals in the business world to serve as adjunct faculty, UOP claims to deliver more "practical" education at a significantly lower marginal cost (Breneman 2006). UOP has also become a pioneer in online education. Previously students were required to meet at an UOP building at least one weekend a month, but with the advent of the Internet, UOP can serve students anywhere (Breneman 2006).

While the for-profit model may not serve all students well, but they have the potential it serves those who are on the margin between choosing higher education and participating in the workforce directly after high school. Christensen and Eyring (2011) suggest that the for-profit model may threaten traditional higher education if for-profit

universities are able to provide comparable education outcomes at a lower marginal cost. While the for-profit sector still has considerable room for improvement regarding outcomes, Christensen and Eyring claim that new technologies may close the gap between the sectors and future for-profit universities may become serious competitors to even the most prestigious traditional colleges.

2.2 Trends in the For-Profit Sector

Figure 1 plots the average tuition price for the three different sectors from 2003-2012. The average price at a for-profit university is greater than public universities, but less than traditional non-profit colleges. The average price for private non-profit and public institutions has steadily increased over the last decade, while tuition at for-profit universities have remained relatively constant; even decreasing during the last two years. These results might be evidence of the move from traditional physical facilities to online education in the for-profit sector.

Note: In the next draft, I will download information from IPEDS about the growth of enrollment and market share of for-profit universities.

3 Theoretical Model

Colleges and universities can approach first degree[4] price discriminating behavior because of the unique conditions surrounding the process of applying for admission and financial aid where students disclose extensive information about their financial, demographic, and academic background.

[4] The empirical literature, however, regarding first degree price discrimination is sparse because it is very difficult to obtain extensive information about potential customers. The literature regarding price discrimination mostly focuses on third degree price discrimination; when a monopolist offers different prices to groups of consumers with similar characteristics and elasticities of demand for the same product. Examples of third degree price discrimination include gasoline (Shepard, 1991), automobiles (Ayers and Siegelman, 1995; Goldberg, 1996), airlines (Borenstein and Rose, 1994), and Broadway musicals (Leslie, 2004).

Figure 8 displays an overview of the theoretical model. This model is divided into two stages. In the first stage, the governing boards of two universities (i.e. state legislatures, a Board of Regents or Trustees) set a baseline tuition level based on the behavior of a representative student within the context of the Hotelling (1929) linear city model. Since the governing board does not deal directly with individual students, they price tuition to maximize profit with the understanding that the admission board will offer financial aid in the second stage.

In the model's second stage, the university's admission board takes the baseline tuition rate and maximizes the university's social welfare function by price discriminating among students with various elasticities of demand. These elasticities depend on income, merit and other factors. Modeling price discriminating behavior of traditional universities is difficult because it is assumed that the primary goal of a university is not to maximize profit. There have been many proposals to what a university's objective function should be. Examples include maximizing the institution's utility by accepting academically talented and traditional underrepresented students (Ehrenberg and Sherman 1984; Ehrenberg 1999), human capital production with students as inputs (Castipias 1987), a general equilibrium model where universities maximize prestige and sell education to students (Epple, Romano, Sieg 2006), or to sponsor faculty research, athletics and needy students (McPherson, Schapiro, and Winston 1993). In this study, I assume that traditional universities maximize a social welfare function given a budget constraint where profit maximization is a special case[5]. The model is solved via backwards induction. Thus the solution to the second stage of the model will be outlined first followed by the first stage.

[5] Models of price discrimination where institutions maximize a given social welfare function against a budget constraint have been used in previous studies most notably Feldstein (1972a and 1972b), LeGrand (1975), and Steinberg and Weisbrod (2005). Fethke (2011) and Turner (2012) use similar models to describe how universities set tuition. This study is unique in that it uses two stages to describe the differences in objectives in setting the baseline tuition rate and how universities use financial aid to price discriminate.

3.1 Second Stage: Out of Pocket Price by Admission Board

In the second stage, the baseline tuition rate for University j (denoted $\bar{P}_j$) is passed down from the governing body to the individual institutions for implementation. The institution however observes parents' and students' incomes that allow the institution to determine an individual student's willingness and ability to pay. The universities use this information to tailor a scholarship offer.

The theoretical underpinnings of university price discrimination are different from traditional models because universities are generally not for-profit institutions. Thus it would not be appropriate to assume that a university's objective function is to maximize profit. While their expenses are limited by a binding budget constraint, universities are similar to other government and non-profit entities (i.e. hospitals, day care organizations, religious institutions, etc.) that have goals and motivations that deviate from simple profit maximization.

I assume that a university maximizes a social welfare function that weighs each individual's utility according to its institutional mission. For example, public universities may weigh the utility of in-state students greater than their out-of-state classmates or a school may offer a greater financial aid package to a poorer student than his equally meritorious (but more well off financially) classmate.

Assume that the university has the following social welfare function:

$$W_j = f(w_{ij}; u_{ij}) = w_{1,j}u_{1,j}(S(P_{1,j})) + w_{2,j}u_{2,j}(S(P_{2,j})) + ...w_{i,j}u_{i,j}((S(P_{i,j})) \qquad (1)$$

Where W_j is University j's social welfare function that includes the weights (w_{ij}) the university places on each individual student's (i) utility (u_{ij}). The student's utility function is a function of a latent variable indicating whether the student attends college

(S_i) and numeraire. Assume that S_i is an increasing function with respect to income and academic ability, but decreasing with the final individual tuition price (P_{ij}) that is paid by student i to university j.

In addition to profit maximization, another key difference between universities and private sector firms is the requirement that is in place, by either policy or law, that the university cannot charge more than the "sticker price" $(\bar{P}_j)$. Universities face a situation where if it chooses to price discriminate,then it must make up the difference between the price that the student actually pays (P_{ij}) and $\bar{P}_j$. Every scholarship comes at a cost to the university. Thus the budget constraint for University j is:

$$\int_1^i ((\bar{P}_j - P_{ij})S_i(P_{i,j}))di \leq E_j + G_j + P_{i,j}S(P_{i,j}) \tag{2}$$

Thus Universities j's objective is to:

$$\max_{P_{ij}} \mathcal{L} = \int_1^i w_i u_i \; di + \lambda \left(E_j + G_j + P_{i,j}S(P_{i,j}) - \int_1^i (\bar{P}_j - P_{ij})S_i \; di \right) \tag{3}$$

The first order condition from the university's maximization problem is:

$$\frac{\partial \mathcal{L}}{P_{ij}} = w_i \frac{\partial u_i}{\partial P_{ij}} + \lambda \left(P_{ij} \frac{2\partial S_i}{\partial P_{ij}} + 2S_i - \bar{P}_j \frac{\partial S_i}{\partial P_{ij}} \right) = 0 \tag{4}$$

By invoking the envelope theorem we know that $\partial u_i / \partial p_{ij} = -S_i$, thus

$$w_i S_i = \lambda \left(2P_{i,j} \frac{\partial S_i}{\partial P_{ij}} + 2S_i - \bar{P}_j \frac{\partial S_i}{\partial P_{j,i}} \right) \tag{5}$$

Next divide (5) by S_i and define:

$$\epsilon_{i,j} = \frac{\partial S_i}{\partial P_{i,j}} \frac{P_{i,j}}{S_i} < 0 \tag{6}$$

where $\epsilon_{i,j}$ is the price elasticity of demand of student i for university j. This yields:

$$w_i = \lambda \left(2 + 2\epsilon_{i,j} - \frac{\bar{P}_j \epsilon_{i,j}}{P_{i,j}} \right) > 0 \tag{7}$$

given that $\bar{P}_j \geq P_{ij}$.

Rearranging (7) yields:

$$\frac{P_{i,j} - (\bar{P}_j - P_{i,j})}{P_{i,j}} = \left(\frac{1}{\epsilon_{ij}} \right) \frac{w_i - 2\lambda}{\lambda} \tag{8}$$

Equation (8) is an augmented version of the classic Lerner Index which shows the inverse relationship between the spread between price and marginal cost and the consumer's price elasticity of demand. However, unlike for-profit monopolists universities discount the required baseline tuition rate so in this case the Lerner Index is negative. The left hand side is augmented with an expression for the tradeoff between the value that institution places on a particular student attending the university and the marginal social welfare that is gained by an extra dollar of revenue. If the university values its institutional mission more than an extra dollar of revenue, it will charge a price less than the baseline price i.e. offer financial aid.

For-profit universities are a special case within the augmented Lerner Index. For-profit universities simply set $w_i = 3\lambda$. Thus, for the case of for-profit universities, equation (8) collapses back to the traditional Lerner index derived from profit maximization.

Continuing with the assumption of a traditional university, assume further that since the university is required by law to charge no more than $\bar{P}_j$ then if $w_i = 2\lambda$, the university simply does not offer financial aid but rather charges the full price. Thus the

after scholarship price for student i is:

$$P_{i,j} = \frac{\bar{P}_j}{1 - \frac{max(w_{ij} - 2\lambda, 0)}{\epsilon_{ij}\lambda}} > 0 \tag{9}$$

Define:

$$\xi_{ij} = \left(1 - \frac{max(w_{ij} - 2\lambda, 0)}{\epsilon_{i,j}\lambda}\right) \geq 1 \tag{10}$$

One again, a for-profit university simply sets $w_{ij} = 2\lambda$. Given this assumption, equation 9 simplifies to $P_{ij} = \bar{P}_j$, meaning that a for-profit institution should not offer any additional discount from the "sticker price" tuition for its students. This behavior is evident from the few positive values of institutional aid from the descriptive statistics regarding for-profit universities provided in Section 5.2.2.

3.2 First Stage: Setting the Sticker Tuition Price by Governing Board

In the first stage, I assume a traditional Hotelling linear city and that potential students are distributed uniformly across product space of unitary distance. Two universities are located on either side of this line. University 1 is considered to be more prestigious than University 2 by all students and the utility of attending the less prestigious university u_{i2} is discounted by a factor of $\alpha \in (0, 1)$. Assume that u_{ij} is large enough that the entire market is served regardless of $\alpha > 0$.

All of the students who lie between these universities have already been accepted and thus face a decision regarding which university the student will ultimately enroll. Once the student decides, switching costs are high enough to prevent transferring to another school. Students however do face a transport cost. This transport cost can be attending a university that is not the students' first choice, to which the student does not have strong

ties (i.e. parents are not alumni) or extra costs due to room and board as opposed to living at home and attending the university that is geographically closer.

In the first stage, tuition prices are set by a governing body (such as a state legislature, Board of Regents, trustees, administration of an individual university, etc) that cannot observe the individual students' welfare and thus will base their pricing decision on a representative consumer who has a median utility for higher education $\hat{u}$. Also assume that policy makers price to maximize profits so that public subsidies and investments from endowments are held to a minimum. The indifferent consumer is such that:

$$\hat{u} - t\hat{x} - P_{i,1} = \alpha\hat{u} - t(1 - \hat{x}) - P_{i,2}$$

Solving for $\hat{x}$ and $1 - \hat{x}$ yields:

$$\hat{x} = \frac{(1-\alpha)\hat{u} - P_{i1} + P_{i,2} + t}{2t}$$

$$1 - \hat{x} = \frac{(\alpha-1)\hat{u} - P_{i2} + P_{i,1} + t}{2t}$$

The governing boards of each universities sets price to maximize profit, where $\hat{x}$ represents demand for University 1 and $1 - \hat{x}$ represents demand for University 2. Thus the objective function for the governing board of University 1 is:

$$\max_{\bar{P}_1} (\bar{P}_1 - c) \left(\frac{(1-\alpha)\hat{u} - P_{i1} + P_{i2} + t}{2t} \right)$$

and University 2:

$$\max_{\bar{P}_2} (\bar{P}_2 - c)(1 - \hat{x}) = \left(\frac{(\alpha-1)\hat{u} - P_{i2} + P_{i1} + t}{2t} \right)$$

Assuming that governorship boards are forward looking, they will anticipate that

the admissions board will offer financial aid to prospective students, thus we incorporate the individual price determined in equation (8). This is done by substituting $\xi_j P_{ij}$ for $\bar{P}_j$ into each universities' objective function.

Taking the first order conditions and solving for the reaction functions for both universities yields:

$$R_1(P_2) = \frac{(1-\alpha)\hat{u} + \xi_2 P_2 + t + \xi_1 c}{2\xi_1} \tag{11}$$

$$R_2(P_1) = \frac{(\alpha-1)\hat{u} + \xi_1 P_1 + t + \xi_2 c}{2\xi_2} \tag{12}$$

Solving the reaction reactions yields the following for the equilibrium individual price actually paid by the student:

$$\bar{P}_1 = \frac{(1-\alpha)\hat{u} + 3t + (2\xi_1 + \xi_2)c}{3\xi_1} \tag{13}$$

$$\bar{P}_2 = \frac{(\alpha-1)\hat{u} + 3t + (2\xi_2 + \xi_1)c}{3\xi_2} \tag{14}$$

Since $\alpha < 1$, it follows that, all things equal, if University 1 is considered more prestigious then University 2 then $P_1 > P_2$. This extra term, $(1-\alpha)$ represents a prestige premium, where the more prestigious University charges a higher price. Correspondingly the less prestigious university charges a lower price to compensate the indifferent consumer for the drop in utility. As the prestige gap closes, University 1 lowers its price and University 2 raises its price until there is no gap and the price of either good depends on the price elasticities and welfare weights for each school contained in the terms ξ_1 and ξ_2.

The financial aid package offered by University J is:

$$F_{i,j} = \bar{P}_j - P_{i,j} = \xi_j P_{ij} - P_{ij}.$$

Proposition 1 *As the weight that the institution assigns to the utility of its students increases, then final tuition rate will decrease, and the financial aid package increases.*

This result is shown by taking the first derivative of P_{ij} and $F_i j$ with respect to w_i.

$$\frac{\partial P_{i,j}}{\partial w_i} = \frac{(1-\alpha)\hat{u} + 3t}{\xi_j^2 \epsilon_{ij} \lambda} < 0 \tag{15}$$

$$\frac{\partial F_{i,j}}{\partial w_i} = \left(\frac{2}{3}c + \frac{(1-\alpha)\hat{u} + 3t}{\xi_{ij}^2}\right)\left(\frac{-1}{\epsilon\lambda}\right) > 0 \tag{16}$$

If a university exhibits profit seeking behavior, then w_i will tend to zero. These results imply that a for-profit university would charge the particular student a higher final tuition price and offer less financial aid than a comparable traditional university.

Proposition 2 *As an individual's price elasticity of demand for the University becomes more inelastic, the final tuition rate will increase, and the financial aid package offered by the university will decrease.*

This proposition is also simple to prove by taking the first derivative of P_{ij} and F_{ij} with respect to $\epsilon_{i,j}$.

$$\frac{\partial P_{i,j}}{\partial \epsilon_{ij}} = \left(\frac{(1-\alpha)\hat{u} + 3t}{\xi_j^2}\right)\left(\frac{max(w_i - \lambda, 0)}{\epsilon_{ij}^2 \lambda}\right) > 0. \tag{17}$$

$$\frac{\partial F_{i,j}}{\partial \epsilon_{ij}} = \left(\frac{2}{3}c + \frac{(1-\alpha)\hat{u} + 3t}{\xi_{ij}^2}\right)\left(\frac{-max(w_i - \lambda, 0)}{\epsilon_{ij}^2 \lambda}\right) < 0 \tag{18}$$

These results imply that as a student becomes more sensitive to the tuition price, universities will be more likely to award the student additional financial aid and lower the effective tuition price for the student. Profit seeking behavior will dampen the magnitudes

of these changes and thus universities will be less willing to offer financial aid.

In conclusion, the theoretical model gives two testable hypothesis to measure differences in price discrimination and financial aid allocation between for-profit and traditional higher education. First, for-profit higher education places a higher weight on revenue instead of student utility, thus for-profit universities should offer lower amounts of financial aid for similar students attending comparable institutions. Second, students who are less sensitive to an increase in tuition price for a particular institution should receive less financial aid and pay more out of pocket for their college education.

4 Data

4.1 Description of Data

This study uses data from the National Postsecondary Student Aid Survey (NPSAS). These data contain information from many sources including student interviews, student responses to the Free Application for Federal Student Aid (FAFSA), and surveys completed by college and university administrators about their institutions. Data contained in the NPSAS describe student characteristics such as grades, standardized test scores, and parents' income. NPSAS also identifies the college or university that the student attends and provides data about enrollment size, public or private status, and tuition pricing. The National Center of Education Statistics (NCES), a subsidiary of the United States Department of Education, updates the NPSAS with a new cross section every four years. I use the 2007-2008 and 2003-2004 waves of the data. I have restricted my sample to undergraduates who attend institutions that are considered open admission or minimally selective which should model institutions that are most likely to be in the choice set of students considering enrolling at a for-profit university.

Every four years, NCES complies the NPSAS by a random sample of both

institutions and students. The goal of the NPSAS is to create a representative sample of typical college students for each of the fifty states, the District of Columbia, and Puerto Rico. Each institution of higher education that is eligible for federal student aid (i.e. Title IV compliant) is assigned a sampling probability and sampled with replacement so that the NPSAS creates a representative sample of the college student population in each state. Further, to create a nationally representative sample, the following states are over-sampled to compensate for their comparative size: California, Georgia, Illinois, Minnesota, New York, and Texas. After the number of observations per institution is determined, NCES randomly samples students such that the sample would represent of the student body with regards to demographic information, types of financial aid, and major.

4.2 Summary Statistics

4.2.1 Overall Summary Statistics

Table 1 displays summary statistics for all exogenous and financial aid variables aggregated across the three education sectors (private for-profit, private non-profit, and public). The average household income of my sample is $48,810. In the NPSAS, the income variable depends on the dependency status of the student. If the student is considered a dependent [6] (independent), then parents' (student's) income is reported. Dependent students comprise 48.0 percent of my sample. The average GPA of my sample is 2.99. Demographically, 17.2 percent of students sampled are African-American, 14.3 percent are Hispanic, and 3.2 percent are Asian. Also, roughly 37.9 percent of the students in this sample are pursuing four year degrees, 52.4 percent are pursuing a two year degree, and 9.7 percent are pursuing a certificate that should take less than two years to complete.

In addition to the demographic characteristics of the individual students, the

[6] Students are generally considered independents if they are over 24 years of age, married, veterans, have children, and/or are orphaned.

NPSAS provides information regarding institutional characteristics that help to understand how institution control affects financial aid allocation. In this sample, 12.8 percent of students are studying at a for-profit university, while 68.4 are studying at a public institution and 18.8 percent are at a private, non-profit college. The average "sticker" price or the price charged by an institution before any type of financial aid is $5,410 per year and the average enrollment size is 9,040[7].

Regarding financial aid outcomes, students received, on average, $1,090 in Pell Grants, $640 in institutional aid, $1,260 in federally subsidized student loans, and $1,260 in unsubsidized student loans. After grants students paid, on average, $8,570 of tuition out of pocket or using loans.

4.2.2 Summary Statistics by Sector

It is important to point out the differences of the student populations between the three sectors. While there are considerable differences between students at private non-profit and public universities; the differences between the private for-profit sector and the traditional sector are stark. Table 2 compares summary statistics for personal and institutional characteristics between the three sectors.

One key institutional difference between the private for-profit sector and traditional colleges and universities is that 31.9 percent of students at for-profit universities are considered to be dependent on their parents, while 51.1 percent and 55.1 percent of students at public and private non-profit respectively are considered dependent. Many for-profit universities tailor their curriculum to serve the needs of working adults who are more likely to be older, married, and have children than students at traditional universities. Since students at for-profit universities are more likely to be independent, the NPSAS reports only the student's income and thus the average income at for-profit universities is

[7]The NPSAS reports this variable as fall headcount

$32,110 compared to $51,800 and $57,390 for students at the public and private, non-profit sectors respectively.

There are other differences between the sectors regarding demographics. Students at for-profit universities are more likely to be female with 66.0 percent of their student body, compared to 59.1 percent and 60.7 percent of student bodies at public and private non-profit universities. Student bodies at for-profit universities are also more likely to be more racially diverse with 27.0 percent of for-profit students are African-American and 24.5 percent are Hispanic. In the public sector, only 15.1 percent and 11.1 percent of students are African-American and Hispanic; while of the students attending private, non-profit universities 13.8 percent of African-American and 16.0 percent are Hispanic. The racial diversity of for-profit universities has been controversial. Critics accuse for-profits of deceptive techniques designed to recruit minority students, while for-profits claim that they are simply enrolling students from minority populations who have traditionally been excluded by the traditional sector. Academically, students have similar GPAs across the three sectors.

Tuition prices at for-profit institutions also differ from the traditional sector as institutions. The average sticker price at for-profits universities is $10,500 which actually less than a private non-profit university tuition price of $11,970, but more than the average baseline tuition price of public universities of $2,490. One explanation for these summary statistics is the practice of "high-tuition high-aid" among many pretentious private, non-profit universities. These institutions set very sticker tuition prices and then use their large endowments to offer large financial aid packages to their students.

Table 3 displays financial aid summary statistics across sectors. Students at for-profit universities receive, on average, $9,950 in total aid which is less than students at private non-profit universities, but more than students at public universities. However, this statistic is misleading because it is an aggregate of grants and loans. Parsing out the

different components of the financial aid package reveals a more accurate comparison across sectors. While students at for-profit universities only receive, on average, $270 in institutional aid, which is significantly less than their peers at private institutions, for-profit students receive significantly higher amount of federally funded student aid. For-profit students generally receive $1,740 in Pell Grant aid compared to $890 at public colleges and $1,200 at private colleges. Students at for-profit universities took on $2,150 in subsidized student loans and $4,110 in unsubsidized students loans which is significantly greater than the other two sectors. On average, students at for-profits pay more out of pocket for their educations (around $14,730 per year) than students at public universities (average of $6,230 per year), but still less than students at private, non-profit universities (average of $12,560).

Figure 2 shows histograms of the sample by each component of a student's financial aid package. One area of concern is the long left hand tail of zeros that represent a corner solution by the university to offer no financial aid to the student. In the theoretical model, this result is modeled by setting the welfare weight w_i equal to the Lagrange multiplier (or the utility that the university receives from an extra dollar of revenue). I use the the hurdle model proposed by Cragg (1971) to adjust coefficient estimates to account for the large mass of zeroes.

5 Empirical Models

5.1 Baseline Ordinary Least Squares (OLS)

To estimate the effect that attending a for-profit university has on a given student's financial aid package, I measure the following using Ordinary Least Squares:

$$Aid_i = X\beta_1 + S\beta_2 + \alpha_{1i}(profit) + \alpha_{2i}(public) + \epsilon_i$$

where X is a matrix of student characteristics (such as race, gender, GPA, and SAT scores) and S is a matrix of institutional characteristics (such as the enrollment size and "sticker price" tuition rate). In addition to these controls, I include dummy variables for whether the institution was publicly controlled ($public$) or a private, for-profit university ($profit$).

These exogenous controls help to understand what drives the allocation of financial aid dollars. If a student receives dollars independent of institution control and only because of financial need or merit, then the coefficients estimates associated with the public and for-profit dummy variables should be close to zero or statistically insignificant. If, however, institutions allocate financial aid differently because of differing objective functions as outlined in the theoretical model, then these dummy variables should be statistically and economically significant.

I also use multiple outcomes variables to understand how the composition of the financial aid package changes given institution control. I examine the effect of attending a for-profit university on the amount of total aid a student receives, institutional aid (such as private or merit scholarships), Pell Grants, subsidized student loans, unsubsidized student loans, and net cost of attendance. The net cost of attendance as the "sticker price" tuition minus all grants and scholarships that the student does not need to repay including veteran benefits. Student loans are included in the net cost.

5.2 Correcting for Self-Selection across Higher Education Sectors

As evident in Table 2, the student populations across the sectors differ greatly. Also, students are not randomly assigned to institutions, creating a situation where unobservables may be driving the decision to enroll at a particular university (Chung 2012). If one cannot control for every factor that is significant to the enrollment decision, then failure to correct for self-selection will bias basic OLS results (Roy 1951). Heckman (1979) proposes a two stage method to correct for self-selection bias. This well-known

method describes a situation where the dependent variable in the selection equation is dichotomous (for example, whether a worker selects into the labor force). Berger (1988), Brewer, Eide, and Ehrenberg (1999), Strayer (2002), and Willis and Rosen (1979) adapt the original Heckman framework to a situation where agents can self-select into various outcomes such as college majors.

Following the logic of Lee (1983), assume a selection equation where a given student chooses a school from among the three education sectors. I express the student's maximum utility given each of the alternatives as:

$$V_{ij}^{*} = \alpha X + \delta Z + \nu_{ij}, \tag{19}$$

where X is the matrix of personal, academic, and institutional characteristics used previously, and Z are instruments used for identification in the selection equation. I include in Z the number of dependent children, if the student is a married female, and the number of hours worked at a job outside of the university. The student will choose University J when:

$$S_{ij} = J \text{ iff } V_{ij}^{*} > Max\ S_{ik}^{*}(j \neq k) \tag{20}$$

and

$$u_{ij} = max\ V_{ij}^{*} - \nu_{ij}. \tag{21}$$

If ν_{ij} is independently and identically distribution with a type I extreme value distribution, then the selection equation can be estimated as a multinomial logit model

$$Pr(u_i < \alpha X + \delta Z) = Pr(S_j = j) = \frac{exp(\alpha X + \delta Z)}{\sum exp(\alpha X + \delta Z)} \tag{22}$$

To calculate the selection correction term, I use the predicted log odds of choosing school type J $\hat{S}_j$ and then transform these predicted probabilities using an inverse cumulative standard normal distribution such that:

$$H(\hat{S}_{i,J}) = \Phi^{-1}(\hat{S}_{i,j}) \tag{23}$$

I then insert these transformed predicted value

$$\lambda_i = \frac{\phi(H(\hat{S}_{i,J})}{\Phi(H(\hat{S}_{i,J}))}. \tag{24}$$

I include the selection equation term in the baseline ordinary least squares equation outlined in section 6.1 and estimate the following:

$$Aid_i = X\beta_1 + S\beta_2 + \alpha_1(profit) + \alpha_2(public) + \alpha_3\lambda_i + \epsilon_i. \tag{25}$$

The addition of the self-selection term corrects previous estimates for the selection of students into a for-profit university. The estimated parameter values are now consistent.

5.3 Hurdle Model

One concern with financial aid data is the mass of observations where the student receives no financial aid. This result reflects a corner solution from the university's optimization problem [8] as opposed to censored data traditionally modeled by the Tobit model where we do not know the true value.

Cragg (1971) proposes a maximum likelihood routine that is quite useful in these circumstances where two decisions are being made. First, is the decision to receive zero or positive aid, and second is how much aid the university should allocate to the student.

[8] In the theory section this is essentially setting the welfare weight to zero and charging the student the baseline price determined by the governing board in the first stage

Researchers have used this model in a number of situations such as cigarette smoking (Jones 1989) and purchase of agriculture goods (Newman *et al.* 2003). However, this study is among the first to estimate the hurdle model to study financial aid allocation.

Hurdle models, like the Tobit model, contain two maximum likelihood routines that are estimated jointly. First, I model the decision to allocate any aid by estimating a probit model. Second, I model the allocation decision using a truncated normal regression model. The key difference between the hurdle model and the traditional Tobit model is that the decision to give a student positive financial aid and the quantity of aid are assumed to be independent choices and thus the estimated coefficients for the participation and allocation decisions are different.

Define y to be the amount of a type of financial aid that the university allocates to an applicant. The truncated regression model is:

$$f(y|\ \mathbf{x}, y > 0) = \left[\Phi(\mathbf{x}\beta/\sigma)\right]^{-1} \phi\left[(y - \mathbf{x}\beta)/\sigma\right]/\sigma, \quad y > 0 \tag{26}$$

where β is a vector containing the coefficients on the variables used to explain financial aid allocation.

To yield the unconditional mean of y given $\mathbf{x}$, one invokes Bayes Theorem and multiplies $f(y|\mathbf{x}, y > 0)$ by $P(y > 0|\mathbf{x}) = \Phi(\mathbf{x}\gamma)$, where γ is a vector containing the coefficients on the variables used to explain the whether a student receives positive financial aid. (Wooldridge, 2010, p. 693). This multiplication yields the follow log likelihood:

$$\begin{aligned} l_i = 1[y_i = 0]\ log[1 - \Phi(\mathbf{x}\gamma)] + 1[y_i > 0]\ log[\Phi(x\gamma)] + \\ 1[y_i > 0]\{-log[\Phi(\mathbf{x}\beta/\sigma)] + log\{\phi[(y_i - \mathbf{x}\beta)/\sigma]\} - log(\sigma)\}. \end{aligned} \tag{27}$$

This likelihood function should adjust the coefficients estimates in the previous

sections for the long tail of observations with zero financial aid.

6 Results

6.1 Baseline Ordinary Least Squares (OLS)

6.1.1 Full Sample

Table 5 displays the results from the baseline OLS regression for all students contained in my sample. These results give evidence for the hypothesis derived from the theoretical model that the net cost of attending a for-profit university should increase and price discriminating behavior at for-profit university (via financial aid allocation) should also decrease. Column (1) shows the regression results using total aid as the dependent variable. Total aid is comprised of all federal, state, and institutional grant aid, veteran benefits, and subsidized student loans. The omitted institution control variable in all results is the dummy variable for private non-profit universities. Compared to the private non-profit sector, students at for-profit and public institutions tend to receive $451.07 and $910.12 less in total financial aid.

In columns (2)-(5) show how different components of a student's financial aid package changes differ between sectors. Students at public institutions tend to receive less institutional aid than private non-profit universities but receive more Pell Grant dollars from the federal government. Public university students also take on more subsidized and unsubsidized student loans. This result may be driven by the new model of financial aid at elite private universities where the "sticker price" tuition is very high, but private universities offer more financial aid to qualifying students because of private donations or endowments. For-profit university students receive $2,330.86 less in institutional aid than similar students at non-profit universities, and take on $460.74 and $2,440.24 more in

subsidized and unsubsidized student loans respectively.

Students at for-profit universities pay nearly $3,299.68 more in net cost compared to students at private non-profit universities. Consider the previously cited literature regarding the lower labor market outcomes for students who graduate from for-profit universities. This evidence implies that the net present value of graduating from a for-profit university is dramatically less than a traditional university. One surprising result is that students at public universities pay a higher net cost of $1,957.53 than students at private universities. This result may be because of declining tuition subsidies from state legislatures that contribute to rapidly increasing tuition prices at state universities.

6.1.2 Subsamples by Degree Programs

Next, I conduct the same analysis using subsamples of the following degree program: four year degrees, two year degrees, and less than two year degrees (certificate programs). The second section of Table 5 shows results for students completing four year programs. The results from this table are very similar to the results from the pooled sample. For-profit universities provide $576.52 less total aid and $2,577.80 in institutional aid to their students. Students at for-profit universities also take out $329.20 and $2,688.86 more in subsidized and non-subsidized student loans compared to those at private non-profit universities. Net of grants, students at for-profit pay $4,215.60 more for their four year degree than students at private, non-profit universities.

The third section of Table 5 displays results for students earning only two year associate degrees. Traditionally, for-profit universities have specialized in vocational training including associate degrees and certificates. The results for two year degrees are quite similar to four year degrees, but the magnitudes are quite smaller. Two year degree seekers tend to take on less student loans than four year students, but for-profit students still take on $383.24 more in subsidized student loans and $2,688.86 more in unsubsidized

loans. The net cost paid by students at for-profit universities is $401.39 greater than nonprofit, private universities.

The fourth section of Table 5 shows the results for students pursuing a less than two year degree or a technical certificate. Students pursing a technical certificate at a for-profit university receive $248.98 (although the result is not statistically significant) more in total financial aid than at a private college, but the bulk of this aid appears to be in both subsidized and unsubsidized loans since students at for-profit colleges take on $366.66 more in subsidized loans and $922.41 in unsubsidized loans. Students at for-profit colleges receive $80.21 less in institutional aid and $421.36 less in Pell Grants. Despite the increases in loans, it appears that for-profit colleges cost less net of financial aid than private colleges by $1,044.71. This finding may be a result of the small number of nonprofit, private universities that offer technical certificates.

6.2 Results Corrected for Self-Selection

6.2.1 Evidence of Self-Selection

First, I follow Lee (1983) and Berger (1988) to calculate the extent of self-selection across education sectors. Table 6 displays the coefficients for λ by type of aid as dependent variable. All the coefficients for λ are negative expect for subsidized students loans for Pell Grants and net cost. For all types of aid, λ is statistically significant. These results are evidence for extensive self-selection in any empirical estimates of the effect of institution control on student aid or price discrimination. The value of λ for students attending for-profit universities is negative for all dependent variables except Pell Grants and Net Cost. A negative result indicates that if students were randomly assigned to universities, a student with similar characteristics would receive less aid, than a student who selected into a for-profit university. This result means that students at for-profit universities are

receiving less aid than if they were randomly assigned to another type of school. This result may be driven by evidence contained in Table 2 in Section 5.2.2 that students at for-profit universities tend to have smaller SAT scores and come from lower socio-economic circumstances. The positive result for Pell Grant and net cost implies that students are receiving more Pell Grant aid and paying a higher net cost than if they were randomly assigned to a for-profit or traditional university. Regarding Pell Grants, this result may occur because for-profit universities are quite effective at encouraging FAFSA completion. These results indicate that students are rationally attending for-profit universities given their academic and personal characteristics in accordance with the findings by Chung (2012).

6.2.2 Comparing Financial Aid Packages Across Sectors with Self-Selection

Table 6 contains estimates for differences in aid type for attending a for-profit or public university, compared to private, nonprofit institutions, for a given student after correcting for self-selection. Students attending for-profit universities receive $69.96 less in total aid, but this result is not statistically significant. While this is different from the baseline estimates, the composition of the students' financial aid packages are quite similar. Students at for-profit universities receive $2,376.25 less in institutional aid than students at non-profit universities, but receive $96.62 more Pell Grant dollars from the Federal Government. Students at for-profit universities take on considerably more student loan debt than their peers at other institutions: $544.14 in subsidized student loans and $2,765.29. This higher amount of student loan debt leaves the student with a higher net cost of $3,791.58. This result may be influenced by the high tuition-high aid model that is quickly becoming prevalent among private universities. Another explanation is that a student at a for-profit university may not have been eligible for as much institutional aid given their academic preparation as a student who self-selected into a private university.

While students at public universities receive less in total aid and institutional aid, they do not incur as much student loan debt (both subsidized and unsubsidized) as their peers at for-profit institutions.

6.3 Estimating Differences in Financial Aid using a Double-Hurdle Model

6.3.1 First Stage Probit Model for Positive Aid

Finally, I calculate the differences in financial aid allocation between for-profit and traditional universities using the truncated hurdle model proposed by Cragg (1971). This maximum likelihood routine adjusts the estimated coefficients produced by ordinary least squares for the long tail of observations representing students who receive no financial aid. Table 7 displays the results from the hurdle model.

The first row in Table 7 represents the first stage probit model that measures the probability that student receives a certain amount of aid or has a net cost of zero. Students at for-profit universities are more likely to receive some sort of aid than comparable students at private universities by 6.3 percent points, but this aid appears to be in the form of federal aid such as Pell Grants, subsidized student loans, and unsubsidized student loans. Students at for-profit universities are 18.9 percentage points less likely to receive institutional aid, 3.5 percent points more likely to receive Pell Grants, 20.1 percentage points more likely to take out a subsidized Stafford loan, and 30.5 percentage points more likely to receive an unsubsidized loan. Administrators at for-profit universities are known to be quite effective at ensuring that new students complete the Free Application for Federal Student Aid (FAFSA) and thus are more likely to receive federal aid. One study even estimates FAFSA completion rates for students at for-profit universities to be 95 percent (Kantrowitz 2009).

Public universities also allocate financial aid differently than traditional, private universities, but at a decreased magnitude compared to for-profit universities. Students at public universities are 4.7 percentage points less likely to receive institutional aid, 2.5 percentage points less likely to receive Pell Grant aid, and 4.7 percentage points less likely to take out a subsidized student loan, and 1.0 percentage points more likely to have a positive net cost.

6.3.2 Second Stage Conditional Mean-Truncated Regression Model

The second row in Table 7 represents the results from the second stage truncated regression model ($f(y|\mathbf{x}, y > 0)$) or how the dependent variables effect financial aid allocation given that a student receives positive aid. Students who received positive financial aid and attended a for-profit university received \$617.80 more than comparable students at a traditional private university. One striking result is that students at for-profit universities receive \$819.69 less institutional aid than their comparable peers at a tradition private institution. This result conforms to the proposition from the theoretical model that predicts that for-profit institutions will offer less aid than a university who places a higher welfare weight and thus would be more willing to offer discounts. For-profit students make up the gap left by a reduced amount of institutional aid by taking on more unsubsidized loans. For-profit students take on \$1,343.27 more unsubsidized loans than students at a traditional private university. Also for the conditional mean, students at for-profit universities receive \$125.86 less in Pell Grants and \$212.48 less than in subsidized Stafford loans. The net cost of for-profit education (cost of attendance minus aid) is \$3,315.70 greater than traditional, private colleges.

Public universities differ significantly from private universities (both traditional and for-profit universities), but the magnitudes seem to smaller than the for-profit institutions. Students at public universities tend to, on average, receive \$763.00 more total aid than

traditional private universities. Public university students receive $132.42 more in institutional aid albeit at a statistically insignificant letter , but receive $613.14 more in Pell Grants, $640.32 in subsidized Stafford loans, and $166.42 less in unsubsidized loan. The net cost for public students is $2,398.46 more than private, traditional universities. One possible explanation for this result is the rise of the high tuition-high aid model among many prestigious, private universities where the university sets a high baseline tuition price and then offers each student a significant financial aid package such that any accepted student should be able to matriculate regardless of ability to pay.

6.3.3 Second Stage Unconditional Mean-Truncated Regression Model

After estimating the unconditional mean, many of the coefficient magnitudes regarding students at for-profit universities increased. Students at for-profit universities receive $890.22 more in total aid (including grants and loans) than students at traditional, private universities. Students at for-profit universities, however, receive $819.69 less in institutional aid than their comparable peers studying at private, traditional institutions. Students at for-profit universities receive more federal aid than private institutions. Students at for-profit institutions receive $572.44 more in subsidized Stafford loans and $1,978.45 more in unsubsidized student loans. Thus the increased amount of total aid received by students at for-profit universities consists mostly of student loans and not grants. This result has important policy implications for the federal government because it appears that for-profit universities offer significantly less institutional aid to their own students, but rely on the federal government to subsidize their student's education. Also, the net cost of for-profit university students is greater than private students by $3,713.35. Thus even though for-profit colleges charge, on average, a lower baseline tuition price than traditional, private universities, students at for-profit universities pay more after aid than peers at private universities.

Public universities also allocate financial aid differently according to the hurdle model. Students at public universities receive $653.35 less in total aid than their peers at traditional private universities and, similarly to students at for-profit universities, receive $88.72 less in institutional aid. However, students at public universities receive $378.40 more in Pell Grants, $393.47 in subsidized student loans. One interesting result is that public university students pay $2,467.71 more in terms of net cost than students at private universities.

7 Conclusion

There has been much discussion regarding the role of the emerging for-profit sector in higher education. Unfortunately, there has been little theoretical and empirical evidence regarding education outcomes and costs in this sector. This paper proposes a two-stage theoretical model that explains differences in price discrimination between a profit maximizing university and a welfare maximizing university. I find that as a university strives to maximize profit it will be less likely to award financial aid and the final price that a student pays will increase.

Next, I tested the hypotheses from the theoretical model using the National Postsecondary Student Aid survey. I find that, before correcting for self-selection, students at for-profit universities receive small amounts of federal aid, take on higher amounts of student loan debt, and pay a higher net cost. Also these results are mostly driven by students who are pursing four year or Bachelor's degrees.

Using a modified Heckman selection procedure where the selection model is a multinomial logit, I find that students do positively select into the each higher education sector. Most students select into a for-profit university because they receive more aid and the net cost is lower than if they were randomly assigned into an institution in another

sector. Students at for-profit institutions receive less total and institutional financial aid and a negligible increase in federal Pell Grant dollars. Students at for-profit universities are more taking out larger amounts of student loans (both subsidized and unsubsidized). However, students do pay a lower net cost when compared to private universities.

These results are important because an ever increasing amount of financial aid dollars are allocated each year to students at for-profit universities. While these students are receiving comparable amounts of aid as students at universities in other sectors, for-profit universities are less generous in their price discriminating behavior. Combined with evidence from the literature regarding lower education outcomes at for-profits, the net present value for an education at a for-profit university may be lower. Thus these universities may be attractive to students with little or no outside option. However, for-profit higher education, as education outcomes improve, for-profit universities may become an intriguing option for higher achieving students and may be a possible solution for boosting the number of college graduates in an increasingly competitive labor market.

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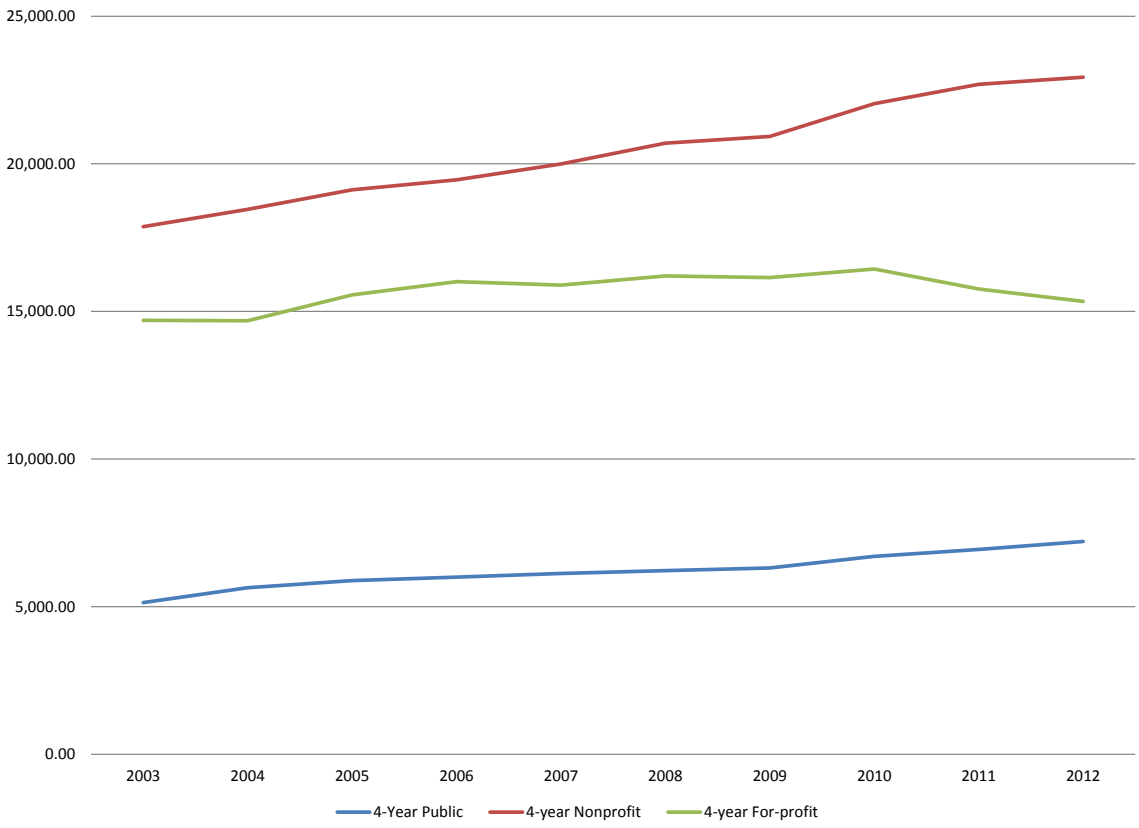
Figure 1: Change in Tuition Rate Across Sectors (2012 dollars).



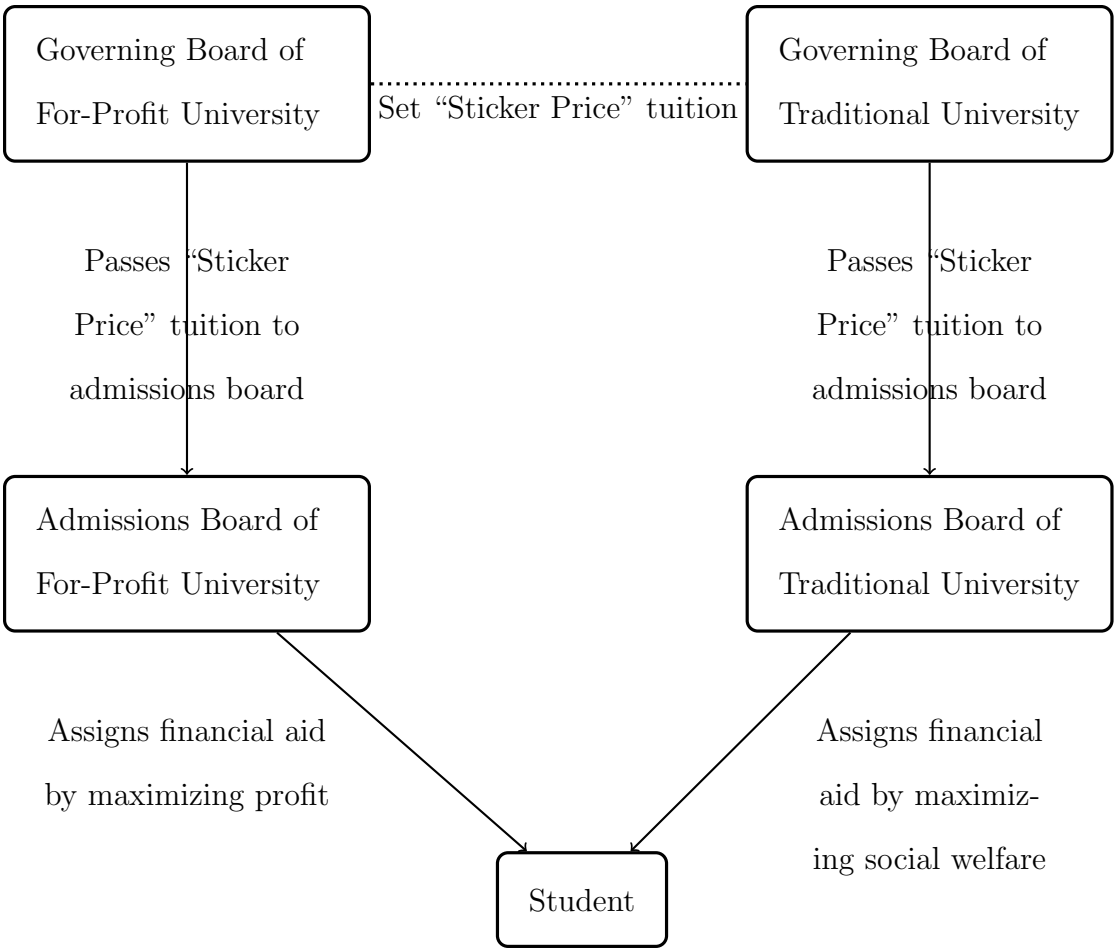

Governing Board of For-Profit University
Set "Sticker Price" tuition
Governing Board of Traditional University
Passes "Sticker Price" tuition to admissions board
Passes "Sticker Price" tuition to admissions board
Admissions Board of For-Profit University
Admissions Board of Traditional University
Assigns financial aid by maximizing profit
Assigns financial aid by maximizing social welfare
Student

Table 1: Summary Statistics for All Sectors-Nonselective and Minimally Selective

Variable	Mean	Std. Dev.	Observations
Student Demographics			
Income	$48,810	48,350	133,020
Dependent	0.480	0.500	133,020
Female	0.606	0.489	133,020
Married	0.216	0.411	133,020
Children	0.603	1.100	133,020
GPA	2.99	0.807	133,020
Asian	0.032	0.177	133,020
Black	0.172	0.377	133,020
Hispanic	0.143	0.350	133,020
Age	25.99	9.067	133,020
Resident	0.909	0.287	133,020
Institutional Characteristics			
Private For-Profit	0.188	0.391	133,480
Public	0.684	0.465	133,480
Private Non-Profit	0.128	0.334	133,480
4-year	0.379	0.485	133,480
2-year	0.524	0.499	133,480
Less 2-year	0.097	0.296	133,480
Tuition	$5,410	6,220	105,230
Enrollment Size	9,040	13,580	133,020
Types of Financial Aid			
Total Aid Package	$6,210	7,170	133,480
Pell Grant	$1,110	1,600	133,480
Institutional Aid	$640	2,400	133,480
Subsidized Student Loans	$1,260	1,930	133,480
Unsubsidized Student Loans	$1,680	3,500	133,480
Net Cost	$8,570	8,060	133,480

Table 2: Summary Statistics by Sector

Variable	Public	Private Non-Profit	Private For-Profit
Institutional Characteristics			
4 year	0.303	0.796	0.370
	(0.460)	(0.403)	(0.483)
2 year	0.669	0.168	0.239
	(0.471)	(0.374)	(0.426)
Less 2 year	0.027	0.036	0.391
	(0.163)	(0.187)	(0.488)
Tuition	\$2,490	\$11,970	\$10,500
	(2,460)	(8,010)	(6,740)
Enrollment Size	11,330	3,310	4,630
	(9,260)	(3,820)	(24,390)
Student Demographics			
Income	\$51,800	\$57,390	\$32,110
	(49,070)	(53,850)	(36,640)
Dependent	0.511	0.552	0.320
	(0.500)	(0.497)	(0.466)
Female	0.591	0.607	0.660
	(0.492)	(0.488)	(0.474)
GPA	2.94	3.05	3.10
	(0.820)	(0.736)	(0.793)
Asian	0.034	0.027	0.030
	(0.181)	(0.162)	(0.170)
Black	0.151	0.138	0.270
	(0.358)	(0.345)	(0.444)
Hispanic	0.111	0.160	0.245
	(0.314)	(0.367)	(0.430)
Age	25.82	25.33	27.05
	(9.172)	(8.850)	(8.746)
Resident	0.939	0.800	0.874
	(0.239)	(0.400)	(0.331)
Number of Observations	91,290	17,030	25,160

Table 3: Financial Aid by Sector

Variable	Public	Private Non-Profit	Private For-Profit
Total Aid	\$5,040	\$13,650	\$9,260
	(6,200)	(11,900)	(7,310)
Pell Grant	\$830	\$940	\$1,630
	(1,450)	(1,540)	(1,700)
Institutional Aid	\$490	\$4,450	\$240
	(1,880)	(6,330)	(1,380)
Subsidized Loans	\$1,120	\$2,130	\$2,050
	(2,020)	(2,570)	(1,890)
Unsubsidized Loans	\$1,220	\$2,670	\$3,600
	(2,940)	(5,160)	(4,750)
Net Cost	\$5,870	\$11,640	\$9,250
	(5,980)	(12,370)	(8,220)

Table 4: Summary Statistics for Financial Aid Variables

Variable	Percent zero	Mean w/ zeroes	Mean w/o zeroes
Total Aid	25.32	6,210	8,310
		(7,170)	(7,160)
Pell Grant	60.11	1,090	2,740
		(1,600)	(1,390)
Institutional Aid	83.67	640	3,920
		(2,390)	(4,710)
Subsidized Student Loans	63.52	1,260	3,460
		(1,930)	(1,620)
Unsubsidized Student Loans	67.80	1,680	1,680
		(3,500)	(4,410)
Net Cost	21.66	8,570	10,950
		(8,060)	(7,550)

Note: The first column of this table shows the percentage of students who do not receive a particular type of financial aid. The second column shows the average amount of financial aid including observations with a zero value. The third column shows the average amount of financial aid a student received not including observations with a zero value.

Figure 2: Histograms By Financial Aid Component

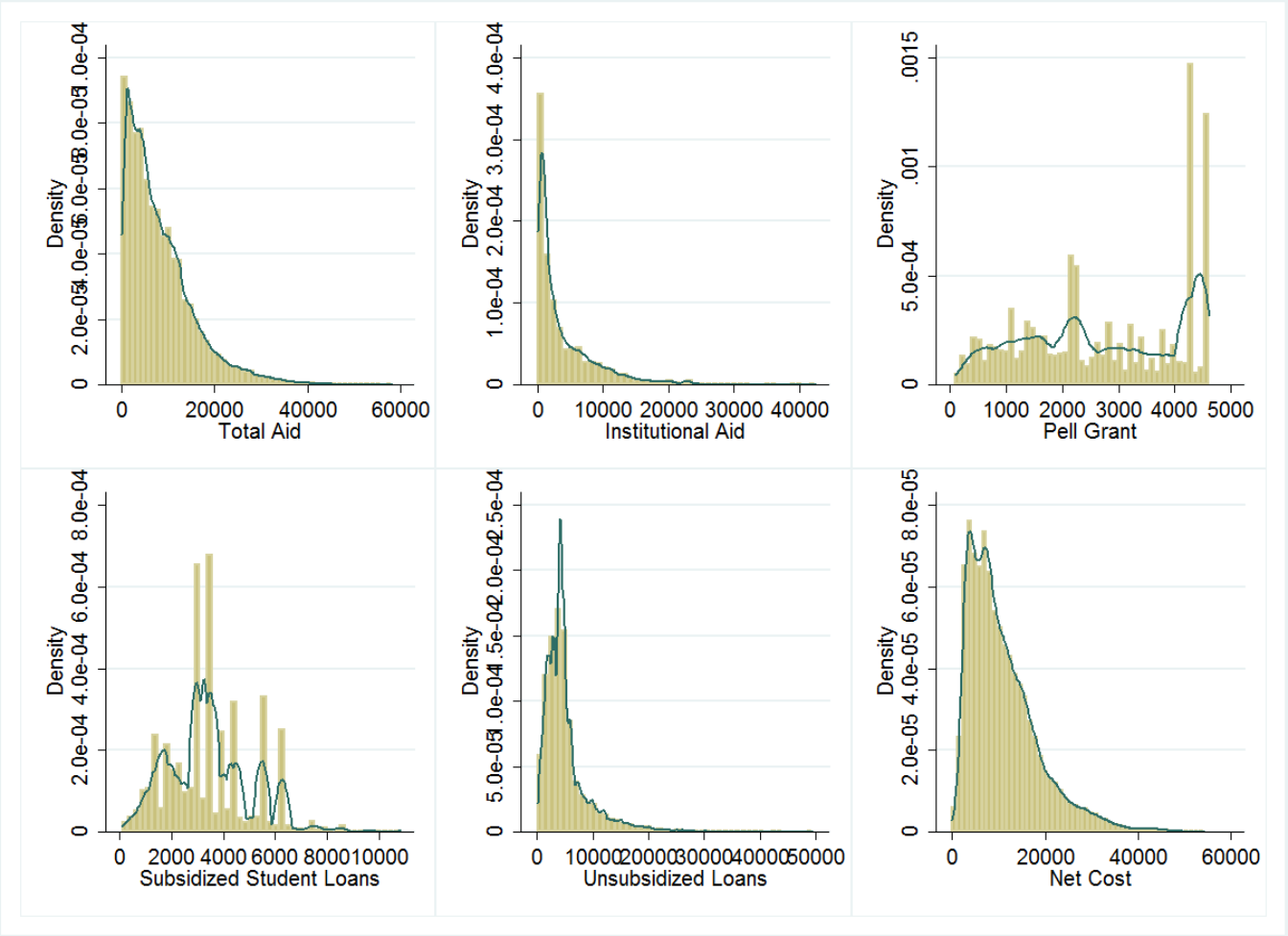


Table 5: Baseline OLS estimates by Institutional Level

VARIABLES	(1) Total Aid	(2) Institutional Aid	(3) Pell Grant	(4) Subsidized Loan	(5) Unsubsidized Loan	(7) Net Cost
Pooled Sample						
For-Profit	-451.07***	-2,330.86***	42.10***	460.74***	2,440.24***	3,299.68***
	(85.083)	(37.142)	(16.58)	(22.79)	(49.64)	(69.59)
Public	-910.12***	-1,079.02***	66.78***	90.52***	596.46***	1,957.53***
	(79.57)	(34.16)	(11.89)	(22.33)	(43.04)	(58.54)
Four Year	3,956.53***	83.75***	-95.40***	1,239.76***	1,415.02***	-2,039.32***
	(61.76)	(21.45)	(16.08)	(17.55)	(37.57)	(66.27)
Two Year	1,077.29***	83.97***	-309.72***	261.99***	551.21***	-1,176.22***
	(59.11)	(20.34)	(16.01)	(15.86)	(35.67)	(61.56)
Four Year						
For-Profit	-576.52***	-2,577.80***	-47.91***	329.20***	2,688.86***	4,215.60***
	(117.96)	(47.07)	(21.46)	(33.21)	(76.48)	(95.92)
Public	-561.47***	-1,174.076***	122.66***	229.20***	746.54***	1,878.09***
	(106.59)	(47.52)	(19.52)	(30.62)	(55.99)	(74.85)
Two Year						
For-Profit	-395.78**	-804.02***	-228.02***	383.24***	922.41***	401.39***
	(166.48)	(63.84)	(36.00)	(38.92)	(85.07)	(116.64)
Public	-1,847.25***	-696.74***	-76.76**	-263.59***	-68.99	1,843.37***
	(145.87)	(50.55)	(34.27)	(34.43)	(76.36)	(102.06)
Less Than Two Year						
For-Profit	248.98	-89.21*	-421.36***	366.66***	962.66***	-1,044.71***
	(177.89)	(50.35)	(63.49)	(55.36)	(97.52)	(194.26)
Public	-445.70**	-108.34**	-261.65***	179.51***	215.08**	114.86
	(202.82)	(54.69)	(70.35)	(60.70)	(104.92)	(216.46)

Controls include income, dependency status, female, race, married resident, GPA, SAT, age, number of students enrolled, and tuition

Robust Standard Errors in parentheses

*** p < 0.01, ** p < 0.05, * p < 0.1

Table 6: Differences in Financial Aid by Sector with Self-Selection Correction

VARIABLES	(1) Total Aid	(2) Inst. Aid	(3) Pell Grant	(4) Sub Loan	(5) Unsub Loan	(6) Net Cost
For-Profit	-69.96	-2,376.25***	96.92***	544.14***	2,765.29***	3,791.58***
	(81.33)	(33.50)	(18.58)	(23.36)	(55.88)	(72.02)
Public	-28.30	-903.29***	277.02***	383.63***	765.68***	3,002.07***
	(94.94)	(33.25)	(22.30)	(27.29)	(56.01)	(74.10)
λ	-2,918.40***	-526.86***	-386.19***	-553.92***	-178.86***	-2,047.92***
	(77.26)	(31.72)	(14.39)	(20.48)	(44.92)	(69.65)

Controls include income, dependency status, female, race, married resident, GPA, SAT, age, number of students enrolled, and tuition

Bootstrap Standard Errors in parentheses

*** p < 0.01, ** p < 0.05, * p < 0.1

Table 7: Differeces in Financial Aid Allocation by Control using Hurdle Model (Marginal Effects)

VARIABLES	(1) Total Aid	(2) Institutional Aid	(3) Pell Grant	(4) Sub Loan	(5) Unsub Loan	(6) Net Cost
First Stage Probit						
For-Profit	0.063***	-0.189***	0.035***	0.201***	0.305***	0.008***
	(0.007)	(0.004)	(0.007)	(0.007)	(0.006)	(8.328e-4)
Public	0.003	-0.047***	-.025***	0.047***	-0.001	0.010***
	(0.007)	(0.005)	(0.008)	(0.007)	(0.007)	(6.892e-4)
IMR	-0.148***	-0.063***	-0.114***	-.121***	-1.438e-4	-0.002***
	(0.005)	(0.004)	(0.006)	(0.005)	(0.005)	(8.394e-4)
Conditional Mean						
For-Profit	617.80***	-819.69***	-125.86***	-212.48***	1,343.27***	3,667.22***
	(53.45)	(23.36)	(20.85)	(24.90)	(69.67)	(64.80)
Public	763.00***	132.42	613.14***	640.32***	-166.42***	2,398.46***
	(66.76)	(311.269)	(22.86)	(31.20)	(76.614)	(73.43)
IMR	-2,430.12***	-822.00***	-651.34***	101.43	412.45***	-1,263.83***
	(49.55)	(17.74)	(16.87)	(78.54)	(52.11)	(51.21)
Unconditional Mean						
For-Profit	890.22***	-819.69***	31.43**	572.44***	1,978.45***	3,713.58***
	(63.18)	(23.36)	(14.84)	(22.50)	(42.98)	(65.14)
Public	653.35***	-88.72***	378.40***	393.47***	34.03	2,467.71***
	(68.47)	(10.68)	(16.38)	(24.56)	(38.99)	(73.47)
IMR	-2,901.89***	-478.14***	-597.22***	-511.24***	164.80	-1,273.22***
	(53.51)	(13.24)	(12.10)	(18.78)	(28.19)	(51.79)

Controls include income, dependency status, female, race, married resident, GPA, SAT, age, number of students enrolled, and tuition

Delta Method Standard Errors in parentheses

*** p < 0.01, ** p < 0.05, * p < 0.1