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Sticker Price Elasticity as Predictor of Tuition Reset Success: A Quantitative Approach

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Sticker Price Elasticity as Predictor of Tuition Reset Success: A Quantitative Approach

By

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Abstract

Few quantitative studies exist on tuition reset outcomes despite increasing frequency and interest among industry practitioners. The purpose of this study is to examine the relationship between sticker price elasticity and changes in first-year student enrollment, net tuition and fee revenue from first-year students, percent of first-year students who are Pell-eligible, and changes in transfer student enrollment using multivariate logistic and linear regression models. The independent variable is the sticker price elasticity of demand from two years preceding the announcement of a reset.

This study contributes to the literature by adding to evidence regarding the signaling role of sticker price in higher education and provides a template for future studies regarding the impact of tuition resets. For industry practitioners, this study provides an overview of tuition reset outcomes and indicators of the suitability of tuition resets as a strategy at the institutional level. This study finds sticker price elasticity is a poor predictor of tuition reset success. Increases to advertising spending and gains in net assets in the years prior to the reset are more consistent predictors of success. This study also finds no evidence of a direct correlation or of "threshold effects" between the size of a reset and the number of first-year students enrolled or net tuition and fee revenue increases.

The study concludes with applications of findings and recommendations for future research with emphasis on the role of advertising as a mechanism to explain the rationale for resetting.

Keywords: Sticker price elasticity, price strategy, tuition elasticity, higher education pricing, tuition reset, tuition rollback

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Definition of Terms

This study uses the following terms, phrases, and acronyms which are essential for understanding:

Circular Area Profiles (CAPS)

An application of the Missouri Census Data Center that aggregates data from the American Community Survey (ACS) from the U.S. Census to approximate circular areas and radius values and provide summary demographic statistics (Missouri Census Data Center, 2019).

Contact Hour

A period of time consisting of (1) A 50- to 60-minute class, lecture, or recitation in a 60-minute period; (2) A 50- to 60-minute faculty-supervised laboratory, shop training, or internship in a 60-minute period; or (3) 60 minutes of preparation in a correspondence course (NCES National Center for Education Statistics, 2017).

Credence Goods

Credence goods are items in which the benefits are unknown and may never be fully known (e.g. purchase of insurance, dental work, quality of training product warranties). They are difficult to evaluate. Credence goods are purchased on the belief they will deliver a benefit, even if the customer is unaware of its doing so (Smith, 2017; Wirtz & Lovelock, 2016).

Discount Rate:

Discount Rate refers to the reduction in costs students pay, expressed as a percentage of costs. Unless otherwise specified, Discount Rate is assumed to refer to the NACUBO Discount Rate calculation (described below).

Direct Cost of Attendance (DCOA or Sticker Price):

DCOA is the cost of attendance that is charged directly by the college or university (e.g. tuition, fees, room and board as published). It does not include books and supplies (Sallie Mae, 2018). DCOA is also referred to as sticker price.

First-year Student:

A student who has completed less than the equivalent of one full year of undergraduate work that is less than 30 semester hours (in a 120-hour degree program) or less than 900 contact hours (NCES National Center for Education Statistics, 2017).

Form 990:

Tax-exempt organizations are required to file a Form 990 on an annual basis with the IRS in lieu of a tax return. This information is used by regulators, funders, journalists and the general public to evaluate the organization's operational and financial performance (Blazek & Adams, 2009).

Full-time Student:

Undergraduate: A student enrolled for 12 or more semester credits, or 12 or more quarter credits, or 24 or more contact hours a week each term. (NCES National Center for Education Statistics, 2017)

GuideStar:

GuideStar is a non-profit organization that provides a searchable database of Form 990s and other forms of information on over 2.7 million nonprofits (GuideStar, 2019) to libraries, fundraising organizations, and the general public.

Integrated Postsecondary Education Data System (IPEDS):

The Integrated Postsecondary Education Data System is an NCES database to which all Title IV receiving institutions must provide accurate data aggregated at the institutional level. Data is collected via 11 surveys (called catalogs).

National Center for Educational Statistics (NCES):

"The National Center for Education Statistics (NCES) is the primary federal entity for collecting and analyzing data related to education in the U.S. and other nations. NCES is located within the U.S. Department of Education and the Institute of Education Sciences. NCES fulfills a Congressional mandate to collect, collate, analyze, and report complete statistics on the condition of American education; conduct and publish reports; and review and report on education activities internationally."(Institute of Education Sciences, 2018)

National Association of College and University Business Officers (NACUBO):

"The National Association of College and University Business Officers (NACUBO) is a membership organization representing more than 1,900 colleges and universities across the country. NACUBO specifically represents chief business and financial officers through advocacy efforts, community service, and professional development activities. The association's mission is to advance the

economic viability, business practices and support for higher education institutions in fulfillment of their missions."(NACUBO, 2018)

NACUBO Discount Rate:

The NACUBO Discount Rate is the percentage of tuition and fees charged given back in the form of institutional grant aid using both funded and unfunded sources (NACUBO, 2016). This is the most frequently used form of calculating a discount rate (Ruffalo Noel Levitz, 2017).

Net Price:

The Higher Education Opportunity Act of 2008 defines institutional net price as "the average yearly price actually charged to first-time, full-time undergraduate students receiving student aid at an institution of higher education after deducting such aid." In IPEDS, average institutional net price is generated by subtracting the average amount of federal, state/local government, or institutional grant and scholarship aid from the total cost of attendance (NCES National Center for Education Statistics, 2017).

Overall Discount Rate:

An overall discount rate is the percentage of tuition, fees, room and board charged given back in the form of institutional grant aid using both funded and unfunded sources (Ruffalo Noel Levitz, 2017). This is an important variation on NACUBO Discount Rate as it assesses discounting against room and board revenues as well.

Price Elasticity:

Price elasticity is a microeconomic concept employed to measure price sensitivity (Kagan, 2010). Short for price elasticity of demand, price elasticity is the

percentage change in quantity demanded of a good produced by a one percent change in its price, holding all other factors constant (Fischer et al., 1988). See Appendix C for further information.

Room and Board:

Room charges are "the charges for an academic year for rooming accommodations for a typical student sharing a room with one other student." Board charges are "Charges assessed students for an academic year for meals." (NCES National Center for Education Statistics, 2017).

Sticker Price:

Sticker price refers to the direct cost of attendance in this study. Indirect costs such as estimated books and travel expenses are not considered in this study.

Tuition and Fees:

"The amount of tuition and required fees covering a full academic year most frequently charged to students. These values represent what a typical student would be charged and may not be the same for all students at an institution. If tuition is charged on a per-credit-hour basis, the average full-time credit hour load for an entire academic year is used to estimate average tuition. Required fees include all fixed sum charges that are required of such a large proportion of all students that the student who does not pay the charges is an exception." (NCES National Center for Education Statistics, 2017)

Tuition Reset:

"A tuition reset is a substantial reduction in a college's published tuition price—what people generally think of as its 'sticker price' before scholarships and

financial aid are awarded. The price reduction typically applies for students enrolled in on-campus undergraduate programs, as opposed to graduate or online-only programs."(Lawlor, 2016). Frequently, tuition resets do not have a substantial impact on net price (Casamento, 2016; Lapovsky, 2015). Tuition resets are sometimes referred to as tuition rollbacks.

Chapter 1 - Introduction

J.C. Penney traditionally priced goods at high prices but then provided discounts to target middle-class consumers who value both quality and savings. However, with increasing competition from low-price department stores (e.g. Walmart, Target) new CEO Ron Johnson tried to end coupon discounts and simply offer everyday low prices in 2012. The results were disastrous. J.C. Penney experienced a 25% loss of sales and a net loss of $985 million due to management's failure to understand the J.C. Penney customer enjoyed the thrill of the hunt for bargains (Aisner, 2013).

In many ways, private not-for-profit colleges face a similar dilemma (Seltzer, 2017a). They depend on a high-price and high-discount pricing model but increasingly face greater competition from lower-price competitors. Some institutions have found resetting their tuition led to increased enrollment. Others found implementing the tuition reset strategy to be a mistake and subsequently implemented material price increases returning to a high-price and high-discount model. Knowing how price communicates value to their consumers is critical to selecting an optimal price strategy in a competitive environment where mistakes threaten institutional viability.

Research Problem

The pricing model of higher education in the United States is under pressure, especially in the private not-for-profit sector (Casamento, 2016). The Obama administration introduced a number of initiatives attempting to make college attendance more affordable including reducing the rates of tuition increases, reducing student debt and encouraging more transparency on behalf of colleges (Lewin, 2013). In 2017 the

Chronicle of Higher Education ran an exposé entitled *The Tuition Pricing Crisis* (Pryor, 2017). The exposé highlighted concerns of politicians, parents, and industry pundits about the high and rising costs of education. It went on to describe a variety of innovative approaches colleges and universities are taking to revisit pricing models but concluded none of the approaches thus far were entirely satisfactory.

The dominant pricing model in the private 4-year not-for-profit sector is tuition discounting. In conjunction with high sticker prices that traditionally serve as a signal of quality (Gilmore, 1990), deep discounts are provided to students. The discounts take the form of institutional scholarships and grants targeted to attract students distinguished by desirable attributes such as academic merit, athletic ability, or other characteristics used to shape a class. Discounts are intended to increase the number of students enrolled by reducing the net price actually paid by the targeted group (Duffy, 2014; Rine, 2016). Tuition discounts enable colleges to target specific subpopulations of students by providing scholarships that meet specific criteria (Duffy, 2014; Ehrenberg, 2000).

Despite these benefits, tuition discounting has also been linked to several negative effects. These risks include publishing an artificially inflated direct cost of attendance (Rine, 2016) which mask the true price of attendance, also known as net price. Masking the net price of attendance can discourage families from applying (Davis, 2003; SallieMae & Ipsos Public Affairs, 2015). High unfunded discount rates can weaken college budgets (Davis, 2003; Deegan & Deegan, Jr., 2014) and increase the financial risk of recruitment strategy failure when insufficient numbers of students are recruited to pay for unfunded discounts (Behaunek, 2015; Davis, 2003; Rine, 2016).

Excessive pressures to increase discount rates can lead to a tragedy of the commons problem, a situation where competition deteriorates the health of a competitive environment (Hardin, 1998). On the one hand colleges and universities feel compelled to offer ever-higher scholarships and discounts to attract students. NACBUO reported the national average discount rate for first-year students was 52.2% during the 2018-2019 fiscal year (Valbrun, 2019). On the other hand, many chief financial officers in higher education wonder if the financial model of their institutions remains viable given the run of increasing discount rates over the past two decades (Lederman & Seltzer, 2017; NACUBO, 2016; Rine, 2016), combined with projected declines in the population of college-going high school seniors (Western Interstate Commission for Higher Education, 2016).

More and more colleges and universities are considering a tuition reset strategy (Bernard, 2019; Kantrowitz, 2019), up to 20% of private not-for-profit institutions according to one prominent survey (Pryor, 2017). Within the 2017-2018 academic year alone, 24 colleges announced plans to reduce tuition for the 2018-2019 academic year (See Appendix A). Typically, tuition resets are executed as a reduction of the published sticker price, but with a roughly commensurate reduction in financial aid such that the net price students pay remains basically the same (Bernard, 2019).

The practical effects of a tuition reset are the subject of ongoing industry debate (Seltzer, 2017a). Proponents argue tuition resets can make college more affordable and are more transparent because the difference between published sticker price and what students actually pay is reduced (Lapovsky, 2015; Toppo, 2019). Critics, however, question if tuition resets are merely marketing gimmicks without long-term benefit to the

institution or student (Bloom, 2017; Eldridge & Cawley, 2017; Seltzer, 2017a). Indeed, some students have ended up paying a higher net price as a result of the tuition reset (Krupnick, 2016). Newton observes the results of tuition resets have been uneven at best, on the basis that higher education shoppers make their decisions primarily upon value-shopping (2019).

The study of tuition resets contributes to a wider body of literature regarding theories of price signaling in service industries under deteriorating conditions. In situations where potential customers depend upon extrinsic factors to assess the quality of an offering, price provides an important signal of quality (Nagle et al., 2011; Simon, 2015; Utaka, 2015; Zeithaml, 1988). However, price also represents the monetary portion of sacrifice in order to enjoy the benefits of using an offering (Nagle et al., 2011; Rao, 2010; Zeithaml, 1988). In the world of higher education, higher prices have generally been associated with higher quality, (Archibald & Feldman, 2011; Ehrenberg, 2000; Wright, 2015) but discussions increasingly emphasize cost-related issues such as affordability, accessibility, and problems associated with student debt.

Institutions considering a tuition reset must navigate a series of paradoxes. As a signal of quality, lowering the sticker price should not give prospective students an impression of lower quality. Further, potential new students and their families need to perceive the institution's offerings are more affordable even as the net price which signals fiscal cost remains the same.

Purpose of Research

The purpose of this study is to examine the relationship between sticker price sensitivity and changes in first-year student enrollment, net tuition and fee revenue from

first-year students, the proportion of first-year students who are Pell-eligible, and transfer student enrollment following a tuition reset. In our multivariate logistic and linear regression models the independent variable of interest is sticker price sensitivity as measured by the sticker price elasticity of demand (Bradley & Singell Jr., 2010; Farhan, 2016) in the two years prior to the announcement of the reset event. The dependent variables stemming from industry dialog (Bloom, 2017; Casamento, 2016; Lapovsky, 2015) are percent change in first-year students enrolled, percent change in net tuition and fee revenue from first-year students, change in percent of the first-year cohort that is Pell-eligible, percent change in transfer students enrolled, likelihood the tuition reset will increase first-year enrolled, and likelihood the tuition reset will increase net tuition and fee revenue from first-year students. The effects of increased spending on advertising, population density, and varied measures of fiscal health are introduced as intervening variables (S. Bodfish, personal communication, May 23, 2017; Casamento, 2016; Kumar, 2005; Lapovsky, 2015).

Chapter 2 – Literature Review

In service industries such as higher education, price can play two communication roles, both as an indicator of quality and as an indicator of cost. As an industry matures or transitions to decline, consumers may respond to price messages in different ways. In the higher education market, sticker price elasticity and net price elasticity are different considerations. Tuition resets offer a unique lens by which responses to changes in both sticker price and net price can be investigated. The following literature review funnels from broad topics of price theory, to the general context of higher education, and then drills-in to the specific phenomenon of tuition resets. The literature review aims to set the context for examining price elasticity as a predictor of success for tuition resets.

Price as Signal of Quality or Sacrifice

In competitively mature or declining markets, price strategy works to both create and harvest value (Simon, 2015). Valerie Zeithaml (1988) argues that consumers perceive value by comparing perceptions of benefit (what will they receive in both monetary and non-monetary terms) to perceptions of cost (what will they have to give up in both monetary and non-monetary terms). When perceptions of benefit are high and perceptions of cost are low, consumers perceive high value and are more willing to purchase. The role of price in shaping these perceptions is a function of both industry and consumer characteristics.

As a service industry, traditional colleges and universities need to overcome the challenges of intangibility, heterogeneity, inseparability, and perishability (Lovelock & Gummesson, 2004; Wirtz & Lovelock, 2016) to increase perceptions of value. The

education process itself is intangible in that it is an exercise of mental stimulation. It is heterogeneous in that each student will learn and gain differently, even if given the same experience. Traditional classroom experiences are inseparable, meaning the experience of teaching and learning cannot be separated from the process of learning. Finally, traditional education is perishable in that it cannot be stored (Wirtz & Lovelock, 2016).

Customer characteristics are also a critical consideration for understanding how prices are understood, specifically knowledge of price, purchase characteristics, perceived fairness and value components (Rao, 2010). When customers lack price knowledge, they become more dependent upon outside cues to estimate what others are paying, and what they should expect to pay for a service. Characteristics of the purchase may also enhance or reduce price sensitivity. Students who want to enroll at a prestigious university might be willing to pay a premium for advance consideration. Perceived fairness can become a concern if segments of students come to believe others are receiving a better deal. Establishing clear price fences and transparency in pricing can help address concerns about fairness (Nagle et al., 2011). Finally, it is critical for colleges and universities to deeply understand the variety of value components their offerings represent to prospective students. Value components can be functional (e.g. a credential), financial (e.g. lowest price), social (e.g. the prestige of having earned a degree at a well-regarded institution) and psychological (the self-rewarding value of learning in itself).

Prospective students are highly dependent upon quality signals or cues to establish perceptions of benefit (Rao, 2010) given the nature of higher education as a credence good. Customers cannot fully access or understand the offering until they consume it. Therefore, they become reliant upon other “clues” or “signals” to infer the

quality of the offering (Nagle et al., 2011). While the education itself is intangible, its quality is inferred in part by physical manifestations such as the condition of the physical campus facilities, feelings the customer gets by interacting with recruitment staff, reputation and rankings from third-party services, and most importantly for the discussion at hand: price (Luca & Smith, 2013).

Insofar as the price can be used by uninitiated buyers as a signal to quality, a higher sticker price can create perceptions of value. A high price itself can create a perception of quality and willingness to pay, a notion called Chivas Regal effect which has been dominant in higher education pricing models (Askin & Bothner, 2016; Quigley et al., 2000). Thorstein Veblen observed that in luxury good markets high prices created barriers which in turn created a positive sense of exclusivity (Breaking Down Finance, 2019). In higher education marketing, high prices work to stimulate demand by communicating a sense of prestige and quality (Turner, 2011).

Research in consumer goods provides a theoretical basis for understanding the relationship of price to perceptions of quality. Shirai (2014) found high-quality low-price appeals created negative perceptions when offered in the context of other high-priced offerings. However, when offered in a context with other low-price offerings, it generated positive impressions. This suggests that colleges with favorable rankings compared to higher price peers might be well served to sustain high sticker prices to preserve favorable perceptions.

However, the price also represents a cost to consumers, a sense that sacrifice is required to access the benefits of an offering (Chang et al., 2015; Zeithaml, 1988). From the perspective of the supplier, the goal of value signaling is to decrease sensitivity (move

towards price inelastic behavior). Recent research on college pricing suggests the ways high sticker prices are interpreted may change over time; a higher sticker price may signal higher quality sometimes, but also may signal higher cost and thereby discourage enrollment (Fincher & Katsinas, 2017). More and more prospective students rule out a college choice based on sticker price alone. According to SallieMae & Ipsos Public Affairs, in 2015, 50% of students eliminated a college choice based on cost alone prior to applying. By 2018 the figure grew to 70% (SallieMae & Ipsos Public Affairs, 2015, 2018). Beyond enrollment of new students, tuition increases not matched by increases in financial aid for current students may result in student attrition, and thus revenue loss (Bryan & Whipple, 1995).

Previous studies of price elasticity in the higher education market have found that market enrollment demand overall is relatively inelastic with regards to the sticker price tuition increases (Gallet, 2017; Tellis, 1988). However, price response behavior varies based on individual student characteristics (e.g. level of student, demographic factors) (Carter & Curry, 2011) and by types of education delivery. Upperclassmen have lower elasticity coefficients than underclassmen as they risk losing credit should they decide to transfer (Bryan & Whipple, 1995). A study of Morehouse College, a historically black college for men, found that demand for course-hour enrollment was price inelastic but income elastic which favors a high tuition and high discount model (Price & Sheftall, 2015).

Another study, Bradley et al (2010) looks at the difference between sticker price and net price elasticities in the higher education context. The researchers found students were relatively inelastic with regards to sticker price, but more elastic with regards to net price.

However, behavior varied between different levels of financial need. High price and high discount scenarios encouraged enrollments of lower-income students, and low discount models which raised net price discouraged their enrollment. Such behavior is consistent with findings in student choice modeling performed by market research firms, such as Ruffalo Noel Levitz, that perform price sensitivity studies. Frequently, the negative influence of increasing tuition and fees on willingness to enroll is less than the positive influence of increasing financial aid by the same amount—which ultimately brings the prospective student to a final consideration of net price (S. Bodfish, personal communication, May 23, 2017).

Tuition resets provide a natural experiment for researchers of higher education to compare the relationship of sticker price elasticity with net price elasticity. In a tuition reset, the sticker price (which often signals quality and is expected to increase) is usually reduced by a significant amount, but the net price (which signals cost and would also be expected to be reduced if sticker price is reduced) typically remains unchanged. In some cases, the net price may actually increase as the sticker price decreases (Krupnick, 2016). Such changes in price can create a dissonance in the minds of potential students regarding what the "right" price should be.

The interpretation of future prices cannot be independent of current prices since the current price serves as a reference point to understand future changes (Dolan & Simon, 1996; Meehan et al., 2011). When changing prices, it is to the institution's advantage to supply a rationale for the change rather than leave things to the customer's interpretation. A price increase might be more acceptable if it is explained by a commensurate and demonstrable increase in quality. In general, customers are willing to pay if what is

offered fits their preferences (Davey et al., 2006). A price decrease, which breaks an expected pattern of increases, risks signaling reduced value for an offering.

To mitigate such perceptions, firms could message some type of "greater price transparency" or "cost-savings passed along" appeal. (Dolan & Simon, 1996; Nagle et al., 2011). In industries that are price inelastic especially, a price reduction could be interpreted as a response to increased competition and lead to further erosion of perceived value for the firm's offerings (Foubert et al., 2018; Meehan et al., 2011). Further, price cuts can lead to reactive price cuts by competitors (Dolan & Simon, 1996) and run the risk of triggering expensive price wars, which may result in erosion of overall market value (Smith, 2017).

Bodfish (personal communication, May 23, 2017), Casamento (2016), Lapovsky (2015, 2019) and Lawlor (2016) emphasize the need for the execution of extensive marketing campaigns to accompany tuition resets to help multiple audiences interpret the tuition reset from a value perspective, including websites, email campaigns, press releases, and town-hall-style meetings for Q&A. Common messaging included emphasis on cost reduction to some students, pricing transparency, and consistency in quality.

Higher Education Moving to Greater Price Competition

The goals of an institutional price strategy reflect industry conditions and characteristics. In mature or declining industries, the competitor set and competing products are defined more clearly. Price-based competition is intensified as consumers lose a sense that products are differentiated, and capacity exceeds demand. The problem of over-capacity is especially acute if exit barriers are significant (Meehan et al., 2011; Nagle et al., 2011; Porter, 1998b). Toxic markets emerge where price competition

becomes so severe that firms compete at prices lower than the costs of production (Porter, 1998a).

Traditional higher education markets reflect many industry characteristics of mature and declining markets. According to the National Clearinghouse Research Center, overall college enrollments have declined for the sixth consecutive year, and are expected to continue to decline in the foreseeable future (Fain, 2017). The 4-year private not-for-profit sector—the sector where many tuition resets are occurring—has experienced negative growth in five of the most recent seven years (National Student Clearinghouse Research Center, 2017). In December 2017, Moody's Investor Service downgraded the higher education sector from "stable" to "negative" (Harris, 2017). The negative ratings continued throughout 2019 due to constrained tuition revenue (Osborn & Fitzgerald, 2019). Due to delays in having children during the Great Recession starting in 2008, the number of college-bound high school graduates could decline by a staggering 15% by the mid-2020s according to WICHE data (Jaschik, 2018; Western Interstate Commission for Higher Education, 2016) further exacerbating current enrollment declines, especially in the northeast.

As enrollment declines continue, the market is undergoing structural changes to reduce over-capacity. Many higher education theorists such as Clayton M. Christensen predict mass closures and mergers among small, non-elite, and private colleges with the rise of online learning and other new innovative educational models (Christensen & Eyring, 2011; Poole, 2017). Such predictions seem to be coming to fruition as mergers and closures are becoming increasingly frequent (Fernandez, 2017; Woodhouse, 2015). Websites are emerging among industry news firms to track the number and reasons for

college closures and mergers (Bauman & O'Leary, 2019; Education Dive Staff, 2019; Jaschik, 2019).

However, significant exit barriers exist within higher education slowing the correction of over-capacity. Per accreditation standards, colleges must form plans for current students. Mergers and college closures are becoming more frequent—roughly five annually on average (Woodhouse, 2015). The mergers and closures are expected to increase in frequency. Members of the college community may resist the closure process. In an interesting case, Sweet Briar College, a prestigious women's college, sought to close in 2015 due to increasing discount rates and diminishing enrollments. However, loyal alumni fought to restart the college. As of 2017, enrollments are in decline again(Seltzer, 2017b). Similarly, Montreat College was on the verge of closure but received major philanthropic support (Ball, 2016) and has been attempting to rebuild over the last three years.

In mature markets, competitive forces act to reduce the differentiation between purchase options (Smith, 2017). In other words, there is pressure to "commoditize" offerings. In higher education, commoditization assumes at least two significant forms. First, there is an explosion of rating and ranking systems that facilitate easy comparison between presumably similar options, thereby creating a sense of interchangeability between options. The U.S. News & World Report, one of the most well-known among many rankings, ranks colleges within categories based on their Carnegie Classification. The criteria used include reputation, the academic profile of incoming students, retention and graduation rates, and financial strength (Morse et al., 2016). New rankings have also emerged within the last ten years which emphasize the financial pay-out of college

including Payscale.com (Payscale, 2017), Money Magazine (Clark, 2016), and Forbes (Coudriet, 2018). The Department of Education developed a college ranking system under the Obama administration. However, after protracted discussion with higher education leaders, the Department of Education settled on a College Scorecard system, wherein key statistics about cost, retention, and employment outcomes are listed (DoE Press Office, 2016).

Students are increasingly unbundling their education experience; it can no longer be assumed that the pursuit of a degree will be a singular four-year course of study at a single institution (Selingo, 2013). Increasingly, students earn credits from multiple institutions to complete their degree, a process referred to as student swirl (Selingo, 2013). Underlying the approach is the assumption that courses between institutions are interchangeable and credits can be transferred to the institution of record without a substantive degradation in the quality of overall education received (Borden, 2004; Christensen & Eyring, 2011).

Another factor contributing to the decline in enrollment in traditional colleges is increasing receptivity to alternative forms of online instruction and nontraditional credentialing for skills development among employers (Farrington, 2014; Selingo, 2013). New forms of life-preparation such as online degree completion allow for more self-paced learning. Apprenticeships allow students to learn hands-on trades (U.S. Department of Labor, 2018; Varetto, 2017) and earn credit for life-learning in a system known as competency-based assessment (Gruppen et al., 2016). In many technical fields, online "badges" can be accrued which certify mastery of some specific skills or areas (Muilenburg & Berge, 2016). Each of these alternatives diverts the number of students

that otherwise would have considered the 4-year traditional colleges and offers their own unique competing value propositions (Kirst & Stevens, 2015; Selingo, 2013).

Higher education has also long been an industry with significant information asymmetry. The suppliers (e.g. colleges and universities) collect information about the potential consumers and determine the price to be paid (via determination of financial aid offers contingent upon family income, student academic profile, student fit for other desired attributes). Such information asymmetry has traditionally allowed colleges and universities to utilize revenue management practices which price discriminate based on desired enrollment goals and applicant profiles (Rebbapragada et al., 2010). However, the increase of consumer information revealing net price paid, debt levels of graduates, and graduation rates dramatically reduces the information asymmetry.

Given the compounding effect of these deteriorating market conditions—reduced differentiation, an increasing number of alternatives, decreased information asymmetry and excess capacity—the influence of buyers' bargaining power is increased. Under these conditions, price strategy becomes a more critical and competitive factor as it becomes the basis for the buyer's final decision. The most visible evidence of increasing buyer-power is the increase of discounts—in the form of institutional scholarship and grant aid—that colleges and universities offer to students to entice enrollment. According to the 2018 Tuition Discounting Study performed annually by NACUBO, the First-Time, Full-Time Freshman discount rate reached an all-time high of 52.2% in Fall 2018. This is up 12.3 percentage points from 39.9% from ten years ago, with more than 1.2 percentage points increase per year (NACUBO, 2019; Valbrun, 2019). In other words, while the sticker price of colleges and universities has continued to increase significantly, the

revenue received by the college on a per-student basis has only increased marginally (Newton, 2019). Many researchers perceive the increase in discounting as an unsustainable phenomenon (Behaunek, 2015; Davis, 2003; Rine, 2016) which can lead to market toxicity wherein offerings are sold at prices lower than the cost to provide (Porter, 1998b).

The Tuition Reset Strategy

Pricing in higher education raises a series of complex financial and marketing concerns. The sticker price is the published price for tuition, fees, room, and board. Colleges award scholarship and grant aid to discount the sticker price, resulting in a lower net price. Discount rate is the percentage of tuition and fees given back in the form of institutional discounts (NACUBO, 2019; Ruffalo Noel Levitz, 2017). During the first year of attendance, the amount of institutional scholarship and grant aid awarded is set for each student. In later years, tuition and fees increase, but the institutional scholarship and grant awards usually do not change except in cases of demonstrable changes in family income. Therefore, the discount rates are usually higher for first-year students than returning students who pay more from annual rate increases (Ehrenberg, 2000).

Against the general trend of rising sticker prices to attend college, tuition resets (also known as tuition reductions or tuition rollbacks) lower the published sticker price of tuition and fees, but also make reductions to institutional grants and scholarships to accomplish approximately the same net price (Bernard, 2019; Lapovsky, 2015). Such a change has several important financial implications:

- Only students who are full-paying—or close to full-paying—will realize savings by the amount of the tuition reduction (or the difference between the amount of

the tuition reduction and the aid they received) (S. Bodfish, personal communication, May 23, 2017; L. Lapovsky, personal communication, March 1, 2016). The resulting loss of revenue can be expensive to the institution when the number of current students who have low discount rates is considered (Lapovsky, 2015).

- To break-even financially, tuition resets need to enroll large enough quantities of new students to cover the loss of revenue from both new and continuing students who would have been full—or nearly full—paying (S. Bodfish, personal communication, May 23, 2017; Casamento, 2016; Lapovsky, 2015). If an institution has many near-full-pay or full-pay students, a tuition reset is unlikely to break even.
- Students receiving institutional grants at the same amount (or greater) than the tuition reset amount will pay approximately the same net price (S. Bodfish, personal communication, May 23, 2017; Lapovsky, 2015).
- Because the aid current students receive will be reduced commensurate to the tuition reduction amount, funded aid dollars can be freed to meet a higher percentage of need and for more students (S. Bodfish, personal communication, May 23, 2017). Net tuition revenues from these students will remain about the same.
- The institution's ability to meet need from funded institutional grant aid sources is increased because the calculated need for students is reduced by the tuition reduction amount, aiding long term financial stability (Browning, 2013; Martin,

2004). Because funded grant aid goes further, institutions reduce reliance on unfunded grant aid.

- Institutions reduce their NACUBO Discount Rate which is viewed as positive from the perspective of potential creditors.

Tuition resets also represent a significant marketing opportunity to reposition the institution among its peers (Lawlor, 2016). Because 70% of students report eliminating colleges as an option on the basis of cost alone prior to applying (SallieMae & Ipsos Public Affairs, 2018), institutions that implement tuition resets hope to significantly expand the number of prospective students who would consider applying to their institution. Frequently, a significant promotional campaign effort is launched to create awareness of the price change, explain how it will benefit students, and seek to reposition the institution among its constellation of competitors (S. Bodfish, personal communication, May 23, 2017; L. Lapovsky, personal communication, March 1, 2016; Lawlor, 2016).

In summary, to be successful from a financial perspective, a tuition reset should attract enough students so that the cost of the reset—in terms of promotional costs and lost incremental revenues from full-paying and low-discount-rate returning students—is covered by a higher volume of new students enrolled. To be successful from a marketing perspective, institutions need to make students believe the quality of education they will be receiving is the same as or better than that prior to the reset, and the price they will be paying is “fair” (Bodfish, 2017).

Research Questions

Tuition resets offer a natural experiment to assess the impact of sticker price elasticity on several facets of enrollment behavior. This study will address the following research questions:

1. Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict the likelihood of an increase in first-year student enrollment for institutions implementing a tuition reset?
2. Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict the likelihood of an increase in net tuition and fee revenue from first-year students for institutions implementing a tuition reset?
3. Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict an increase in first-year student enrollment for institutions implementing a tuition reset?
4. Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict an increase in net tuition and fee revenue from first-year students for institutions implementing a tuition reset?
5. Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict an increase in the proportion of first-year Pell-eligible student enrollment for institutions implementing a tuition reset?
6. Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict an increase in transfer student enrollment for institutions implementing a tuition reset?

As discussed in the literature review, many practitioners emphasize the role of advertising in successfully implementing a tuition reset. For each of the above research questions, this study also examines the intervening effects of a change in advertising spending.

Additional considerations will also be explored such as whether the size of a tuition reduction influences results, influence on transfer student enrollment, and the influence of a reset on retention. We will also consider if resets following the 2010 Great Recession were more successful than those preceding it.

Significance of the Study

This research makes several important contributions to the literature:

Tuition resets are happening more often. Between 1995 and 2005, 22 institutions announced a tuition reset. Between 2005-2015, 66 institutions announced tuition resets (a 300% increase). In only the three years between 2015 and 2018, 36 institutions announced tuition resets. While the effectiveness of tuition resets is still a matter for discussion and research, clearly a growing number of institutions are willing to consider the reset strategy.

There are few academic studies on the tuition reset strategy, despite increasing attention in news and media. Academic and privately funded studies focused on qualitative methods such as multiple case studies. Important multiple case studies include:

- Lucie Lapovsky's (2015) multiple-case study *Tuition Reset: An Analysis of Eight Colleges that Addressed the Escalating Price of Higher Education* continues to be cited in news articles frequently and was funded by the Lumina Foundation.

- Laura Casamento's (2016) dissertation, *A Multiple Case Study Analysis Exploring How Less Selective, Tuition-Dependent Colleges and Universities Approached an Undergraduate Tuition Price Reset Strategy* provides further case study analysis.
- Eldridge and Cawley (2017) described the experience of planning for a tuition reset and how Rosemont College interpreted the results in *Beyond the headlines: the mechanics of a tuition reset*.

More recently a few researchers are also studying resets using quantitative methods:

- Alex Bloom (2017) of Education Advisory Board reported the results of a study of 27 institutions in a blog post entitled *Appealing but ineffective: Why tuition resets aren't consistently successful* and found that tuition resets were not consistently successful.
- Sarah Kottich's dissertation *Tuition Reductions: A Quantitative Analysis of the Prevalence, Circumstances and Outcomes of an Emerging Pricing Strategy in Higher Education* assessed a range of effects of tuition resets implemented by 45 institutions (2017).
- Lucie Lapovski, Kottich's dissertation advisor, then released a quantitative study (2019) of tuition reset results.

To the best of this author's knowledge, this study of 72 institutions regarding the impact and financial implications of tuition resets is the largest and most comprehensive quantitative analysis to date.

This study provides a new quantitative lens for understanding tuition resets. The preliminary results section supplies a valuable characterization of results that institutions implementing tuition resets have realized through descriptive statistics. Further, combining elements of the event-study methodology from finance with the variety of variables from IPEDS, the impact of tuition resets on a host of institutional factors can be explored in subsequent studies such as change in academic profile of students that apply, changes in ethnic composition of first-year students, 4-year graduation rates (as an indicator of college completion), changes in indicators of institutional financial health, and many others.

This study extends literature about the effects of price as a quality signal in service industries. Tuition resets offer a natural experiment by which researchers can contrast the influence of sticker price and net price on a purchase decision. Because tuition resets change the sticker price and while net price remains substantially the same, the signaling impact of sticker price changes can be statistically tested using a series of important outcome variables such as application generation, admitted students, enrolled students, and revenue from first-year students.

This study also makes important contributions to practice. Industry practitioners are asking many important questions about the outcomes and implications of a tuition reset. This study supplies baseline information that addresses the scale and breadth of outcomes experienced by institutions implementing tuition resets.

Especially important from the practitioner perspective, the study also addresses prediction questions. Building on the general question of what happens when institutions reset their tuition, recruitment managers need to assess the suitability and effectiveness of

the tuition resetting strategy for their specific institution. Predictive models created in this study can help practitioners understand potential outcomes and the drivers of different potential outcomes for specific institutions, within the constraints of the model accuracy and predictive power.

Chapter 3 - Methodology

As discussed in earlier chapters, in service industries such as higher education, price can play two roles; both as an indicator of quality and as an indicator of cost. But as industries mature or transition to decline, consumers may respond to price messages in different ways. In the higher education market, researchers can model sticker price elasticities and net price elasticities separately. Tuition resets offer a natural experiment through which the influence of sticker price alone on facets of enrollment behavior can be better understood.

This chapter describes the methods used to test the research problems identified in the previous chapters. First, a rationale for borrowing from the event-study methodology will be provided, and a detailed description of how it can be adapted to the process of a tuition reset implementation. Second, the process of selecting participants and gathering data is described. Third, the variables for observation are described. Fourth, detailed procedures are described for gathering, cleaning, and analyzing the data will be described. Finally, the methods of data analysis are detailed.

Research Design and Rationale

This study borrows elements from the event study methodology but is not a true event study in that there is no comparison with institutions that have not reset. A tuition reset usually is a specific one-time event, unlike tuition discounting which involves an ongoing annual process of defining discounting goals. Typically—although there are exceptions—an institution operates at a “high price/high discount,” performs the reset, and in subsequent years resumes the annual cycle of setting prices with discounts. As

discrete one-time occurrences in the life-span of an institution, the event-study methodology offers a favorable analytical lens from which to understand both the phenomenon of tuition-resets (Boehmer, 1991), but also to highlight the role sticker price elasticity plays in impacting varied dependent variables such as first-year enrollment, net tuition and fee revenue from first-year students, and changes in the percentage of Pell-eligible first-year students.

Born from the discipline of finance to analyze the impact of stock splits, event studies involve the comparison of statistically modeled firm performance prior to a specific event—such as the announcement of a tuition reset—with the performance following (MacKinlay, 1997). The event study methodology has been extended to other fields, including marketing, to better understand the financial impact of different potential actions on firms (McWilliams & Siegel, 1997; Skiera et al., 2017; Sorescu et al., 2017).

To apply elements of the event-study methodology to the phenomenon of tuition resets, a conceptual timeline was developed (See Table 1 below) to emulate how the process of a tuition reset unfolds (S. Bodfish, personal communication, May 23, 2017):

Table 1
Conceptual model for tuition reset timeline and variable calculation

Relative Year	Definition	Management Events
-3	Three years prior to the reset	No change.
-2	Two years prior to the reset	No Change
-1	One year prior to the reset	FY Enrolled reflect old student charge structure, however, tuition reset is formally announced.
0	First-year at new lower sticker price in effect	Recruitment results reflect the understanding of the new reset price structure.

Note: Most colleges run on a July to June fiscal year system. Therefore, relative years split calendar years.

While tuition resets occurred during different years for different institutions, a uniform model that standardizes events and measures to a relative timeline is needed. Price elasticities are assessed based on price and first-year student enrollments between years -3 and -1. This approximates the timing needed to complete decisions about whether to proceed with a tuition reset. Recruitment results of the reset are assessed in Year 0 where the first cohort of first-year students aware of the new reset price structure enrolls.

Data analysis will employ binary logistic and linear regression methods, both of which are quantitative (Chapman & Feit, 2015; Field, 2013; Salkind, 2017). Implementing a tuition reset strategy involves an assessment of risk to practitioners. Research questions 1 and 2 (R1 and R2) pertain to how independent variables influence the likelihood of a specified outcome (more students or more net revenue from first-year students). Binary logistic regression is used to identify the influence of independent variables on the log-likelihood of a Boolean event (the dependent variable) occurring (Chapman & Feit, 2015). The results of logistic regression can be used to give probabilities of a successful outcome on an institutional basis.

Research questions 3, 4, 5, and 6 (R3, R4, R5, and R6) pertain to the influence of independent variables on levels of an independent variable. Linear regression is used to quantify the influence of one or more independent variables on levels of an independent variable (Berenson et al., 1992; Salkind, 2017). Where this discussion focuses on the influence of sticker price elasticity, other variables—as discussed in the literature and as mentioned by industry experts—are included in models to increase their statistical power.

Participants and Sampling

As of 2016, there were 1,594 4-year private not-for-profit colleges as recognized by the National Center for Education Statistics (2018), a relatively well-defined industry sector. Tuition resets are a contrarian phenomenon which depends, in part, on highly publicized announcements of price reductions to attract attention (Lapovsky, 2015; Lawlor, 2016).

To develop the analysis dataset, multiple methods of 'discovering' tuition reset institutions were used. I interviewed Scott Bodfish, Vice President of Market Research at Ruffalo Noel Levitz (S. Bodfish, personal communication, May 23, 2017) who provided a list of institutions he was familiar with that had implemented tuition resets. I conducted internet searches to reveal lists of institutions that implemented tuition resets or identify institutions themselves. The major lists found included Affordable Schools.net (Affordable Schools, 2017), Cappex (Kantrowitz, 2017), Edvisors (Edvisors, 2017), Education Dive (Shumski, 2014), NAICU (National Association of Independent Colleges and Universities, 2017) and more recently Savingforcollege.com (Kantrowitz, 2019). I reached out to Alex Bloom of EAB (2017) via telephone discussion to compare the list I had compiled at that point to his. I set up Google Alerts to provide notifications when items were published to the web with the phrases "tuition reset" or "tuition cut." To further increase the validity of the institution list, news articles and institutional website announcements were collected to document tuition resets that were the result of specific intentional marketing efforts, and not attributed to other causes (e.g. institutional mergers, negotiations with state legislatures). Finally, I reviewed and compared institutions on my list to those listed in the appendix of Sarah Kottich's dissertation (2017).

To the researcher's knowledge, the resulting list of 142 institutions which announced tuition resets is the most comprehensive list yet compiled, and the sample size represents an overwhelming majority of the total population of institutions that have implemented tuition resets for the period under observation (July 1997 to July 2018). At present, there are 72 private not-for-profit, 4-year or above institutions for which enough information is available to perform data analysis. Of this 72, 43 have advertising and promotion expenditure information.

After compiling the list of institutions, the tuition resets were verified by identifying web pages with public news announcements of the tuition reset, tuition reset announcement microsites hosted within institutional websites. Further, IPEDS data was pulled for student charges to ensure the tuition and fee reductions reported were realized in regulatory reporting. Sarah Kottich (2017) identified a list of institutions that initially appeared to have conducted tuition resets, but disqualified them due to extenuating circumstances. These institutions are also excluded.

Measures

This research will focus on the impact of sticker price elasticity on several facets of enrollment behavior. A broad set of data points was developed to strengthen the explanatory power of models developed in support of the research questions. Because this study uses publicly available data sources (IPEDS, IRS, U.S. Census Bureau), industry-standard definitions are assumed. Refer to Appendix B for a comprehensive list of variable definitions used in this study, data sources, and official definitions according to the sources.

Drawing from this broader set of measures, it is appropriate to highlight a few of the more important measures directly referenced in the research questions:

- *Sticker price elasticity* (or PED_Sticker) measures price elasticity using changes in first-year students enrolling as a measure of demand quantity and sticker price as the measure of price change.
- *Transfer sticker price elasticity* (or PED_Sticker_XFR) measures price elasticity using changes in transfer students enrolling as a measure of demand quantity and sticker price as the measure of price change.
- *First-year student enrollment change percent* (Enrolled_CHG_PCT) is the percent change in the number of first-time students enrolled between the year prior to and during the first year of the reset. First-time students enrolled (Enrolled_Y0) refers to the number of first-time, degree/certificate-seeking undergraduate students who applied, were admitted and enrolled (full- or part-time) at an institution for the most recent fall period available. These include early decision, early action, and students who began studies during the summer prior to that fall during the year of a tuition reset (NCES National Center for Education Statistics, 2017).
- *Reset success by enrollment* (Reset_Success_Enrollment) is a categorical variable that indicates if the tuition reset resulted in a five percent or greater increase in first-time student enrollment relative to the year prior. If there was a five percent or greater increase this measure would be true, otherwise, it is false. A five percent increase in one year marks a material increase in first-year student enrollment.

- *Net tuition and fee revenue from first-year students* (FY_Net_Revenue_Y0) is the average net price times the number of first-year students enrolled (Enrolled_Y0)
- *Net tuition and fee revenue from first-year students' percent change* (Net_FY_TFRevenue_CHG_PCT) is the percent change between Y-1 and Y0 in net tuition and fee revenue from first-year students.
- *Reset success by first-year net revenue* (Reset_Success_NetRevenue) is a categorical variable that indicates if the tuition reset resulted in five percent or more dollars of net revenue from first-year students relative to the year prior. If there was five percent net revenue or more, this measure would be true, otherwise is false. A five percent increase in net tuition and fee revenue from first-year students in one year marks a material increase.
- *Difference in percent Pell* (PercentPell_CHG) is the percentage difference in Pell-eligible students between the year prior to the reset (PercentPell_YearPrior) and during the first-year at the new lower price (PercentPell_Y0).
- *Retention change (Retention_CHG)* is the difference in first-year student retention rates between Y-1 and Y0.

It is also appropriate to include financial ratios—used to assess aspects of the financial health of colleges and universities—as independent variables prior to the reset given their prominence in many discussions found in the literature. Many practitioners emphasize the need for colleges to be financially vital prior to undertaking a tuition reset (S. Bodfish, personal communication, May 23, 2017; Casamento, 2016; Lapovsky, 2019; Lawlor, 2016). KPMG's Composite Financial Index (CFI) is a summary measure of an institution's financial health based on four ratios (Pelletier, 2015). These ratios have also

been adapted by the Austen Group's Financial Indicators Tool (FIT) and are widely known by higher education finance professionals:

- *Primary reserve ratio*—also known as the operating reserve ratio in FIT—(Operating_Reserve_Ratio_YearPrior) explores whether an institution's resources are enough and flexible or liquid enough to support its mission.
- *Net operating revenues ratio*—also known as the operating margin ratio in FIT—(Operating_Margin_Ratio_YearPrior) looks at whether operating results show that the institution is living within its available resources.
- *Return on net position ratio*—also known as the change in net assets ratio in FIT— (Change_in_Net_Assets_Ratio_YearPrior) examines how well the institution's asset performance and management support its strategic direction.
- *Viability Ratio* (ViabilityRatio_YearPrior) assesses how strategically the institution's financial resources, including debt, are managed to advance the institution's mission.
- While not a part of CFI, the e*quity ratio* (EquityRatio_Y0) is an important measure of financial leverage in the year prior to implanting a tuition reset.

Many practitioners who have written about tuition reset emphasize the need to implement a marketing campaign in conjunction with a tuition reset (S. Bodfish, personal communication, May 23, 2017; Casamento, 2016; Lapovsky, 2015; Lawlor, 2016). A survey of all reset institutions to provide estimates of promotional expenditures specific to the tuition reset was considered but ultimately rejected due to the likelihood of a low response rate (Dillman et al., 2014) which would net insufficient information to make statistically significant observations. Institutional "Advertising and Promotion"

expenditures from Form 990 data during the years prior to and during a tuition reset event was available for a sub-set (N=43) of the institutions implementing a tuition reset. From this data, two measures of advertising were developed:

- *Advertising and promotion spend year prior* (AdvertsingPromotionSpend_YearPrior) is the dollars spent in advertising and promotion expenditures during the year the tuition reset is announced, presumably to promote the reset in part.
- *Change in advertising and promotion spend by percentage* (AdvertsingPromotion_CHG_PCT) is the percentage difference in advertising expenditures between Year -1 and Year -2. As a percentage, this measure normalizes institutions of different sizes.

Data Collection Procedure

Approval from George Fox University's Institutional Review Board (IRB) was unnecessary due to the use of anonymous panel data. No individual-level data were used for analysis. The data set used for analysis combined institution-level information from IPEDS, Form 990s, and U.S. Census Data. Appendix B provides a comprehensive list of variable definitions used in the analysis, identifies the primary source of data for each variable and official definitions according to the source.

IPEDS

Colleges and universities participating in the Title IV financial aid program are required to provide accurate annual statistical reports to the Department of Education through the Integrated Postsecondary Education Data System (or IPEDS) (National Center for Educational Statistics, 2017). As a public service, IPEDS data is accessible

through the IPEDS Data Center to researchers for download. As pertaining to this study, the IPEDS Data Center allows downloading of needed data including institutional characteristics, institutional address/location, tuition and fees charged, applications, the number of first-year students who enrolled, the number of first-year students who received institutional grant aid, and the average amount of institutional grant aid first-year students received. From these data points, other important ratios can be calculated.

While this research has identified a list of institutions that have implemented tuition resets between 1995 and 2018, the availability of data from IPEDS varies by survey component. The IPEDS data review process also precludes publicly publishing institutional information for up to two years thus creating lags in the availability of information. IPEDS data used in this analysis was harvested through a multi-step process:

1. A comparison group file was created which contained the OPEID and name of every institution on the list of reset institutions (See Appendix A). The OPE ID number uniquely identifies each institution in IPEDS to the Office of Postsecondary Education (CEDS, 2019; NCES National Center for Education Statistics, 2017).
2. A variable set file was created which captured all variables used in the analysis from the IPEDS data center. Variables were selected from the following catalogs (or sub-surveys of IPEDS) for as many years as were available:
    - Institutional Characteristics
    - Admissions and Test Scores
    - Student Charges
    - Retention rates, Entering Class, and Student to Faculty Ratio

- Student Financial Aid and Net Price
- Finance

3. The institutional data was downloaded based on the Institution list and selected variables cited in the Variables list using the *IPEDS Compare Institutions* tool (National Center for Educational Statistics, 2019). The downloaded file was a .csv which could be opened and manipulated in Excel.
4. The downloaded IPEDS data was then staged for review. Using the provided data dictionary, all numerically coded variables were transformed into their text values (e.g. institution types). The columns were sorted so all variables were grouped together and placed in a series format by year. All calculated variables based on IPEDS data fields were added without error checking so error messages due to incomplete data could be clearly identified.
5. A copy of the raw data was scaffolded to prepare for implementing the event-study model (described above). A column was added which listed the year of reset as it applied to each institution name. A row was added to standardize the fiscal year each variable represented (Years in IPEDS Sometimes reference the start of a fiscal year, and for other variables reference the end of a fiscal year, and sometimes reference both). Institution records were then sorted by institution type, and by reset year.
6. With scaffolding in place, data were checked for completeness and data types:
    - Institutions that were publicized to have implemented resets but did not report lower tuition and fees charged to IPEDS were removed from the

data set. This happened when program-specific resets rather than institution-level resets occurred.

- Because the scope of this research is private not-for-profit institutions, all other colleges were filtered out of the data set.
- If institutions were missing counts for the variable "Enrolled" but had a first-year full-time financial aid cohort, the value of first-year full-time financial aid cohort was provided to the variable "Enrolled."
- Each row was checked for missing data, and then that data values were of the expected data types, and that data were within expected ranges.

7. A time-series calculation was inserted above each Year of Reset grouping of institutions and for each variable set. Year 0 was the first year of the new sticker price. Year -3 was three years prior to the new price. Year 3 was the third year following the change (or 4th year at the new price). After these time-series calculations were inserted, all rows for all variables were realigned horizontally from an actual year system to the new relative-year/time-scaled system.

Form 990

The Form 990 is roughly analogous to a tax return filed with the IRS to disclose sources and uses of funds by a not-for-profit organization (Blazek & Adams, 2009). Most public and private colleges and universities are tax-exempt under the Internal Revenue Code 501(c)(3) and are therefore required to complete an IRS Form 990 on an annual basis (Association of American Universities, 2014; Internal Revenue Service, 2018).

Financial data for each private not-for-profit institution was drawn from both IPEDS and Form 990 information to support the analysis of financial health using the

Composite Financial Index (CFI) methodology. The Financial Indicators Tool (FIT) as provided by The Austen Group provided detailed calculation instructions to calculate these ratios and the CFI based on data from IPEDS and Form 990 data (Chabotar, 2006; The Austen Group, 2019a).

Form 990 information data was acquired through a free academic GuideStar Premium subscription to GuideStar by Candid (GuideStar, 2019). Access to this subscription required written verification of the goal of this study and approval of the George Fox University librarian.

The following steps were performed to create a financial data analysis file:

1. A copy of the IPEDS analysis dataset was made following Step 7 above.
2. All variables were removed, except for all years available of the following:
    - Institution Identifier
    - Institution Name
    - Year of Reset
    - Endowment assets (year-end) per FTE enrollment (FASB)
    - Equity ratio (FASB)
    - Net assets beginning of the year
    - Net assets end of the year
    - Total change in net assets
    - Total expenses
    - Total net assets
    - Debt related to Property Plant and Equipment
    - Total unrestricted net assets - EOY

- Temporarily restricted net assets
- Permanently restricted net assets included in total restricted net assets
- Property Plant and Equipment net of accumulated depreciation
- Total Revenue

3. A time-series calculation was inserted above each Year of Reset grouping of institutions and for each variable set. Year 0 was the first year of the new sticker price. Year -3 was three years prior to the new price. Year 3 was the third year following the price change (or 4th year at the new price).
4. For each institution, for each year, Form 990 data in GuideStar (which is reported to the IRS by an institution's finance office and has to match an audited Financial Statement) was compared to IPEDS finance data (which is reported through finance or Institutional Research). To maintain an audit trail of changes, all places where Form 990 data over-rode IPEDS data the font color was changed to burgundy in the worksheet.
    - Institution names and Employer Identification Numbers (EIN's) were used to ensure a match between specific institutions found in IPEDS and Form 990 searches.
    - If there were missing data elements in IPEDS data, the Form 990 data was supplied.
    - If there were conflicts between IPEDS and Form 990 data, the Form 990 data would take precedence over the IPEDS data. Form 990 data is provided to the IRS and is subject to audit, and therefore under a higher level of scrutiny (Blazek & Adams, 2009, p. 990).

- If the ending balance of an earlier year conflicted with the starting balance of the following year, the following year's starting balances would take precedence over the ending balance of the earlier year on the assumption that errors were discovered and corrected.

5. The "Advertising and Promotion" data elements were added to the analysis sheet for three years prior and up to the year of each institution's tuition reset.
6. Some data elements (See Appendix B for detailed information) were calculated and added including the four KPMG ratios and CFI (both with and without debt as according to FIT) as demonstrated in the Appendix of the sample FIT report (The Austen Group, 2019b).
7. Columns were re-aligned horizontally from an actual year system to the relative-year/time-scaled system. Columns prior to Year -3 and following Year 3 were removed.
8. The finance variables data set was merged with the IPEDS data set by Institution ID.

U.S. Census Population and Geographic data

Tuition resets represent a strategic opportunity to capture the attention of individuals who might not otherwise consider an institution, and more individuals are better. With this in mind, industry practitioners have posited institutions with access to dense regional populations are better positioned for success (S. Bodfish, personal communication, May 23, 2017) since most students attend colleges within a one-day drive of their home (Wexlar, 2016). According to CIRP's *American Freshman: National*

Norms Fall 2017 survey about half (44.9%) of students attending a 4-year private not-for-profit institution attend within 100 miles or less (2019).

To introduce the influence of distance, population size, and density to the models, geographic and population data provided in IPEDS was supplemented with 2010 U.S. Census data (SF3 files) using the Missouri Census Data Center's Circular Area Profiles (CAPS) application (Missouri Census Data Center, 2017). CAPS enables the researcher to obtain population estimates and population density estimates within a 100-mile and 200-mile radius of an institution's zip code according to 2010 U.S. Census data (the most recent census applicable for the significant majority of institutions that have implemented a reset).

Population and population density information were collected as follows:

1. For each institution, the zip code of the main campus was identified and looked up in CAPS (Missouri Census Data Center, 2019). IPEDS provided
    - Institution's zip code
    - U.S. Bureau of Economic Analysis (BEA) Region
2. The following data points were captured and recorded, directly appending the IPEDS data analysis file from Step 8 above:
    - Population in 200 miles
    - Population in 100 miles
    - Population density in 200 miles
    - Population density in 100 miles

3. Calculated fields were added to compare the local population (within 100 miles) to the more distant population (between 100 and 200 miles) of the zip code where the institution is located.
    - Percent of 200 miles population in 100-miles population
    - Ratio of 100 miles density to 200-miles density

Data Analysis

The purpose of this study is to examine the relationships between measures of sticker price elasticity and the change in first-year student enrollment, change in net revenue from first-year students, and change of first-year students who are Pell-eligible following a tuition reset using multivariate binary logistic and linear (OLS) regression models. The effects of advertising will be explored as an intervening variable. It will add to the body of knowledge by characterizing the outcomes of tuition resets and investigating the two roles of price as a signal of quality or as a signal of sacrifice.

Following the completion of data collection, we proceed with the data analysis in three phases:

- Phase 1 provides descriptive statistics.
- Phase 2 performs binary logistic regression analysis.
- Phase 3 performs multivariate linear regression analysis.
- Because advertising data is only available for a subset of institutions, each regression in Phase 2 and Phase 3 is performed twice, first without advertising (a larger sample) and then with advertising (a smaller sample).

Phase 1: Descriptive Analysis Procedure

In Phase 1, a preliminary analysis will characterize the results of tuition resets using descriptive methods such as frequencies and measures of central tendency. The results of this analysis will be informative to academics and practitioners seeking to understand the frequency and scope of potential outcomes for tuition resets. The following frequency tables will be provided through analysis using Microsoft Excel on the analysis data set:

- Number of tuition resets per year, for each year of the period of observation
- Institutional control of institutions performing tuition resets
- BEA Statistical regions where tuition resets occur
- Characteristics of institutions performing a tuition reset
- Range of outcomes from performing a tuition reset

Phase 2: Binary Logistic Regression Procedure

In phase 2, binary logistic regression analysis will be performed in RStudio (RStudio, 2019) to explore research questions 1 and 2. Binary logistic regression is a statistical method used to predict the log-likelihood of an event occurring for a given entity (Hosmer et al., 2013; Lang, 1999). Binary logistic regression assumes the dependent variable is dichotomous (UCLA Institute for Digital Research and Education, 2019). Pertaining to research question 1, the Reset_Success_Enrollment variable was defined to be 1 if 5% or more first-year students were enrolled in the year of the reset, and 0 if not. Pertaining to research question 2, the Reset_Success_FYNetRevenue variable was defined to be 1 if 5% or more first-year students were enrolled in the year of the reset, and 0 if not. The data analysis procedure is as follows employing a purposeful

step-up strategy drawing in variables from the larger data set (Bursac et al., 2008; Grace-Martin, 2014) as described in Appendix B:

1. Export the Excel-based data collection file into a .csv file.
2. Run descriptive statistics for each variable and ensure datatypes are detected properly. Recast variables as necessary.
3. Run Pearson's Product Moment correlation to identify possible variables that influence the Reset_Success_Enrollment and Reset_Success_FYNetRevenue variables. Variables with a p-value of .1 or lower will be considered of interest.
4. Given variables of interest, run GLM Binary logistic regressions according to each research question. Observations with missing data are eliminated in a row-wise basis.
    - Question 1. Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict the likelihood of an increase in first-year student enrollment for institutions implementing a tuition reset?
    - Question 2. Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict the likelihood of an increase in net revenue from first-year students for institutions implementing a tuition reset?

Table 2
Binary logistic regression configuration for research questions 1 and 2

Research Question	Independent Variable of interest	Other independent variables	Dependent variable
R1.	PED_Sticker	AdvertsingPromotion_CHG_PCT ViabilityRatio_YearPrior X200Density	Reset_Success_ Enrollment
R2.	PED_Sticker	AdvertsingPromotion_CHG_PCT App_Trend DiscountRate_YearPrior Equity_Ratio_YearPrior PercentPell_YearPrior X200Population StickerPrice_YearPrior ViabilityRatio_YearPrior Year_of_Reset	Reset_Success_ NetRevenue

Note: Independent variables of interest found during correlation analysis.

Interpretation of the binary logistic regression model output involves four steps:

1. To assess model fit, deviance residuals should be examined to ensure they are evenly distributed around the median (Chapman & Feit, 2015). Akaike's Information Criterion (AIC) provides information about model strength among a given set of data; the lower the AIC, the stronger the model (Mazerolle, 2007). When no further variables from the analysis set can be added which lower the AIC, the model is the strongest possible given the data available. Statistical significance of the model can be evaluated by implementing a Chi-Square statistic on the Degrees of Freedom reported in the logistic output (Hosmer & Lemesbow, 1980).
2. After building the logistic model with the lowest possible AIC, the statistically significant coefficients can be identified and explained as odds ratios. Coefficients with a *p*-value of .1 are considered significant. Integer

variables will be interpreted so that a 1-unit change in quantity will correspond to a change in the log odds by the amount of the coefficient. For values that remain, the listing of that variable shows the change in log odds by the difference from the base level to the level mentioned in the coefficient (UCLA Institute for Digital Research and Education, 2019). Next, the log-likelihood coefficients will be transformed to odds ratios by calculating the exponent of the coefficient.

3. The next step of interpreting the binary logistic regression model is to calculate the effectiveness of modeled predictions via a confusion matrix (Chapman & Feit, 2015). For each institution in the model, the research question-specific logistic regression is run and the applicable Enrollment_Success_Prob_Score and FYNetRevenue_Success_Prob_Score field will be populated with a value of 0 to 1 with the predicted likelihood of success. These calculations will be compared to the actual Reset_Success_Enrollment and Reset_Success_FYNetRevenue fields in a confusion matrix as follows:

	Predicted False	**Predicted True**
Actual False	True Negative (TN)	False Positive (FP)
Actual True	False Negative (FN)	True Positive (TP)

4. Model accuracy, precision, recall, specificity and false positive rates are calculated to assess varied dimensions of the model's performance. Following are the definitions and calculation steps for each of these

diagnostic statistics drawn from the confusion matrix (Hosmer et al., 2013; Saito & Rehmsmeier, 2015):

- *Accuracy* is calculated as follows (Analytics Vidhya Content Team, 2015; Field, 2013; UCLA Institute for Digital Research and Education, 2019):

  Accuracy = (True Positive + True Negative) /

  (True Positive + True Negative+ False Positive + False Negative)

- *Precision* pertains to the accuracy of predicting positive outcomes. Precision is calculated as follows (Saito & Rehmsmeier, 2015):
- Precision = True Positive / (True Positive + False Positive)

  Recall pertains to the ratio of all positive cases that are accurately predicted by the model. Recall is calculated as follows (Saito & Rehmsmeier, 2015):

  Recall = True Positive / (True Positive + False Negative)

- *Specificity* indicates how often negative values were predicted. Specificity is calculated as follows (Saito & Rehmsmeier, 2015):

  Specificity = True Negative / (True Negative + False Positive)

- *False Positive Rate* indicates how often positive outcomes are predicted relative to the total number of actual negative events. The False Positive Rate is calculated as follows (Saito & Rehmsmeier, 2015):

  False Positive Rate = False Positive / (False Positive + True Negative)

- The *F-Score* is a harmonic mean of precision and recall which rates the predictive power of a model from 1 (perfect predictions) to 0 (predicts perfectly incorrectly) (Hosmer et al., 2013):

  F Score = (2*Recall*Precision) / (Recall + Precision)

Phase 3: Multivariate Linear Regression Procedure

In phase 3, multivariate linear regression (ordinary least squares-OLS) will be performed in RStudio (RStudio, 2019) to explore research questions 3, 4, and 5. Multivariate linear regression (OLS) is a statistical method used to predict levels of a dependent variable based on levels of an independent variable (Chapman & Feit, 2015; Field, 2013; Salkind, 2017). Similar to the logistic regression, model variables were 'discovered' through a purposeful step-up strategy drawing in variables from the larger data set (Field, 2013; Grace-Martin, 2014; Montgomery et al., 2006) as defined in Appendix B. The multivariate linear regression (OLS) data analysis procedure is as follows:

1. Export the Excel-based data collection file into a .csv file.
2. Run descriptive statistics for each variable and ensure datatypes are detected properly. Recast variable as necessary. Identify and remove extreme outliers using boxplots and remove them from the data set (Chapman & Feit, 2015; Field, 2013).
3. Run the Shapiro-Wilk normality test for all integer variables to understand skew and normality within each variable. If the p-value is less than .10, the variable distribution is assumed to be normal (Chapman & Feit, 2015). While variables without a normal distribution were not removed from consideration in building linear models, it was considered important for the researcher to understand

possible sources of bias which could skew modeling results (Bommae, 2015; Field, 2013).

4. Run Pearson's Product Moment correlation to identify possible variables that influence the dependent variable for each research question. Variables with a *p*-value of .1 or lower are of interest and considered for insertion in the model.
5. Given the list of variables of interest discovered in point 4 above, run OLS multivariate linear regressions according to each research. Observations with missing data are eliminated in a row-wise basis.

- Question 3. Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict an increase in first-year student enrollment for institutions implementing a tuition reset?
- Question 4. Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict an increase in net tuition and fee revenue from first-year students for institutions implementing a tuition reset?
- Question 5. Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict an increase in first-year Pell-eligible student enrollment for institutions implementing a tuition reset?
- Question 6. Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict an increase in transfer student enrollment for institutions implementing a tuition reset?

Table 3

Multivariate linear regression (OLS) configuration for research questions 2,4,5 and 6

Research Question	Independent Variable of interest	Other independent variables	Dependent variable
R3	PED_Sticker	AdvertsingPromotion_CHG_PCT App_Trend Change_in_Net_Assets_Ratio_YearPrior	Enrolled_CHG_PCT
R4	PED_Sticker	AdvertsingPromotion_CHG_PCT App_Trend Change_in_Net_Assets_Ratio_YearPrior DiscountRate_Trend_2YearPrior StickerPrice_CHG StickerPrice_YearPrior	Net_FY_TFRevenue_CHG_PCT
R5	PED_Sticker	AdvertsingPromotionSpendYearPrior App_Trend PercentPell_YearPrior StickerPrice_CHG_PCT	PercentPell_CHG
R6	PED_Sticker_XFR	AdvertsingPromotion_CHG_PCT Change_in_Net_Assets_Ratio_YearPrior StickerPrice_CHG_PCT	XFR_Enroll_PCT_CHG

Note: Independent variables of interest found during correlation analysis.

6. To verify purposeful variable selection did not introduce multicollinearity, calculate a variance inflation factor—or VIF—for each variable in the model (Comprehensive R Archive Network, 2019; Grigsby, 2018). If a variable's VIF is greater than 10, consider options for variable replacement and return to Step 4.

Interpretation of the multivariate linear regression models (OLS) output involves only two major steps. First, the Adjusted R-squared indicates what percent of the variance in the dependent variable is explained by the independent variables included in the model (Chapman & Feit, 2015; Field, 2013).

Second, the influence of each independent variable is assessed holding all other variables constant. Independent variables will be considered statistically significant if their *p*-value is less than .10. A coefficient is calculated for each independent variable

which indicates the strength and directionality of each independent variable's relationship.

The coefficient can be read "for each one-unit change in the independent variable, the dependent variable will change by the coefficient value" (Berenson et al., 1992; Salkind, 2017). Independent variables that are not statistically significant will be left in the model to illustrate the model's predictive power was enhanced by controlling for purposely selected and relevant variables (Grace-Martin, 2012).

Researcher's Perspective, Assumptions and Delimitations

All research endeavors assume a certain level of uncertainty inherent in design and execution. The following are the researcher's perspective, assumptions, and delimitations. Proposed mitigations are discussed as applicable.

Researcher's perspective

The researcher comes to this issue as a strategist in the higher education space. My previous employment position was as an Associate Vice President of Strategy and Decision Support for a 4-year private liberal arts institution that considered a range of price strategies, including the tuition reset. Currently, I serve as the Market Strategy Analyst for Ruffalo Noel Levitz, a higher education management consulting firm, in the market research practice. My colleagues at Ruffalo Noel Levitz have advised some institutions listed in this study that have implemented tuition resets. I am frequently asked for recommendations about when a tuition reset is advisable. I suspect high sticker price is increasingly seen as a signal of cost, not quality, among low- and middle-income families shopping for 4-year private baccalaureate education. Finally, I believe the tuition

reset strategy can be viable for an increasing minority of 4-year private institutions, but only after careful analys is given for the very significant risks involved.

Assumptions

This research makes certain assumptions:

First, the list of identified institutions is sufficiently representative of the overall population of institutions that have attempted tuition resets. Implementing a tuition reset involves significant risk and depends upon awareness building, so they are publicly announced.

Second, although IPEDS provides detailed definitions of data elements required to complete the surveys, different institutions may interpret these uniform instructions in slightly different ways based on the peculiarities of their business model.

Third, this research assumes that Form 990 data is more reliable than IPEDS data. When Form 990 data and IPEDS data conflict, the Form 990 data is considered determinative on the basis it was likely provided by an institution's finance office following the annual audit rather than an institutional research office.

Fourth, this research assumes more recent financial data is more reliable than earlier reported data. Occasionally year-end balance sheet items from a previous year are different than the corresponding beginning-of-year balance sheet items of the following year. In such cases, the beginning-of-year balances in the following year are considered determinative, and the adjustment assumed to be a correction in accounting procedures.

Fifth, this research assumes advertising and promotion expenditures related to a tuition reset are represented in the advertising and promotion line in institutional Form 990s during the year of announcing the reset.

Delimitations

This study is delimited to narrow the scope of this study, the analysis will be performed on 142 identified institutions that have formally announced a tuition reset from the years 1997 through 2018 (some have performed tuition resets more than once within the period of observation). This list of institutions was compiled via interviews with industry experts (Bloom, 2017; S. Bodfish, personal communication, May 23, 2017; L. Lapovsky, personal communication, March 1, 2016) web site lists (Edvisors, 2017; Kantrowitz, 2017, 2019; Kottich, 2017), Google searches and Google Alerts. This list is narrowed further based on the availability of completeness of IPEDS data with regards to the required variables in all relevant years of observation.

Peers for each of the tuition reset institutions were not identified to form a benchmark comparison group due to time constraints and the burdens of manual Form 990 data collection. Future studies could include such peer sets consistent with the event-study methodology to explore if the results of institutions that implemented a reset varied from those which did not, under the criteria by which benchmark institutions would be selected.

The most current data available from IPEDS is currently Fall 2018 (National Center for Educational Statistics, 2019). Further, only private not-for-profit institutions will be considered as classified during the year in which the tuition reset took place to compare tuition reset outcomes to overall changes in sector enrollment. Some institutions have done tuition resets for specific populations (e.g. only in-state students) or specific programs (e.g. international students only, certain majors). These institutions have been removed from the sample as IPEDS data can only be compared at the aggregated

institutional level. The effects on specific subpopulations cannot be effectively and reliably isolated.

Many further legitimate research questions regarding the effectiveness of tuition resets could be asked. Issues of net revenue from overall enrollment (both first-year and continuing students), changes to the academic profile, student debt loads, sustainability of enrollment gains when present, effects on persistence to graduation, and impact on perceptions of quality among diverse audiences are all valid directions for further research and exploration. However, to maintain a manageable focus for this research, only the previously referred to research questions will be addressed in this study. To answer these extended questions, a deeper literature review, different data gathering tasks, and different analytical procedures would be required.

Chapter 4 - Results

In service industries such as higher education, price serves both as an indicator of quality and as an indicator of cost to consumers. As industries mature or transition to decline, consumers may transition from seeing a high price as a signal of quality to a signal of cost. In the higher education market, institutions find themselves increasingly competing based on published price as competitive pressures increase. Tuition resets, which a growing number of colleges have implemented or are considering, offer a natural experiment through which the influence of sticker price on facets of enrollment behavior can be explored. This study examines the relationship of sticker price sensitivity (as measured by sticker price elasticity) on different measures of tuition reset success for private not-for-profit institutions.

Section 1 presents descriptive statistics and frequency distribution information to characterize institutions that implement tuition resets and provide an assessment of the range of outcomes they have realized. Section 2 provides the preliminary results of multivariate logistic regressions in support of research questions 1 and 2. Section 3 presents the results of multivariate linear regression in support of research questions 3, 4, and 5. Sections 2 and 3 analyze models both with and without advertising and promotion variables. The chapter concludes with an analysis of three additional questions arising through the research process. The chapter examines evidence from the sample data to address these questions and suggest areas for future in-depth research:

- *How influential is the year of the tuition reset?* Is there evidence that resets following the Great Recession (as demarcated by 2010) are successful more

frequently in terms of increased first-year student enrollment or net tuition and fee revenue from first-year students than those before the Great Recession?

- *Are there "threshold effects" which pertain to the amount of a tuition reset?* Beyond looking for a linear correlation between the amount of the tuition reset and enrollment increases, this question seeks evidence that tuition resets need to be of a certain size to begin with before positive effects could even be expected.
- *Do tuition resets have an impact on retention?* An increase in the retention of continuing students helps offset the cost of lost revenue from near full-pay and full-pay students.

Section 1. Frequency Distribution Results

Tuition reset announcements frequently refer to both the fall term and a hyphenated academic year when the new pricing is in effect. The academic year bridges two calendar years. The earlier calendar year indicates the fall term when the new tuition level and enrollment results from the first year of recruiting are measured. The second calendar year indicates the spring term and is when the final financial results of a tuition reset are measured. An institution's fiscal year is aligned with this later year. This study uses the hyphenated format for the year of a reset in this section to aid future researchers seeking to replicate this study. The early year is needed to obtain the correct institutional characteristics, admissions and enrollment IPEDS files. The later year is needed to obtain the associated financial IPEDS data and Form 990 data.

Within the 24-year span from academic years 1996-1997 to 2019-2020, 142 institutions implemented some form of tuition reset. Tuition resets were rare through 2010-2011, with some intervening years (1997-1998, 2000-2001,2001-2002, 2007-2008)

having no resets at all. However, starting in 2011-2012 the number of tuition resets increased to six or more each year. In all but three years, private not-for-profit, 4-year or above institutions implemented most tuition resets. Figure 1 and Table 4 present the number of institutions of all types implementing tuition resets at some level (institutional or for select programs) for each year where one or more tuition resets took place.

Figure 1

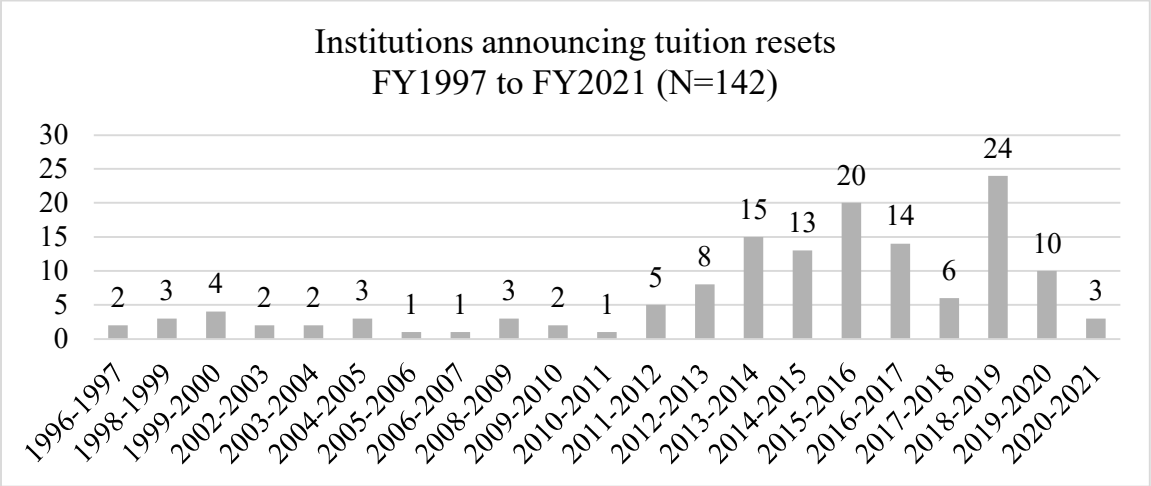

Table 4
Number of tuition resets each year

Year of Reset	All Resets	Private not-for-profit, 4-year or above	Other control
1996-1997	2	2	0
1998-1999	3	3	0
1999-2000	4	2	2
2002-2003	2	2	0
2003-2004	2	2	0
2004-2005	3	2	1
2005-2006	1	1	0
2006-2007	1	1	0
2008-2009	3	3	0
2009-2010	2	2	0
2010-2011	1	1	0
2011-2012	5	5	0
2012-2013	8	8	0
2013-2014	15	11	4
2014-2015	13	12	1
2015-2016	20	14	6
2016-2017	14	3	11
2017-2018	6	5	1
2018-2019	24	17	7
2019-2020	10	10	0
2020-2021	3	3	0

Note: Tuition resets counted at an institutional level only. The source is IPEDS Data Center. 72 private not-for-profit, 4-year or above institutions that implemented tuition resets between 2002-2003 and 2017-2018 are of special interest for this study.

Over the last 24 years, all types of institutions—public or private, 2-year or 4-year, colleges or universities—implemented tuition resets. However, private not-for-profit, 4-year or above institutions implemented 77% of resets. Tuition resets at public institutions can be system-wide, but also in response to mandates from public officials. Table 5 presents the frequency of tuition resets by institutional control as reported through IPEDS.

Table 5

Institution tuition resets by institutional control

	N	Percent
Private not-for-profit, 4-year or above	109	77%
Public, 4-year or above	23	16%
Private for-profit, 4-year or above	3	2%
Administrative Unit	3	2%
Public, 2-year	2	1%
Private for-profit, 2-year	1	1%
Private not-for-profit, 2-year	1	1%
Total	142	

Note: Tuition resets counted at an institutional level only. The source is IPEDS Data Center.

Tuition resets also occurred throughout all BEA statistical regions of the United States, especially in the Southeast (30%), Great Lakes (19%), and Mid East (15%). Table 6 presents the count and percentage of tuition resets that occur within each BEA statistical region as reported through IPEDS. For greater context, Table 6 also presents the number of institutions in each region from all sectors. Multi-region refers to institutions with major campuses in multiple states or a significant online presence.

Table 6
Tuition resets by BEA Statistical regions

BEA Region	Total Institutions	Reset Institutions	Percent of Reset Institutions	Percent of institutions in each region doing reset	States Included
Southeast	1,540	42	30%	3%	AL AR FL GA KY LA MS NC SC TN VA WV
Great Lakes	895	27	19%	3%	IL IN MI OH WI
Mid East	1,037	21	15%	2%	DE DC MD NJ NY PA
Far West	889	17	12%	2%	AK CA HI NV OR WA
Plains	519	11	8%	2%	IA KS MN MO NE ND SD
New England	351	10	7%	3%	CT ME MA NH RI VT
Southwest	656	9	6%	1%	AZ NM OK TX
Rocky Mountains	246	3	2%	1%	CO ID MT UT WY
Multi-region	5	2	1%	40%	Multiple states or online
Total	6,138	142			

Note: Tuition resets counted at the institutional and program level. The source is IPEDS Data Center

Of the 142 identified institutions that implemented any form of a tuition reset, 72 private not-for-profit, 4-year or above institutions implemented tuition resets at the institution level between academic years 2002-2003 and 2017-2018. Data collection for this study focused on this group of 72 institutions. Table 7 summarizes several important characteristics of these 72 institutions.

Table 7
Characteristics of institutions implementing tuition reset strategy

	N	25th Percentile	Median	Average	75th Percentile
Sticker price before reset	72	$19,688	$25,475	$28,120	$37,464
Sticker price change by percent	72	-9.92%	-17%	-18%	-24%
Sticker price change in dollars	72	($2,130)	($4,084)	($4,967)	($6,956)
Sticker Price following reset	72	$15,760	$21,180	$23,153	$29,585
Population 100 miles	72	3,396,204	6,038,902	8,720,441	9,612,004
Population 200 miles	72	14,866,474	20,830,766	22,756,810	27,099,683
Population Density 100 miles	72	128	210	367	440
Population Density 200 miles	72	141	197	260	334
Sticker Price Elasticity	71	(3.37)	(0.28)	(0.07)	4.07
Transfer Sticker Price Elasticity	56	(1.77)	0.27	2.26	5.04
Net Price Elasticity	66	0.50	0.80	0.90	1.04
Advertising and Promotion Spend Year Prior	43	$61,477	$186,812	$439,693	$453,197
Change in Advertising Spend in Percent Year Prior	37	-27.05%	2%	22%	33%
Equity Ratio Year Prior	63	47.50	65.00	58.49	76.50
Viability Ratio Year Prior	50	0.08	0.53	0.79	1.26
Change in Net Assets Ratio Year Prior	55	(0.00)	0.02	0.05	0.09
FIT SCORE CFI Year Prior	50	0.40	2.14	2.99	3.86
Application Trend	51	-8.03%	6%	28%	40%
Enrolled Trend	71	-33.14%	-6%	0%	12%
Transfer Enrolled Trend	61	-19.72%	6%	181%	42%
Discount Rate Prior	67	17.67%	36%	35%	53%
Discount Rate Trend-2 Years Prior	66	-2.51%	2%	1%	8%
Percent Pell - Year Prior	63	37%	47%	51%	66%

Note: 72 Private not-for-profit, 4-year or above institutions that implemented a tuition reset between 2002-2003 and 2017-2018. Interpret each row independently.

Important observations of tuition reset and institution characteristics from Table 7 are:

- The average tuition reset amount is 18% of the sticker price.
- The average tuition reset expressed in dollars is $4,967, or approximately $5,000.

- The range of sticker price elasticity for first-year students (from -3.37 to 4.07) and transfer students (from -1.77 to 5.04) suggests a wide range of behavioral responses to sticker prices in the years preceding a tuition reset. Negative elasticities mean when sticker price increases, the number of enrolled students decreases. Elasticities less than -1 reflect 'elastic' behavior (for a 1% decline in price, there is a larger percent increase in enrollment). For elasticities between 0 and -1, consumers are price inelastic (for a 1% drop in price, there is a smaller percentage increase in enrollment). If the elasticity is positive, the market is starting to reflect Veblen effects where a higher price can increase enrollment. See Appendix C for more detail.
- The financial condition of institutions implementing resets is leaning towards the lower middle range of the Austen Group's FIT Score Range; a scale from -4 to 10. CFI scores for many institutions performing a tuition reset range from .40 to 3.86. Falling in the lower ranges of the scale indicates the need for "thorough review of institutional effectiveness" or "significant changes needed to achieve their mission" (The Austen Group, 2019b).

Table 8 summarizes the actual tuition reset results for the 72 private not-for-profit institutions. The potential risks involved with tuition resets becomes clear in that at the 25th percentile many outcome measures are highly undesirable.

Table 8
Range of actual outcomes from tuition reset

	N	25th Percentile	Median	Average	75th Percentile
Applications Change in percent	57	-7%	8%	19%	25%
Applications Change count	57	(29)	119	215	298
Change in Yield	57	-4%	0%	3%	5%
NACUBO Discount Rate Change	57	-15%	-5%	-6%	3%
Enrollment Change Percent (Y0)	70	-12%	0%	19%	33%
Net Revenue Change Percent (Y0)	57	-26%	-4%	15%	23%
Percent FY Pell	57	-5%	1%	1%	7%
Retention Change	60	-2%	2%	5%	9%
Transfer Enrolled Change by Percent	61	-20%	6%	18%	42%

Note: Private not-for-profit, 4-year or above institutions that implemented a tuition reset between FY2003 and FY2018. Interpret each row independently.

We can observe the following for institutions with available outcomes data:

- Institutions implementing a tuition reset expect to see an increase in completed applications, but at the 25th percentile, there is a decline of 7%.
- At the 25th percentile of all institutions that implemented a tuition reset, yield rates decreased by 4% or more. The decrease in yield can offset gains from increased applications, or compound losses if applications were the same or lower.
- Most institutions saw a reduction in the NACUBO Discount Rate, which is positive and expected. However, at the 75th percentile institutions had an increase in discount rate. This could be a result if institutions reduced both sticker price and average net price.
- The median result of a tuition reset is a loss of 4% of revenue from first-year students. Considering an additional loss from continuing full-pay and near full-

pay students, the potential for revenue loss from a tuition reset should be taken quite seriously.

- Over half of institutions implementing a tuition reset experienced a 1% or greater increase in first-year Pell student enrollment in the first year of the new lower tuition.
- Half of the institutions which implemented a tuition reset experienced an increase of 2% or more increase in first-year student retention.
- Half of the institutions which implemented a tuition reset experienced an increase in transfer student enrollment of 6% or more.

Positive outcomes from tuition resets are possible, but they are not without assuming significant risk. Identifying factors that predict successful outcomes becomes an important task.

Section 2. Multivariate Binary Logistic Regression Results

Multivariate logistic regression is used to identify the influence of independent variables on the likelihood of an event occurring (Stoltzfus, 2011). Research Questions 1 and 2 analyze the influence of sticker price elasticity (PED_Sticker) on the likelihood of increasing first-year students enrolled (Reset_Success_Enrollment)(R1) and net tuition and fee revenue from first-year students (Reset_Success_Revenue)(R2). Because advertising and promotion data was available for only 43 of the 72 private not-for-profit institutions, two models are developed using purposeful stepwise selection both with and without the advertising and promotion variables for each research question. Following are the results of each model:

Research Question 1

The most basic assessment of the success of a tuition reset is whether it is likely to result in more first-year students enrolling. Assuming the reason for considering a tuition reset is that the institution perceives sticker price sensitivity of prospective students, R1 asks:

> R1: Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict the likelihood of an increase in first-year student enrollment for institutions implementing a tuition reset?

Because this question pertains to the probability of an event, namely the successful recruitment of more first-year students (Reset_Success_Enrollment), we use the following logistic regression model (Stoltzfus, 2011) to test the influence of sticker price elasticity (PED_Sticker) on the likelihood of increased enrollment without considering the influence of advertising:

$$\text{Logit}(y) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

where,

Logit(y) is the log odds that a tuition reset will result in a 5% or greater increase in first-year student enrollment (Reset_Success_Enrollment).

α is constant.

X_1 is sticker price elasticity (PED_Sticker) of a college's recruitment population in the years prior to a tuition reset. Sticker price elasticity is measured as the percent change of first-year student enrollment given a 1% increase in the sticker price.

X_2 is the viability ratio in the year prior to a tuition reset (ViabilityRatio_YearPrior), assessing how strategically the institution manages financial resources, including debt, to advance the institution's mission.

X_3 is the percent of first-year students who are Pell-eligible (PercentPell_YearPrior)

X_4 is the population density in the area within 200 miles of the campus implementing a tuition reset (X200Density).

The logistic model runs on a sample of 45 institutions with valid data. Table 9 presents the results.

Table 9
Logistic regression analysis of FY enrollment success without advertising variables

	Odds Ratio	95% Confidence Interval	Regression Coefficient	*p*-value
PED_Sticker	1.0021	0.9676-1.0501	0.1200	0.9042
ViabilityRatio_YearPrior	2.1839	1.185-5.3958	2.0850	0.0371**
PercentPell_YearPrior	1.0376	1.0003-1.0839	1.8340	0.0666*
X200Density	1.0032	0.9991-1.0078	1.4590	0.1445
N	45	Chi-Squared	10.4261	
AIC	61.935	Degrees of Freedom	4	
Loglikelihood	-25.96742 (5)	*p*-value	0.0338	
Dispersion	1.2983			
	Predicted False	Predicted True		
Actual False	17	6		
Actual True	8	13		
Accuracy	0.6818	Precision	0.6842	
Recall	0.6190	False Positive Rate	0.2609	
Specificity	0.7391	Error	0.3182	
F-Score	0.6500			

*Note: *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively*

The results show sticker price elasticity (PED_Sticker) is not associated with a higher probability of increasing enrollment 5% or more first-year students (Reset_Success_Enrollment). The significant explanatory variables are ViabilityRatio_YearPrior and PercentPell_YearPrior. The viability ratio provides an

indicator of the financial vitality of an institution. As an institution's vitality ratio in the year prior to a tuition reset increase, the odds of enrolling 5% or more first-year students (Reset_Success_Enrollment) increase by a factor of 2.1839. The federal Pell grant program helps low-income families afford college, and thus the percent of an institution's first-year class that is Pell-eligible be a proxy for serving low-income students. For each percent of an institution's first-year cohort being Pell-eligible in the year prior to a tuition reset (PercentPell_YearPrior), the odds of enrolling 5% or more first-year students increase by a factor of 1.0376.

To assess the model fit, we note the model's Chi-Squared is 10.4261 and the *p-value* is 0.0371 and significant at the 5% level. The Akaike's Information Criteria (AIC) statistic is a relative measure of model fit with lower values preferred to higher. In the next model, the AIC declines which indicate a better "fit" of results by the explanatory variables with the addition of advertising variables.

Ratios of the confusion matrix characterize the efficacy of explanatory variables employed in the model. The model predicted outcomes for Reset_Success_Enrollment with 68% accuracy. When the model predicts positive outcomes (Precision), they were correct 68% of the time. The model's False Positive Rate (e.g. a positive outcome predicted when a negative result occurred) was 26%. As previously defined, the F-Score is a harmonic mean of precision and recall which rates the predictive power of a model from 1 (perfect predictions) to 0 (predicts perfectly incorrectly). The F-Score for this model is 0.6500 enabling comparison to other models.

The second proposed model which includes advertising variables is as follows:

$$\text{Logit}(y) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

where,

Logit(y) is the log odds that a tuition reset will result in 5% or greater increase in first-year student enrollment (Reset_Success_Enrollment).

α is constant.

X_1 is sticker price elasticity (PED_Sticker) of a college's recruitment population in the years prior to a tuition reset. Sticker price elasticity is measured as the percent change of first-year student enrollment given a 1% increase in the sticker price.

X_2 is the percent change in advertising and promotion spending (AdvertsingPromotion_CHG_PCT) reported on the advertising and promotion lines of an institution's Form 990 from Year -2 to Year -1. A positive number indicates an increase in advertising and promotion expenditures.

X_3 is the population density in the area within 200 miles of the campus implementing a tuition reset (X200Density).

X_4 is the percent of first-year students who are Pell-eligible (PercentPell_YearPrior).

The logistic model runs with a sample of 32 institutions with valid data. Table 10 shows the results.

Table 10
Logistic regression analysis of FY enrollment success with advertising

	Odds Ratio	95% Confidence Interval	Regression Coefficient	*p-value*
PED_Sticker	0.7584	0.5697-0.9328	-0.2766	0.0242**
AdvertsingPromotion_CHG_PCT	16.5420	2.6728-292.3708	2.8059	0.0158**
X200Density	1.0069	1.001-1.0145	0.0069	0.0375**
PercentPell_YearPrior	0.9550	0.8915-1.0079	-0.0460	0.1278
N	32	Chi-Squared	14.1724	
AIC	40.064	Degrees of Freedom	4	
Loglikelihood	-15.03120 (5)	*p*-value	0.0068	
Dispersion	1.1135			
	Predicted False	Predicted True		
Actual False	15	2		
Actual True	3	12		
Accuracy	0.8438	Precision	0.8571	
Recall	0.8000	False Positive Rate	0.1176	
Specificity	0.8824	Error	0.1563	
F-Score	0.8276			

*Note: *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively*

The results show sticker price elasticity (PED_Sticker) is a statistically significant explanatory variable of tuition reset enrollment success (Reset_Success_Enrollment), as defined by a 5% or greater increase in first-year students. The more price-sensitive an institution's population of prospective students are (as indicated by a 1 unit decrease in PED_Sticker) the odds of tuition success increase by a factor of .7584.

However, the effect of sticker price elasticity is minor (.7584) relative to increases in advertising and promotion spending (AdvertisingPromotion_CHG_PCT) and population density within a 20-mile radius of the institution implementing a tuition reset (X200Density). For each percent increase in advertising and promotion spending, the odds of successfully increasing first-year student enrollment by 5% or more increase by a

factor of 16.542. For each percent increase in population density within 200 miles radius of campus, the odds of a successful reset increase by a factor of 1.0069.

The Chi-squared of the model is 14.1724 and the *p*-value is 0.0068, which is significant at the 1% level. The Akaike's Information Criteria (AIC) statistic, a relative measure of model fit where lower values are preferred, is 40.064, which reflects marked improvement compared to the previous model's AIC of 61.935.

Ratios of the confusion matrix for the model with advertising variables compare favorably to the previous model in terms of the efficacy of predictions. The model predicts outcomes for Reset_Success_Enrollment with 84% accuracy, a substantive improvement over 68% from the previous model. Positive outcomes are predicted (Precision) correctly 86% of the time, a substantial improvement over 68% in the previous model. The False Positive Rate was (e.g. a positive outcome predicted when a negative result occurred) 12%, which is also an improvement over the 26% in the earlier model. The F-Score of this model is 0.8276, higher than 0.6500 in the previous model. Including the percent change in advertising and promotion spending improved the predictive power of this model by each measure.

Based on these models, sticker price elasticity (PED_Sticker) has a statistically significant influence on tuition reset success (Reset_Success_Enrollment). High population density (X200Density) and more advertising and promotion spending (AdvertsingPromotion_CHG_PCT) also increase the odds of successful tuition resets substantively. If advertising and promotion spending are not considered, a higher percentage of low-income students as represented by Pell-eligibility (PercentPell_YearPrior) in an institution's incoming first-year student body increases the

probability of tuition reset success (Reset_Success_Enrollment) indicating the Pell students are likely to be sticker-price sensitive.

Research Question 2

A second basic assessment of the success of a tuition reset is whether the strategy is likely to result in an increase in net tuition and fee revenue from first-year students. An institution can successfully recruit more first-year students attracted by a lower sticker price, but also lose net tuition and fee revenue by additionally giving substantive discounts. Therefore, the second research question is:

> R2: Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict the likelihood of an increase in net revenue from first-year students for institutions implementing a tuition reset?

Because this question pertains to the probability of an event, in this case, a 5% or greater increase in net tuition and fee revenue from first-year students (Reset_Success_Revenue), the following logistic regression model (Stoltzfus, 2011), using stepwise variable selection, tests the influence of sticker price elasticity on the likelihood of increased net tuition and fee revenue from first-year students, without considering the influence of advertising:

$$\text{Logit}(y) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \alpha$$

where,

Logit(y) is the log odds a tuition reset will reset in 5% or greater increase in net tuition and fee revenue from first-year student enrollment (Reset_Success_Revenue).

α is constant.

X_1 is sticker price elasticity (PED_Sticker) of a college's recruitment population in the years prior to a tuition reset. Sticker price elasticity is measured as the percent change of first-year student enrollment given a 1% increase in the sticker price.

X_2 is Percent of first-year students who are Pell-eligible in the year prior to a tuition reset (PercentPell_YearPrior).

X_3 is the change in applications between years -3 and -1 expressed as a percentage of applications in year -3 (App_Trend)

X_4 is the viability ratio in the year prior to a tuition reset (ViabilityRatio_YearPrior), assessing how strategically the institution manages financial resources, including debt, to advance the institution's mission.

X_5 represents the discount rate as the first-year NACUBO Discount Rate during year -1 (DiscountRate_YearPrior).

X_6 is the Sticker price in the year prior to a reset (StickerPrice_YearPrior), which is the sum of published tuition, fees, room and board. The sticker price is an attribute of the institution resetting tuition separate from sticker price elasticity which is an attribute of the first-year student population considering an institution. This variable is included with the presumption the higher the sticker price is prior to a tuition reset, the more net revenue will potentially be gained through a tuition reset.

The first logistic model for R2—without considering the advertising and promotion spending variables—runs on a sample of 37 institutions with valid data. Table 11 below shows the results.

Table 11

Logistic regression analysis of FY net revenue success without advertising spending variables

	Odds Ratio	95% Confidence Interval	Regression Coefficient	*p*-value
PED_Sticker	1.0538	0.9474-1.2112	0.0524	0.3794
PercentPell_YearPrior	1.0221	0.9736-1.0788	0.0219	0.3862
App_Trend	0.7639	0.2331-2.7518	-0.2693	0.6478
ViabilityRatio_YearPrior	1.8948	0.9711-4.4688	0.6391	0.0821*
DiscountRate_Prior	536.7361	1.7121-1215662	6.2860	0.0677*
StickerPrice_YearPrior	0.9999	0.9997-1.0000	-0.0001	0.1058
N	37	Chi-Squared	7.6941	
AIC	56.266	Degrees of Freedom	6	
Loglikelihood	-21.1332 (7)	*p*-value	0.2614	
Dispersion	1.4089			
	Predicted False	Predicted True		
Actual False	18	4		
Actual True	7	8		
Accuracy	0.7027	Precision	0.6667	
Recall	0.5333	False Positive Rate	0.1818	
Specificity	0.8182	Error	0.2973	
F-Score	0.5926			

*Note: *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively*

Results show that sticker price elasticity (PED_Sticker) does not have a statistically significant influence on the probability of tuition reset success measured by 5% or more increase in net tuition and fee revenue from first-year students (Reset_Success_Revenue). While the viability ratio (ViabilityRatio_YearPrior) and discount rate (DiscountRate_Prior) are significant, the model's fit remains poor. The Chi-squared is only 7.6941 and the *p*-value is 0.2614, which is not significant at any conventional significance level.

The second proposed model—which includes the advertising spending variable—is as follows:

$$\text{Logit}(y) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \varepsilon$$

where,

Logit(y) is the log odds a tuition reset will result in 5% or greater increase in first-year student net tuition and fee revenue (Reset_Success_Revenue) or not.

α is constant.

X_1 is sticker price elasticity (PED_Sticker) of a college's recruitment population in the years prior to a tuition reset. Sticker price elasticity is measured as the percent change of first-year student enrollment given a 1% increase in the sticker price.

X_2 is the percent change in advertising and promotion spending (AdvertsingPromotion_CHG_PCT) reported on the advertising and promotion lines of an institution's Form 990 from Year -2 to Year -1. A positive number indicates an increase in advertising and promotion expenditures.

X_3 is the percent of first-year students who are Pell-eligible (PercentPell_YearPrior)

X4 is the population in the area within 200 miles of the campus implementing a tuition reset (X200Population).

X_5 is the equity ratio, which measures an institution's leverage. The equity ratio compares total assets to total equity. Higher equity ratios imply a more conservative approach to financial management and lower debt. Equity ratio year prior (Equity_Ratio_YearPrior) is the equity ratio of an institution at year -1.

X_6 is the year a reset occurs (Year_of_Reset). It indicates the year of the fall semester when the newly reduced published sticker price is put into effect. A positive correlation means the more recent the reset the greater the likelihood of success.

The second logistic model for R2—with consideration of the advertising and promotion spending variables—is run on a sample of 30 institutions with valid data. Results are presented in Table 12 below.

Table 12
Logistic regression analysis of FY Net Revenue Success considering advertising and promotion variables

	Odds Ratio	95% Confidence Interval	Regression Coefficient	*p*-value
PED_Sticker	0.8876	0.7078-1.0581	-0.1192	0.2222
AdvertsingPromotion_CHG_PCT	8.4963	1.4627-168.6628	2.1400	0.0612*
PercentPell_YearPrior	0.9934	0.919-1.0709	-0.0066	0.8606
X200Population	1.0000	0.9999-1.0000	0.0000	0.1798
Equity_Ratio_YearPrior	1.0626	0.9911-1.1704	0.0607	0.1231
Year_of_Reset	2.8640	1.2265-11.7298	1.0520	0.0599*
N	30	Wald Chi Square	14.4268	
AIC	39.954	Degrees of Freedom	6	
Loglikelihood	-12.9770 (7)	*p*-value	0.0252	
Dispersion	1.1284			
	Predicted False	Predicted True		
Actual False	15	3		
Actual True	3	9		
Accuracy	0.8000	Precision	0.7500	
Recall	0.7500	False Positive Rate	0.1667	
Specificity	0.8333	Error	0.2000	
F-Score	0.7500			

*Note: *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively*

The results show that sticker price elasticity (PED_Sticker) does not have a statistically significant influence on the probability of tuition reset success in terms of net tuition and fee revenue, from first-year students (Reset_Success_Revenue) using a 5% or greater increase as criteria for success. Increased spending in advertising and promotion

(AdvertisingPromotion_CHG_PCT) and the year of reset (Year_of_Reset) have significant statistical influence. For each percent increase in advertising and promotion spending in the year prior to a reset, the odds of increasing the net tuition and fee revenue 5% or more will increase by a factor of 8.4963. For each year beyond 2001, the odds of increasing net tuition and fee revenue from first-year students increased by a factor of 2.8640. We will examine the influence of year on tuition reset outcomes more closely in the next section.

The model provides a good fit as the Chi-squared is 14.4268 and the *p-value* is 0.0252, which is significant at the 5% level. The Akaike's Information Criteria (AIC) statistic, a relative measure of model fit where lower values are preferred, is 39.954 representing a marked improvement compared to the previous model's AIC of 56.266.

To characterize the efficacy of predictions provided by this model, we examine ratios of the confusion matrix. The model predicts outcomes for Reset_Success_Revenue with 80% accuracy (meaning both positive and negative outcomes are predicted correctly). Positive outcomes are predicted (Precision) correctly 75% of the time. The False Positive Rate, measuring the chance of a positive outcome predicted when a negative result occurred, is 17%. The F-Score of this model which includes advertising is 0.75 which is an improvement over 0.5926 in the previous model. By each measure, including the percent change in advertising and promotion, spending improves the predictive performance of this model over the first model for R2.

Based on these models, there is no evidence that sticker price elasticity in the year prior to a tuition reset influences the likelihood of having a 5% or more increase in net tuition and fee revenue from first-year students. However, an increase in advertising and

promotion spending in the year preceding a reset increases the odds of institutions realizing 5% or more increases in net tuition and fee revenue from first-year students in the first year of the reset.

Section 3. Multivariate Linear Regression Results (OLS)

While logistic regression asks if an independent variable increases the likelihood of an event occurring, linear regression asks a related but separate question; does an increase in levels of an independent variable influence the levels of a dependent variable. In this section, we use multivariate linear regression (OLS) to investigate if sticker price elasticity can be used to predict the change in the number of first-year students enrolled (R3), the change in the amount of net tuition and fee revenue from first-year students (R4), the percent of first-year students enrolled that are Pell-eligible (R5), and the change in the number of transfer students enrolled (R6) for institutions that implement tuition resets.

As in the previous section, advertising and promotion spending data is available for only 43 of the 72 private not-for-profit institutions. Therefore, two models are developed using purposeful stepwise selection methods, one consideration of the advertising and promotion spending variables and the other without for each research question.

Research Question 3

In R1, partial support is found that sticker price elasticity is a significant predictor of the likelihood of enrolling more first-year students among institutions that perform tuition resets. Here, the model tests if increasing levels of sticker price elasticity can be used to predict increasing levels of enrollment:

R3: Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict an increase in first-year student enrollment for institutions implementing a tuition reset?

To predict the percentage change in first-year student enrollment (Enrolled_CHG_PCT) the following model which does not consider advertising and promotion spending variables is constructed using stepwise variable selection. Variable inflation factors (VIF) calculated on independent variables protect from overfitting due to collinearity. Only variables with VIF less than 4 are used in the model (Grigsby, 2018). The model is:

$$y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

where,

y is the percent change in first-year students enrolled (Enrolled_CHG_PCT) in the year of a tuition reset.

α is the constant.

X_1 is sticker price elasticity (PED_Sticker) of a college's recruitment population in the years prior to a tuition reset. Sticker price elasticity is measured as the percent change of first-year student enrollment given a 1% increase in the sticker price.

X_2 is the percent change in net assets established during the year prior to a tuition reset (Change_in_Net_Assets_Ratio_YearPrior), e.g. the change from Year -2 to Year -1 net assets include unrestricted, temporarily restricted, and restricted assets. A positive number indicates a growth in net assets.

X_3 is the trend in applications between years -3 and -1 (App_Trend), which is expressed as a percentage growth rate. A positive number indicates an increase in applications and a negative number indicates a decline.

X_4 is the sticker price during the year of a tuition reset announcement (StickerPrice_YearPrior) as expressed in dollars. Sticker price includes tuition, fees, room and board.

The first OLS linear regression model for R3—without consideration of the advertising and promotion spending variable—runs on a sample of 44 institutions with valid data. Table 13 shows the results.

Table13

Linear regression analysis of percent change in first-year student enrollment without considering advertising and promotion variables

	β	Std. Error	T value	*p*-value	VIF
PED_Sticker	-0.0128	0.0121	-1.0630	0.2941	1.1168
Change_in_Net_Assets_Ratio_YearPrior	3.6910	0.6740	5.4760	0.0000 ***	1.0778
StickerPrice_YearPrior	0.0000	0.0000	-0.9040	0.3716	1.2211
App_Trend	0.2574	0.1504	1.7120	0.0949 *	1.3095
N	44	F Statistic		9.438 (4,39)	
Adjusted R^2	0.4398	*p*-value		0.0000	

*Note: *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively*

Results show sticker price elasticity (PED_Sticker) does not have a statistically significant influence on changes in first-year student enrollment (Enrolled_CHG_PCT). However, institutions with growth in net assets (Change_in_Net_Assets_Ratio_YearPrior) and growth in application volume (App_Trend) in the years preceding a tuition reset are better positioned to experience growth in first-year student enrollment. For each 1% increase in net assets, the first-year student enrollment increases by 3.69%. For each 1% increase in application volume, the first-year student enrollment increases by 0.2574%.

To assess the fitness of the model, we observe the model's *p*-value is 0.0000, which is significant at the 1% level. The model explains 43.98% of the variance in the change in first-year students enrolled (Enrolled_CHG_PCT) using the sample of 44 institutions.

The second proposed model, which includes the influence of the advertising and promotion spending variable, is as follows:

$$y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

where,

y is the percent change in first-year students enrolled (Enrolled_CHG_PCT) in the year of a tuition reset

α is the constant.

X_1 is sticker price elasticity (PED_Sticker) of a college's recruitment population in the years prior to a tuition reset. Sticker price elasticity indicates the percent change of first-year student enrollment given a 1% increase in the sticker price.

X_2 is the percent change in advertising and promotion spending (AdvertsingPromotion_CHG_PCT) reported on the advertising and promotion lines of an institution's Form 990 from Year -2 to Year -1. A positive number indicates an increase in advertising and promotion expenditures.

X_3 is the percent change in net assets established during the year prior to a tuition reset (Change_in_Net_Assets_Ratio_YearPrior), e.g. the change from Year -2 to Year -1 net assets include unrestricted, temporarily restricted, and restricted assets. A positive number indicates a growth in net assets.

X_4 is the trend in applications between years -3 and -1 (App_Trend), which is expressed as a percentage growth rate. A positive number indicates an increase in applications and a negative number indicates a decline.

The second OLS linear regression model for R3, which includes the advertising and promotion spending variable is run on a sample of 30 institutions with valid data. Table 14 presents the results.

Table 14
Linear regression analysis of percent change in first-year student enrollment including advertising and promotion variables

	β	Std. Error	T value	*p*-value	VIF
PED_Sticker	-0.0094	0.0239	-0.3930	0.6979	1.3332
Change_in_Net_Assets_Ratio_YearPrior	3.8912	0.7225	5.3860	0.0000***	1.2982
AdvertsingPromotion_CHG_PCT	0.3247	0.1818	1.7860	0.0862*	1.1607
App_Trend	-0.0270	0.2657	-0.1020	0.9199	1.0949
N	30	F Statistic		11.24 (4,25)	
Adjusted R^2	0.5855	*p*-value		0.0000	

*Note: *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively*

In this second model, sticker price elasticity (PED_Sticker) does not have a statistically significant influence on changes in first-year students enrolled (Enrolled_CHG_PCT). Change in net assets year prior (Change_in_Net_Assets_Ratio_YearPrior) and advertising and promotion spending change by percent (AdvertsingPromotion_CHG_PCT) do have significant influence. For each 1% increase in net assets, first-year students enrollment increases by 3.8912%. For each 1% increase in advertising and promotion spending in the year a reset is announced, first-year students enrollment increases by 0.3247%.

The model's fit is good with a *p*-value of 0.0000, which is significant even at the 1% level. The model explains 58.55% of the variance in the change in first-year students enrolled (Enrolled_CHG_PCT). Although the sample size is smaller, inclusion of the

advertising and promotion spending variable enhanced the explanatory power of this model as the F Statistic increased from 9.438 to 11.240.

Both models for R3 show that sticker price elasticity (PED_Sticker) has a no statistically significant influence on the first-year student enrollment (Enrolled_Change_PCT) at institutions implementing a tuition reset. However, consistent with suggestions from previous studies, institutions implementing tuition resets which invest more in advertising and promotion during the year preceding a reset and exhibit increasing financial health (e.g. a positive change in net assets) are better positioned to enjoy higher levels of enrollment gain through the tuition reset process.

Research Question 4

In R2 sticker price elasticity (PED_Sticker) was not a significant predictor of the likelihood of increasing net tuition and fee revenue from first-year students (Net_FY_TFRevenue_CHG_PCT) among institutions that perform tuition resets. Here, we develop models to examine if sticker price elasticity (PED_Sticker) can be used to predict the change in net tuition and fee revenue from first-year students (Net_FY_TFRevenue_CHG_PCT).

> R4: Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict an increase in net tuition and fee revenue from first-year students for institutions implementing a tuition reset?

To predict a change in net tuition and fee revenue on a percentage basis (Net_FY_TFRevenue_CHG_PCT) the following model which does not consider the advertising and promotion spending variables is constructed using stepwise variable

selection. Variable inflation factors (VIF) calculated on independent variables protect from overfitting due to collinearity. Only variables with VIF less than 4 are used in the model (Grigsby, 2018). The model is:

$$y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \varepsilon$$

where,

y is the percent change in net tuition and fee revenue from first-year students (Net_FY_TFRevenue_CHG_PCT) in the year of a tuition reset

α is the constant.

X_1 is sticker price elasticity (PED_Sticker) of a college's recruitment population in the years prior to a tuition reset. Sticker price elasticity is measured as the percent change of first-year student enrollment given a 1% increase in the sticker price.

X_2 is the percent change in net assets established during the year prior to a tuition reset (Change_in_Net_Assets_Ratio_YearPrior), e.g. the change from Year -2 to Year -1 net assets include unrestricted, temporarily restricted, and restricted assets. A positive number indicates a growth in net assets.

X_3 represents the percentage change in NACUBO Discount Rate between years -3 and -1 (DiscountRate_Trend_2YRPrior).

X_4 is the sticker price during the year of a tuition reset announcement (StickerPrice_YearPrior) as expressed in dollars. Sticker price includes tuition, fees, room and board.

X_5 is the trend in applications between years -3 and -1 (App_Trend) which is expressed as a percentage change in applications. A positive value for App_Trend indicates an increase in applications.

X_6 is the dollar amount of the tuition reset (StickerPrice_CHG). A negative value for StickerPrice_CHG indicates sticker price was reduced during the tuition reset event.

The first OLS linear regression model for R4—without consideration of the advertising and promotion variables—runs on a sample of 44 institutions with valid data. Table 15 presents the results:

Table 15
Linear regression analysis of percent change in first-year student net revenue without considering advertising and promotion variables

	β	Std. Error	T value	*p*-value	VIF
PED_Sticker	0.0070	0.0184	0.3820	0.7050	1.3446
Change_in_Net_Assets _Ratio_YearPrior	2.5570	0.9388	2.7240	0.0098***	1.0838
DiscountRate_Trend_2YRPrior	2.0550	0.8719	2.3570	0.0238**	1.4713
StickerPrice_YearPrior	-0.0000	0.0000	-2.1310	0.0398**	1.7251
App_Trend	-0.0289	0.2162	-0.1340	0.8945	1.4029
StickerPrice_CHG	0.0000	0.0000	-1.0580	0.2969	1.4460
N	44		F Statistic		3.575 (6,37)
Adjusted R^2	0.2644		*p*-value		0.0068

*Note: *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively*

No evidence is found that sticker price elasticity (PED_Sticker) has a statistically significant influence on changes in net tuition and fee revenue from first-year students (Net_FY_TFRevenue_CHG_PCT). The significant variables are Change in Net Assets Year Prior (Change_in_Net_Assets_Ratio_YearPrior), Discount Rate Trend Two Years Prior (DiscountRate_Trend_2YRPrior), and Sticker Price Year Prior (StickerPrice_YearPrior). For each 1% increase in net assets, the net tuition and fee revenue from first year students (Net_FY_TFRevenue_CHG_PCT) will increase by

2.575%. For each 1% increase in discount rate between years -3 and -1 (DiscountRate_Trend_2YRPrior), first-year student net tuition and fee revenue (Net_FY_TFRevenue_CHG_PCT) will increase by 2.055%. For each $1,000 increase in sticker price (StickerPrice_YearPrior) in the year prior to a tuition reset, net tuition and fee revenue from first-year students (Net_FY_TFRevenue_CHG_PCT) will decrease by 0.03809%. This final point is counter-intuitive as institutions with higher sticker prices would be expected to benefit the most from a tuition reset.

The model's *p*-value is 0.0068, which is significant at the 1% level. The model explains 26.44% of the variance in the change in net tuition and fee revenue from first-year students (Net_FY_TFRevenue_CHG_PCT). The F Statistic is comparatively low at 3.575.

The second proposed model—which includes the advertising and promotion spending variable—is as follows:

$$y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon$$

where,

y is the percent change in net tuition and fee revenue from first-year students (Net_FY_TFRevenue_CHG_PCT) in the year of a tuition reset

α is the constant.

X_1 is sticker price elasticity (PED_Sticker) of a college's recruitment population in the years prior to a tuition reset. Sticker price elasticity is measured as the percent change of first-year student enrollment given a 1% increase in the sticker price.

X_2 represents the percentage change in NACUBO Discount Rate between years -3 and -1 (DiscountRate_Trend_2YRPrior).

X_3 is the percent change in net assets established during the year prior to a tuition reset (Change_in_Net_Assets_Ratio_YearPrior), e.g. the change from Year -2 to Year -1 net assets include unrestricted, temporarily restricted, and restricted assets. A positive number indicates a growth in net assets.

X_4 is the percent change in advertising and promotion spending (AdvertsingPromotion_CHG_PCT) reported on the advertising and promotion lines of an institution's Form 990 from Year -2 to Year -1. A positive number indicates an increase in advertising and promotion expenditures.

X_5 is the trend in applications between years -3 and -1 (App_Trend) which is expressed as a percentage change in applications. A positive value for App_Trend indicates an increase in applications.

The second OLS linear regression model for R4—including the advertising and promotion spending variables—runs on a sample of 30 institutions with valid data. Table 16 presents the results:

Table 16

Linear regression analysis of percent change in first-year student net revenue considering advertising and promotion variables

	β	Std. Error	T value	*p*-value	VIF
PED_Sticker	-0.0539	0.0354	-1.5220	0.1411	1.3394
DiscountRate_Trend_2YRPrior	7.3915	1.9395	3.8110	0.0008***	2.5106
Change_in_Net_Assets_Ratio_Year Prior	2.3523	1.0666	2.2050	0.0372**	1.2989
AdvertsingPromotion_CHG_PCT	0.5667	0.3000	1.8890	0.0710*	1.4508
App_Trend	1.2054	0.5801	2.0780	0.0486**	2.3959
N	30	F Statistic		5.915 (5,24)	
Adjusted R^2	0.4587	*p*-value		0.0011	

*Note: *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively*

The results present no evidence that sticker price elasticity (PED_Sticker) has a statistically significant influence on changes in net tuition and fee revenue from first-year

students (Net_FY_TFRevenue_CHG_PCT). Rather, the significant variables are the two-year trend of the NACUBO Discount Rate prior to the year of a reset announcement (DiscountRate_Trend_2YRPrior), change in net assets in the year prior to a reset (Change_in_Net_Assets_Ratio_YearPrior), increased spending in advertising and promotion (AdvertsingPromotion_CHG_PCT), and trends in application volume (App_Trend). For each 1% increase in discount rate between years -3 to -1 (DiscountRate_Trend_2YRPrior) the percent change in first-year student net tuition and fee revenue (Net_FY_TFRevenue_CHG_PCT) will increase 7.3915%. For each 1% increase in net assets, the percent change in first-year student net tuition and fee revenue (Net_FY_TFRevenue_CHG_PCT) will increase by 2.3523%. For each 1% increase in advertising and promotional spending in year -1 (AdvertsingPromotion_CHG_PCT) the percent change in first-year student net tuition and fee revenue (Net_FY_TFRevenue_CHG_PCT) will increase by .5667%. For each 1% increase in applications between years -3 and -1 (App_Trend) the percent change in first-year student net tuition and fee revenue (Net_FY_TFRevenue_CHG_PCT) will increase 1.2054%.

The model's *p*-value is 0.0011, which is significant even at the 1% level. The model explains 45.87% of the variance in the change in net tuition and fee revenue from first-year students (Net_FY_TFRevenue_CHG_PCT). The F-statistic is stronger at 5.915 compared to 3.575, compared to the earlier model.

Given both models for R4, no direct support is found that sticker price elasticity (PED_Sticker) is a statistically significant predictor of the percent change of net tuition and fee revenue from first-year students (Net_FY_TFRevenue_CHG_PCT) at institutions implementing a tuition reset. However, consistent with suggestions from previous studies,

institutions implementing tuition resets which invest in increased advertising and promotion during the year preceding a reset, have rising discount rates and increasing application pools in the years leading up to the year of the tuition reset announcement and exhibit growth in net assets are better positioned to enjoy increased net tuition and fee revenue from first-year students through the tuition reset process.

Research Question 5

One of the motivations institutions cite for implementing tuition resets is to attract low-income students which may believe attendance at a private not-for-profit institution is out of reach. The presumption is if the sticker price was reduced, a larger number of lower-income students would consider an institution and enroll. Pell grants are income-based federal education grants which can serve as a proxy for low-income student segments. The fifth research question is as follows:

> R5: Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict an increase in the percentage of first-year Pell-eligible student enrollment for institutions implementing a tuition reset?

To predict changes in the percent of Pell-eligible students in the first-year cohort (PercentPell_CHG) the following model, which does not consider advertising and promotion variables, is constructed using stepwise variable selection. Variable inflation factors (VIF) calculated on independent variables protect from overfitting due to collinearity. Only variables with VIF less than 4 are used in the model (Grigsby, 2018).

The model is:

$$y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon$$

where,

y is the change in percentage of Pell-eligible students within the first-year student cohort (PercentPell_CHG) during the year of a tuition reset

α is the constant.

X_1 is sticker price elasticity (PED_Sticker) of a college's recruitment population in the years prior to a tuition reset. Sticker price elasticity is measured as the percent change of first-year student enrollment given a 1% increase in the sticker price.

X_2 is the amount of sticker price reduction (StickerPrice_CHG_PCT) expressed as a percentage of the sticker price in year -1. Larger reductions are expressed as larger negative coefficients.

X_3 is the percent of the first-year student cohort who are Pell-eligible in year -1 (PercentPell_YearPrior).

X_4 is the year the tuition reset occurred (Year_of_Reset). This variable uses the year of the fall term when the new cohort entered.

X_5 is the trend in applications between years -3 and -1 (App_Trend) which expressed as a percentage change in applications. A positive value for App_Trend indicates an increase in applications.

The first OLS linear regression model for R5—without consideration of advertising and promotion variables—runs on a sample of 43 institutions with valid data. Table 17 presents the results:

Table 17
Linear regression analysis of percent change in first-year Pell student enrollment without considering advertising

	β	Std. Error	T value	*p*-value	VIF
PED_Sticker	-0.3905	0.2120	-1.8420	0.0736*	1.2679
StickerPrice_CHG_PCT	-33.6367	16.0577	-2.0950	0.0431**	1.2864
PercentPell_YearPrior	-0.3297	0.0940	-3.5070	0.0012***	1.3744
Year_of_Reset	-0.7650	0.8196	-0.9330	0.3567	1.2690
App_Trend	-1.3289	2.4187	-0.5490	0.5860	1.4210
N	43	F Statistic		4.796 (5,37)	
Adjusted R^2	0.3113	*p*-value		0.0018	

*Note: *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively*

The results show evidence that sticker price elasticity (PED_Sticker) is a statistically significant influence on changes in the percent of Pell-eligible first-year students (PercentPell_CHG). For each point sticker price elasticity of first-year students increases (demarcated by a negative number becoming larger) the percent change of first-year students being Pell-eligible would increase by 0.3905%.

Other significant predictor variables are the percent change of sticker price (StickerPrice_CHG_PCT) and percent Pell-eligible students in the year prior. (PercentPell_YearPrior). For each 1% reduction in sticker price (StickerPrice_CHG_PCT), the percent change in the percent of Pell-eligible students among members of the first-year cohort will increase 33.6367%. The existence of Pell-eligible students prior to a tuition reset has a significant negative effect on the amount of change expected. Institutions with high percentages of Pell-eligible students tend to have smaller changes in the percent Pell-eligible students with a tuition reset in comparison to

those with lower percent Pell-eligible. This may be because they are already successfully accessing low-income market segments.

The model's *p*-value is 0.0018, which is significant even at the 1% level. The model explains 31.13% of the variance in the change in the percent of Pell-eligible students in the first-year cohort (PercentPell_CHG). The F Statistic is 4.796.

The second model—which includes advertising variables—is as follows:

$$y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon$$

where,

y is the change in percentage of Pell-eligible students within the first-year student cohort (PercentPell_CHG) during the year of a tuition reset

α is the constant.

X_1 is sticker price elasticity (PED_Sticker) of a college's recruitment population in the years prior to a tuition reset. Sticker price elasticity is measured as the percent change of first-year student enrollment given a 1% increase in the sticker price.

X_2 is the percent change in advertising and promotion spending (AdvertsingPromotion_CHG_PCT) reported on the advertising and promotion lines of an institution's Form 990 from Year -2 to Year -1. A positive number indicates an increase in advertising and promotion expenditures.

X_3 is the percent of the first-year student cohort who are Pell-eligible in year -1 (PercentPell_YearPrior).

X_4 is the year the tuition reset occurred (Year_of_Reset). This variable uses the year of the fall term when the new cohort entered.

X_5 is the of sticker price reduction (StickerPrice_CHG_PCT) expressed as a percentage of the sticker price in year -1. Larger reductions are expressed as larger negative coefficients.

The second OLS linear regression model for R5—including consideration of advertising and promotion variables—is run on a sample of 38 institutions with valid data. Table 18 presents the results:

Table 18
Linear regression analysis of percent change in first-year Pell student enrollment considering advertising

	β	Std. Error	T value	*p*-value	VIF
PED_Sticker	-0.1384	0.2148	-0.6440	0.5240	1.0257
AdvertsingPromotionSpend YearPrior	0.0000	0.0000	-3.4600	0.0016***	1.0291
PercentPell_YearPrior	-0.1930	0.0665	-2.9010	0.0067***	1.0466
Year_of_Reset	-1.8340	0.8803	-2.0830	0.0453**	1.2071
StickerPrice_CHG_PCT	-27.5300	14.0900	-1.9540	0.0595*	1.2012
N	38	F Statistic		4.783 (5,32)	
Adjusted R^2	0.3383	*p*-value		0.0022	

*Note: *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively.*

No evidence is found that sticker price elasticity (PED_Sticker) is a significant predictor of change in the percent of an institution's Pell-eligible population (PercentPell_CHG) for institutions implementing a tuition reset. However, significant predictors are the increased spending in advertising and promotion (AdvertsingPromotionSpendYearPrior), the percent of first-year students who are Pell-eligible in the year prior to a tuition reset (PercentPell_YearPrior), the year of the tuition reset, and the percent change in sticker price (StickerPrice_CHG_PCT). Although statistically significant, the effect size of increased advertising and promotion spending is very small (AdvertsingPromotionSpendYearPrior). Like the prior model, the existence of Pell-eligible students prior to a tuition reset has a significant negative effect. For each 1% of the first-year student cohort who are Pell-eligible in the year prior to the reset, the

predicted change in Pell-eligible students in the first year of the reset declines by .1930%. As suggested earlier, institutions with high percentages of Pell-eligible students tend to have smaller changes in the percent Pell-eligible students with a tuition reset in comparison to those with lower percent Pell-eligible. For each 1% reduction in sticker price (StickerPrice_CHG_PCT) the percent change in Pell-eligible students among members of the first-year cohort will increase 27.53%.

The *p*-value is model is 0.0022, which is significant even at the 1% level. The model explains 33.83% of the variance in the change in the percent of Pell-eligible students in the first-year cohort (PercentPell_CHG), which is a slight improvement over the prior model. The F Statistic is 4.785, again substantially the same.

Based on these models, there is only partial support that sticker price elasticity (PED_Sticker) is a statistically significant predictor of the percent change of Pell-eligible first-year students (PercentPell_CHG) enrolling at institutions implementing a tuition reset. The Percent Pell students prior to the reset (A lower percent the year prior would predict a larger increase), the amount of Sticker Price change (the greater the reduction the greater the increase in Pell), and year of reset (the earlier the reset year the greater the increase in Pell students) are more influential predictors.

Research Question 6

Many private 4-year not-for-profit institutions recruit transfer students in addition to first-time, first-year students. Such transfers are a critical source of revenue in addition to first-year students. While transfer students value time-to-complete, 53% indicate financial concerns may interfere with their ability to finish (Hossler & Bontrager, 2014). Consistent with our findings in Phase 1, Lapovsky (2019) observed more than half of

institutions that implemented a tuition reset saw increased transfer student enrollment. The sixth research question is as follows:

> R6: Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict an increase in transfer student enrollment for institutions implementing a tuition reset?

To examine the influence of sticker price elasticity among transfer students (PED_Sticker_XFR) on changes in the percent change transfer student enrollment (XFR_Enroll_CHG_PCT) the following model without advertising and promotion variables is constructed using stepwise variable selection. Variable inflation factors (VIF) calculated on independent variables protect from overfitting due to collinearity. Only variables with VIF less than 4 are used in the model (Grigsby, 2018). The first model which does not consider advertising and promotion variables is:

$$y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

where,

y is the change in percentage of transfer students enrolled (XFR_Enroll_CHG_PCT) during the year of a tuition reset

α is the constant.

X_1 is sticker price elasticity (PED_Sticker) of a college's recruitment population in the years prior to a tuition reset. Sticker price elasticity is measured as the percent change of first-year student enrollment given a 1% increase in the sticker price.

X_2 is the percent change in net assets established during the year prior to a tuition reset (Change_in_Net_Assets_Ratio_YearPrior), e.g. the change from Year -2 to Year

-1 net assets include unrestricted, temporarily restricted, and restricted assets. A positive number indicates a growth in net assets.

X_3 is Population density in the area within 100 miles of the campus implementing a tuition reset (X100Density). Population density is an estimate of the number of people living per square mile.

X_4 is the percent of the first-year student cohort who are Pell-eligible in year -1 (PercentPell_YearPrior).

The first OLS linear regression model for R6—without consideration of advertising and promotion variables—runs on a sample of 47 institutions with valid data. Table 19 presents the results:

Table 19
Linear regression analysis of percent change in transfer student enrollment without considering advertising

	β	Std. Error	T value	*p*-value	VIF
PED_Sticker_XFR	-0.0003	0.0054	-0.0550	0.9565	1.0808
Change_in_Net_Assets_Ratio_YearPrior	0.9095	0.3282	2.7710	0.0083***	1.1321
X100Density	0.0005	0.0002	2.5540	0.0144**	1.0887
PercentPell_YearPrior	0.0065	0.0037	1.7250	0.0918*	1.1776
N	47	F Statistic		4.623 (4,42)	
Adjusted R^2	0.2395	*p*-value		0.0035	

*Note: *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively.*

No evidence is found that sticker price elasticity among transfer students (PED_Sticker_XFR) is a significant predictor of change in the percent of transfer students enrolled (XFR_Enroll_CHG_PCT) for institutions implementing a tuition reset. However, significant predictors are changes to net assets (Change_in_Net_Assets_Ratio_YearPrior), population density within 100 miles of the campus (X100Density), and the percent Pell-eligible students in the year prior to the reset (PercentPell_YearPrior). For each 1% increase in net assets

(Change_in_Net_Assets_Ratio_YearPrior) the percent change in transfer students enrolled (XFR_Enroll_CHG_PCT) will increase .9095% (not a 2.3523 percentile increase). More populous regions better position institutions to see an increase in the number of transfer students enrolled. For each person increase in population density calculated within the region 100 miles of campus (X100Density), the percent change in transfer students enrolled (XFR_Enroll_CHG_PCT) will increase by 0.0004869%. Institutions that draw a higher percentage of their first-year student cohort from low-income populations as shown by Pell eligibility are better positioned to see an increase in the percent change of transfer students enrolled. For each percent of Pell-eligible students in the first-year cohort during the year prior to a reset, the percent change in transfer students enrolled (XFR_Enroll_CHG_PCT) increases by .0065%.

The model's *p*-value is 0.0035, which is significant even at the 1% level. The model explains 23.95% of the variance in the percent change in transfer students enrolled.

The second model—which includes advertising variables—is as follows:

$$y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon$$

where,

y is the change in percentage of transfer students enrolled (XFR_Enroll_CHG_PCT) during the year of a tuition reset

α is the constant.

X_1 is sticker price elasticity (PED_Sticker) of a college's recruitment population in the years prior to a tuition reset. Sticker price elasticity is measured as the percent change of first-year student enrollment given a 1% increase in the sticker price.

X_2 is the percent change in advertising and promotion spending (AdvertsingPromotion_CHG_PCT) reported on the advertising and promotion lines of an institution's Form 990 from Year -2 to Year -1. A positive number indicates an increase in advertising and promotion expenditures.

X_3 is the percent change in net assets established during the year prior to a tuition reset (Change_in_Net_Assets_Ratio_YearPrior), e.g. the change from Year -2 to Year -1 net assets include unrestricted, temporarily restricted, and restricted assets. A positive number indicates a growth in net assets.

X_4 is Population density in the area within 100 miles of the campus implementing a tuition reset (X100Density). Population density is an estimate of the number of people living per square mile.

X_5 is the percent of the first-year student cohort who are Pell-eligible in year -1 (PercentPell_YearPrior).

The second OLS linear regression model for R6—without consideration of advertising and promotion variables—runs on a sample of 31 institutions with valid data. Table 20 presents the results:

Table 20

Linear regression analysis of percent change in transfer student enrollment considering advertising

	β	Std. Error	T value	*p*-value	VIF
PED_Sticker_XFR	-0.0139	0.0106	-1.3090	0.2023	1.3025
AdvertsingPromotion_CHG_PCT	0.4000	0.1049	3.8130	0.0008***	1.2619
Change_in_Net_Assets_Ratio_YearPrior	1.4632	0.4121	3.5510	0.0016***	1.1386
X100Density	0.0007	0.0002	3.4570	0.0020***	1.0936
PercentPell_YearPrior	0.0022	0.0040	0.5440	0.5910	1.1576
N	31	F Statistic		7.628 (5,25)	
Adjusted R^2	0.5249	*p*-value		0.0002	

*Note: *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively.*

No evidence is found that sticker price elasticity among transfer students (PED_Sticker_XFR) is a significant predictor of change in the percent of transfer students enrolled (XFR_Enroll_CHG_PCT) for institutions implementing a tuition reset. However, significant predicts are increased spending in advertising and promotion (AdvertsingPromotion_CHG_PCT), changes to net assets (Change_in_Net_Assets_Ratio_YearPrior), and population density within 100 miles of the campus (X100Density). For each 1% increase in advertising and promotion spending in the year prior to a reset (AdvertsingPromotion_CHG_PCT) the percent change in transfer student enrollment (XFR_Enroll_CHG_PCT) increases by .4%. For each 1% increase in net assets (Change_in_Net_Assets_Ratio_YearPrior) the percent change in transfer students enrolled (XFR_Enroll_CHG_PCT) will increase 1.4632%. More populous regions better position institutions to see an increase in the number of transfer students enrolled. For each person increase in population density calculated within the region 100 miles of campus (X100Density) the percent change in transfer students enrolled (XFR_Enroll_CHG_PCT) will increase by 0.0006578%. Given the introduction of advertising and promotion spending, the variable percent Pell-eligible students is no longer a statistically significant predictor.

The model's *p*-value is 0.0002, which is significant even at the 1% level. The model explains 52.49% of the variance in the percent change in transfer students enrolled, a substantive improvement over the first model.

Based on these models, there is no evidence that Sticker Price Elasticity as measured in the years preceding a tuition reset would be a statistically significant predictor of transfer student enrollment for institutions implementing a tuition reset.

However, consistent with the literature, the more vital an institution is (as measured by a positive change in net assets), the greater the population density within 100 miles, and the greater the percentage increase in advertising and promotion, the more transfer student enrollment would be expected to increase.

Additional Findings

The dataset compiled for this study also allows for preliminary analysis of other important questions academics and practitioners frequently ask about the effects of tuition resets. In this section we will examine questions pertaining to the size of a tuition reset, effects of a tuition reset on retention, and the effectiveness of tuition resets preceding and following the Great Recession.

Amount of reset

For many institutions considering a tuition reset, a natural assumption is larger tuition reset amounts will attract a greater number of enrolled students. The tuition reset amount should be sufficiently large to capture the attention of new populations of prospective students (S. Bodfish, personal communication, May 23, 2017). However, Table 21 presents no evidence of a direct correlation between the tuition reset amount expressed in dollars and common tuition reset outcomes such as changes in first-year students enrolled, net tuition and fee revenue from first-year enrolled, and the number of transfer students enrolled. For each outcome, the correlations are not significant at 10% for the *p*-value.

Table 21
Correlation of sticker price change and reset outcomes

Outcome Variable	N	*t*-value	Degrees of Freedom	Pearson's product-moment correlation	*p*-value
Enrolled Change	68	0.25	67	0.03	0.81
Enrolled Change by Percent	69	1.12	68	0.13	0.27
Net first-year Tuition and Fee Revenue Change	56	0.44	55	0.06	0.66
Net first-year Tuition and Fee Revenue Change by Percent	56	-0.80	55	-0.11	0.43
Transfer Enrolled Change	60	-0.83	59	-0.11	0.41
Transfer Enrolled Change by Percent	60	0.78	59	0.10	0.44

*Note: *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively.*

The lack of correlation between sticker price and outcomes is also found when the reset amount is considered on a percentage basis, as shown in Table 22:

Table 22
Correlation of sticker price change by percent and reset outcomes

Outcome Variable	N	*t*-value	Degrees of Freedom	Pearson's product-moment correlation	*p*-value
Enrolled Change	68	0.75	67	0.09	0.46
Enrolled Change by Percent	69	0.95	68	0.11	0.35
Net first-year Tuition and Fee Revenue Change	56	0.78	55	0.10	0.44
Net first-year Tuition and Fee Revenue Change by Percent	56	-1.19	55	-0.16	0.24
Transfer Enrolled Change	60	0.12	59	0.02	0.91
Transfer Enrolled Change by Percent	60	0.14	59	0.02	0.89

*Note: *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively.*

However, simple correlations that assume linear relationships do not capture non-linear threshold effects. Another way to look at the relationship between sticker price reductions and the likelihood of success is to examine if resets which are larger are successful—as defined by an enrollment increase of 5% or more prior to the year preceding the new lower sticker price—more frequently. Table 24 shows the number of institutions at varied increasing levels of sticker price reset amount. If there is a threshold effect, we would expect to see a low success percentage until we hit a certain size, and

then the percentage success would increase and continue to increase (as we have exceeded the threshold level).

Unfortunately, no such effect is present in the current data set. In fact, there is no discernible pattern of enrollment success percent rates as the size of the reset increases; and if anything the cumulative percent success rate seems to decrease (From 63% success at resets up to $2,000 to 47% when all resets up to $17,999) as larger and larger reset amounts are considered as shown by Table 23:

Table 23
Cumulative tuition reset enrollment success rates by reset amount

Reset Amount	Number of Resets	Enrollment Success	Enrollment Success Percent	Cumulative Count	Cumulative Success	Cumulative Percent Success
Up to $2,000	16	10	63%	16	10	63%
$2,000 to $3,999	19	7	37%	35	17	49%
$4,000 to $5,999	18	9	50%	53	26	49%
$6,000 to $7,999	4	0	0%	57	26	46%
$8,000 to $9,999	7	5	71%	64	31	48%
$10,000 to $11,999	2	1	50%	66	32	48%
$12,000 to $13,999	4	0	0%	70	32	46%
$14,000 to $15,999	1	1	100%	71	33	46%
$16,000 to $17,999	1	1	100%	72	34	47%

Note: Enrollment success is a 5% increase in first-year students over the year prior.

Given the lack of a threshold effect in terms of enrollment, it is unsurprising no threshold effects are observable when looking at net tuition and fee revenue from first-year students as seen in Table 24:

Table 24
Cumulative tuition reset FY net tuition and fee revenue success rates by reset amount

Reset Amount	Number of Resets	Enrollment Success	FY Net Revenue Success Percent	Cumulative Count	Cumulative Success	Cumulative FY Net Revenue Success Percent Success
Up to $2,000	16	8	50%	16	8	50%
$2,000 to $3,999	19	2	11%	35	10	29%
$4,000 to $5,999	18	5	28%	53	15	28%
$6,000 to $7,999	4	0	0%	57	15	26%
$8,000 to $9,999	7	4	57%	64	19	30%
$10,000 to $11,999	2	0	0%	66	19	29%
$12,000 to $13,999	4	1	25%	70	20	29%
$14,000 to $15,999	1	1	100%	71	21	30%
$16,000 to $17,999	1	1	100%	72	22	31%

Note: FY net tuition and fee revenue success is a 5% or greater increase over the year prior.

With the current sample of 72 private not-for-profit institutions which have implemented a tuition reset, observations based on frequency distributions of tuition reset success rates do not lend support to a direct relationship between the size of the sticker price reduction and the likelihood of success; either through correlation analysis nor through observations of success percentages at different sizes of a tuition reset.

Retention

While most institutions cite recruitment and financial objectives as motivation to implement a tuition reset, effects on current student enrollment must also be considered (Casamento, 2016). Increasing retention of first-year students is a way to recuperate lost revenue from reduced per-student payments of full-pay and near full-pay continuing students. While IPEDS data do not allow direct analysis of tuition and fee revenues specific to continuing students, changes in first-year retention rates can be modeled from

information in this dataset. Of the 72 institutions in this study's sample, 60 had valid retention data. The median change to retention was +2 percentage points and average change was +5 percentage points.

Variable inflation factors (VIF) calculated on independent variables protect from overfitting due to collinearity. Only variables with VIF less than 4 are used in the model (Grigsby, 2018). To predict a percentage point change in retention, a multivariate OLS regression model is developed adding variables without consideration of advertising in a stepwise fashion as follows:

$$y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

where,

y is the change in fall-to-fall first-year student's retention (Retention_CHG) between the year prior to the reset and the first-year of the reset.

α is the constant.

X_1 is sticker price elasticity (PED_Sticker) of a college's recruitment population in the years prior to a tuition reset. Sticker price elasticity is measured as the percent change of first-year student enrollment given a 1% increase in the sticker price.

X_2 is the percent change in net assets established during the year prior to a tuition reset (Change_in_Net_Assets_Ratio_YearPrior), e.g. the change from Year -2 to Year -1 net assets include unrestricted, temporarily restricted, and restricted assets. A positive number indicates a growth in net assets.

X_3 is the sticker price reduction (StickerPrice_CHG_PCT) expressed as a percentage of the sticker price in year -1. Larger reductions are expressed as larger negative coefficients.

The first OLS linear regression model for changes in retention, without consideration of advertising and promotion variables, runs on a sample of 48 institutions with valid data. Table 25 shows the results:

Table 25
Linear regression analysis of percent change in first-year student retention without considering advertising variables

	β	Std. Error	T value	*p*-value	VIF
PED_Sticker	0.1179	0.0866	1.3610	0.1804	1.0954
Change_in_Net_Assets_Ratio_YearPrior	18.0865	6.6087	2.7370	0.0089***	1.0057
StickerPrice_CHG_PCT	-29.2041	14.5477	-2.0070	0.0509*	1.0903
N	48	F Statistic			4.157 (3,44)
Adjusted R^2	0.1677	*p*-value			0.0112

*Note: *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively.*

No evidence is found that sticker price elasticity (PED_Sticker) of first-year students can be used to predict changes in first-year student retention (Retention_CHG). That said changes in net assets (Change_in_Net_Assets_Ratio_YearPrior) and the percent of sticker price change (StickerPrice_CHG_PCT) are found to be statistically significant predictors of changes in first-year student retention. For each 1% increase in net assets during the year prior to a tuition reset first-year student retention increases by 18.0865%. For each 1% decrease in the sticker price, the first-year student retention rate will increase 29.2041%.

The model's *p*-value is 0.0112, which is significant at the 5% level. The model explains only 16.77% of the variance of the change in first-year student retention. The F statistic is 4.157.

To predict a percentage point change in retention, a second multivariate OLS regression model is developed with consideration of advertising in a stepwise fashion as follows:

$$y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

where,

y is the change in fall-to-fall first-year student's retention (Retention_CHG) between the year prior to the reset and the first-year of the reset.

α is the constant.

X_1 is sticker price elasticity (PED_Sticker) of a college's recruitment population in the years prior to a tuition reset. Sticker price elasticity is measured as the percent change of first-year student enrollment given a 1% increase in the sticker price.

X_2 is advertising and promotion change by percent (AdvertsingPromotion_CHG_PCT) represents a percentage change in spending on the advertising and promotion lines of an institution's Form 990 reporting which compares Year -1 to Year 0. A positive number represents increased advertising and promotion expenditures.

X_3 is the percent change in net assets established during the year prior to a tuition reset (Change_in_Net_Assets_Ratio_YearPrior), e.g. the change from Year -2 to Year -1 net assets include unrestricted, temporarily restricted, and restricted assets. A positive number indicates a growth in net assets.

X_4 is the sticker price reduction (StickerPrice_CHG_PCT) expressed as a percentage of the sticker price in year -1. Larger reductions are expressed as larger negative coefficients.

The second OLS linear regression model for changes in retention with advertising and promotion variables runs on a sample of 31 institutions with valid data. Table 26 presents the results:

Table 26
Linear regression analysis of change in first-year student retention considering advertising

	β	Std. Error	T value	*p*-value	VIF
PED_Sticker	0.4862	0.3188	1.5250	0.1393	1.2887
Change_in_Net_Assets _Ratio_YearPrior	38.5055	9.4326	4.0820	0.0004***	1.1356
AdvertsingPromotion_CHG_PCT	3.8749	2.4496	1.5820	0.1258**	1.2261
StickerPrice_CHG_PCT	-29.7761	15.6196	-1.9060	0.0677*	1.0410
N	31	F Statistic		6.234 (4,26)	
Adjusted R^2	0.4110	*p*-value		0.0012	

*Note: *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively.*

No evidence is found that sticker price elasticity (PED_Sticker) is a significant predictor of change in first-year student fall-to-fall retention (Retention_CHG), but interestingly neither is advertising and promotion spending (AdvertsingPromotion_CHG_PCT). Like the previous model changes in net assets (Change_in_Net_Assets_Ratio_YearPrior) and the percent of the sticker price change (StickerPrice_CHG_PCT) are significant predictors of change in first-year student fall-to-fall retention (Retention_CHG). For each percent increase in net assets during the year prior to a tuition reset (Change_in_Net_Assets_Ratio_YearPrior), the percent change in retention (Retention_CHG) increases 38.5055%. For each percent decrease in sticker price (StickerPrice_CHG_PCT), the percent change in retention will increase by 29.7761% (Retention_CHG).

The model's *p*-value is 0.0112, which is significant at the 5% level. The model explains 41.10% of the variance of the change in first-year student retention, a substantive improvement over the prior model. The F statistic is 6.234, higher than the previous model.

The Great Recession and Tuition Resets

In prior models, the year of reset was a predictor of the likelihood of increased net tuition and fee revenue from first-year students (R2) and had a statistically significant influence on the change in percent Pell-eligible students (R5). The number of tuition resets per year increased significantly following 2010. This time period corresponds to the end of the Great Recession (Clark, 2010; Grawe, 2018) but also renewed concerns surrounding student debt (Baum, 2016). It is natural to ask if tuition resets prior to 2010 have been more successful than those preceding 2010. Table 27 compares the success rates of tuition resets preceding and following 2010:

Table 27
Tuition reset success preceding and following 2010

	Resets 2002 to 2010	*Resets 2011 to 2017*
Count	14	58
Enrollment Success (1)	7	27
Enrollment Success Percent	50.0%	46.6%
Net Tuition and Fee Revenue Success (2)	5	17
Net Tuition and Fee Revenue Success Percent	35.7%	29.3%

Note: (1) Enrollment success is 5% or greater increase of first-year students in first-year of reset price
(2) Net Tuition and Fee Revenue Success is 5% or greater increase in net tuition and fee revenue from first-year students in the first year of the reset price.

Prior to 2010, 7 of 14 resets (50%) resulted in a 5% or greater increase in enrollment and 5 of 14 (or 36%) resulted in a 5% increase in net tuition and fee revenue from first-year students. Following 2010, 58 institutions implemented a tuition reset with 27 increasing enrollments by 5% or more (46.6%) and 17 (or 29%) increased net tuition and fee revenue from first-year students. Despite the increased frequency of tuition resets after 2010, success rates are slightly lower. However, these differences are not statistically significant when analyzed with Welch Independent Samples T-Tests:

Table 28
Tuition reset success preceding and following 2010, Independent samples t-test

	Enrollment Success	Net Tuition and Fee Success
t-value	-0.35	0.01
Degrees of Freedom	17.65	19.23
p-value	0.73	0.99

*Note: *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively.*

The evidence then is that there is no statistically significant difference in success rates prior to or following 2010.

Chapter 5 - Discussion

Chapter 5 contextualizes findings from Chapter 4 to the research purpose and goals. The chapter begins with a summary of the study including research purpose, problem, and specific research questions. The chapter then outlines major findings and applies these to discussions of theory and the profession. The chapter then documents the limitations of the study and provides suggestions for further research. The chapter ends with concluding thoughts.

Summary of the Study

The traditional high price and high discount model which has dominated higher education more and more is coming to be considered unsustainable (Lederman & Seltzer, 2017; Pryor, 2017). In response, an increasing number of institutions are considering implementing tuition resets (Kantrowitz, 2019) wherein the published sticker price is reduced, but also accompanied by a roughly commensurate reduction in financial aid. The net price students pay remains essentially the same (Bernard, 2019). However, results to date have been mixed (Bloom, 2017; Seltzer, 2017a).

The purpose of this study is to examine the relationship between measures of sticker price elasticity and the change in first-year student enrollment, net tuition and fee revenue from first-year students, first-year students who are Pell-eligible, and transfer students enrolled following a tuition reset using multivariate logistic and linear regression models.

The main independent variable of interest is sticker price sensitivity as measured by the sticker price elasticity of demand (Bradley & Singell Jr., 2010; Farhan, 2016) in

the two years prior to the announcement of the reset event. The dependent variables stemming from industry dialog (Bloom, 2017; Casamento, 2016; Lapovsky, 2015) are increased first-year students enrollment, increase in net tuition and fee revenue from first-year students, increase in the percentage of Pell-eligible students in the first-year cohort, increase in transfer students enrollment, likelihood the tuition reset will increase first-year student enrollment, and likelihood the tuition reset will increase net tuition and fee revenue from first-year students. The effects of increased advertising and promotion spending was introduced as an intervening variable (S. Bodfish, personal communication, May 23, 2017; Casamento, 2016; Kumar, 2005; Lapovsky, 2015).

The research questions this study looked to address were as follows:

1. Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict the likelihood of an increase in first-year student enrollment for institutions implementing a tuition reset?
2. Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict the likelihood of an increase in net tuition and fee revenue from first-year students for institutions implementing a tuition reset?
3. Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict an increase in first-year student enrollment for institutions implementing a tuition reset?
4. Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict an increase in net tuition and fee revenue from first-year students for institutions implementing a tuition reset?

5. Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict an increase in the percent of first-year Pell-eligible student enrollment for institutions implementing a tuition reset?
6. Does sticker price elasticity in the two years prior to the announcement of a tuition reset predict an increase in transfer student enrollment for institutions implementing a tuition reset?

As discussed in the literature review, many practitioners emphasize the role of advertising in a successful tuition reset. For each of the above research questions, this study examines the intervening effects of changes in advertising spending and indicators of financial health.

To explore these questions, a quantitative analysis of 72 private not-for-profit, 4-year or above institutions was conducted from a larger list of 142 resets. These institutions implemented tuition resets between the academic years 2003-2004 and 2017-2018. Data regarding these institutions and their resets was assembled from IPEDS, Form 990 data, and the U.S. Census Bureau. Of these 72 institutions, advertising and promotion expenditure information was provided for 43.

Major Findings

The major findings of this study were presented in three parts: a review of frequency distributions which provide documentation of the types of institutions which implement tuition resets and catalog the outcomes realized, findings that pertain directly to the research questions this study sought to address, and additional findings which can seed future research or be of special interest to industry practitioners.

Frequency Distributions

A major contribution of this study is to characterize institutions implementing tuition resets and the breadth of results these institutions have realized. Among the 72 private not-for-profit, 4-year or above institutions analyzed, the average tuition reset amount was 18% of the sticker price, and the average tuition amount reset expressed in dollars was $4,967.

The focus of this study is the role of sticker price elasticity as a predictor of tuition reset success. This study assumes institutions seek to implement tuition resets because of perceived student sticker-price sensitivity; expressed by a sticker-price elasticity of -1 or lower. However, at the institution recruitment population level, the range of sticker price elasticity for first-year students (from -3.37 to 4.07) and transfer students (from -1.77 to 5.04) of institutions implementing a tuition reset provides evidence of a wide range of behavioral responses to sticker price in the years preceding a tuition reset, including responses reflecting Veblen effects wherein higher prices would be expected to increase demand.

Many institutions implementing tuition resets reflect low levels of financial health. According to the analysis of Form 990 data, the interquartile range of FIT scores for institutions implementing a tuition reset ranged from 0.40 (should perform a thorough review of institutional effectiveness) to 3.86 (significant changes needed to achieve mission) (The Austen Group, 2019b) on a scale from -4 to 10.

Institutions implementing tuition resets realized a wide range of outcomes that underscore both the significant risks and potential rewards. In terms of increased enrollment of first-year students, the median outcome was 0% and the average was

+19%. In terms of net revenue from first-year students, the median outcome was a 4% loss and an average gain of 19%. The median results of other important outcomes were a 1 percentage point increase in the percent of first-year students who are Pell-eligible, 2 percentage point increase in first-year student retention, and a 6% increase in transfer students enrolled. Institutions looking to implement a tuition reset should be clear on their goals and the results they would like to achieve.

Institutions implementing tuition resets assume significant levels of risk. Among the 72 institutions that implemented a tuition reset the 25th percentile (which represents the outcome of 1 in 4 institutions that implement a tuition reset) outcomes indicate a decline in applications of 7% or more, yield on admitted students declined by 4% or more, discount rates increases by 3% or more (indicating a reduction of both sticker price and net price), enrollment of first-year students declines by 12% or more, and net revenue from first-year students decreases by 26% or more. No one institution realized all these negative effects, but if any particular institution realizes one or more of these effects, it could be difficult to recover. Institutions planning to implement a tuition reset should carefully consider their risk threshold and options to mitigate potential negative consequences.

Research questions

The six research questions, as well as an additional finding pertaining to retention, focus on the role of sticker price elasticity as a statistically significant predictor of various dimensions of success for institutions implementing a tuition reset. Table 29 summarizes the findings after examining models that both exclude and include the advertising and promotion spending variables.

Table 29

Summary of Findings

	R1	R1A	R2	R2A	R3	R3A	R4	R4A	R5	R5A	R6	R6A	AF2(1)	AF2A(1)
PED_Sticker	*x*	***S***	*x*	*x*	*x*	*x*	*x*	*x*	*S*	*x*	-	-	*x*	*x*
PED_Sticker_XFR	-	-	-	-	-	-	-	-	-	-	*x*	*x*	-	-
Reset_Success_Enrollment	DV	DV	-	-	-	-	-	-	-	-	-	-	-	-
Reset_Success_NetRevenue	-	-	DV	DV	-	-	-	-	-	-	-	-	-	-
Enrolled_CHG_PCT	-	-	-	-	DV	DV	-	-	-	-	-	-	-	-
Net_FY_TFRevenue_CHG_PCT	-	-	-	-	-	-	DV	DV	-	-	-	-	-	-
PercentPell_CHG	-	-	-	-	-	-	-	-	DV	DV	-	-	-	-
XFR_Enroll_CHG_PCT	-	-	-	-	-	-	-	-	-	-	DV	DV	-	-
Retention_CHG	-	-	-	-	-	-	-	-	-	-	-	-	DV	DV
PercentPell_YearPrior	s	x	x	x	-	-	-	-	S	S	S	x	-	-
ViabilityRatio_YearPrior	S	-	x	-	-	-	-	-	-	-	-	-	-	-
Enrolled_Trend	S	-	-	-	-	-	-	-	-	-	-	-	-	-
200Density	x	S	-	-	-	-	-	-	-	-	-	-	-	-
AdvertsingPromotion_CHG_PCT	-	S	-	S	-	S	-	S	-	-	-	S	-	x
App_Trend	-	-	x	-	S	x	x	S	x	-	-	-	-	-
StickerPrice_YearPrior	-	-	x	-	x	-	S	-	-	-	-	-	-	-
DiscountRate_Prior	-	-	x	-	-	-	-	-	-	-	-	-	-	-
Year_of_Reset	-	-	-	S	-	-	-	-	x	S	-	-	-	-
200Population	-	-	-	x	-	-	-	-	-	-	-	-	-	-
Equity_Ratio_YearPrior	-	-	-	x	-	-	-	-	-	-	-	-	-	-
Change_in_Net_Assets_Ratio_YearPrior	-	-	-	-	S	S	S	S	-	-	S	S	S	S
DiscountRate_Trend_2YRPrior	-	-	-	-	-	-	S	S	-	-	-	-	-	-
StickerPrice_CHG	-	-	-	-	-	-	x	-	-	-	-	-	-	-
StickerPrice_CHG_PCT	-	-	-	-	-	-	-	-	S	S	-	-	S	S
AdvertsingPromotionSpendYearPrior	-	-	-	-	-	-	-	-	-	S	-	-	-	-
100Density	-	-	-	-	-	-	-	-	-	-	S	S	-	-
Evidence	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No

Note: Evidence is Yes if there is a statistically significant relationship between sticker price elasticity (the primary independent variable of interest) and the dependent variable at .1% level or lower. Underlined variables are dependent variables. 'x' indicates use of variable in the model but no statistically significant relationship. S indicates a statistically significant relationship between the independent variable and dependent variable. (1) Results from additional findings quest 2 relates to predicting retetion (OLS Linear regression).

In short, sticker price elasticity in the years preceding a tuition reset is a weak predictor of success for institutions looking to implement a tuition reset. Sticker price elasticity was a significant predictor of tuition reset success only when the change in advertising and promotion spending was considered (R1A). Sticker price elasticity was also a significant predictor of a percent Pell increase when advertising was not considered. For all other research questions, sticker price elasticity was not a significant factor in explaining the likelihood of success or other levels of the examined outcome variables.

From this study, however, we found the percent change in advertising and promotion spending is positively associated with many important tuition reset outcomes: the likelihood of increased enrollment, the likelihood of increasing net tuition and fee revenue from first-year students, the percent change in enrollment, the percent change in net tuition and fee revenue from first-year students, and change in first-year student retention rate. For all research questions, the addition of advertising and promotion variables strengthened the explanatory power of models. These findings confirm evidence from earlier qualitative studies that institutions need to invest in promoting reasons for the tuition reset and how it benefits students.

Similarly, we found evidence that the change in net assets ratio was positively associated with increases in enrollment, increases in net tuition and fee revenue, and increases in first-year student retention. Such evidence is consistent with findings from qualitative studies that institutions implementing tuition resets should do so from a position of growing financial vitality, rather than as an effort to reverse financial decline.

Other Findings

Institutions implementing a tuition reset often ask about the right amount of a tuition reset with the expectation a larger tuition reset will attract more attention than a smaller one. This study found no correlation between the size of a tuition reset (in either absolute dollar terms or as a percentage of the sticker price) and outcomes in terms of enrollment or net tuition and fees from first-year students. This study also found no evidence of a "threshold amount" (in either absolute dollar terms or as a percentage of the sticker price) wherein outcomes in terms of enrollment or net tuition and fees from first-year students changed significantly after a certain amount was cut. These findings are contrary to those beliefs held by intuitions that resets need to be of a certain size to attract attention and underscore the need for advertising.

Many institutions implementing a tuition reset experienced an increase in retention. Models to predict this increase in first-year student retention show the statistically significant influence of Change in Net Assets Ratio and percent change in advertising and promotion spending change. The influence of sticker price elasticity was not significant.

Despite a notable increase in the number of tuition resets attempted annually FY2011 and following, no statistically significant difference was found between the success rates of tuition resets prior to or following 2010 when assessing a 5% or greater increase in first-year student enrollment or increase of net tuition and fee revenue from first-year students.

Implications for Theory

The study of tuition resets is an emerging field. Building upon previous qualitative and quantitative studies, this is the most comprehensive study to date of tuition resets by the number of tuition resets considered and breath of data elements incorporated into the analysis. This study investigates a list of 142 institutions that implemented the tuition reset strategy between the 1996-1997 academic year and 2020-2021. Further, this study supplies a deeper analysis of 72 4-year, not-for-profit institutions that implemented a reset between the 2003-2004 and 2017-2018 academic years for which more extensive data is available. From these 72 institutions, 43 provided advertising and promotion spending information on Form 990s. Kottich's (2017) quantitative examination of tuition resets, the largest previous quantitative study, examined results from 45 private not-for-profit 4-year institutions.

Similar to Kottich's (2017) use of IPEDS and Form 990 data to analyze the results of a tuition reset, this study added U.S. Census Bureau data to consider factors of population and population density. This study also included the use of advertising and promotion spending from Form 990s. Future researchers can review the tuition reset lists compiled in this study and add analysis of further resets as publicly available data sets are extended with annual updates.

This study extends literature about the effects of price as a quality signal in higher education. Tuition resets offer a natural experiment by which researchers can contrast the influence of sticker price and net price on a purchase decision. This study found no direct relationship between change in sticker price and the enrollment or net tuition and fee revenues realized in the first year of the reset. However, sticker price change by percent

was a significant predictor of the proportion of first-year students who are Pell-eligible (without considering advertising and promotion spending) and increases in first-year student retention rates. These findings suggest the direct influence of sticker price may be greater on low-income families.

The findings of this study underscore the central role of advertising and promotion investment in the tuition reset process. Increased spending in advertising and promotions in the year prior to the tuition reset was positively associated with many important outcomes as shown in Chapter 4. However, the size of the sticker price reduction and price sensitivity of prospective students have weaker or no effects. On this basis, the tuition reset announcement should be seen as a marketing opportunity to both build brand awareness (Bodfish, 2017) and change the price position of the institution relative to known competitors (Shirai, 2015). Changing sticker price alone has little effect, changing the price in conjunction with a clear and compelling explanation for an unexpected price reduction does (Dolan & Simon, 1996; Shirai, 2015). Advertising and promotion investment also allows the resetting institution to explain the rationale behind a tuition reset, reconcile any dissonance of a lower price position with expectations for high quality, reconcile messages of affordability with a strategy that moves towards price transparency, and frames the competitive set to which an institution should continue to be compared.

Implications for the Profession

Tuition resets involve significant risk and are far from a quick fix to difficult recruitment trends faced by many institutions. The distribution frequencies section of this study demonstrates that many institutions implementing tuition resets have experienced

negative outcomes including decreases in applications, lower first-year enrollment, and losses in net tuition and fee revenue. Institutions with weak financial health compound the severity of these risks as their ability to absorb a negative outcome is less. But many institutions also realize gains by these same measures. Institutions considering a tuition reset, then, are well-advised to note the risks involved and consider their capacity to withstand one or more of these negative outcomes.

Beyond a general description of the outcomes of a tuition reset, enrollment professionals and consultants would like to know if they should consider implementing a tuition reset at a *specific* institution. Models developed in this study are not sufficiently predictive to make a determinative recommendation if an institution should go ahead with a reset, but they do show factors that can help institutions rule out the implementation of the strategy.

First, this study found institutions implementing tuition resets often have students that do not exhibit sticker price-sensitive behavior at the population level. Institutions need to have a detailed understanding of how their specific students will respond to changes in sticker price prior to implementing a tuition reset. This finding highlights the need for student-level price sensitivity analysis in the years preceding a tuition reset. Such market research quantifies the independent influence of cost of attendance (at reset, normal or higher levels) and financial aid has on the decision of sub-populations to enroll at a specific institution (S. Bodfish, personal communication, May 23, 2017; Carter & Curry, 2011; Casamento, 2016).

Second, this study found that a change in net assets in the year prior (Change_in_Net_Assets_Ratio_YearPrior) to a reset is one of the most consistent

independent variables (R3, R4, R6, Retention) associated with levels of enrollment and net tuition and fee revenue increase. Tuition resets help institutions with growing net assets. Institutions with a lower or negative change in net asset ratios may see unexpected negative outcomes. Consistent with earlier qualitative studies, institutions should be financially healthy before the implementation of a tuition reset (Casamento, 2016; Kottich, 2017; Lawlor, 2016).

Third, this study found a positive correlation between changes in advertising spending and some important tuition reset outcome measures such as an increase in first-year student enrollment, an increase in net tuition and fee revenue, and an increase in transfer student enrollment. Institutions considering a tuition reset need to prepare to make a significant investment in marketing and advertising to promote the reset. Institutions that fail to make a substantive investment in advertising and promotion not only secure a financial loss from full-pay continuing students but also risk neglecting opportunities to benefit from the price reduction. Prospective students and parents who no longer consider an institution based on sticker price need to be told they should take another look because of news of the reset. Students and parents already considering the reset need to be told the rationale for the reset lest they perceive quality will suffer as a result.

Limitations

Known limitations constrain this research:

First, IPEDS has known lags in reporting, as mentioned previously. If an institution takes its fall enrollment census in October of year 0, it will not be publicly visible in IPEDS until 15-24 months later. This lag was a major reason why this study is

limited to 72 private not-for-profit institutions with sufficient IPEDS data available. This is the largest sample size of existing academic studies of tuition resets known by the author.

Second, statistically, only a small number of institutions perform tuition resets each year. While the event-study methodology allowed us to investigate the effects of a tuition reset based on the full sample size, the results depend upon the proper controlling for the influence of outliers. The small sample size prohibited splitting the sample data file to test for overfitting in the logistic regression models. The available sample size for future studies will increase as the number of institutions implementing tuition resets in the future increases. With larger sample sizes, the statistical robustness and reliability of quantitative methods available increases.

Third, little has been written from an academic perspective on the phenomenon of tuition resets. Because of this gap in documented literature, greater reliance upon theoretical concepts and analogy from other industries were used to interpret observed trends in higher education, which leaves some potential for error.

Fourth, the sample for this study was only institutions that implemented a tuition reset. Future studies can name a parallel peer group by criteria under investigation (e.g. institution size by enrollment, operating budget, institutional control) and attribute changes to the tuition reset compared to other factors affecting the private not-for-profit sector.

Fifth, the study focuses on the outcomes from first-year students. Full break-even analysis of a tuition reset should consider the financial impact from transfer and continuing students as well. Secondary data sources such as IPEDS and Form 990s does

not provide data suitable for analyzing these issues. Institutions report tuition, fees, room and board at the institutional level, without separation between continuing, first-year, and transfer students. Rather than analyzing data at the institutional level, data would need to be collected at the student level for each institution.

The findings of this study are generalizable only to private 4-year not-for-profit institutions. Public institutions may reset for different reasons than private institutions (e.g. under mandates from governing bodies, compliance with state funding mandates) and have different goals as a result. Tuition resets for specific academic degrees and programs are not within the scope of this study and face different communications challenges.

Recommendations for Further Research

More and more institutions announce tuition resets each year. However, evidence from this study supports the previous findings that tuition resets involve significant risks. Further research will help institutions improve their understanding of risks involved and outline criteria wherein implementation of a tuition reset will increase the enrollment of first-year students, transfer students, and improve both retention and net tuition and fee revenue.

Tuition resets are still a recent phenomenon and require further study. The direction of such research can include profiling institutions considering a reset (e.g. predicting which institutions will implement a reset), identifying factors that predict successful tuition resets, and describing how tuition resets impact aspects of an institution's profile and/or segments of students).

Studies that predict which institutions will implement a tuition reset could look more closely at the institutional size (enrollment and annual operating budget) and quality of student body (selectivity, average test scores) which are often cited reference points of college presidents and enrollment management professionals. This study documented wide variations by BEA Statistical region in the number of tuition resets implemented but did not attempt to explain this variance. Future studies could look at regional variances and seek to explain why the tuition reset strategy is more attractive in some regions (e.g. number of colleges, the income of families in the region, demographic trends, type of dominant competitors).

Future studies about tuition resets should identify and characterize drivers for successful tuition reset outcomes. Factors that lead an institution to consider a tuition reset may or may not also lead to the successful execution of that strategy. Future studies then can also test institution size (e.g. by enrollment or annual tuition revenue) and the academic profile of students (e.g. through test scores) as factors that portend successful outcomes.

This study found no evidence of a direct relationship between the size of the tuition reset and increase in enrollment despite the expectation that a larger tuition reset amount would attract more attention than a smaller amount. Future research should explore why evidence to date runs contrary to this expectation. Future research should focus on the relationship between tuition reset reduction amount, level of advertising given inquiry pool size, and efficacy of different tuition reset messages (e.g. affordability emphasis or transparency emphasis). This final point bears more explanation.

Because tuition resets create a meaning paradox (lower sticker price, higher quality, but the same net price), the burden falls on the institution to explain the rationale for the tuition reset. Future studies can test specific messaging themes (e.g. affordability, value, transparency, revitalized brand, association with capital campaigns) coded from tuition reset announcements for correlation with positive tuition reset outcomes.

Future studies should also describe how tuition resets impact aspects of an institution's profile and/or segments of students). The impact of tuition resets on continuing students continues to be an under-discussed consideration. This study, consistent with Kottich (2017) finds institutions that conducted a tuition reset experienced an increase in retention. A multiple case-study approach that considers both financial and attitudinal information could shed important light on how institutions performing tuition resets can make plans to ensure current students are retained and can assist in future recruitment efforts. Researchers do not yet understand the impact of tuition resets on other factors such as student satisfaction and graduation rates. More research will clarify how tuition resets impact recognized drivers of retention, especially when financial aid packages for continuing students are frequently reduced in dollar amount.

Tuition resets are also frequently proposed as a strategy to attract lower-income students (Davis, 2003; Rine, 2016). This study shows that the percent of Pell-eligible students in a first-year cohort on average increased by 1% at the median and average. This study also found the change in Pell-eligible student enrollments is associated with the size of the sticker price change, the number of Pell-eligible students already in the first-year cohort, and the year of the reset. Future studies can look at whether changes in

the percent Pell-eligible students continues to increase in the years following a reset, and whether Pell-eligible students pay less following a reset.

Finally, this study primarily sought to understand the major effects of a tuition reset in the first year of the reset. A major conversation in the industry relates to whether the benefits of a tuition reset persist beyond the first-year. Future studies can compare the results from the first-year with outcomes in later years.

Conclusions and Final Thoughts

At a time when researchers and practitioners are questioning the dominant model of higher education pricing—tuition discounting—an increasing number of institutions are considering the tuition reset strategy. Proponents of the tuition reset point to advantages in terms of perceived affordability, price transparency, and college access. Critics impugn it as an ineffective and deceptive marketing tactic as net price stays about the same. This study has shown evidence that the tuition reset strategy is risky, but some institutions have successfully implemented it. Whether an institution opts to reset or continue to discount tuition at a high-price and high discount level, the pricing strategy needs to accurately communicate the institution's quality to prospective students.

Colleges often reference concerns of prospective students about high published prices for higher education as a primary reason to implement a tuition reset. A rational and compassionate response to such concern about prices is to reduce the published price and show commitment to affordability and transparency in pricing. However, this study found sticker price sensitivity as measured by sticker price elasticity has no significant effect on the tuition reset outcomes. Of the 12 models developed in response to the six research questions, sticker price elasticity was only a statistically significant predictor for

the likelihood of success of enrollment increase when used in conjunction with increase in advertising spending. Sticker price elasticity was also a predictor for the increase in the proportion of first-year Pell recipients in a first-year class when not considering changes in advertising spending.

Additionally, the tuition reset amount itself seems to be of lesser importance. Sticker price change (in dollars) was not a significant predictor for most outcomes. The sticker price change by percent variable was significant only in predicting a change in the proportion of Pell-eligible students following the reset (the larger the reduction, the greater the percentage increase in the proportion of Pell-eligible students). Although limited by small samples at higher tuition reset amounts, examination of success rates did not suggest the existence of threshold sizes of reduction amounts to increase the chances of successfully implementing a tuition reset.

While sticker price elasticity and the amount of tuition reduction were not significant predictors for tuition reset success, change promotion and advertising expenditures as reported on Form 990s was. A percentage increase in advertising spending was a significant factor in determining the likelihood of enrollment success, the likelihood of increased net revenue from first-year students, change in first-year student enrollment, net tuition and fee revenue from first-year students, the proportion of Pell-eligible first-year students and first-year student retention. These results underscore the need to invest in an overarching brand strategy and communications plan which explains the rationale behind and benefits of a tuition reset which had been emphasized in qualitative studies (Casamento, 2016; Lapovsky, 2015) and practitioners consulting in this area (S. Bodfish, personal communication, May 23, 2017; Lawlor, 2016).

Consistent with previous qualitative studies (S. Bodfish, personal communication, May 23, 2017; Casamento, 2016), tuition resets are more likely to have successful outcomes when the institution is thriving. Increases in net assets in the year leading into the announcement of a tuition reset is associated with increases in first-year student enrollment, net tuition and fee revenue from first-year students, transfer student enrollment, and first-year student retention. On this basis, tuition resets should be seen as a component in a wider brand repositioning strategy, not as a pricing tactic to reverse the decline. The pricing strategy needs to accurately communicate the benefits of an institution in terms that prospective students value.

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Appendix A

Following is a listing of institutions considered in the preparation of this study, including information regarding institutional context and information sources to document the tuition reset. The final column indicates if there is enough data available to include each institution in one or more substantial components of analysis outlined in this proposal. Following the table of institutions, a list of website links is provided which document online lists of tuition resets and announcements of specific tuition resets for institutions listed.

Table A1
List of institutions implementing a tuition reset

Institution Name	First Year of New Tuition	Sector	Notes	Cappex	NAICU	Edvisors	Kottich	Web Search	IPEDS Data	Use in analysis
Waldorf College (IA) (Now Waldorf University)	1987-1988	Private for-profit, 4-year or above		X		X				
Muskingum College (OH)	1996-1997	Private not-for-profit		X		X				
North Carolina Wesleyan College (NC)	1996-1997	Private not-for-profit		X		X				
Bluefield College	1998-1999	Private not-for-profit		X		X				
Pine Manor College (MA)	1998-1999	Private not-for-profit		X		X				
Sheldon Jackson College (AK)	1998-1999	Private not-for-profit	Closed in 2007	X		X				
Thiel College (PA)	1998-1999	Private not-for-profit		X		X				
College of William & Mary (Richard Bland College of William and Mary) (VA)	1999-2000	Public, 2-year		X		X				
Marlboro College (VT)	1999-2000	Private not-for-profit		X		X				
University of Virginia (VA)	1999-2000	Public		X		X				
Wells College (NY)	1999-2000	Private not-for-profit		X		X				
Bethany College (WV)	2002-2003	Private not-for-profit		X		X		X		
Heidelberg University	2002-2003	Private not-for-profit	Heidelberg College to Heidelberg University (2009)	X		X				X
Waldorf College (University)	2003-2002	Private for-profit, 4-year or above		X		X				
Abilene Christian University (TX)	2003-2004	Private not-for-profit	1 program	X		X				
The College of Idaho (Albertson College)	2003-2004	Private not-for-profit		X		X				X
Westminster College (MO)	2003-2004	Private not-for-profit		X		X				X
Eureka College (IL)	2004-2005	Private not-for-profit		X		X				X
Lourdes University	2004-2005	Private not-for-profit								X
Salem International University	2004-2005	Private for-profit, 4-year or above								
North Park University (IL)	2005-2006	Private not-for-profit		X		X		X		X
Roosevelt University	2005-2006	Private not-for-profit								X
Amridge University	2006-2007	Private not-for-profit	Name change to Regions University from Southern Christian University in 2006; then name change to Amridge University in 2008							X

South Dakota Colleges (SD)	2006-2007	Public	Out-of-state only	X		X				
Blackburn College (IL)	2008-2009	Private not-for-profit		X		X	Y	X		X
North Park University	2008-2009	Private not-for-profit								X
Warner Pacific College	2008-2009	Private not-for-profit					Y			
Davis & Elkins College	2009-2010	Private not-for-profit	1% reduction		X					X
Penn Foster College	2009-2010	Private not-for-profit	Online, 28%	X		X				
William Jessup University	2009-2010	Private not-for-profit			X			X		X
Baptist Bible College (MO)	2010-2011	Private not-for-profit					Y			X
Rabbinical College of Telshe (OH)	2010-2011	Private not-for-profit	7% cut					X		
Waldorf College (University)	2010-2011	Private for-profit, 4-year or above							X	
Beis Medrash Heichal Dovid (Far Rockaway, NY):	2011-2012	Private not-for-profit			X		Y	X		X
Bluefield College (VA)	2011-2012	Private not-for-profit	25% for working adults		X					
Brewton-Parker College (GA)	2011-2012	Private not-for-profit		X	X		Y	X		X
Davis College	2011-2012	Private not-for-profit	13.8% reduction	X	X		Y	X		X
John Wesley University (NC)	2011-2012	Private not-for-profit								X
Sewanee-The University of the South (TN)	2011-2012	Private not-for-profit		X	X	X	Y	X		X
Urbana University (Urbana, OH):	2011-2012	Private not-for-profit	50 percent for online intersession courses		X					
Burlington College	2012-2013	Private not-for-profit	Summer 2012 - 25 percent discount for summer semester	X		X				
Cabrini College (PA)	2012-2013	Private not-for-profit	Name change to Cabrini University in 2016	X	X	X	Y	X		X
Cleary University (MI)	2012-2013	Private not-for-profit					Y			
Duquesne University (PA)	2012-2013	Private not-for-profit	School of education only	X	X					
Jarvis Christian College	2012-2013	Private not-for-profit					Y	X		X
Lincoln College	2012-2013	Private not-for-profit		X	X	X	Y	X		X
Montreat College	2012-2013	Private not-for-profit								X
Our Lady of Holy Cross College (University of Holy Cross)	2012-2013	Private not-for-profit								X
Patten University	2012-2013	Private not-for-profit	Formerly Oakland Bible Institute							
Regent University	2012-2013	Private not-for-profit	20% of undergraduate online		X					
Seton Hall University	2012-2013	Private not-for-profit	$21,000 for high achieving students	X	X	X		X		
University of Charleston	2012-2013	Private not-for-profit	22% for freshman and transfer students	X	X	X	Y	X		X
William Peace University	2012-2013	Private not-for-profit		X	X	X	Y			X
Alfred University (NY)	2013-2014	Private not-for-profit						X		X
Allen University	2013-2014	Private not-for-profit								X
Ancilla College	2013-2014	Private not-for-profit, 2-year						X		
Belmont Abbey College	2013-2014	Private not-for-profit		X	X	X	Y			X
Central Christian College of Kansas	2013-2014	Private not-for-profit								X
City University of Seattle	2013-2014	Private not-for-profit								
Concordia University-Saint Paul	2013-2014	Private not-for-profit		X	X	X	Y	X		X
Cox College	2013-2014	Private not-for-profit								X
Harrison College	2013-2014	Private for-profit	(IN, OH, NC, Online) (9 programs)	X		X				
Hiwassee College	2013-2014	Private not-for-profit	more than				Y	X		X
Life Pacific College	2013-2014	Private not-for-profit								X

Life University	2013-2014	Private not-for-profit							X
Manhattanville College	2013-2014	Private not-for-profit							
Martin University	2013-2014	Private not-for-profit							X
Mid-Continent University	2013-2014	Private, not-for-profit	2014 - Bankruptcy						
Saint Louis Christian College	2013-2014	Private not-for-profit		X			Y		X
Alaska Pacific University	2014-2015	Private not-for-profit		X	X	X	Y	X	X
Ashland University (OH)	2014-2015	Private not-for-profit		X	X	X	Y	X	X
Ave Maria University (FL)	2014-2015	Private not-for-profit		X			Y	X	X
Bethune-Cookman University (FL)	2014-2015	Private not-for-profit					Y		
Converse College	2014-2015	Private not-for-profit		X	X	X	Y	X	X
Friends University	2014-2015	Private not-for-profit	Actually, NOT a reset, it's a tuition guarantee plan					X	
Lesley University	2014-2015	Private not-for-profit		X			Y	X	X
National Louis University	2014-2015	Private not-for-profit		X					X
Ohio Northern University	2014-2015	Private not-for-profit		X	X	X	Y	X	X
Pacific States University	2014-2015	Private not-for-profit		X					X
Piedmont International University (NC)	2014-2015	Private not-for-profit	Winston-Salem, NC	X			Y		X
Prescott College	2014-2015	Private not-for-profit					Y	X	X
Seton Hall University	2014-2015	Private not-for-profit	Reduced tuition to $22,500 for freshmen.		X				
Southern Virginia University	2014-2015	Private not-for-profit	reduced tuition by 23 percent	X	X		Y		X
St Vincent's College	2014-2015	Private not-for-profit		X			Y		X
Wilson College	2014-2015	Private not-for-profit		X			Y		X
York College of Pennsylvania	2014-2015	Private not-for-profit						X	
Boston Baptist College (MA)	2015-2016	Private not-for-profit		X			Y		X
College of Mount Saint Vincent	2015-2016	Private not-for-profit	Followed by 56% increase	X			Y	X	X
Everest University (FL, MO)	2015-2016	Private not-for-profit	Various campuses owned by Zenith Education Group as of 2015; formerly owned by for-profit Corinthian Colleges.	X					
Grace College and Theological Seminary	2015-2016	Private not-for-profit					Y	X	X
Holy Apostles College and Seminary (CT)	2015-2016	Private not-for-profit					Y		X
Lewis and Clark State College	2015-2016	Public	After 49% increase in 2014-2015	X					
Lincoln Christian University	2015-2016	Private not-for-profit		X			Y		X
National Louis University	2015-2016	Private not-for-profit	Followed tuition reduction in 2014-2015	X					X
Northwood University-Texas	2015-2016	Private not-for-profit							X
Paul Quinn College	2015-2016	Private not-for-profit		X			Y		X
St. Vincent's College (CT)	2015-2016	Private not-for-profit	Followed tuition reduction in 2014-2015	X			Y		X
Stephen F. Austin State University (TX)	2015-2016	Public		X					
Stillman College	2015-2016	Private not-for-profit		X			Y	X	X
University of North Texas (TX)	2015-2016	Public	OK residents only	X		X			
Wilberforce University (OH)	2015-2016	Private not-for-profit		X					X
Wilmington College	2015-2016	Private not-for-profit		X			Y		X
Burlington College (VT)	2016-2017	Private not-for--profit	9 percent reduction [Closed May 2016]		X		Y	X	
Central Washington University	2016-2017	Public		X					
Eastern Washington University	2016-2017	Public		X					
Evergreen State College	2016-2017	Public		X					
Iowa Wesleyan University (IA)	2016-2017	Private not-for-profit					Y		
Lewis and Clark State College	2016-2017	Public		X					

Pima Community College (AZ)	2016-2017	Public, 2-year	Out-of-state and internationals only	X				
Rosemont College	2016-2017	Private not-for-profit		X	X	Y	X	X
Rutgers University – Camden (NJ)	2016-2017	Public	Low- and middle- income NJ residents only	X			X	
University of Bridgeport (CT)	2016-2017	Private not-for-profit	(In-State) reduced tuition for in-state students to $18,500		X		X	
University of St. Joeseph (CT)	2016-2017	Private not-for-profit	29 percent reduction in room and board		X			X
University of Washington (WA)	2016-2017	Public		X				
Utica College	2016-2017	Private not-for-profit		X	X	Y	X	
Washington State University (WA)	2016-2017	Public		X				
Western Washington University (WA)	2016-2017	Public		X				
College of St. Mary (Omaha, NE)	2017-2018	Private not-for-profit		X	X	Y	X	X
Columbia College (SC)	2017-2018	Private not-for-profit				Y	X	X
Immaculata University (PA)	2017-2018	Private not-for-profit		X	X	Y	X	X
La Salle University (PA)	2017-2018	Private not-for-profit		X	X	Y	X	X
Marian University (Fond du Lac, WI)	2017-2018	Private not-for-profit			X		X	X
University of Southern Mississippi (MS)	2017-2018	Public	Out of state only	X				
Avila University	2018-2019	Private not-for-profit		X	X			
Benedict College (SC)	2018-2019	Private not-for-profit			X		X	
Birmingham-Southern College (AL)	2018-2019	Private not-for-profit		X	X		X	
Canisius College, Buffalo, NY	2018-2019	Private not-for-profit			X		X	
Champlain College Online (VT)	2018-2019	Private not-for-profit	Career-focused adult higher education (Online) 50% tuition reduction				X	
Cleary University	2018-2019	Private not-for-profit	Public service workers only				X	
Cleveland Institute of Music (OH)	2018-2019	Private not-for-profit		X			X	
College of St. Joseph (VT)	2018-2019	Private not-for-profit					X	
Colorado Mountain College	2018-2019	Public					X	
Cornerstone University (MI)	2018-2019	Private not-for-profit		X			X	
Drew University (NJ)	2018-2019	Private not-for-profit		X			X	
Eastern Nazarene College	2018-2019	Private not-for-profit					X	
Elizabeth City State University	2018-2019	Public					X	
Glenville State College	2018-2019	Public					X	
Mills College (CA)	2018-2019	Private not-for-profit		X	X		X	
Seton Hall University	2018-2019	Private not-for-profit					X	
Sweet Briar College	2018-2019	Private not-for-profit		X	X		X	
The Masters University (CA)	2018-2019	Private not-for-profit	Announced with affirmation of mission, new majors, success in athletics, and a new capital campaign.				X	
University of Detroit Mercy	2018-2019	Private not-for-profit			X		X	
University of North Carolina, Pembroke	2018-2019	Public					X	
University of Sioux Falls (Sioux Falls, SD)	2018-2019	Private not-for-profit			X		X	
University of the Sciences (PA)	2018-2019	Private not-for-profit		X	X		X	
Warner Pacific University (formerly College)	2018-2019	Private not-for-profit			X		X	
Western Carolina University	2018-2019	Public					X	
Albright College	2019-2020	Private not-for-profit			X			

Capital University	2019-2020	Private not-for-profit	50 percent tuition reduction for incoming undergraduates whose families have chosen mission-centered careers through nonprofit and public-service work under the Good Guarantee program	X	X
Cornish College of the Arts	2019-2020	Private not-for-profit			X
Elizabethtown College	2019-2020	Private not-for-profit		X	X
Elmira College	2019-2020	Private not-for-profit		X	X
Greensboro College	2019-2020	Private not-for-profit			X
Ontario Province	2019-2020	Public	10 per cent tuition rate cut on all publicly assisted college and universities in Ontario for the 2019-2020 academic year; not applicable to foreign students.		X
St. John's College (NY)	2019-2020	Private not-for-profit	(Santa Fe, NM and Annapolis MD)	X	X
University of Sioux Falls	2019-2020	Private not-for-profit			X
University of the Cumberlands	2019-2020	Private not-for-profit			X
Wells College (NY)	2019-2020	Private not-for-profit			X

* Note: More data will be coming available in Fall 2019 for analysis.

The following list of websites document both specific institutional tuition resets, but also lists of institutions that have implemented this strategy. Major sources as reflected in the table above are in **bold** typeface:

- http://belmontabbeycollege.edu/admissions/home-school/explore/tuition-and-fees/tuition-reset/
- http://homernews.com/homer-news/business/2013-05-22/alaska-pacific-university-cuts-tuition-by-30-percent
- http://money.cnn.com/galleries/2011/pf/1111/gallery.colleges_lower_tuition/2.html
- http://relevantscience.blogspot.com/2012/07/38-colleges-lowering-their-tuition.html
- http://www.al.com/news/tuscaloosa/index.ssf/2015/01/stillman_college_reducing_tuit.html
- http://www.benedict.edu/cms/?q=node/1481
- http://www.capitalgazette.com/news/annapolis/ac-cn-st-johns-college-tuition-0913-story.html
- http://www.cleveland.com/metro/index.ssf/2013/08/ashland_university_will_reduce.html
- http://www.cleveland.com/metro/index.ssf/2017/09/cleveland_institute_of_music_t.html
- http://www.collegegold.com/applydecide/tuitionfreezelist
- http://www.drew.edu/admissions-aid/undergraduate-admissions/tuition-reset/?

- http://www.glenville.edu/news/? *p*=24959
- http://www.grace.edu/newsandevents/? *p*=8686
- http://www.kansascity.com/news/politics-government/article176099841.html
- http://www.lasalle.edu/tuitionreset/
- http://www.masters.edu/news/increase-in-opportunity-through-decrease-in-tuition?utm_source=All+Emails+Active&utm_campaign=71c83d25e1-EMAIL_CAMPAIGN_2017_11_13&utm_medium=email&utm_term=0_3ece201a10-71c83d25e1-181935489
- http://www.nj.com/education/2017/09/one_of_njs_costliest_universities_slashes_tuition.html
- http://www.omaha.com/news/education/college-of-st-mary-to-cut-sticker-price-by-citing/article_3d926a3c-1efe-5eef-923e-e59867649fd7.html
- http://www.poorhandmaids.org/index.php/latest-news/current-events/item/45-ancilla-college-lowers-tuition-costs
- http://www.register-herald.com/news/glenville-state-college-lowering-tuition-by-percent/article_2eadc3d0-da0d-11e7-b73e-572a36719380.html
- http://www.rosemont.edu/admissions/tuition-and-aid/our-tuition-promise/media-coverage.php
- http://www.sentinel-echo.com/kentucky/news/university-of-the-cumberlands-announces-percent-cut-of-tuition/article_a095849d-a240-5e2e-8656-ef19002a57a6.html
- http://www.thestate.com/news/local/education/article208435774.html
- http://www.utica.edu/uc/affordability-initiative/
- http://www7.shu.edu/admissions/public-tuition-rate-program.cfm
- https://affordableschools.net/30-colleges-reversing-rise-tuition/
- https://chognews.org/2018/01/18/warner-pacific-college-becomes-warner-pacific-university-reduces-tuition/
- https://columbiabusinessreport.com/news/education/70895/
- https://crosscut.com/2019/01/cornish-college-reduces-tuition-20-percent-increase-enrollment
- https://enc.edu/news/eastern-nazarene-college-announces-lower-tuition-rates-for-fall-2018/
- https://finance.yahoo.com/news/college-mount-saint-vincent-announces-120000448.html
- https://law.onu.edu/promise
- https://money.cnn.com/2011/11/28/pf/christian_colleges/index.htm

- https://sacramentopress.com/2009/02/06/bucking-trends-william-jessup-university-announces-decrease-in-tuition-for-2009-2010-academic-year-private-university-also-announces-new-scholarship-program-to-assist-students/
- https://webcpm.com/articles/2018/03/20/benedict-college-tuition.aspx?s=CPMWeeklyUpdate_120418&admgarea=CPMWeeklyUpdate
- https://westfaironline.com/78712/university-of-bridgeport-promises-lower-tuition-for-residents/
- https://www.artsci.com/news/2017/9/19/la-salle-universitys-tuition-reset-boosts-enrollment-while-skeptics-question-strategy-new-coverage
- https://www.ashland.edu/admissions/tuition-reset
- https://www.aspentimes.com/news/cmc-cuts-tuition-for-bachelors-degrees-hikes-other-rates/
- https://www.bizjournals.com/boston/blog/mass_roundup/2013/10/lesley-university-cuts-tuition-25.html
- https://www.bizjournals.com/boston/blog/mass_roundup/2014/10/lesley-universitys-slump-highlights-risks-of-new.html
- https://www.bostonglobe.com/metro/2018/03/31/for-small-private-colleges-fewer-students-means-more-worries/1jjd8ZFusBt3kGjHOcpIqM/story.html
- https://www.bsc.edu/lowertuition/faq.html
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Appendix B

A single data set was required to perform this study. Below is the data dictionary used with notes regarding variable names, sources, definitions, and modifications to source data.

Table B1
Data dictionary and detailed variable definitions

Measure	Variable Name	Source	Definition
Institution ID	UnitID	IPEDS: Institutional Characteristics	Identification number used by the U.S. Department of Education's Office of Postsecondary Education (OPE) to identify schools that have Program Participation Agreements (PPA) so that its students are eligible to participate in Federal Student Financial Assistance programs under Title IV regulations. This is a 6-digit number followed by a 2-digit suffix used to identify branches, additional locations, and other entities that are part of the eligible institution.
Institution Name	Institution Name	IPEDS: Institutional characteristics	Name of the institution
Year of Reset	Year of Reset	Observation	By Observation or press announcement
Before 2008	Before_2008	Calculation	If Year of Reset < 2008, Before_2008 = 1, Else Before_2008 = 0
Population 100 miles	100Population	CAPS: U.S. CENSUS	Population within 100 miles circumference of the campus zip code.
Population Density within 100 miles	100Density	CAPS: U.S. CENSUS	Average population density for the area within 100 mils circumference of the campus zip code.
Population 200 miles	200Population	CAPS: U.S. CENSUS	Population within 100 miles circumference of the campus zip code.
Population Density within 200 miles	200Density	CAPS: U.S. CENSUS	Average population density for the area within 100 mils circumference of the campus zip code.
Percent of 200 in 100	PCTof200in100	Calculation	PCTof200in100 = 100Population / 200 Population
Ratio of 100 in 200	Ratio100in200	Calculation	Ratio100in200 = 100Density / 200Density
Southwest Census Region	Southwest	IPEDS: Institutional characteristics	Southwest AZ NM OK TX
Far West Census Region	Far_West	IPEDS: Institutional characteristics	Far West AK CA HI NV OR WA
Mideast Census Region	Mid_East	IPEDS: Institutional characteristics	Mid East DE DC MD NJ NY PA
Southeast Census Region	Southeast	IPEDS: Institutional characteristics	Southeast AL AR FL GA KY LA MS NC SC TN VA WV
Great Lakes Census Region	Great_Lakes	IPEDS: Institutional characteristics	Great Lakes IL IN MI OH WI
Plains Census Region	Plains	IPEDS: Institutional characteristics	Plains IA KS MN MO NE ND SD

New England Census Region	New_England	IPEDS: Institutional characteristics	New England CT ME MA NH RI VT
Rocky Mountains Census Region	Rocky_Mountains	IPEDS: Institutional characteristics	Rocky Mountains CO ID MT UT WY
Multi-location Census Region	MultiLocation	IPEDS: Institutional characteristics	Major formally recognized administrative units exist in multiple states.
Tuition and Fees - Year -3	TuitionandFees_YMinus3	IPEDS: Student Charges	The amount of tuition and required fees covering a full academic year most frequently charged to students. These values represent what a typical student would be charged and may not be the same for all students atan institution. If tuition is charged on a per-credit-hour basis, the average full-time credit hour load for an entire academic year is used to estimate average tuition. Required fees include all fixed sum charges that arerequired of such a large proportion of all students that the student who does not pay the charges is an exception. Three years prior to reset.
Tuition and Fees - Year -1	TuitionandFees_YMinus1	IPEDS: Student Charges	The amount of tuition and required fees covering a full academic year most frequently charged to students. These values represent what a typical student would be charged and may not be the same for all students at an institution. If tuition is charged on a per-credit-hour basis, the average full-time credit hour load for an entire academic year is used to estimate average tuition. Required fees include all fixed sum charges that are required of such a large proportion of all students that the student who does not pay the charges is an exception. One year prior to reset.
Tuition and Fees - Year 0	TuitionandFees_Y0	IPEDS: Student Charges	The amount of tuition and required fees covering a full academic year most frequently charged to students. These values represent what a typical student would be charged and may not be the same for all students at an institution. If tuition is charged on a per-credit-hour basis, the average full-time credit hour load for an entire academic year is used to estimate average tuition. Required fees include all fixed sum charges that are required of such a large proportion of all students that the student who does not pay the charges is an exception. In the first-year at the new reduced rate.
Room and Board - Year -3	RoomandBoard_YMinus3	IPEDS: Student Charges	ROOM CHARGES - The charges for an academic year for rooming accommodations for a typical student sharing a room with one other student. BOARD CHARGES - The charge for an academic year for meals, for a specified number of meals per week. Three years prior to reset.
Room and Board - Year -1	RoomandBoard_YMinus1	IPEDS: Student Charges	ROOM CHARGES - The charges for an academic year for rooming accommodations for a typical student sharing a room with one other student. BOARD CHARGES - The charge for an academic year for meals, for a specified number of meals per week. One year prior to reset.

Room and Board - Year 0	RoomandBoard_Y0	IPEDS: Student Charges	ROOM CHARGES - The charges for an academic year for rooming accommodations for a typical student sharing a room with one other student. BOARD CHARGES - The charge for an academic year for meals, for a specified number of meals per week. During the first-year with the new tuition and fee amount.
Sticker Price - Year -3	StickerPrice_YMinus3	Calculation	StickerPrice_YMinus3 = TuitionandFees_YMinus3 + RoomandBoard_YMinus3
Sticker Price - Year -1	StickerPrice_YMinus1	Calculation	StickerPrice_YMinus1 = TuitionandFees_YMinus1 + RoomandBoard_YMinus1
Sticker price Year 0	StickerPrice_Y0	Calculation	StickerPrice_Y0 = TuitionandFees_Y0 + RoomandBoard_Y0
Sticker Price Change	StickerPrice_CHG	Calculation	StickerPrice_CHG = StickerPrice_Y0 - StickerPrice_YMinus1
Sticker Price Change by Percent	StickerPrice_CHG_PCT	Calculation	StickerPrice_CHG_PCT = (StickerPrice_Y0 - StickerPrice_YMinus1) / StickerPrice_YMinus1
Applications - Year -3	Apps_YMinus3	IPEDS: Admissions and Test Scores	APPLICANT - An individual who has fulfilled the institution's requirements to be considered for admission (including payment or waiving of the application fee, if any) and who has been notified of one of the following actions: admission, nonadmission, placement on waiting list, or application withdrawn (by applicant or institution). Three years prior to reset.
Applications - Year -1	Apps_YMinus1	IPEDS: Admissions and Test Scores	APPLICANT - An individual who has fulfilled the institution's requirements to be considered for admission (including payment or waiving of the application fee, if any) and who has been notified of one of the following actions: admission, nonadmission, placement on waiting list, or application withdrawn (by applicant or institution). One year prior to the reset.
Applications - Year 0	Apps_Y0	IPEDS: Admissions and Test Scores	APPLICANT - An individual who has fulfilled the institution's requirements to be considered for admission (including payment or waiving of the application fee, if any) and who has been notified of one of the following actions: admission, nonadmission, placement on waiting list, or application withdrawn (by applicant or institution). During the year of the reset.
Applications Trend	App_Trend	Calculation	App_Trend = (Apps_YMinus1 - Apps_YMinus3) / Apps_YMinus3
Applications Change	App_CHG	Calculation	App_CHG = Apps_Y0 - Apps_YMinus1
Applications Change by Percent	App_CHG_PCT	Calculation	App_CHG_PCT = (Apps_Y0 - Apps_YMinus1) / Apps_YMinus1
Admits - Year -3	Admits_YMinus3	IPEDS: Admissions and Test Scores	ADMISSIONS - Applicants that have been granted an official offer to enroll in a college or university. Three years prior to the reset.
Admits - Year -1	Admits_YMinus1	IPEDS: Admissions and Test Scores	ADMISSIONS - Applicants that have been granted an official offer to enroll in a college or university. One year prior to the reset.
Admits Year 0	Admits_Y0	IPEDS: Admissions and Test Scores	ADMISSIONS - Applicants that have been granted an official offer to enroll in a college or university. During the first-year of the reset.
Admits Trend	Admit_Trend	Calculation	Admits_Trend = (Admits_YMinus1 - Admits_YMinus3) / Admits_YMinus3
Admit Rate Change	AdmitRate_CHG	Calculation	Admits_CHG = Admits_Y0 - Admits_YMinus1

Enrolled - Year -3	Enrolled_YMinus3	IPEDS: Admissions and Test Scores	The number of first-time, degree/certificate-seeking undergraduate students who applied, were admitted, and enrolled (full or part time) at an institution for the most recent fall period available. Include early decision, early action, and students who began studies during the summer prior to that fall. Three years prior to a tuition reset.
Enrolled - Year -1	Enrolled_YMinus1	IPEDS: Admissions and Test Scores	The number of first-time, degree/certificate-seeking undergraduate students who applied, were admitted, and enrolled (full or part time) at an institution for the most recent fall period available. Include early decision, early action, and students who began studies during the summer prior to that fall. One year prior to a tuition reset.
Enrolled - Year 0	Enrolled_Y0	IPEDS: Admissions and Test Scores	The number of first-time, degree/certificate-seeking undergraduate students who applied, were admitted, and enrolled (full or part time) at an institution for the most recent fall period available. Include early decision, early action, and students who began studies during the summer prior to that fall. During the year of a tuition reset.
Enrolled Trend	Enrolled_Trend	Calculation	Enrolled_Trend = (Enrolled_YMinus1 - Enrolled_YMinus3) / Enrolled_YMinus3
Enrolled Change	Enrolled_CHG	Calculation	Enrolled_CHG = Enrolled_Y0 - Enrolled_YMinus1
Enrolled Change by percent	Enrolled_CHG_PCT	Calculation	Enrolled_CHG_PCT = (Enrolled_Y0 - Enrolled_YMinus1) / Enrolled_YMinus1
Yield Rate Change	Yield_CHG	Calculation	Yield_CHG = ((Enrolled_Y0 / Admits_Y0) - (Enrolled_YMinus1/Admits_YMinus1))
Reset Success by Enrollment	Reset_Success_Enrollment	Calculation	If Enrolled_Y0>=(Enrolled_YMinus1*1.05) Then Reset_Success_Enrollment=1, Else Reset_Success_Enrollment=0
Sticker Price Elasticity of Demand	PED_Sticker	Calculation	PED_Sticker = ((Enrolled_YMinus3 - Enrolled_YMinus1) / Enrolled_YMinus3) / ((StickerPrice_YMinus3 - StickerPrice_YMinus1)/ StickerPrice_Yminus3)
Net Price Elasticity of Demand	PED_Net	Calculation	PED_Net = ((Enrolled_YMinus3 - Enrolled_YMinus1) / Enrolled_YMinus3) / ((NetPrice_YMinus3 - NetPrice_YMinus1)/ NetPrice_Yminus3)
Net First-Year Revenue Change	Net_FY_TFRevenue_CHG	Calculation	Net_FY_TFRevenue_CHG = (AvgNetPrice_Y0 * Enrolled_Y0) -(AvgNetPrice_YMinus1 * Enrolled_YMinus1)
Net first-year Revenue Change by Percent	Net_FY_TFRevenue_CHG_PCT	Calculation	Net_Revenue_CHG_PCT = Net_FY_TFRevenue_CHG / (AvgNetPrice_YMinus1 * Enrolled_YMinus1)
Reset Success by First-Year Net Revenue	Reset_Success_FYNetRevenue	Calculation	If FYNetRevenue_Y0>=(FYNetRevenue_YMinus1*1.05) Then Reset_Success_FYNetRevenue=1, Else Reset_Success_FYNetRevenue=0

Number of First-Year Enrolled Receiving Institutional Grant Aid - Year -3	NumFYRecvIG_Yminus3	IPEDS: Student Financial Aid and Net Price	Number of full-time, first-time degree/certificate-seeking undergraduate students who were awarded institutional grants (scholarships/fellowships). Institutional grants - Scholarships and fellowships granted and funded by the institution and/or individual departments within the institution, (i.e., instruction, research, public service) that may contribute indirectly to the enhancement of these programs. Includes scholarships targeted to certain individuals (e.g., based on state of residence, major field of study, athletic team participation) for which the institution designates the recipient. Three years prior to a tuition reset.
Average first-year Institutional Grant Aid Amount - Year -3	AvgFYIGAid_YMinus3	IPEDS: Student Financial Aid and Net Price	Average amount of institutional grants (scholarships/fellowships) awarded to full-time, first-time degree/certificate-seeking undergraduate students. Three years prior to a tuition reset.
Number of First-Year Enrolled Receiving Institutional Grant Aid - Year -1	NumFYRecvIG_Yminus1	IPEDS: Student Financial Aid and Net Price	Number of full-time, first-time degree/certificate-seeking undergraduate students who were awarded institutional grants (scholarships/fellowships). Institutional grants - Scholarships and fellowships granted and funded by the institution and/or individual departments within the institution, (i.e., instruction, research, public service) that may contribute indirectly to the enhancement of these programs. Includes scholarships targeted to certain individuals (e.g., based on state of residence, major field of study, athletic team participation) for which the institution designates the recipient. One year prior to a tuition reset.
Average first-year Institutional Grant Aid Amount - Year -1	AvgFYIGAid_YMinus1	IPEDS: Student Financial Aid and Net Price	Average amount of institutional grants (scholarships/fellowships) awarded to full-time, first-time degree/certificate-seeking undergraduate students. One year prior to a tuition reset.
Number of First-Year Enrolled Receiving Institutional Grant Aid - Year 0	NumFYRecvIG_Y0	IPEDS: Student Financial Aid and Net Price	Number of full-time, first-time degree/certificate-seeking undergraduate students who were awarded institutional grants (scholarships/fellowships). Institutional grants - Scholarships and fellowships granted and funded by the institution and/or individual departments within the institution, (i.e., instruction, research, public service) that may contribute indirectly to the enhancement of these programs. Includes scholarships targeted to certain individuals (e.g., based on state of residence, major field of study, athletic team participation) for which the institution designates the recipient. During the year of the tuition reset.
Average first-year Institutional Grant Aid Amount - Year 0	AvgFYIGAid_Y0	IPEDS: Student Financial Aid and Net Price	Average amount of institutional grants (scholarships/fellowships) awarded to full-time, first-time degree/certificate-seeking undergraduate students. During the year of a tuition reset.
Average Net Price - Year -3	AvgNetPrice_YMinus3	Calculation	AvgNetPrice_YMinus3 = ((TuitionandFees_YMinus3 + RoomandBoard_Minus3) * Enrolled_YMinus3) - (AvgFYIGAid_YMinus3 * NumFYRecIG_YMinus3)

Average Net Price - Year -1	AvgNetPrice_YMinus1	Calculation	AvgNetPrice_YMinus1 = ((TuitionandFees_YMinus1 + RoomandBoard_Minus1) * Enrolled_YMinus1) - (AvgFYIGAid_YMinus1 * NumFYRecIG_YMinus1)
Average Net Price - Year 0	AvgNetPrice_Y0	Calculation	AvgNetPrice_Y0 = ((TuitionandFees_Y0 + RoomandBoard_Minus3) * Enrolled_Y0) - (AvgFYIGAid_Y0 * NumFYRecIG_Y0)
NACUBO Discount Rate - Year -3	DiscountRate_YMinus3	Calculation	DiscountRate_YMinus3 = (NumFYRecvIG_YMinus3 * AvgFYIGAid_Minus3) / (Enrolled_Minus3 * TuitionandFees_Minus3)
NACUBO Discount Rate - Year -1	DiscountRate_Prior	Calculation	DiscountRate_Prior = (NumFYRecvIG_YMinus1 * AvgFYIGAid_Minus1) / (Enrolled_Minus1 * TuitionandFees_Minus1)
NACUBO Discount Rate - Year 0	DiscountRate_Y0	Calculation	DiscountRate_Y0 = (NumFYRecvIG_Y0 * AvgFYIGAid_Y0) / (Enrolled_Y0 * TuitionandFees_Y0)
NACUBO Discount Rate Trend	DiscountRate_Trend_2YRPrior	Calculation	DiscountRate_Trend_2YRPrior = (DiscountRate_Prior - DiscountRate_YMinus3) / DiscountRate_YMinus3
NACUBO Discount Rate Change	NACUBO_DiscountRate_CHG	Calculation	NACUBO_DiscountRate_CHG = DiscountRate_Y0 - DiscountRate_YMinus3
NACUBO Discount Rate Decrease	NACUBO_DR_DECREASE	Calculation	If NACUBO_DiscountRate_CHG <0, NACUBO_DR_DECREASE = 1, Else NACUBO_DR_DECREASE = 0
Percent Pell_ Year -1	PercentPell_YearPrior	IPEDS	Percentage of full-time, first-time degree/certificate-seeking undergraduate students who were awarded Pell grants. The Pell Grant program (Higher Education Act of 1965, Title IV, Part A, Subpart I, as amended.) provides grant assistance to eligible undergraduate postsecondary students with demonstrated financial need to help meet education expenses. One year prior to tuition reset.
Percent Pell Change	PercentPell_CHG	Calculation	PercentPell_CHG = PercentPell_Y0 - PercentPell_YearPrior
Percent Pell-Year 0	PercentPell_Y0	IPEDS	Percentage of full-time, first-time degree/certificate-seeking undergraduate students who were awarded Pell grants. The Pell Grant program (Higher Education Act of 1965, Title IV, Part A, Subpart I, as amended.) provides grant assistance to eligible undergraduate postsecondary students with demonstrated financial need to help meet education expenses. During the year of a tuition reset.
Percent Pell - Year 1	PercentPell_Y1	IPEDS	Percentage of full-time, first-time degree/certificate-seeking undergraduate students who were awarded Pell grants. The Pell Grant program (Higher Education Act of 1965, Title IV, Part A, Subpart I, as amended.) provides grant assistance to eligible undergraduate postsecondary students with demonstrated financial need to help meet education expenses. One year following a tuition reset.

Percent Pell - Year 2	PercentPell_Y2	IPEDS	Percentage of full-time, first-time degree/certificate-seeking undergraduate students who were awarded Pell grants. The Pell Grant program (Higher Education Act of 1965, Title IV, Part A, Subpart I, as amended.) provides grant assistance to eligible undergraduate postsecondary students with demonstrated financial need to help meet education expenses. Two years following a tuition reset.
Percent Pell - Year 3	PercentPell_Y3	IPEDS	Percentage of full-time, first-time degree/certificate-seeking undergraduate students who were awarded Pell grants. The Pell Grant program (Higher Education Act of 1965, Title IV, Part A, Subpart I, as amended.) provides grant assistance to eligible undergraduate postsecondary students with demonstrated financial need to help meet education expenses. Three years following a tuition reset.
Retention Rate - Year -1	Retention_YMinus3	IPEDS	The full-time retention rate is the percent of the (fall full-time cohort from the prior year minus exclusions from the fall full-time cohort) that re-enrolled at the institution as either full- or part-time in the current year. One year prior to the tuition reset.
Retention Rate - Year 0	Retention_YMinus1	IPEDS	The full-time retention rate is the percent of the (fall full-time cohort from the prior year minus exclusions from the fall full-time cohort) that re-enrolled at the institution as either full- or part-time in the current year. During the year of a tuition reset.
Retention Rate Change	Retention_CHG	Calculation	Retention_CHG = Retention_Y0 - Retention_YMinus1
Debt related to Property Plant and Equipment - Year -1	Debt_Property_Plant_Equipment_YearPrior	Form 990	
Property Plant and Equipment net of accumulated depreciation - Year -1	PropertyPlantEqpmntNetAccumltd_Depr_YearPrior	Form 990	
Permanently restricted net assets included in total restricted net assets - Year -1	PermRestNetAsstsIncldInTotalRestNetAssets_YearPrior	Form 990	
Temporarily restricted net assets - Year -1	TempRestNetAssets_YearPrior	Form 990	
Total unrestricted net assets - Year -1	TotalUnrestNetAssets_YearPrior	Form 990	
Total net assets - Year -1	TotalNetAssets_YearPrior	Form 990	
Total expenses - Year -1	TotalExpns_YearPrior	Form 990	
Total Revenue - Year -1	TotalRevenue_YearPrior	Form 990	
Debt related to Property Plant and Equipment - Year -2	Debt_Property_Plant_Equipment_YMinus2	Form 990	

Property Plant and Equipment net of accumulated depreciation - Year -2	PropertyPlantEqpmntNetAccumltd_Depr_YMinus2	Form 990	
Permanently restricted net assets included in total restricted net assets - Year -2	PermRestNetAsstsIncldInTotalRestNetAssets_YMinus2	Form 990	
Temporarily restricted net assets - Year -2	TempRestNetAssets_YMinus2	Form 990	
Total unrestricted net assets - Year -2	TotalUnrestNetAssets_YMinus2	Form 990	
Total net assets - Year -2	TotalNetAssets_YMinus2	Form 990	
Total expenses - Year -2	TotalExpns_YMinus2	Form 990	
Total Revenue - Year -2	TotalRevenue_YMinus2	Form 990	
Advertising and Promotion Spend - Year -2	AdvertsingPromotionSpend_YMinus2	Form 990	
Advertising and Promotion Spend - Year -1	AdvertsingPromotionSpendYearPrior	Form 990	
Change in Advertising and Promotion Spend	AdvertsingPromotion_CHG	Calculation	AdvertsingPromotion_CHG = AdvertsingPromotionSpendYearPrior - AdvertsingPromotionSpend_YMinus2
Change in Advertising and Promotion Spend by Percentage	AdvertsingPromotion_CHG_PCT	Calculation	AdvertsingPromotion_CHG_PCT = (AdvertsingPromotionSpendYearPrior - AdvertsingPromotionSpend_YMinus2) / AdvertsingPromotionSpend_YMinus2

Equity Ratio - Year -1	Equity_Ratio_YearPrior	IPEDS	Equity ratio for public and private-not-for profit institutions using FASB standards is derived as follows: Total net assets (F2A06) divided by total assets (F2A02) One year prior to the tuition reset. Net assets are the excess of assets over liabilities or the residual interest in the institution's assets remaining after liabilities are deducted. The change in net assets results from revenues, gains, expenses, and losses. FASB institutions classify net assets into three categories: permanently restricted, temporarily restricted, and unrestricted. GASB institutions classify net assets into three categories: invested in capital, net of related debt; restricted (with separate displays of restricted-expendable and restricted-nonexpendable net assets); and unrestricted. Although the terms are similar, the composition of the categories of net assets between FASB and GASB institutions can differ significantly. Total assets include a) Cash, cash equivalents, and temporary investments; b) Receivables (net of allowance for uncollectible amounts); c) Inventories, prepaid expenses, and deferred charges; d) Amounts held by trustees for construction and debt service; e) Long-term investments; f) Plant, property, and equipment; and, g) Other assets
Endowment per FTE Student - Year -1	EndowmentperFTE_YearPrior	IPEDS	Endowment assets (year-end) per FTE enrollment for public and private not-for-profit institutions using FASB standards is derived as follows: Endowment assets (year-end) (F2H02) divided by 12-month FTE enrollment (FTE12MN). One year prior to the tuition reset. Endowment assets are gross investments of endowment funds, term endowment funds, and funds functioning as endowment for the institution and any of its foundations and other affiliated organizations. Endowment funds are funds whose principal is nonexpendable (true endowment) and that are intended to be invested to provide earnings for institutional use. Term endowment funds are funds which the donor has stipulated that the principal may be expended after a stated period or on the occurrence of a certain event. Funds functioning as endowment (quasi-endowment funds) are established by the governing board to function like an endowment fund but which may be totally expended at any time at the discretion of the governing board. These funds represent nonmandatory transfers from the current fund rather than a direct addition to the endowment fund, as occurs for the true endowment categories. The full-time-equivalent (FTE) enrollment used is the sum of the institutions' FTE undergraduate enrollment and FTE graduate enrollment (as calculated from or reported on the 12-month Enrollment component) plus the estimated FTE of first-professional students. Undergraduate and graduate FTE are estimated using 12-month instructional activity (credit and/or contact hours).

Operating Reserve Ratio - Year -1	Operating_Reserve_Ratio_YearPrior	Calculation (CFI)	Operating_Reserve_Ratio_YearPrior = (TotalUnrestNetAssets_YearPrior+TempRestNet Assets - (PropertyPLantEqpmntNetAccumltd_Depr_YearPrior - Debt_Property_Plant_Equipment_Year_Prior))/TotExpns_YearPrior
Viability Ratio - Year -1	ViabilityRatio_YearPrior	Calculation (CFI)	Viability_Ratio_YearPrior = (TotalUnrestNetAssets_YearPrior+TempRestNet Assets - (PropertyPLantEqpmntNetAccumltd_Depr_YearPrior - Debt_Property_Plant_Equipment_Year_Prior))/Debt_Property_Plant_Equipment_Year_Prior
Change in Net Assets - Year -1	Change_in_Net_Assets_Ratio_YearPrior	Calculation (CFI)	Change_in_Net_Assets_Ratio_YearPrior = (TotalNetAssets_YearPrior - TotalNetAssets_YMinus2) / TotalNetAssets_YMinus2
Operating Margin Ratio - Year -1	Operating_Margin_Ratio_YearPrior	Calculation (CFI)	Operating_Margin_Ratio_YearPrior = (TotalUnrestNetAssets_YearPrior - TotalUnrestNetAssets_YMinus2) / (TotalRevenue_YearPrior - ((PermRestNetAsstsIncldInTotalRestNetAssets_YearPrior - PermRestNetAsstsIncldInTotalRestNetAssets_YMinus2) + (TempRestNetAssets_YearPrior - TempRestNetAssets_YMinus2))
CFI Score - Year -1	FIT_SCORE_CFI_YearPrior	Calculation (CFI)	FIT_SCORE_CFI_YearPrior = (Operating_Reserve_Ratio_YearPrior X .35) + (ViabilityRatio_YearPrior X .35) + (Change_in_Net_Assets_Ratio_YearPrior X .20) + (Operating_Reserve_Ratio_YearPrior X .10)
CFI Score Minus Debt - Year -1	FIT_SCORE_CFI_ModifiedNODEBT_YearPrior	Calculation (CFI)	FIT_SCORE_CFI_ModifiedNODEBT_YearPrior = (Operating_Reserve_Ratio_YearPrior X .55) + (ViabilityRatio_YearPrior X .30) + (Operating_Reserve_Ratio_YearPrior X .15)

Appendix C.

This study makes extensive use of the principle of price elasticity of demand as applied to sticker price elasticity for first-year students (PED_Sticker), sticker price elasticity for transfer students (PED_Sticker_XFR) and net price elasticity of first-year students (PED_Net) as defined in the Definition of Terms and Appendix A. Appendix C provides further explanation for interpretation of price elasticity using the direct result of the price elasticity formula rather than the absolute value of the price elasticity of demand formula which is is standard practice in most economics textbooks.

Price elasticity of demand defined and use of absolute value

Price elasticity of demand (or PED) is a microeconomic principle to quantify the influence of price changes on demand. Alfred C Marshall, credited with defining the concept said (2006), “Elasticity of demand may be defined as the percentage change in quantity demanded to the percentage change in price”. Accordingly, the formula for point price elasticity is as follows (Boyes, 2012; Fischer et al., 1988):

PED = Percent change in quantity demanded / Percent change in price

The value of PED can be understood to refer to the percent change in demand for a 1% increase in price. If a price increases 5% and demand declines 10% as a result, the value for PED is calculated to be -2. Each 1% increase in price results in a 2% reduction in demand. Results from the PED formula are negative for most goods in most industries. Economists refer to price elasticity based on the absolute value of PED, so larger values indicate a greater level of elastic behavior (Boyes, 2012; Fischer et al., 1988; Intelligent Economist, 2019; tutor2u, 2019). As applied to our example, although the results of the

PED equation is actually -2, economists will say the PED is 2. If PED for a different good is -3, economists will say PED is higher at 3 even though the result of the PED equation (-3) is lower than -2.

Ranges of PED linked to strategies to maximize total revenue

Building on this use of absolute value to describe the results of PED, different ranges for PED imply the need for different strategies to maximize total revenue. Table 30 provides explanations of price elasticity of demand from standard economic textbooks and online resources which outline PED ranges with associated strategies to maximize net revenue (Boyes, 2012; Fischer et al., 1988; Intelligent Economist, 2019; tutor2u, 2019):

Table 30
Price elasticity of demand types and strategy implications

Direct results from PED calculation (1)	Absolute value of PED (2)	Type of PED	Price increase will	Price decrease will	Note
$X > 0$	$X < 0$	Veblen good	Increase total revenue	Decrease total revenue	Increased demand with higher prices
0	0	Perfectly inelastic	Increase total revenue	Decrease total revenue	
$0 > X > -1$	$0 < X < 1$	Relatively inelastic	Increase total revenue	Decrease total revenue	Demand decreases less than results of increased prices
-1	1	Unit elastic	No effect	No effect	Net revenue the same, gains from price increase offset by lost volume
$-1 > X > \infty$	$1 < X < \infty$	Relatively elastic	Decrease total revenue	Increase total revenue	Reduction of price increases total revenue, price sensitive
$-\infty$	∞	Perfectly elastic	Eliminate all total revenue	Unlimited total revenue	Theoretical construct of perfect competition

Note: (1) Results from PED Calculation in raw form. (2) Economists typically speak of PED using absolute value.

Confounding the issue of Veblen goods

Veblen goods are special product categories where higher prices signal exclusivity which is itself valuable. These product categories are exceptional in that they have positive results for PED which could be confusing to readers who are familiar with the typical convention of referring to PED as an absolute value of the negative ratio. Restated, if a price increase of 2% results in a 4% increase in enrollment, the raw result of PED is +2 which is a result in the Veblen effect range. Multiple studies suggest higher education pricing can reflect Veblen effects (Lambert, 1999; McConnell et al., 2018).

Conventions in this study

This study will use the direct results of the PED formula when providing results from Sticker price elasticity and net price elasticity. While acknowledging this is a break from convention commonly used in economics, it will allow for clearer interpretation of results where ranges of results may contrast populations that respond to price increases in both positive and negative patterns.