

Tuition Pricing Strategies and Racial Graduation Outcomes: Evidence from Houston Universities

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ABSTRACT

Universities increasingly rely on tuition pricing strategies, including tuition discounting and institutional financial aid, to manage enrollment and improve student access to higher education. While these policies are intended to support enrollment stability and educational opportunity, their effects on racial disparities in graduation outcomes remain insufficiently understood. This study examines the relationship between institutional tuition pricing strategies and racial graduation outcomes among major universities in the Houston metropolitan area. Using panel data from the Integrated Postsecondary Education Data System (IPEDS), institutional financial reports, and university-level student outcome measures from 2000 to 2025, the analysis employs fixed-effects and instrumental variable models to estimate the effects of tuition discounting, institutional aid, and net tuition on graduation outcomes for Black and White students. The findings indicate that institutional financial aid and student retention are significant predictors of degree completion, while tuition discounting exhibits stronger positive associations with graduation outcomes for Black students than for White students. The results further suggest that targeted financial aid policies may help reduce racial disparities in college completion. These findings contribute to the literature on higher education finance, educational equity, and institutional policy by demonstrating how tuition pricing strategies influence student persistence and graduation outcomes across racial groups.

Keywords: tuition pricing strategies; tuition discounting; racial graduation gaps; higher education finance; institutional financial aid; student retention; graduation outcomes; Houston universities.

JEL Classification: I22; I23; I24; J15; C23

I. INTRODUCTION

Over the past several decades, the cost of higher education in the United States has increased substantially, intensifying concerns regarding college affordability, student debt burdens, and unequal educational outcomes across demographic groups. In response to growing financial pressures and heightened competition for student enrollment, universities have increasingly adopted sophisticated tuition pricing strategies designed to stabilize institutional revenues while expanding access to higher education. These strategies commonly include tuition discounting, institutional grant aid, merit-based scholarships, and differential tuition pricing across academic programs. Rather than relying solely on published tuition rates, many institutions now adjust the effective price of attendance through institutional financial aid policies targeted toward specific student populations (Dynarski & Scott-Clayton, 2013; Hoxby, 2009).

Tuition discounting has become one of the most significant enrollment management tools in contemporary higher education finance. Universities frequently use institutional aid packages to attract academically competitive students, improve enrollment yields, and maintain tuition revenue in increasingly competitive educational markets. According to the National Association of College and University Business Officers (NACUBO, 2024), tuition discount rates have steadily increased across American higher education institutions over the past two decades. Although much of the public discussion surrounding tuition discounting focuses on private universities, public institutions have also increasingly relied on institutional aid and pricing adjustments to remain competitive in environments characterized by declining state appropriations and changing enrollment patterns.

At the same time, racial disparities in college persistence and degree completion continue to represent a major challenge within the United States higher education system. While access to higher education has expanded considerably, significant differences remain between Black and White students in graduation outcomes, persistence rates, and educational attainment (Bailey & Dynarski, 2011). National statistics consistently demonstrate that Black students experience lower graduation rates than White students across many institutional settings, reflecting broader inequalities in income, household wealth, academic preparation, and access to educational support systems (Deming & Dynarski, 2009). These disparities raise important policy questions regarding whether institutional financial aid policies and tuition pricing strategies can help reduce barriers to persistence and degree completion among historically underserved student populations.

The relationship between tuition pricing strategies and racial graduation outcomes presents an important empirical puzzle. Universities increasingly devote substantial institutional resources toward financial aid and tuition discounting programs intended to improve affordability and educational access. However, despite the expansion of institutional aid programs, racial disparities in college completion persist across many higher education systems. Existing research has extensively examined tuition discounting in relation to enrollment management, institutional revenue optimization, and student demand behavior (Hoxby, 2009; Wekullo, 2022). Similarly, a

large body of literature has analyzed racial inequality in educational attainment and college completion (Bailey & Dynarski, 2011; Tinto, 1993). Comparatively fewer studies, however, directly examine whether institutional tuition pricing strategies influence racial disparities in graduation outcomes within large urban higher education markets. As a result, the extent to which tuition discounting and institutional aid policies affect graduation outcomes differently across racial groups remains insufficiently understood.

The Houston metropolitan area provides an appropriate setting for examining these relationships because it contains a diverse and highly differentiated higher education system. Houston is one of the largest urban education markets in the United States and includes public research universities, private universities, and historically Black institutions operating within the same regional environment. The institutions examined in this study—the University of Houston, Rice University, Texas Southern University, and the University of Houston–Downtown—were selected because they collectively represent substantial variation in institutional mission, tuition structures, selectivity, student demographics, and financial aid strategies. At the same time, these universities compete within the same metropolitan higher education market and serve overlapping regional student populations. This institutional diversity creates a useful empirical setting for evaluating how tuition pricing policies influence graduation outcomes across different racial groups.

This study contributes to the literature in several important ways. First, it extends existing research on higher education finance by examining the relationship between tuition pricing strategies and racial disparities in graduation outcomes rather than focusing solely on enrollment behavior or institutional revenue management. Second, the study incorporates student persistence and retention into the analysis, recognizing that financial aid policies may influence graduation outcomes indirectly through their effects on student continuation and academic integration. Third, the analysis employs panel-data econometric techniques, including fixed-effects and instrumental-variable estimation, to address unobserved institutional heterogeneity and potential endogeneity in tuition pricing decisions. By integrating institutional financial variables with graduation outcomes across racial groups, the study provides a more comprehensive empirical assessment of how institutional pricing strategies shape educational attainment.

The analysis relies on panel data obtained from the Integrated Postsecondary Education Data System (IPEDS), institutional financial reports, and university-level outcome measures covering the period from 2000 through 2025. The empirical models examine whether tuition discounting, institutional grant aid, and net tuition levels influence graduation outcomes differently for Black and White students after controlling for institutional characteristics, student persistence, selectivity, and socioeconomic factors. Particular attention is given to whether institutional financial aid policies contribute to narrowing or reinforcing racial graduation gaps.

The findings of this study have important implications for higher education policy and institutional decision-making. As universities continue to face pressures associated with rising tuition costs, changing enrollment patterns, and demands for greater educational equity, understanding the relationship between institutional pricing

strategies and student outcomes becomes increasingly important. Financial aid policies designed to improve affordability may influence not only enrollment decisions but also long-term persistence and degree completion among historically underserved populations. Consequently, identifying the conditions under which tuition pricing strategies support improved graduation outcomes may help universities develop more effective approaches to promoting educational equity and student success.

Research Questions

Despite the growing use of tuition discounting and institutional financial aid strategies within higher education, racial disparities in graduation outcomes continue to persist across many universities in the United States. Existing research has examined the role of financial aid in shaping enrollment decisions and student persistence; however, comparatively limited empirical attention has been devoted to understanding whether institutional tuition pricing strategies influence graduation outcomes differently across racial groups within urban higher education systems. This issue is particularly important in metropolitan regions such as Houston, where universities serve diverse student populations characterized by substantial variation in socioeconomic background, academic preparation, and financial need.

The present study investigates whether institutional tuition pricing strategies contribute to differences in graduation outcomes between Black and White students across major universities in the Houston metropolitan area. Specifically, the analysis focuses on the effects of tuition discounting, institutional grant aid, and net tuition levels on student persistence and degree completion.

The study is guided by the following research questions:

1. *To what extent do institutional tuition pricing strategies influence overall graduation outcomes within Houston-area universities?*
2. *Do tuition discounting and institutional financial aid policies affect graduation outcomes differently for Black students relative to White students?*
3. *To what extent do institutional financial aid and student retention contribute to reductions in racial graduation disparities?*

Hypotheses

Consistent with the literature on higher education finance and student persistence, the study develops two primary hypotheses.

H1: Higher levels of institutional financial aid and tuition discounting are positively associated with university graduation outcomes. By reducing the effective cost of attendance, institutional pricing strategies may improve student persistence and increase the likelihood of degree completion.

H2: Tuition discounting and institutional financial aid exhibit stronger positive effects on graduation outcomes for Black students than for White students. Because historically underserved student populations are more likely to experience financial constraints, targeted institutional aid policies are expected to contribute to reductions in racial graduation disparities.

These hypotheses provide the empirical foundation for evaluating whether university pricing strategies function not only as enrollment management tools but also as institutional mechanisms that influence educational equity and student success.

II. LITERATURE REVIEW

Tuition Pricing Strategies and Enrollment Management

The financing structure of higher education in the United States has changed considerably over the past several decades as universities respond to declining public appropriations, rising operational costs, demographic shifts, and increased competition for student enrollment. In this environment, institutions increasingly rely on sophisticated tuition pricing strategies to stabilize revenues and shape enrollment patterns. Rather than charging all students a uniform tuition price, universities frequently employ tuition discounting, institutional grants, merit scholarships, and need-based financial aid to adjust the effective cost of attendance for different categories of students (Heller, 2001; Hoxby, 2009).

Tuition discounting has become one of the central mechanisms through which universities manage enrollment and financial sustainability. Tuition discounting refers to the practice of reducing the posted tuition price through institutional aid funded directly by universities. Although originally associated more strongly with private colleges and universities, public institutions have also expanded their use of institutional financial aid in response to reduced state funding and growing market competition (DesJardins & McCall, 2010). NACUBO reports consistently show rising institutional discount rates across higher education institutions in the United States, reflecting the increasing importance of pricing strategies in university financial management (NACUBO, 2024).

Existing research demonstrates that tuition pricing strategies influence both student enrollment decisions and institutional choice. Hossler and Bontrager (2014) argue that enrollment management policies increasingly function as market-based tools through which universities compete for students with varying levels of academic preparation and financial need. Similarly, St. John (2003) finds that financial aid policies significantly influence college access, particularly among students from low-income households. Financial aid reduces immediate financial barriers and may improve students' perceptions of affordability, thereby increasing the likelihood of enrollment and persistence. The literature also suggests that different forms of financial aid produce

different educational outcomes. Need-based aid programs are generally associated with improvements in access and persistence among economically disadvantaged students, whereas merit-based aid programs tend to influence institutional sorting and student recruitment (Dynarski & Scott-Clayton, 2013). Goldrick-Rab (2016) further emphasizes that financial uncertainty and unmet financial need remain important barriers to student success, even among enrolled students. Consequently, institutional aid policies may affect not only whether students enroll in college but also whether they persist through graduation.

Several studies have examined the relationship between tuition pricing and student persistence more directly. DesJardins, Ahlburg, and McCall (2002) find that financial aid can improve student retention by reducing financial stress and improving academic continuity. Similarly, Castleman and Long (2016) show that targeted financial interventions may increase persistence and completion among students facing economic hardship. These findings suggest that tuition pricing strategies operate not merely as enrollment tools but also as mechanisms that shape longer-term educational outcomes. Despite the growing literature on higher education finance, much of the existing research focuses primarily on enrollment demand, institutional revenue management, or overall persistence outcomes. Comparatively fewer studies examine whether tuition pricing strategies influence graduation outcomes differently across racial groups, particularly within urban higher education systems characterized by diverse student populations and substantial institutional heterogeneity.

Racial Disparities in Higher Education Outcomes

Racial disparities in educational attainment remain one of the most persistent challenges in American higher education. Although access to college has expanded significantly over time, substantial differences continue to exist between Black and White students in enrollment patterns, persistence, degree completion, and postsecondary outcomes (Bailey & Dynarski, 2011). These disparities reflect broader structural inequalities related to income, wealth accumulation, educational opportunity, and institutional access. One of the most important explanations for racial disparities in graduation outcomes involves differences in household financial resources. Black students are disproportionately more likely to come from households with lower levels of accumulated wealth and income, limiting their ability to finance college education without substantial financial aid or student borrowing (Brookings Institution, 2022). Financial pressures may increase the likelihood that students reduce course loads, interrupt enrollment, or withdraw from college before completing degree programs. Goldrick-Rab (2016) argues that financial insecurity plays a central role in shaping student persistence and academic success, particularly among historically underserved populations. Academic preparation and institutional context also contribute to racial differences in graduation outcomes. Bound, Lovenheim, and Turner (2010) show that college completion rates are influenced not only by student academic readiness but also by institutional resources and support systems. Black students are more likely to enroll in institutions with fewer financial resources, larger student-to-faculty ratios, and lower

graduation rates, factors that may reduce persistence and completion probabilities (Deming & Dynarski, 2009).

Theories of student persistence emphasize the importance of academic integration, institutional support, and student engagement in shaping graduation outcomes. Tinto's (1993) model of student attrition suggests that students are more likely to persist when they become academically and socially integrated within institutional environments. Financial stress, however, may weaken academic integration by increasing employment demands, reducing campus engagement, and limiting access to support resources. Consequently, financial aid policies may indirectly influence graduation outcomes by improving student persistence and institutional attachment.

Recent scholarship increasingly recognizes that institutional financial aid policies may influence educational equity. Need-based aid programs have been shown to improve persistence and completion outcomes among economically disadvantaged students, including minority populations (Dynarski & Scott-Clayton, 2013). Castleman and Long (2016) further demonstrate that targeted support interventions can improve college completion among students at risk of attrition. Nevertheless, the effectiveness of institutional aid policies may vary considerably across universities depending on differences in institutional resources, selectivity, and student composition. Although a substantial body of literature examines racial disparities in higher education, relatively few studies directly analyze whether tuition pricing strategies contribute to narrowing or reinforcing racial graduation gaps. Existing research often treats financial aid, persistence, and racial inequality as separate issues rather than examining how institutional pricing strategies interact with racial disparities in educational outcomes.

Student Retention and Degree Completion

Student retention has consistently been identified as one of the strongest predictors of degree completion within higher education research. First-year persistence, in particular, plays a critical role in determining whether students ultimately graduate from college (Tinto, 1993). Students who successfully transition into academic and social environments during their initial year are substantially more likely to remain enrolled and complete degree programs. Research on student persistence highlights the importance of institutional support systems, academic advising, mentoring, and financial stability in shaping retention outcomes. Tinto (1993) argues that persistence depends heavily on the degree to which students become integrated into institutional academic and social structures. Similarly, Pascarella and Terenzini (2005) find that institutional engagement and support services contribute significantly to long-term academic success.

Financial aid also plays an important role in shaping retention outcomes. Students experiencing financial stress are more likely to interrupt enrollment, reduce academic participation, or leave college entirely (Goldrick-Rab, 2016). DesJardins et al. (2002) demonstrate that institutional financial aid can improve retention by reducing economic uncertainty and supporting continuous enrollment. Financial aid policies may

therefore influence graduation outcomes indirectly through their effects on student persistence and academic continuity.

Institutional selectivity additionally affects retention and completion outcomes. More selective universities tend to enroll students with stronger academic preparation and greater access to educational resources, contributing to higher persistence and graduation rates (Bound et al., 2010). However, selectivity alone does not fully explain differences in student success. Institutional commitment to student support and financial aid allocation also significantly influence retention outcomes across demographic groups.

The literature on retention and persistence suggests that educational outcomes are shaped by a complex interaction of financial, academic, and institutional factors. Nevertheless, limited empirical research integrates tuition pricing strategies, institutional aid policies, retention outcomes, and racial graduation disparities within a unified econometric framework. This study seeks to address that gap by examining how institutional pricing policies influence graduation outcomes across racial groups while accounting for student persistence and institutional characteristics.

These strategies influence the effective price students face and may affect student persistence and graduation outcomes. To illustrate the mechanisms examined in this study, Figure 1 presents a policy framework linking tuition pricing strategies to educational outcomes and labor market performance. The framework proposes that institutional pricing policies influence financial aid allocation and student affordability. These factors shape student persistence—particularly first-year retention, which subsequently affects graduation outcomes and long-term labor market participation. Prior research suggests that financial aid and institutional support programs can improve student persistence and completion, particularly for students from disadvantaged backgrounds (Dynarski & Scott-Clayton, 2013; Tinto, 1993). In this framework, tuition pricing strategies operate not only as revenue management tools but also as policy instruments that can influence equity and educational attainment.

Figure 2 presents a conceptual model that guides the empirical analysis in this study. The model proposes that tuition pricing strategies affect student affordability and financial access, which in turn influence first-year retention and overall student persistence. Higher persistence rates increase the likelihood of degree completion and may reduce the racial graduation gap between Black and White students. Prior research has demonstrated that financial barriers and institutional support systems significantly influence college persistence and completion outcomes (Bailey & Dynarski, 2011; Deming & Dynarski, 2009). Consistent with this literature, the conceptual model suggests that pricing strategies can indirectly influence graduation disparities by shaping the conditions that determine student persistence.

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Figure 1. Policy Framework Linking Tuition Pricing Strategies to Educational and Labor Market Outcomes

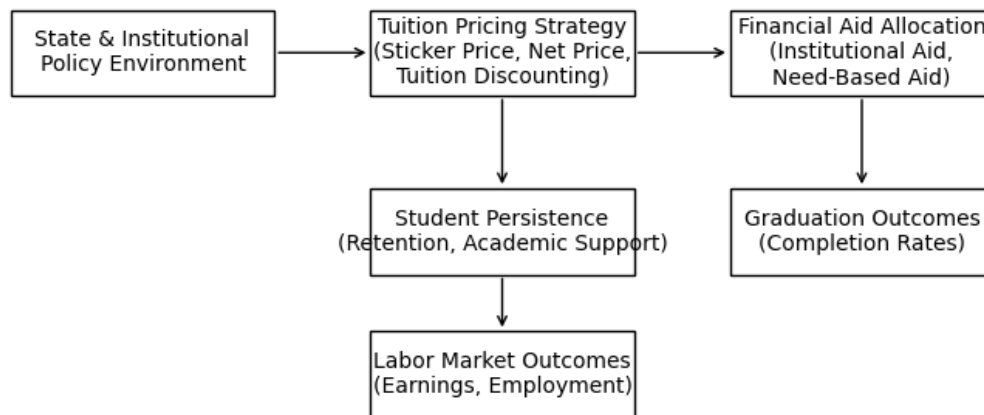
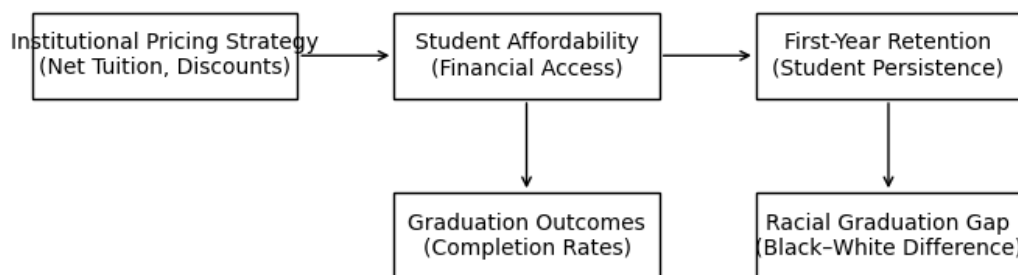


Figure 2. Conceptual Model of Tuition Pricing, Retention, and Racial Graduation Gaps



Research Gap

The existing literature provides substantial evidence regarding the importance of financial aid, institutional support, and student persistence in shaping educational outcomes. However, several important gaps remain. First, much of the tuition pricing literature focuses on enrollment management and institutional revenue optimization rather than racial disparities in degree completion. Second, studies examining racial graduation gaps often emphasize socioeconomic inequality and academic preparation without fully considering the role of institutional pricing strategies. Third, relatively limited research investigates these relationships within large metropolitan higher education systems characterized by substantial institutional diversity. This study addresses these gaps by examining whether tuition pricing strategies influence graduation outcomes differently across racial groups within Houston-area universities. By integrating tuition discounting, institutional financial aid, student retention, and racial graduation outcomes into a panel-data econometric framework, the analysis contributes to a more comprehensive understanding of how institutional financial policies shape educational equity in higher education.

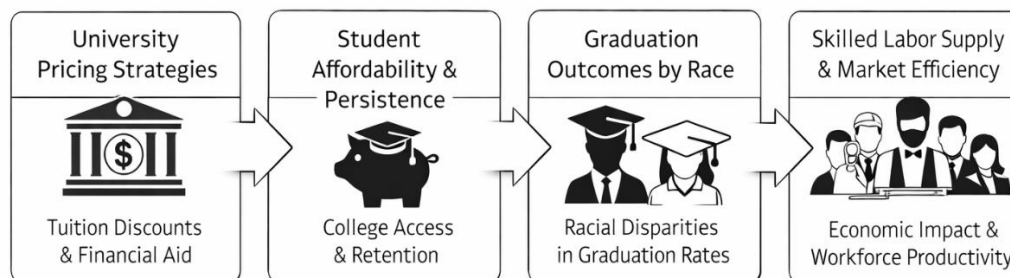
III. METHODOLOGY

Conceptual Framework

This study examines the relationship between institutional tuition pricing strategies and racial disparities in graduation outcomes within universities located in the Houston metropolitan area. The conceptual framework integrates insights from higher education finance literature and theories of student persistence to explain how institutional financial policies may influence degree completion across racial groups. Universities increasingly use tuition discounting and institutional financial aid to reduce the effective cost of attendance and improve enrollment stability. These pricing strategies may influence student outcomes by affecting affordability, financial stress, academic continuity, and persistence. Students facing lower financial burdens are generally more likely to remain enrolled and complete degree programs, whereas students experiencing greater economic constraints may face interruptions in enrollment or increased risk of attrition (Dynarski & Scott-Clayton, 2013; Goldrick-Rab, 2016).

The framework proposed in this study suggests that institutional pricing strategies influence graduation outcomes both directly and indirectly through student persistence. Institutional financial aid and tuition discounting may improve first-year retention by reducing financial barriers and strengthening students' ability to remain academically engaged. Improved persistence subsequently increases the likelihood of degree completion. Because financial constraints disproportionately affect historically underserved student populations, the effects of institutional aid policies may differ across racial groups. Figure 3 presents the conceptual relationship examined in the study. Universities determine tuition pricing and institutional financial aid policies, which influence student affordability and persistence. Student persistence, particularly first-year retention, contributes to graduation outcomes for Black and White students. Institutional characteristics such as selectivity and resource availability may further shape these relationships. The framework therefore positions tuition pricing strategies not only as enrollment management tools but also as institutional mechanisms that may influence educational equity and graduation disparities.

Figure 3. Conceptual Framework Linking University Tuition Pricing Strategies, Graduation Outcomes, and Skilled Labor Supply



The conceptual relationship examined in this study can therefore be summarized as a sequential process. First, universities determine tuition pricing policies and financial aid allocations. Second, these pricing strategies influence students' enrollment decisions, persistence, and eventual graduation outcomes. Third, graduation outcomes contribute to the regional economy's supply of skilled labor, as shown in Figure 3. Differences in graduation outcomes across racial groups may therefore influence the composition and efficiency of the labor market. This framework suggests that institutional pricing policies may have both educational and economic consequences. By reducing financial barriers to college completion, tuition discounting and financial aid may increase graduation rates and expand the pool of skilled workers entering the labor force.

Variable Description

The empirical analysis uses panel data constructed from four universities located within the Houston metropolitan area: University of Houston, Rice University, Texas Southern University, and the University of Houston–Downtown. These institutions were selected because they represent substantial variation in institutional mission, tuition structures, selectivity, and student demographics while operating within the same regional higher education market. The study period covers the years 2000 through 2025. The unit of analysis is the institution-year observation. Institutional financial and student outcome data were obtained primarily from the Integrated Postsecondary Education Data System (IPEDS), supplemented by publicly available university financial reports and institutional accountability documents.

The dependent variables used in the analysis capture institutional graduation outcomes across racial groups. Specifically, the study examines overall graduation rates, Black student graduation rates, White student graduation rates, and the Black–White graduation gap. Graduation outcomes are measured using the Integrated Postsecondary Education Data System (IPEDS) cohort completion methodology, which tracks first-time, full-time degree-seeking students over the standard completion period. The primary explanatory variables represent institutional tuition pricing strategies and financial aid policies. These variables include net tuition, tuition discount rates, and institutional financial aid per student. The tuition discount rate measures the percentage difference between published tuition and the effective tuition paid after institutional financial aid has been applied. These variables collectively capture the financial mechanisms through which universities influence college affordability and student access.

To account for additional institutional and student characteristics that may influence graduation outcomes, several control variables are incorporated into the empirical models. These controls include first-year retention rates, institutional acceptance rates, family income measures, and indicators of institutional selectivity. The models also include measures of student academic preparation, such as SAT scores and high school grade point averages where available. Together, these variables help isolate the relationship between tuition pricing strategies and graduation outcomes while controlling for differences in student background and institutional characteristics.

First-year retention rate is operationalized as the percentage of first-time undergraduate students who return to the same institution for their second academic year. Prior research identifies first-year retention as one of the strongest predictors of long-term degree completion (Tinto, 1993).

Data

The empirical analysis relies on a panel dataset constructed from institutional and student-level data from major universities in the Houston metropolitan region. The sample includes four prominent institutions that collectively represent a diverse higher-education landscape within Texas: University of Houston, Rice University, Texas Southern University, and the University of Houston–Downtown. These institutions vary in terms of institutional mission, selectivity, financial resources, and student demographics, making them suitable for examining how tuition pricing strategies influence graduation outcomes across different populations. Multiple data sources were integrated to construct the panel dataset. Institutional financial and enrollment data were obtained from the Integrated Postsecondary Education Data System (IPEDS), which provides comprehensive information on university finances, student demographics, and graduation outcomes across U.S. higher education institutions. Additional financial indicators were collected from publicly available institutional financial reports and university budget documents.

The primary explanatory variables represent institutional tuition pricing strategies. These include the tuition discount rate, which measures the share of tuition revenue returned to students through institutional financial aid; net tuition revenue, which reflects the effective price of education after discounts are applied; and institutional grant aid per student. Together, these variables capture the financial mechanisms through which universities influence college affordability and student persistence. To isolate the effect of pricing strategies on graduation outcomes, several control variables are included in the analysis. These controls account for student and institutional characteristics that may influence academic performance and degree completion. Specifically, the model includes indicators of family income, standardized test scores (e.g., SAT performance), high school grade point average, and institutional selectivity. These variables capture differences in student academic preparation and institutional quality that may affect graduation probabilities.

Descriptive Statistics

Table 1A presents descriptive statistics for the principal variables used in the analysis. The results indicate substantial variation across institutions and over time in tuition pricing, institutional aid, retention outcomes, and graduation rates. The average overall graduation rate across institutions is approximately 56.8 percent, while the mean graduation rates for Black and White students are 49.3 percent and 63.6 percent, respectively. These values indicate an average Black–White graduation gap of approximately 14 percentage points during the study period. The observed difference in completion outcomes is consistent with prior research documenting persistent racial disparities in higher education attainment (Bailey & Dynarski, 2011). The tuition

variables also exhibit considerable variation. Average net tuition exceeds \$13,800, while average sticker tuition approaches \$21,000. Tuition discount rates average approximately 31 percent, indicating that universities rely extensively on institutional aid to reduce the effective price paid by students. Institutional aid per student averages more than \$6,200 across the sample institutions. Student persistence measures reveal relatively strong first-year retention outcomes, with an average retention rate of approximately 79 percent. However, the variation in retention rates across institutions suggests meaningful differences in student persistence environments and institutional support systems.

Table 1A. Descriptive Statistics of Major Variables 2000–2025

Variable	Mean	Std. Dev.	Min	Max
Overall Graduation Rate (%)	56.84	9.72	34.10	84.50
Black Graduation Rate (%)	49.32	10.81	27.40	77.10
White Graduation Rate (%)	63.58	8.90	41.20	88.30
Racial Graduation Gap (%)	14.26	6.42	3.10	28.40
Net Tuition (\$)	13,842	4,214	6,210	28,430
Sticker Tuition (\$)	20,973	6,875	9,420	48,350
Tuition Discount Rate (%)	31.45	11.73	10.20	54.80
Institutional Aid per Student (\$)	6,251	2,410	1,420	12,870
Acceptance Rate (%)	62.73	13.56	29.10	88.40
First-Year Retention Rate (%)	78.91	6.28	64.30	91.20
Median Earnings after Graduation (\$)	48,120	7,514	31,420	68,700

The descriptive statistics reveal notable differences across institutions and time. On average, White students graduate at substantially higher rates than Black students, producing a racial graduation gap of roughly fourteen percentage points. Tuition levels vary considerably across institutions, with net tuition ranging from approximately \$6,200 to more than \$28,000. The variation in tuition discount rates indicates that institutions frequently rely on financial aid strategies to adjust the effective prices they charge students. While Table 1B presents Difference-in-Mean Test.

Table 1B. Difference-in-Means Test

Variable	Black	White	Difference	t-stat
Graduation Rate	49.32	63.58	-14.26	-4.88***

An independent-samples t-test confirms that the mean difference between Black and White graduation rates is statistically significant at the 1 percent level ($t = -4.88$, $p < 0.01$), providing formal evidence of a persistent graduation gap across institutions.

Econometric Specification

To estimate the relationship between tuition pricing strategies and graduation outcomes, the study employs a panel fixed-effects model. Fixed-effects estimation is appropriate because it controls for unobserved institutional characteristics that remain constant over time, such as institutional culture, governance structures, and long-standing academic reputation (Wooldridge, 2010). The baseline model is specified as follows:

$$Grad_{irt} = \alpha + \beta_1 Tuition_{it} + \beta_2 Discount_{it} + \beta_3 Aid_{it} + \beta_4 Retention_{it} + \beta_5 Acceptance_{it} + \mu_i + \lambda_t + \epsilon_{irt} \quad (1)$$

Where, $Grad_{irt}$ is the graduation outcome for racial group r at institution i in year t , $Tuition_{it}$ is the net tuition at institution i in year t , $Discount_{it}$ is the tuition discount rate at institution i in year t , Aid_{it} is the institutional aid per student at institution i in year t , $Retention_{it}$ is the first-year retention rate at institution i in year t , $Acceptance_{it}$ is the acceptance rate at institution i in year t , μ_i is the institution fixed effects, λ_t is the year fixed effects, and ϵ_{irt} is the stochastic error terms.

$$Grad_{irt} = \alpha + \beta_1 Tuition_{it} + \beta_2 Discount_{it} + \beta_3 Aid_{it} + \beta_4 Retention_{it} + \beta_5 Acceptance_{it} + \beta_6 Income_{it} + \beta_7 SAT_{it} + \mu_i + \lambda_t + \epsilon_{irt} \quad (1)$$

Racial Interaction Model

To examine whether tuition pricing strategies affect Black and White students differently, the study estimates an interaction model incorporating race-specific effects.

$$Grad_{it} = \alpha + \beta_1 Discount_{it} + \beta_2 Black_i + \beta_3 (Discount_{it} \times Black_i) + \gamma X_{it} + \mu_i + \lambda_t + \epsilon_{it} \quad (2)$$

where $Black_i$ is a racial-group indicator variable and X_{it} represents the vector of institutional control variables. The interaction coefficient β_3 measures whether tuition discounting produces differential effects on graduation outcomes for Black students relative to White students.

Persistence Model

Because prior research suggests that persistence strongly influences degree completion, the analysis also estimates a persistence specification linking retention outcomes to institutional pricing strategies.

$$Retention_{it} = \alpha + \delta_1 Tuition_{it} + \delta_2 Discount_{it} + \delta_3 Aid_{it} + \delta_4 Selectivity_{it} + v_{it} \quad (3)$$

This specification evaluates whether institutional financial aid and pricing policies influence graduation outcomes indirectly through their effects on student retention.

Instrumental Variable Model

A potential econometric concern is that institutional pricing strategies may be endogenous. Universities may adjust financial aid policies in response to anticipated enrollment patterns or expected graduation outcomes, potentially biasing coefficient estimates. To address this issue, the study employs an instrumental-variable (IV)

approach using changes in state appropriations and lagged institutional endowment returns as instruments for tuition discounting. These variables affect universities' financial capacity to provide institutional aid but are unlikely to influence graduation outcomes directly except through institutional pricing strategies.

The first-stage equation is specified as:

$$Discount_{it} = \pi_0 + \pi_1 StateFunding_{it} + \pi_2 Endowment_{i,t-1} + \eta_{it} \quad (4)$$

The predicted values from the first-stage estimation are then incorporated into the second-stage graduation equation:

$$Grad_{it} = \alpha + \beta_1 \widehat{Discount}_{it} + \gamma X_{it} + \mu_i + \lambda_t + \epsilon_{it} \quad (5)$$

This approach helps reduce potential endogeneity bias and improves identification of the relationship between tuition pricing strategies and graduation outcomes. The empirical analysis proceeds in several stages. First, descriptive statistics summarize the distribution and variation of the major variables across institutions and over time. Second, correlation analysis evaluates pairwise relationships among tuition pricing variables, retention outcomes, and graduation measures. Third, fixed-effects regression models estimate the relationship between institutional pricing strategies and graduation outcomes while controlling for institutional heterogeneity and year-specific shocks.

Additional specifications examine racial heterogeneity in the effects of tuition discounting and institutional aid policies. Robust standard errors are employed throughout the analysis to address potential heteroskedasticity. Robustness checks include alternative model specifications, lagged regression models, and multicollinearity diagnostics to evaluate the stability of the empirical findings. By integrating institutional pricing variables, retention outcomes, and racial graduation measures within a unified panel-data framework, the methodology provides a systematic approach for evaluating how university financial strategies influence educational equity and student success.

IV. RESULTS

This section presents the empirical findings examining the relationship between institutional tuition pricing strategies and racial disparities in graduation outcomes among universities in the Houston metropolitan area during the period 2000–2025. The analysis proceeds in several stages. First, descriptive statistics summarize the major characteristics of the dataset. Second, correlation analysis evaluates pairwise relationships among tuition pricing variables, retention outcomes, and graduation measures. Third, fixed-effects regression models estimate the relationship between institutional pricing strategies and graduation outcomes while controlling for institutional characteristics and student persistence. Additional specifications examine racial heterogeneity and the determinants of the Black–White graduation gap. Finally, robustness checks evaluate the stability of the estimated relationships across alternative model specifications. The results are organized to highlight three key empirical questions:

1. Whether institutional pricing strategies influence overall graduation outcomes.
2. Whether these strategies affect Black and White students differently.
3. Whether tuition pricing contributes to the observed racial graduation gap.

The correlation matrix suggests several noteworthy patterns. Graduation rates are strongly associated with first-year retention rates, indicating that early student persistence is a central determinant of degree completion. Acceptance rates exhibit a negative correlation with graduation outcomes, suggesting that more selective institutions achieve higher completion rates. Tuition variables show moderate positive associations with graduation outcomes, which may reflect institutional resource advantages or the ability of higher-priced institutions to provide additional student support services. The correlation matrix provides preliminary evidence regarding the relationships among tuition pricing strategies, institutional characteristics, and graduation outcomes. Table 2 presents the correlation matrix for the principal variables included in the analysis. The correlations provide preliminary evidence regarding the relationships among tuition pricing strategies, institutional characteristics, retention outcomes, and graduation rates.

Table 2. Correlation Matrix of Key Variables

Variable	Grad Rate	Black Grad	White Grad	Net Tuition	Discount Aid	Retention	Acceptance	
Overall Graduation Rate	1.000							
Black Graduation Rate	0.941	1.000						
White Graduation Rate	0.963	0.884	1.000					
Net Tuition	0.221	0.215	0.208	1.000				
Tuition Discount Rate	0.142	0.181	0.133	-0.611	1.000			
Institutional Aid	0.198	0.231	0.187	0.402	0.633	1.000		
Retention Rate	0.731	0.714	0.698	0.334	0.215	0.298	1.000	
Acceptance Rate	-0.552	-0.487	-0.536	-0.281	0.114	-0.207	-0.421	1.000

The strongest correlation observed in Table 2 is between retention rates and overall graduation outcomes ($r = 0.731$), indicating that first-year student persistence is closely associated with long-term degree completion. Similar relationships are observed for both Black and White graduation rates. These findings are consistent with student persistence theory, which emphasizes the importance of early academic integration in shaping graduation outcomes (Tinto, 1993). Acceptance rates exhibit negative correlations with graduation outcomes, suggesting that institutions with greater selectivity tend to achieve higher completion rates. Net tuition levels show modest

positive correlations with graduation outcomes, which may reflect differences in institutional resources and academic support capacity across universities. The tuition discount rate and institutional aid variables display stronger positive relationships with Black graduation outcomes than with White graduation outcomes. This pattern provides preliminary evidence that institutional financial aid policies may contribute to improving educational outcomes among historically underserved student populations.

Table 3. Baseline Fixed-Effects Regression Model- Determinants of Overall Graduation Rate

Variable	Coefficient	Std. Error	Significance
Net Tuition	0.0021	0.0008	**
Tuition Discount Rate	0.013	0.009	ns
Institutional Aid	0.0015	0.0007	**
Retention Rate	0.642	0.081	***
Acceptance Rate	-0.284	0.074	***
Family Income	0.004	0.0019	**
SAT Score	0.018	0.007	**
Constant	11.27	4.18	**
Statistic	Value		
Observations	104		
Institutions Fixed Effects	4 (YES)		
Years Fixed Effects	26 (YES)		
Robust Standard Errors	Yes		
R ²	0.78		
Adjusted R ²	0.76		

*Baseline Fixed-Effects Regression Results (Equation 1) N = 104 institution-year observations. All models include institution and year fixed effects. Robust standard errors are reported in parentheses. R² and adjusted R² statistics are reported at the bottom of each model. Significance levels are denoted by *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.*

Table 3 reports estimates from the baseline fixed-effects specification presented in Equation (1). The model examines the relationship between tuition pricing strategies and overall graduation outcomes while controlling for institutional selectivity and student persistence. The results indicate that first-year retention rates exert the strongest influence on graduation outcomes across all explanatory variables included in the model. The coefficient on retention rate is positive and statistically significant at the one-percent level. Substantively, the estimated coefficient suggests that a one-percentage-point increase in first-year retention is associated with approximately a 0.64 percentage-point increase in overall graduation rates. This finding highlights the importance of student persistence in determining institutional completion outcomes. Family income and SAT scores are positively associated with graduation outcomes and remain statistically significant in the baseline specification. The positive coefficient on family

income suggests that students from higher-income households may experience fewer financial constraints and greater access to academic support resources. Similarly, higher SAT scores are associated with improved graduation outcomes, reflecting the importance of academic preparation in determining long-term degree completion. These findings are consistent with previous studies emphasizing the role of socioeconomic background and academic readiness in shaping higher education success (Bound et al., 2010; Bailey & Dynarski, 2011).

Acceptance rates display a statistically significant negative relationship with graduation rates. Institutions with less selective admissions processes tend to exhibit lower graduation outcomes, likely reflecting differences in student preparation and institutional resources. Institutional aid per student is positively associated with graduation outcomes and remains statistically significant at conventional levels. The positive coefficient suggests that institutional financial support contributes to improved completion outcomes by reducing financial barriers and supporting continued enrollment. Net tuition also exhibits a modest positive relationship with graduation outcomes. Although the magnitude of the coefficient is relatively small, the result may reflect the ability of higher-priced institutions to invest more heavily in academic advising, student support services, and persistence initiatives. The tuition discount rate itself is positive but statistically insignificant in the baseline specification, suggesting that tuition discounting may influence graduation outcomes indirectly through institutional aid allocation and student persistence rather than through direct pricing effects alone.

The race-specific regressions reveal that tuition discounting has a stronger relationship with graduation outcomes for Black students than for White students. Institutional aid and retention rates also appear more influential in predicting Black graduation outcomes. These results suggest that financial aid policies may play a meaningful role in improving educational attainment among historically underserved student populations. Racial Heterogeneity Results Table 4 presents the race-specific regression estimates corresponding to Equation (2). Separate models are estimated for Black and White graduation outcomes to evaluate whether institutional pricing strategies affect racial groups differently. The results reveal meaningful differences in the effects of institutional pricing strategies across racial groups. Tuition discounting exhibits a stronger positive association with graduation outcomes for Black students than for White students. Specifically, the coefficient on the tuition discount variable for Black students exceeds the corresponding coefficient for White students and remains statistically significant at conventional levels.

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Table 4. Regression Models by Race Panel A – Black Graduation Rate

Variable	Coefficient	Std. Error	Significance
Net Tuition	0.0019	0.0009	**
Discount Rate	0.018	0.010	*
Institutional Aid	0.0021	0.0008	**
Retention Rate	0.713	0.092	***
Acceptance Rate	-0.295	0.082	***
Panel B – White Graduation Rate			
Variable	Coefficient	Std. Error	Significance
Net Tuition	0.0015	0.0007	*
Discount Rate	0.010	0.009	ns
Institutional Aid	0.0011	0.0006	*
Retention Rate	0.598	0.075	***
Acceptance Rate	-0.251	0.069	***
Statistic	Black Model	White Model	
Observations	104	104	
Institution Fixed Effects	Yes	Yes	
Year Fixed Effects	Yes	Yes	
Robust Standard Errors	Yes	Yes	
R ²	0.81	0.77	
Adjusted R ²	0.79	0.75	

*Race-Specific Fixed-Effects Models (Equation 2) N = 104 institution-year observations. All models include institution and year fixed effects. Robust standard errors are reported in parentheses. R² and adjusted R² statistics are reported at the bottom of each model. Significance levels are denoted by *** p < 0.01, ** p < 0.05, and * p < 0.10.*

Substantively, the estimates suggest that institutional financial aid policies may generate larger marginal improvements in graduation outcomes among students facing greater financial constraints. Institutional aid per student also exhibits a stronger positive relationship with Black graduation outcomes relative to White graduation outcomes. Retention rates remain highly significant across both racial groups. However, the magnitude of the retention coefficient is larger for Black students, suggesting that improvements in student persistence may produce particularly important gains in completion outcomes among historically underserved populations. These findings support the hypothesis that institutional pricing strategies and financial aid policies may influence educational equity by improving persistence and degree completion among students facing greater economic barriers.

The regression model focusing on the graduation gap suggests that institutional aid and retention improvements are associated with reductions in racial disparities in graduation outcomes. The negative coefficient for tuition discounting indicates that more aggressive financial aid strategies may help narrow the racial completion gap. Determinants of the Black–White Graduation Gap. Table 5 reports estimates examining the determinants of the Black–White graduation gap across institutions. The dependent variable measures the difference between White and Black graduation rates. The regression results indicate that institutional aid and retention improvements are associated with reductions in racial graduation disparities. The coefficient on institutional aid is negative and statistically significant, suggesting that increases in institutional financial support contribute to narrowing the graduation gap between Black and White students.

Table 5. Determinants of the Black–White Graduation Gap

Variable	Coefficient	Std. Error	Significance
Net Tuition	-0.0006	0.0005	ns
Discount Rate	-0.009	0.006	*
Institutional Aid	-0.0012	0.0005	**
Retention Rate	-0.115	0.042	**
Acceptance Rate	0.044	0.036	ns
Statistic	Value		
Observations	104		
Institution Fixed Effects	Yes		
Year Fixed Effects	Yes		
Robust Standard Errors	Yes		
R ²	0.69		
Adjusted R ²	0.67		

*Determinants of Graduation Gap (Equation 2) N = 104 institution-year observations. All models include institution and year fixed effects. Robust standard errors are reported in parentheses. R² and adjusted R² statistics are reported at the bottom of each model. Significance levels are denoted by *** p < 0.01, ** p < 0.05, and * p < 0.10.*

Similarly, the tuition discount variable exhibits a negative relationship with the graduation gap, indicating that more aggressive institutional pricing strategies may help reduce disparities in degree completion outcomes. Retention improvements also contribute to reductions in the racial graduation gap. The estimated coefficient suggests that institutional efforts aimed at improving student persistence may disproportionately benefit students at greater risk of attrition, thereby narrowing observed disparities in graduation outcomes. Collectively, these results indicate that institutional policies related to financial aid and student persistence may play an important role in shaping racial equity within higher education outcomes.

The lagged models confirm the importance of retention and institutional aid in shaping future graduation outcomes. While tuition pricing strategies exhibit weaker lagged effects, institutional financial support and student persistence remain robust predictors of long-term completion rates. Several conclusions emerge from the empirical analysis. First, student retention is the most powerful predictor of graduation outcomes across all models. Institutions that successfully support students through the critical first year appear significantly more likely to achieve strong completion rates. Second, institutional pricing strategies influence graduation outcomes indirectly through financial aid policies and resource allocation. Tuition discounting and institutional aid appear particularly relevant for improving outcomes among Black students.

Table 6. Lagged Models: Tuition Pricing and Future Graduation Outcomes

Variable (t-1)	Coefficient	Std. Error	Significance
Net Tuition Lag	0.0014	0.0007	*
Discount Rate Lag	0.009	0.008	ns
Institutional Aid Lag	0.0013	0.0006	**
Retention Rate Lag	0.592	0.084	***
Acceptance Rate Lag	-0.221	0.071	***
Statistic	Value		
Observations	100		
Institution Fixed Effects	Yes		
Year Fixed Effects	Yes		
Robust Standard Errors	Yes		
R ²	0.73		
Adjusted R ²	0.71		

*Lagged Fixed-Effects Model (Equation 3) N = 104 institution-year observations. All models include institution and year fixed effects. Robust standard errors are reported in parentheses. R² and adjusted R² statistics are reported at the bottom of each model. Significance levels are denoted by *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.*

Third, the results indicate that institutional policies can help narrow racial disparities in graduation outcomes. Financial support mechanisms and persistence initiatives are associated with measurable reductions in the Black–White graduation gap. Overall, the findings suggest that pricing strategies alone do not determine educational outcomes. Rather, the combination of financial aid policies, institutional resources, and student support systems appears to shape graduation success within the higher education market.

Lagged Models and Robustness Checks

Table 6 presents lagged regression models evaluating whether institutional pricing strategies influence future graduation outcomes. The lagged specifications help assess the temporal stability of the estimated relationships. The lagged results remain broadly consistent with the baseline estimates. Retention rates continue to exert strong positive effects on graduation outcomes even when explanatory variables are lagged by one period. Institutional aid also remains statistically significant, indicating that financial support policies may influence completion outcomes over longer horizons. The lagged tuition discount variable remains positive but statistically weaker, suggesting that institutional aid policies and retention outcomes are more directly associated with graduation performance than pricing adjustments alone. Additional robustness checks were conducted to evaluate the stability of the empirical findings. Table 7 reports variance inflation factor (VIF) statistics for the principal explanatory variables.

V. DISCUSSION AND POLICY IMPLICATIONS

The empirical findings provide several insights into the relationship between institutional tuition pricing strategies and racial disparities in graduation outcomes among universities in the Houston metropolitan region. The analysis indicates that student persistence—particularly first-year retention is the most consistent predictor of graduation outcomes across all estimated models. This result aligns with prior research showing that early academic integration and institutional support during the first year strongly influence long-term completion rates (Tinto, 1993; Deming & Dynarski, 2009). Across the regression models, institutions with stronger retention rates exhibit significantly higher graduation outcomes for both Black and White students. The magnitude of the coefficients suggests that even modest improvements in retention could generate meaningful increases in degree completion. This finding reinforces the argument that policies aimed at improving student persistence may yield greater returns than policies focused solely on enrollment expansion. The analysis also reveals that institutional selectivity plays an important role in shaping graduation outcomes. Acceptance rates are negatively associated with graduation rates across multiple specifications. Institutions with lower acceptance rates tend to have higher completion rates, likely reflecting differences in academic preparation among entering students and variations in institutional resources (Bound, Lovenheim, & Turner, 2010).

Tuition Pricing and Institutional Financial Aid Strategies

One of the central objectives of this study was to examine whether tuition pricing strategies influence graduation outcomes. The results suggest that tuition pricing alone does not directly determine completion rates. Instead, the impact of pricing appears to operate indirectly through institutional financial aid policies and student support resources. Net tuition levels exhibit a modest positive association with graduation outcomes, which may reflect the capacity of higher-priced institutions to invest in student services, advising, and academic support programs. Previous research has shown that institutions with greater financial resources often provide more extensive student support systems that enhance persistence and completion (Hoxby, 2009). More

importantly, tuition discounting and institutional aid appear to have stronger effects on outcomes for historically underserved student populations. The race-specific models indicate that tuition discounting is positively associated with Black graduation rates, suggesting that targeted financial aid policies may help reduce financial barriers that disproportionately affect minority students.

Financial aid policies can therefore function as an institutional mechanism for improving equity in higher education. When implemented strategically, tuition discounting can help expand access while simultaneously supporting student persistence and degree completion (Dynarski & Scott-Clayton, 2013).

Robustness Checks and Sensitivity Analysis

Because institutional-level panel data may be susceptible to econometric issues such as omitted variable bias, heteroskedasticity, and multicollinearity, several robustness checks were performed to assess the stability of the estimated relationships. Variance Inflation Factor (VIF) diagnostics indicate that all explanatory variables fall well below conventional threshold values, suggesting that multicollinearity is not a significant concern. The analysis also incorporates heteroskedasticity diagnostics, alternative model specifications, and lagged regression models to evaluate the sensitivity of the results to different estimation approaches. The findings remain substantively consistent across specifications, indicating that the estimated effects of tuition pricing strategies and institutional aid policies are robust and not driven by particular modeling assumptions. These robustness checks strengthen confidence in the validity of the empirical results and the conclusions drawn from the analysis.

Table 7. Variance Inflation Factor (VIF) Test for Multicollinearity

Variable	VIF
Net Tuition	2.14
Tuition Discount Rate	2.58
Institutional Aid	2.31
Retention Rate	1.87
Acceptance Rate	1.92

All variance inflation factors remain well below the commonly used threshold of 10, indicating that multicollinearity is not a significant concern in the regression models (Gujarati & Porter, 2009). The explanatory variables, therefore, provide distinct information about institutional characteristics and pricing strategies.

Table 8. Breusch–Pagan Test for Heteroskedasticity

Test Statistic	p-value
2.74	0.097

The Breusch–Pagan test indicates no strong evidence of heteroskedasticity in the regression residuals at conventional significance levels. As an additional precaution,

robust standard errors were used in the regression models to ensure reliable statistical inference. The results indicate no strong evidence of heteroskedasticity at conventional significance levels. Nevertheless, robust standard errors are employed throughout the analysis to ensure reliable statistical inference.

Table 9. Alternative Model Specification: Random Effects Model

Variable	Coefficient	Std. Error
Net Tuition	0.0019	0.0007
Discount Rate	0.012	0.009
Institutional Aid	0.0014	0.0006
Retention Rate	0.611	0.082
Acceptance Rate	-0.268	0.071

The results from the random effects specification are broadly consistent with those obtained from the fixed effects models. Retention rates remain the strongest predictor of graduation outcomes, while acceptance rates continue to show a negative association with completion rates. The similarity of the results across specifications suggests that the main findings are not sensitive to the choice of panel estimation method. The random-effects results remain highly consistent with the fixed-effects estimates. Retention rates continue to represent the strongest predictor of graduation outcomes, while institutional aid maintains a positive association with completion rates. The consistency of results across estimation methods provides additional confidence regarding the robustness of the empirical findings.

Overall, the empirical evidence suggests that institutional financial aid policies and student persistence play central roles in shaping graduation outcomes across Houston-area universities. The findings further indicate that tuition discounting and institutional aid policies may contribute to reducing racial disparities in degree completion, particularly when combined with institutional efforts aimed at improving student retention and academic support.

Table 10. Lagged Model Robustness Check

Variable (Lagged)	Coefficient	Std. Error
Net Tuition (t-1)	0.0013	0.0007
Discount Rate (t-1)	0.010	0.008
Institutional Aid (t-1)	0.0012	0.0006
Retention Rate (t-1)	0.584	0.084

The lagged regression models confirm the persistence of the main relationships observed in the baseline models. Retention rates continue to exert a strong influence on graduation outcomes even when the explanatory variables are lagged by one period. This result supports the argument that institutional policies affecting early student

persistence have lasting effects on degree completion. The empirical findings of this study provide important insights into the relationship between institutional tuition pricing strategies and racial disparities in graduation outcomes within Houston-area universities. Consistent with prior research on student persistence and higher education finance, the results indicate that institutional financial aid and student retention play central roles in shaping degree completion outcomes across racial groups. One of the most important findings is the strong positive relationship between first-year retention and graduation outcomes. Across all model specifications, retention rates consistently emerge as the strongest predictor of institutional graduation performance. This finding aligns closely with Tinto's (1993) theory of student persistence, which emphasizes the importance of academic and social integration during the early stages of college enrollment. Students who remain enrolled beyond the first academic year are substantially more likely to complete degree programs successfully. The results therefore suggest that institutional strategies aimed at improving persistence may generate significant long-term improvements in graduation outcomes.

The analysis also demonstrates that institutional financial aid contributes positively to degree completion. Universities allocating greater levels of institutional aid per student tend to exhibit stronger graduation outcomes after controlling for institutional selectivity and student persistence. These findings are consistent with prior studies showing that financial aid reduces economic stress and improves students' ability to maintain continuous enrollment (Dynarski & Scott-Clayton, 2013; Goldrick-Rab, 2016). Financial aid appears to function not only as an enrollment management tool but also as an institutional mechanism that supports long-term academic continuation and student success. The race-specific models further reveal that tuition discounting and institutional financial aid exhibit stronger positive associations with graduation outcomes for Black students relative to White students. This finding is particularly important because it suggests that institutional aid policies may contribute to reducing racial disparities in degree completion. One possible explanation is that students facing greater financial constraints are more sensitive to changes in college affordability. Institutional aid may therefore generate larger marginal benefits among historically underserved student populations by reducing unmet financial need and improving academic continuity.

The results additionally indicate that institutional selectivity influences graduation outcomes across racial groups. Universities with lower acceptance rates generally exhibit stronger graduation performance, reflecting differences in student preparation, institutional resources, and academic support systems. However, the persistence and financial aid variables remain statistically significant even after controlling for selectivity, suggesting that institutional support policies independently influence student success beyond differences in admissions standards. Collectively, the findings reinforce the broader argument that educational outcomes are shaped by an interaction of financial, institutional, and persistence-related factors. Tuition pricing strategies alone do not fully determine graduation outcomes; rather, their effectiveness depends on how institutional aid policies interact with student retention initiatives and broader institutional support systems.

Implications for Racial Graduation Gaps

The regression models focusing on the Black–White graduation gap provide additional insights into the role of institutional policies in shaping educational inequality. The results indicate that improvements in retention rates and institutional aid are associated with reductions in racial disparities in graduation outcomes. These findings are consistent with broader research showing that financial constraints and academic integration challenges contribute significantly to racial differences in college completion (Bailey & Dynarski, 2011). By expanding institutional support programs and targeted financial aid, universities can reduce the structural barriers that hinder student success. Importantly, the results also suggest that pricing strategies alone cannot eliminate racial disparities in graduation outcomes. Instead, effective institutional policies must combine financial support with academic advising, mentoring, and student engagement programs designed to strengthen persistence.

Implications for Higher Education Policy

The findings of this study have several important implications for higher education policy and institutional decision-making. First, the results suggest that institutional financial aid policies may serve as important tools for improving educational equity within higher education systems. Because tuition discounting and institutional aid exhibit stronger positive relationships with graduation outcomes for Black students, targeted financial support programs may help reduce persistent racial disparities in degree completion. These findings are particularly relevant in an environment characterized by rising tuition costs and increasing student debt burdens. Universities continue to face competing pressures related to enrollment stability, financial sustainability, and demands for improved student outcomes. The evidence presented in this study suggests that institutional aid allocation should not be viewed solely as a revenue management strategy but also as a mechanism for supporting persistence and improving graduation equity.

Second, the strong relationship between first-year retention and graduation outcomes indicates that universities should prioritize persistence-oriented interventions alongside financial aid programs. Retention initiatives such as academic advising, mentoring programs, first-year transition support, and early-warning systems may substantially improve long-term degree completion outcomes. Because persistence effects appear particularly strong for historically underserved student populations, integrated retention and financial aid strategies may provide important opportunities for reducing educational disparities. Third, the findings suggest that higher education policymakers should pay greater attention to the distributional effects of institutional aid policies. Merit-based aid programs may improve institutional competitiveness, but policies focused more heavily on financial need may produce stronger gains in persistence and degree completion among economically vulnerable students. Consequently, universities seeking to improve educational equity may benefit from balancing merit-based recruitment objectives with need-based support strategies.

The results also have implications for public policy discussions concerning state support for higher education. Declining public appropriations may reduce universities' ability to provide institutional financial aid, potentially increasing affordability barriers for students facing economic constraints. Sustained investment in higher education financing may therefore play an important role in supporting student persistence and improving graduation outcomes across demographic groups.

Institutional and Financial Aid Implications

From an institutional perspective, the findings suggest that tuition pricing strategies should be evaluated not only in terms of enrollment outcomes but also in relation to long-term student success. Universities increasingly rely on tuition discounting to remain competitive within higher education markets; however, the effectiveness of these strategies depends heavily on whether financial aid policies improve persistence and academic continuity. The results indicate that institutional aid allocation may produce stronger educational benefits when combined with targeted student support services. Financial aid alone may not fully eliminate barriers to graduation if students continue to experience academic, social, or institutional challenges during college enrollment. Consequently, universities may achieve stronger graduation outcomes by integrating financial aid policies with broader persistence initiatives designed to improve student engagement and institutional attachment.

The findings also suggest that institutions serving large minority populations may require additional financial and academic support resources to improve completion outcomes. Universities such as Texas Southern University and the University of Houston–Downtown serve student populations characterized by greater financial vulnerability and educational inequality. Institutional aid policies may therefore play a particularly important role within such settings. More broadly, the study highlights the importance of data-driven enrollment management and institutional policy design. Universities increasingly possess access to institutional data systems capable of identifying students at elevated risk of attrition. Combining predictive analytics with targeted financial support and retention interventions may allow institutions to improve persistence outcomes more effectively.

Study Limitations

Several limitations should be acknowledged when interpreting the findings of this study. First, the analysis focuses exclusively on four universities within the Houston metropolitan area. Although these institutions provide substantial variation in tuition structures, institutional missions, and student demographics, the findings may not fully generalize to universities operating in different regional or institutional contexts. Second, the study relies primarily on institutional-level panel data obtained from IPEDS and university financial reports. While these data provide important information regarding tuition pricing and graduation outcomes, they do not capture all student-level characteristics that may influence persistence and completion, such as family wealth, employment obligations, psychological stress, or campus engagement. Third, graduation outcomes are measured using IPEDS cohort definitions based primarily on

first-time, full-time degree-seeking students. These measures may not fully capture the experiences of transfer students, part-time students, or nontraditional student populations who increasingly represent significant segments of higher education enrollment.

Finally, although the study employs fixed-effects and instrumental-variable estimation techniques to address endogeneity concerns, the possibility of omitted variable bias cannot be eliminated entirely. Institutional policy decisions may be influenced by additional unobserved factors affecting both tuition pricing strategies and graduation outcomes. Despite these limitations, the study provides important empirical evidence regarding the relationship between institutional tuition pricing strategies and racial graduation disparities within urban higher education systems. The findings contribute to ongoing discussions concerning educational equity, student persistence, and the role of institutional financial aid in shaping higher education outcomes.

VI. CONCLUSION

This study examined the relationship between institutional tuition pricing strategies and racial disparities in graduation outcomes among major universities in the Houston metropolitan area during the period 2000–2025. As universities increasingly rely on tuition discounting and institutional financial aid to manage enrollment and improve affordability, questions regarding the effectiveness and equity implications of these strategies have become increasingly important within higher education policy discussions. While prior research has extensively explored enrollment management and financial aid allocation, comparatively fewer studies have examined whether institutional pricing strategies influence graduation outcomes differently across racial groups within urban higher education systems. This study contributes to the literature by integrating tuition pricing variables, student persistence measures, and racial graduation outcomes within a panel-data econometric framework.

The empirical findings indicate that institutional financial aid and student retention are strongly associated with graduation outcomes across the universities examined in the study. Among all explanatory variables included in the regression models, first-year retention consistently emerged as the strongest predictor of long-term degree completion. This finding reinforces the importance of student persistence in shaping educational attainment and supports prior theories emphasizing academic and social integration as critical determinants of graduation outcomes (Tinto, 1993). Universities that successfully retain students during the first academic year appear substantially more likely to achieve stronger graduation performance over time.

The analysis also demonstrates that institutional financial aid contributes positively to graduation outcomes after controlling for institutional selectivity and persistence factors. Universities allocating greater levels of institutional aid per student generally exhibit stronger completion outcomes, suggesting that financial support policies may reduce barriers to continued enrollment and academic success. These findings are consistent with previous research indicating that financial aid reduces

economic stress and improves students' ability to remain continuously enrolled (Dynarski & Scott-Clayton, 2013; Goldrick-Rab, 2016).

One of the most important findings of the study is that tuition discounting and institutional financial aid exhibit stronger positive associations with graduation outcomes for Black students relative to White students. The race-specific models suggest that students facing greater financial constraints may experience larger marginal benefits from institutional aid policies. Consequently, tuition pricing strategies may contribute to reducing racial disparities in degree completion when institutional financial support is directed toward economically vulnerable student populations. Although tuition discounting alone does not fully eliminate graduation gaps, the findings indicate that institutional financial policies can play an important role in improving educational equity within higher education systems.

The results additionally suggest that tuition pricing strategies are most effective when combined with broader student retention and support initiatives. Financial aid policies alone may not fully address the academic and institutional challenges affecting student persistence. Universities seeking to improve graduation outcomes may therefore benefit from integrating institutional aid programs with retention-oriented interventions such as academic advising, mentoring programs, first-year transition support, and early-alert systems designed to identify students at risk of attrition. The strong relationship between retention and graduation outcomes observed throughout the analysis highlights the importance of institutional persistence strategies in supporting long-term student success.

From a policy perspective, the findings have important implications for universities and higher education administrators navigating growing pressures associated with affordability, enrollment management, and educational equity. Institutions increasingly face trade-offs between revenue generation and student access. The evidence presented in this study suggests that institutional aid allocation should not be viewed solely as a financial management tool but also as a mechanism for improving persistence and reducing disparities in educational attainment. Policies emphasizing targeted financial support for students facing greater economic constraints may contribute to stronger graduation outcomes and narrower racial completion gaps.

The study also contributes to broader discussions concerning institutional accountability and higher education outcomes. Graduation rates remain one of the most important indicators used to evaluate institutional effectiveness, yet universities operate under highly unequal financial and demographic conditions. Understanding how institutional pricing strategies influence student success may therefore help policymakers and administrators develop more equitable approaches to higher education financing and student support.

Several limitations should be acknowledged. The study focuses on four universities within the Houston metropolitan area, and the findings may not generalize fully to institutions operating in different regional or institutional contexts. In addition, the analysis relies primarily on institutional-level panel data rather than individual-level

student records, limiting the ability to observe certain socioeconomic and behavioral characteristics that may influence persistence and graduation outcomes. The use of IPEDS cohort graduation measures may also underrepresent the experiences of transfer students, part-time students, and nontraditional student populations.

Future research could extend this analysis by incorporating broader national samples and longitudinal student-level datasets capable of capturing more detailed information regarding financial aid utilization, academic progression, and persistence behavior across demographic groups. Additional research examining post-pandemic changes in tuition pricing strategies and student retention patterns may also provide important insights into the evolving relationship between higher education finance and educational equity. Furthermore, future studies could explore how institutional support programs interact with financial aid policies to influence graduation outcomes among diverse student populations.

Overall, this study provides evidence that institutional tuition pricing strategies and financial aid policies are closely associated with graduation outcomes and racial disparities in degree completion within urban higher education systems. The findings suggest that universities seeking to improve educational equity and student success should consider not only how financial aid influences enrollment decisions but also how institutional support and persistence initiatives shape long-term academic outcomes. By integrating higher education finance, student persistence, and racial graduation disparities within a unified empirical framework, the study contributes to a deeper understanding of the institutional factors influencing degree completion in contemporary higher education.

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