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DISCUSSION PAPER SERIES

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ABSTRACT

Public Higher Education Costs and College Enrollment

How have changes in the costs of enrolling full-time at public two- and four-year colleges affected student decisions about whether and where to enroll in college? Using local differences in the growth of tuition at community colleges and public four-year colleges we study the impact of public higher education costs on the post-secondary enrollment decisions of high school graduates over three decades. We model prospective students' decisions about whether to attend community college, a public four-year university in their state of residence, other colleges, or no college at all, as relative costs change. We identify enrollment impacts by instrumenting college costs using policy variation imposed by state appropriations and tuition caps. We estimate that in counties where local community college tuition doubled (about average for the study period), the likelihood of post-secondary enrollment fell by about 0.05, on a mean of about 0.80. In addition to reducing college enrollment overall, rising costs at community colleges diverted other students to four-year colleges. Rising relative costs of four-year public colleges similarly diverted some students toward community colleges but did not limit college attendance in the aggregate. We also find evidence of endogeneity in cost-setting at the institution level.

JEL Classification: I22, I23
Keywords: higher education, costs, enrollment

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1 Introduction

Understanding the relationship between the costs of higher education and student enrollment has been a central problem in higher education for decades. Early work on the topic often relied on time-series analyses of single institutions. With better data, more variation in tuition, and the implementation of numerous policy efforts to rein in costs, recent empirical research has improved our understanding of the impact of tuition increases on enrollment at universities and colleges and provided better and clearer insight into the elasticities of demand for higher education. This is a question of obvious importance to public institutions of higher education.

However, a different consideration is equally important to politicians and state policy makers who provide funding and oversight for public colleges and universities. For them, the post-secondary enrollment options and decisions of their constituents are of fundamental and primary interest. How students (and by proxy their parents) fare when faced with the changing costs of enrollment at the various public colleges and universities in their states directly affects voters' support for higher education and elected officials. Of course, the college enrollment behavior of young people also affects human capital in a state and has direct consequences for economic development.

Rather than using institution-level data to assess net enrollment effects of tuition changes, we focus on how three cohorts of high school graduates respond to changing real and relative costs of higher education in their states. While these are related questions, the distinction is subtle but important. Enrollment changes at state colleges and universities subsequent to tuition changes are barometers of how students in the state respond. However, they are imperfect since most colleges enroll some students from out of state. But more importantly, changes in

enrollment at the institution level provides no insight into the college choices of individual students. This ignores a treatment margin of direct importance to policy makers: How do costs affect the likelihood of enrolling in a public four-year college, community college, leaving the state for college, or no college at all.

The relentless increase in the costs of attending college has been a source of concern for students, families, and policy makers for decades. Among students and families, the consequences include daunting decisions about enrollment and soaring levels of debt. For policy makers and analysts, the concern is that rising costs limit access, constrain choice, and reduce persistence. Because of its salience and potentially worrisome effects, the rising cost of public post-secondary education has spurred a variety of policies at the state and local levels. These include local promise programs and state policies to provide merit scholarships to in-state students who attend public flagships. They also include smaller need-based programs. Indeed, in a recent review of all states' higher education authorities' websites, we identified 155 need-based policies implemented across all 50 states in the past quarter-century to reduce the costs of attending public four-year or local community colleges.

At the federal level, the response has mainly been to provide information about the costs of attending college. Evidence about the role of cost in limiting access to college and reducing persistence is long-standing and well established (e.g., Leslie & Brinkman, 1987; Heller, 1997). There is also good evidence that lowering costs via financial aid increases attendance and persistence even if these tools do not always work as directly and clearly as expected (Dynarski & Scott-Clayton, 2013).

The unremitting rise in the costs of higher education and the varied policies state and local governments have implemented in response is the context for this paper. We evaluate how

changes in the costs of enrolling for full-time study at public two- and four-year colleges have affected the decisions about whether and where to enroll in college. To do so, we examine the post-secondary enrollment decisions made by high school graduates during the past three decades – comparing students in states that see different rates of growth in relative tuition at their local two-year and four-year colleges.

In this paper, we update the literature on the relationship between the costs of public higher education and college enrollment decisions. As we describe below, evidence at the national level on this question relies on data that are now more than fifteen years old. For example, Hemelt and Marcotte (2016) used student-level data from high school graduates in 1992 and 2004 to estimate student enrollment in response to changing tuition costs. More recent evidence comes from analyses in select states, relying on local policy changes for identification. In this paper, we broaden the focus to the nation, enabling us to make use of variation in the real costs of higher education in different states to identify impacts on college enrollment.

To compare the enrollment decisions of recently graduated high school students, we harmonize data from three nationally representative surveys that are part of the Secondary Longitudinal Studies Program at the National Center for Education Statistics (NCES) : The High School Longitudinal Survey (HSLS); the Education Longitudinal Survey (ELS); and the National Education Longitudinal Study (NELS). We use these data to create pooled cross-sections of students who graduate high school in 1992, 2004, and 2013. Each of these surveys provides detailed data on student attributes and achievement while in high school and information about college enrollment collected during follow-up interviews two and eight years after high school graduation. Our restricted-use data also identify the state and county where sample respondents lived when they graduated high school. So, we can measure the cost of full-

time enrollment at the public 4-year colleges and local 2-year community colleges that students in each of these cohorts confront as they decide whether or where to enroll after graduating high school. As we illustrate, students in different states in these cohorts confront different patterns of tuition growth over the 1990s, 2000s, and 2010s. We use differences in the changing costs of higher education within states as leverage to identify impacts on enrollment.

To limit the possibility that tuition growth at public colleges is related to unmeasured factors that could affect enrollments, we also use state and local policies to limit tuition or revenue at state colleges and universities as instruments for tuition at the institutional level. This 2SLS strategy allows us to distinguish between the portion of tuition changes due to institutional decisions, and those due to broader constraints from state and local governing bodies and funding agencies.

We estimate that for high school graduates in counties where community college tuition doubled (the average over the study period), the likelihood of enrolling in any form of post-secondary education fell by about 0.05, on a mean of about 0.80. Community colleges serve students who might otherwise not attend college, and rising costs at these institutions reduced college going on net. We also find that relative increases in community college costs led to a substitution toward public four-year colleges.[1] Similarly, we find that increasing costs at four-year schools divert recent high school graduates to community colleges. But we see no evidence that growing tuition costs at public four-year schools limit college attendance in the aggregate. Finally, we find evidence of endogeneity in cost-setting at the institution level. So, our preferred estimates rely on a control function approach that uses the residuals from first stage regressions

[1] These are the democratization and diversion margins described in the community college literature (e.g., Mountjoy, 2019).

of state and local appropriations and state policies to cap tuition growth to instrument for intertemporal changes in institutional costs.

2 Background

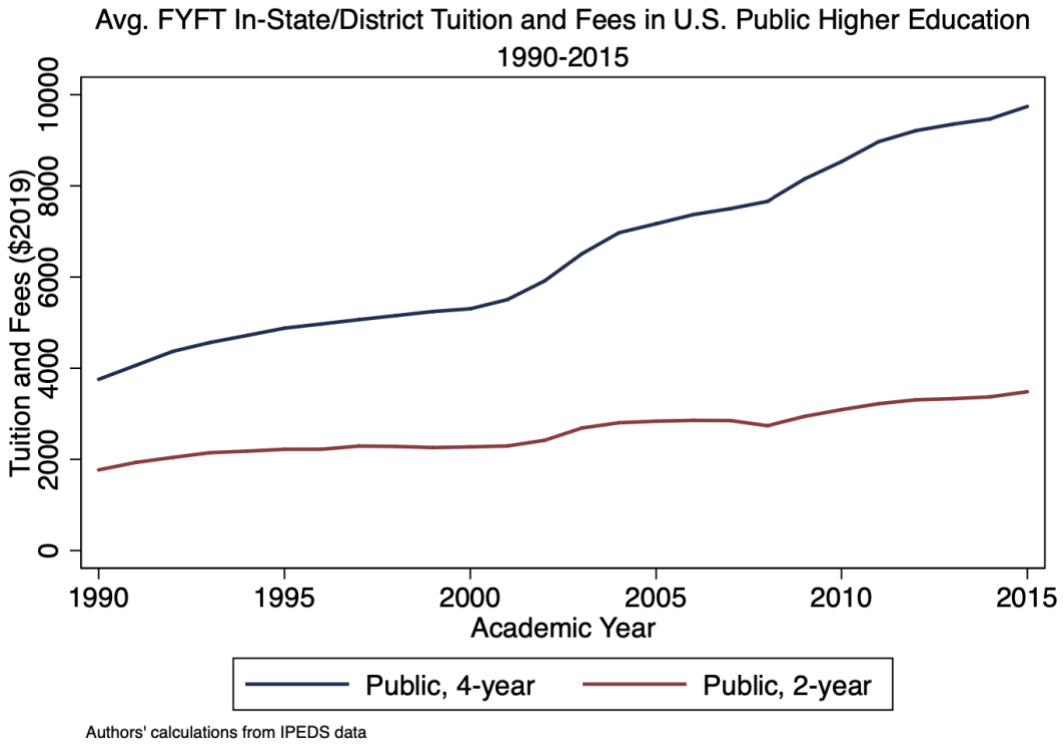
2.1 Tuition Trends

It is well established that the costs of public higher education have risen substantially.[2] This trend has raised concern about whether there is an education "bubble" (e.g., Reilly, 2011; Thompson, 2017) and the levels of debt being carried by college graduates (e.g., Scott-Clayton, 2018). The trends in college costs that have given rise to these concerns are made clear in Figure 1. We display the enrollment-weighted average real cost of full-year, full-time college tuition for in-district/state undergraduate students at public two-year and four-year colleges from 1990 to 2015 – bracketing the years the cohorts we study finished high school.[3]

For public 4-year schools, average in-state tuition increased from $3,756 to $9,742, while the in-district tuition of public two-year schools increased from $1,770 to $3,484.[4] So, over this period, tuition at four-year schools increased by nearly 160% and nearly doubled at two-year schools. While the rate of growth in attendance costs was steady at two-year colleges, four-year institutions saw more rapid growth after 2000. While not included in the figure, the tuition at 4-year, private, not-for-profit schools nearly doubled as well; these costs are nearly three to four times higher than those of public 4-year colleges.[5]

[2] For recent trends in costs, see College Board (2019).
[3] We use the terms community college and public 2-year colleges interchangeably.
[4] These costs are measured in 2019 dollars.
[5] Tuition and fees at a private not-for-profit in 1990 equal $18,101 and $36,655 in 2015.

Figure 1



2.2 Policy Background

In response to rising tuition costs, federal, state, and local governments have implemented various policies to help students attend college. Notably, beginning in 2011, the U.S. Department of Education required that colleges participating in distributing federal student aid make a "net price calculator" available to prospective students.[6] At the state level, policies to rein in costs states have implemented some form of a cap or freeze in the rate of growth tuition at public four-year and community colleges. For example, in 2006, Ohio imposed a cap of 6% on the annual growth of tuition at public four-year colleges, and North Dakota capped tuition increases at 4%. While Minnesota implemented a tuition freeze in 2012 and the University of Wisconsin System did the same in 2014.

[6] https://nces.ed.gov/ipeds/report-your-data/resource-center-net-price

Within states, a variety of programs have been implemented to cover full or partial tuition costs to high school graduates to attend local two- or four-year schools. These include place-based promise programs that provide tuition-free enrollment for students at select colleges - beginning with the Kalamazoo Promise in 2005 and expanding to over 200 promise programs in 41 states. Some promise programs are state-wide such as TnAchieves, which is available in 90 of the 95 counties in Tennessee. Others are more localized. For example, in California, the Long Beach College Promise (implemented in 2008) provides two years of school for free at Long Beach Community College.

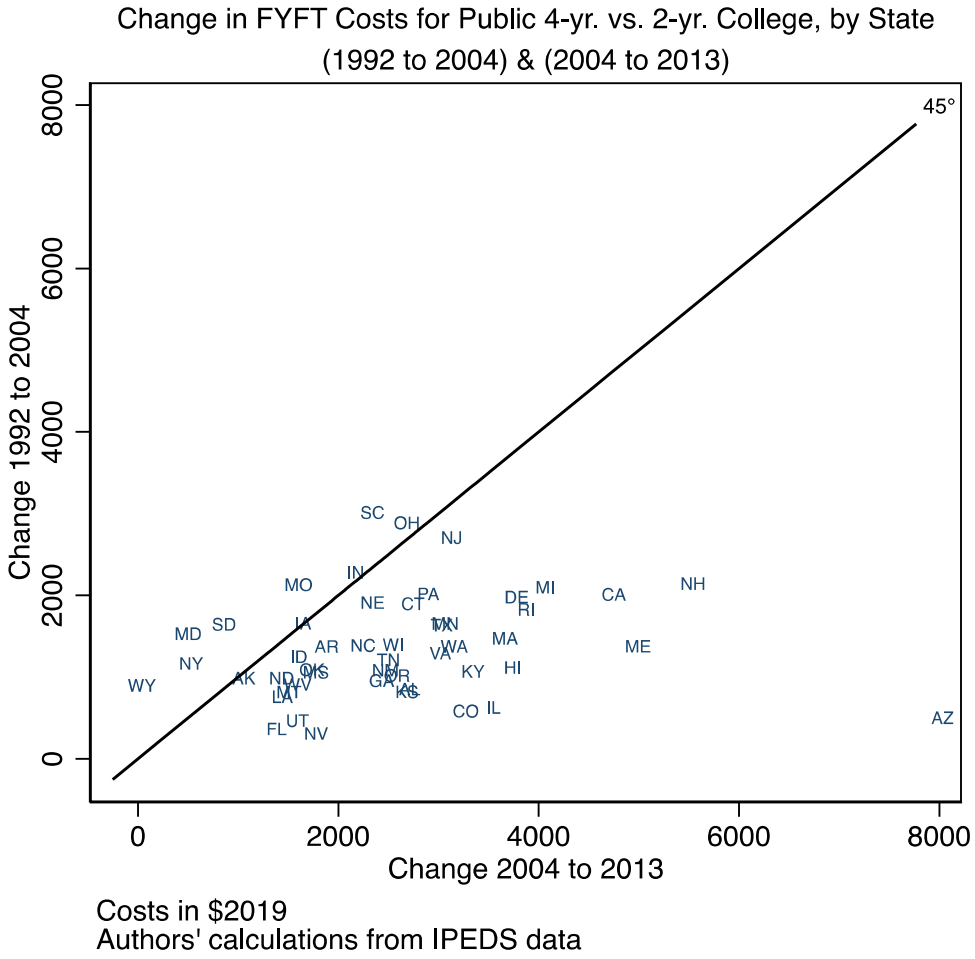
As states and localities have implemented a variety of cost-control measures, growth in the relative costs of attending public four-year colleges and community colleges has also varied. In Figure 2, we plot the growth of average cost of tuition and fees for FYFT enrollment at 4-year versus 2-year public colleges by state, between 1992 and 2004 (y-axis) and 2004 and 2013 (x-axis).[7] These years represent three different decades and align with the high school graduation years of the cohorts we study below. Each point in the scatterplot illustrates the difference between the growth of public 4-year and 2-year tuition in each period (in 2019 dollars). We also include a 45° line for reference, which indicates the points at which the growth of 4-year relative to 2-year college costs was the same for both periods.

The scatterplot illustrates two key points. First, the cost of 4-year college attendance became relatively more expensive in most states between 2004 to 2013. Second, the relative costs of attending 4-year versus 2-year colleges changed differently across states during these decades. For example, in Maryland and New York, the costs of attending a 4-year school increased by nearly $2,000 relative to community colleges between 1992 and 2004. Yet, the

[7] These years coincide with the first and second half of the periods when our study cohorts finished high school.

relative costs of attending 4-year vs. 2- year colleges hardly changed in the next decade in these states. On the other hand, in Arizona, the cost of tuition at 4-year schools increased drastically relative to community colleges between 2004 and 2013, after a decade of nearly equal growth. Other large states like California and Illinois saw sizeable increases in the costs of attending 4-year colleges relative to 2-year colleges between 2004 to 2013. We exploit this variation in the relative costs of 2- and 4-year colleges across states and decades in our empirical models below.

Figure 2



2.3 Literature Review

The earliest research on enrollment responses to changes in tuition and fees relied on institution-level data. Early studies often used data on cost changes and enrollment at one or several colleges or universities, with apparent limitations for establishing counterfactuals. Jackson and Weatherby (1975) review early empirical studies of enrollment responses to price changes at various institutions and reported that institutional enrollment fell by six to nineteen percentage points for each $1,000 increase in cost for full-time study.[8] Later, Leslie and Brinkman (1987) reviewed the growing literature, concluding that a tuition increase of $1,000 is associated with a decrease in enrollments by six to eight percentage points.[9] Heller (1999) updated this review and reported similar estimates of tuition elasticity of enrollment.

More recent and compelling work uses institution-level data over time from the Integrated Postsecondary Education Data System (IPEDS) collected by the NCES. Kane (1995) used these data and estimated that a $1,000 increase in tuition at public 2-year schools is associated with a decrease in public undergraduate enrollment within a state by 3.5 percentage points.[10] Long (2004) found that students in 1972 were 15% less likely to attend any college for each additional $1,000 in cost, while those in 1982 were 11% less likely to attend in response to the same cost increase.[11] This represents a decrease in the elasticity of demand from 0.34 to 0.233. Later papers estimated even smaller price responses.[12] Hemelt & Marcotte (2011) estimated the impact of tuition increases on enrollment and credit hours, differentiating by institution type. They found that a $1,000 increase in tuition is associated with a 2.5 percent

[8] Jackson & Weatherby (1975) report results in 1974 dollars.
[9] Leslie & Brinkman (1987) report results in 1982 dollars.
[10] Kane (1995) reports results in 1991 dollars.
[11] Long (2004) reports results in 2000 dollars.
[12] It is not clear whether the decline in the elasticity of enrollment over time is an artifact of the sample or research design or due to changes in demand for higher education in response to the rising earning premium for a college degree over the period.

decrease in enrollment, noting that effects are larger at Research I and the top 120 public universities.[13]

Studies using institution-level panel data rely on the identifying assumption that intertemporal changes in tuition are independent of other changes at institutions that may affect enrollment demand. Deming and Walters (2020) expanded on this by distinguishing between tuition-price setting that is constrained by state-level appropriations and legislatively mandated tuition caps - separate from institution-level discretionary decisions about tuition levels. Because the latter may reflect institutional choices related to investments in instruction or student services, they may be related to other changes at the institution that affect student demand. Deming and Walters attempt to circumvent this endogeneity concern by instrumenting tuition costs in an institution-level panel framework using state appropriations and tuition caps. They found small or insignificant effects of tuition increases on enrollment.

A different strand of literature uses student-level data within states, examining the impact of costs on enrollment decisions and using natural experiments induced by the introduction of state merit-aid programs that reduce costs of attending select public universities or colleges for eligible in-state students. For example, Dynarski (2000) studied the impact of receiving aid through the Georgia Hope Scholarship on college attendance and found that for every $1,000 in aid, the state attendance rate increases by 3.7 to 4.2 percentage points.[14] Bruce and Carruthers (2014) studied the Tennessee HOPE Scholarship and found little evidence that merit-aid induced college-going or staying in-state but found reduced college costs result in substitution toward enrollment at 4-year colleges over 2-year colleges.

[13] Hemelt & Marcotte (2011) report results in 2006 dollars.
[14] Dynarski (2000) reports results in 1998 dollars.

Several recent papers have exploited within-state variation in the costs of attending community college. Carruthers and Fox (2016) found that a merit scholarship program at a community college in Knox County, Tennessee, appears to have increased community college enrollment, suggesting aid targeted at community colleges can increase post-secondary enrollment at an extensive margin. Denning (2019) examined the impact of community college tuition on college enrollment in Texas. In response to expanding tuition discounts for in-district students, Denning finds that a $1,000 reduction in tuition increased community college enrollment by 5.1 percentage points (an elasticity of -0.29).[15] Acton (2021) exploited residential differences in the relative cost of attending community college in Michigan and found a comparable enrollment response to costs.

Finally, a third strand of literature uses student-level data at the national level, exploiting variation across time and states in the rate of growth of tuition costs to identify effects on college attendance. An early paper of this type is by Manski and Wise (1983). They used data from the National Longitudinal Study (class of 1972) to find that grant aid, provided through the Basic Educational Opportunity Grant, prompted very low-income students to enroll in college but saw less evidence of effects for higher-income families.[16] Hemelt and Marcotte (2016) used NELS and ELS data to identify enrollment changes in response to changes in tuition and fees charged at public colleges during the 1990s and early 2000s. They found that a $1,000 increase in tuition costs decreases the likelihood of enrolling in a community college by nine percentage points.[17] This was nearly twice as large as the enrollment response to a similar price increase at public 4-year institutions.

[15] Denning (2017) reports results in 2012 dollars.
[16] The Basic Educational Opportunity Grant was later named the Pell Grant.
[17] Hemelt & Marcotte (2016) report results in 2010 dollars.

In this paper, we contribute to this literature using national data but draw on lessons from institution-level analyses, too. We use student-level data to model how changes in the relative costs of college affect student enrollment choices, estimating models of the decision graduating high school seniors make about whether and/or where to attend college when faced with different relative prices. Unlike institutional analyses, our contribution is not to model how enrollment changes at a particular college or type of college as costs change. Rather, we examine how students in a particular state decide whether to attend community college, a public 4-year university in their state of residence, other colleges, or no college at all as relative costs change. We draw from the institutional literature to help identify enrollment impacts by instrumenting college costs using policy variation imposed by state appropriations and tuition caps. We discuss our models and empirical strategy next.

3 Model and Data

3.1 Model

As a conceptual orientation, consider a simple model of the choice confronting a student finishing high school. Her aim is to maximize lifetime utility by choosing whether to enroll in one of the *c* different college options available:

(1) $$U_{ic} = f(Y(c), T(c), A(c))$$

Where *Y* is the expected lifetime income student *i* would earn if attending college type *c*, and *T* is the cost of attendance. *A* is a vector of other attributes associated with attending college type *c*. *A* could include the amenities associated with college *c* that might enhance the college experience, such as big-time athletics, a beautiful campus, nice dorms, etc. (e.g., see Jacob, McCall & Stange, 2015). *A* could also include the option or social value of attending college *c*, not priced into economic returns (Stange, 2012). For instance, some colleges might improve

social standing – for example attending an Ivy League school may provide some social value beyond direct economic opportunity. Or, *A* could include the distance from home, which might enhance or detract from its value to the student. We simplify the decision confronting the student by reducing the choice set to:

$$c = \begin{cases} No\ college\ enrollment \\ Enroll\ in\ local\ public\ Comm.College \\ Enroll\ in\ public\ 4-yr.college\ in\ state \\ Enroll\ in\ 4-yr\ out\ of\ state\ or\ private \end{cases}$$

With a completely separable utility function, a prospective student assesses expected utility for each of the four options in her choice set as:

(2) $E(U|c) = E(Y|c) + E(T|c) + E(A|c)$

Since U_Y' and U_A' are positive, and U_T' is negative, her optimization problem requires choosing the post-secondary enrollment option that maximizes anticipated lifetime earnings and consumption amenities net of any tuition costs. Observed enrollment outcomes reflect individual assessments of subsequent lifetime income effects and consumption values compared to relative costs. In a discrete choice framework, we estimate the impact on enrollment choice as a function of the relative cost of enrolling in college type *c*. We parameterize this decision as:

(3) $$E_{ic} = \beta X_{ic} + \delta_2 Ln(2yr)_{ic} + \delta_4 Ln(4yr)_{ic} + \delta_p Ln(Priv)_{ic} + \epsilon_{ic}$$

Where E_{ic} is the observed post-high school choice that is the realized assessment of the utility stream student *i* anticipates from *c*; X_{it} is a vector of student characteristics (such as demographics and high school achievement) and college attributes that might affect future earnings or college consumption value and the costs of enrolling in each of the college options available to student *i* are included in log form. Hence the δ parameters are estimates of the individual and cross-price elasticities for community college, 4-year college in-state, or in private or out-of-state college.

Fundamental to our estimation strategy is the fact that the average costs of enrolling in public 2- and 4-year colleges are determined by county and state of residence. In our empirical specifications of the parametric model, $ln(2yr)_i$ is the cost of tuition and fees for full-time study in student i's local community college; $ln(4yr)_i$ measures the enrollment-weighted average tuition and fees for full-time enrollment in public 4-year colleges in i's state, and $ln(Priv)_i$ measures the enrollment-weighted average tuition and fees required for enrolling in the private 4-year colleges in i's state.[18]

If Equation (2) were estimated with cross-sectional data, estimates of the δ parameters would confound the relative costs of enrolling in a student's local community college and state universities with average differences in institution quality or local labor markets that could affect the consumption value of attendance or earnings after college. We limit this threat to validity by pooling cohorts of high school students over time and including state fixed effects (μ_s), as in Equation (4). In models such as this, the parameters of interest ($\delta_2, \delta_4, and\ \delta_p$) identify the effect of the real costs of attending public 2-year, 4-year, and private colleges for a student in a given state on enrollment decisions off of comparisons of students in the same state, at different times. Equation (3) also includes year fixed effects (θ_t), controlling for general changes in college enrollment decisions that are not specific to place of residence – such as those driven by macroeconomic conditions.

$$(4) \qquad E_{ict} = \beta X_{ict} + \delta_2 Ln(2yr)_{ict} + \delta_4 Ln(4yr)_{ict} + \delta_p Ln(Priv)_{ict} + \theta_t + \sum_s \mu_s + \epsilon_{ict}$$

Using data from pooled cohorts/cross-sections to estimate the impact of college costs on enrollment choices circumvents threats to validity due to fixed attributes of state educational

[18] In our empirical models, we measure tuition and fee costs in logs because they are log-normally distributed and for ease of interpretation. Our results are not sensitive to this choice.

systems (both K-12 and post-secondary) that might affect college-going among a state's high school graduates and be correlated with tuition costs. Empirical models of the form of Equation (4) would identify effects of tuition on college-going by comparing students in the same county/state, but who faced different costs of college attendance by virtue of the cohort into which they were born, compared to the enrollment choices of similar students in other states experiencing different rates of relative growth in tuition at public 2- and 4-yr colleges.

As with any estimates from a model like Equation (4), the principal threats to validity for interpreting the parameters as causal derive from intertemporal changes in institutional characteristics related to tuition costs and that themselves affect demand for seats at local public 2- and 4-yr colleges. For example, it would not be a problem if tuition costs in one state rose more than another because subsidies from state appropriations are declining. But, if tuition increases were due to decisions to invest in academic or other campus programs by the average college in that state increased the costs (and presumably quality) of higher education, we would confound cost with quality changes.

To circumvent this problem, recent papers have employed an instrumental variables (IV) strategy that leverages variation in tuition driven by changes in state appropriations and legislatively imposed tuition caps. Namely, Deming and Walters (2017) and Chakrabarti et al. (2020) implement an IV approach that instruments institutions' tuition costs using year-to-year variation in state appropriations induced by state tuition-policy caps and changes in revenue from the state weighted by the share of an institution's total revenue derived from state appropriations. This is the shift-share approach suggested by Bartik (1991), leveraging the fact that changes in appropriations from the state will have larger effects on the need to offset revenue shortfalls with

tuition increases for institutions that rely more heavily on state appropriations.[19] This IV approach circumvents the potential endogeneity of changes in tuition that affect the cost of attendance but may also be related to institutional level decisions that themselves might affect demand. The idea here is to distinguish between tuition changes due to central legislative decisions and decisions made by college administrators that may reflect time-varying factors related to college demand.

This IV strategy is readily employed using institution-level data but is less tractable in a discrete choice model using student-level data. Nonetheless, tuition at the institution level shapes individual students' college choices. So, we use institution-level data to estimate tuition and fee costs at all public 2- and 4-year colleges as a function of the instruments proposed by Deming and Walters (2020).[20] These would be the first stage estimates from an institution-level IV strategy that distinguish between plausibly exogenous tuition changes outside the control of a student's local community college and in-state 4-year colleges from those shaped by institutional strategy and choices, thereby endogenous to student demand. The residuals in these equations provide information about each institution's own choices on tuition setting. We then use these residuals as controls for unobservable characteristics of the institutions students choose between. These residuals establish control functions of factors other than cost that might shape student demand, such as changes in amenities and local labor market conditions.

We implement this strategy by first estimating Equations (5) and (6) using institution-level data. These estimate tuition costs at public 2- and 4- year colleges as a function of

[19] An example of this pressure was the case of California during the 2008-2009 recession when state appropriations fell to the University of California system by 20 percent (O'Leary, 2009). The Board of Regents subsequently approved a 32 percent increase in tuition and fees (Cathcart and Levin, 2009), with one Regent reporting that "The legislators have told us, essentially, 'The student is your A.T.M. They're how you should balance the budget'" (Friend, 2010, p. 24).

[20] We obtain data on tuition caps for 2- and 4-year colleges directly from Deming and Walters (2020).

institutional attributes, time and institution fixed effects, appropriations from the state (and local governments for community colleges), and tuition constraints imposed by state legislation.

(5) $$Ln(2yr)_{it} = \pi_0 + \pi_1 App2yr_{it} + \pi_2 Cap2yr_{it} + \pi_3 X_{it} + \theta_t + \sum_s \mu_s + \nu_{2it}$$

(6) $$Ln(4yr)_{it} = \pi_0 + \pi_1 App4yr_{it} + \pi_2 Cap4yr_{st} + \pi_3 X_{it} + \theta_t + \sum_s \mu_s + \nu_{4it}$$

$App2yr_{it}$ is defined as the appropriations received by 2-year institutions from state and local appropriations in year *t*, weighted by the proportion total revenue due to these sources in year *t*-1. $App4yr_{it}$ is similarly defined for 4-year institutions' reliance on state appropriations. We then use the enrollment-weighted mean residuals of the public 2- and 4-year colleges in a student's county and state as a control function to augment the specification of Equation (4):

(7)

$$E_{ict} = \beta X_{ict} + \delta_2 Ln(2yr)_{it} + \delta_4 Ln(4yr)_{it} + \delta_p Ln(Priv)_{it} + \theta_t + \sum_s \mu_s + \eta_2 \hat{v}_{2st} + \eta_4 \hat{v}_{4st} + \epsilon_{ict}$$

Equation (7) includes control functions for the institutional determinants of 2-year college tuition in a student's county ($\hat{v}_{2st}$) and 4-year college tuition in a student's state ($\hat{v}_{4st}$).

The coefficients on these control functions are of interest for two reasons. First, they provide a direct (Durbin-Wu-Hausman) test of the endogeneity of institutional price setting on student enrollment decisions. Second, the control function coefficients provide insight into any unmeasured attributes of colleges that coincide with tuition changes affecting students' decisions. If the control functions on tuition at a student's local 2-year (or 4-year) institution are positive (negative), this is evidence that students perceive schools that see relatively large tuition increases as those that are offering better (worse) services, quality, or student experience, too.

As with Equation (4), an empirical implementation of Equation (7) yields estimates of the impacts of the average difference in college attendance for a student, relative to a comparable

student from the same state in a different cohort who faced different costs of attending a 2-year college – holding constant the costs of attending a 4-year school in the state. However, Equation (7) controls directly for enrollment changes due to tuition changes due to institutional discretion, and so provides a more credible causal estimate of the enrollment effects of tuition costs, per se.

Using this specification, we estimate a series of multinomial logit models to estimate the relative costs of enrollment at 2-year versus 4-year public colleges and universities on where a student enrolls, faced with multiple options, and not enrolling at all. Again, the variation driving the estimates will come from differences between cohorts in the cost of attending a 2-year versus public 4-year college within states.

3.2 Data

To examine the effect of changing costs on post-secondary enrollment, we use data from surveys of three cohorts of students followed for up to eight years after high school: The National Education Longitudinal Study (NELS), the Education Longitudinal Study (ELS), and the High School Longitudinal Study (HSLS). These surveys are part of the Secondary Longitudinal Studies Program at the National Center for Education Statistics, designed to study the experiences of nationally representative samples of high school students as they complete their secondary education and transition into college and the labor force (Ingels et al., 2011). These surveys allow us to examine changes in post-secondary enrollment decisions for nationally representative samples of students in three different periods, NELS (1988-2000), ELS (2002-2012), and HSLS (2009-2017).[21] We merge data on tuition costs at 4-year colleges in the states and community colleges in the counties where students finish high school, using data from the

[21] The samples for these surveys are constructed using a two-stage random sampling design, where first, eligible schools are randomly selected, and second, students at each school are randomly selected. When weighted, these surveys are nationally representative of the population. The studies are population-based, and the sample design is used consistently across cohorts.

Integrated Postsecondary Education Data System (IPEDS). To match IPEDS data to the student-level data, we draw upon location information of schools (state and county) available in the Common Core of Data and the Private School Universe Survey.

3.2.1 Student-level Data

The NELS, ELS, and HSLS are nationally representative surveys that begin tracking students between eighth and twelfth grade and then up to eight years after high school graduation.[22] Each includes data from students, parents, teachers, and school administrators. We obtain comparable measures of student demographics, family background, academic ability, and school-level information for each study. These include gender, race and ethnicity, family income, mothers' education attainment, family composition, total enrollment in the respondents' high schools, and standardized math scores.

Importantly, we restrict our analyses to students who graduate high school on time (1992, 2004, 2013) and provide a response to the question asking whether or not they enroll in a post-secondary institution by the time of the second follow-up.[23] Because we rely on information about the costs of college enrollment in the community college district and state where a student resides upon high school graduation, we drop 26 students for whom we do not have information on their state of residence. Additionally, because our estimation strategy relies on changes in tuition at the state level between survey cohorts, we restrict our analyses to students in states that were home to some students from each of the NELS, ELS, and HSLS surveys. This excludes students from Washington, D.C., and Hawaii. Our pooled estimation sample includes 9,515 students from the NELS, 11,530 students from the ELS, and 16,556 students from the HSLS.

[22] The NELS first sampled students in 8th grade, while the ELS first collects data in 10th grade, and the HSLS first collects data in 9th grade.

[23] We exclude roughly 19% of students in the NELS, 18% of students in the ELS, and 10% of students in the HSLS who do not graduate high school with their respective cohorts.

Last, we exclude students who enroll in institutions that offer neither 2-year nor 4-year degrees, private-for-profit institutions, and private 2-year institutions. We then generate variables describing students' first enrollment choice within two years of high school. We define four discrete choices: No post-secondary enrollment; enrolls in an in-state/district public 2-year college; enrolls in a public 4-year school in the graduate's state of residence; or, enrolls in a private 4-year college or a public 4-year institution in a different state.[24]

3.2.2 Institution-level Data

For each student in our pooled NELS/ELS/HSLS data, we merge in data on the tuition and fee costs of enrolling for full-time study in their local community college, public in-state 4-year colleges, and private, not-for-profit 4-year colleges in their state.[25] We obtain these costs from the Integrated Postsecondary Education Data System (IPEDS), collected by NCES on every post-secondary institution participating in federal student aid programs. IPEDS contains enrollment, tuition, completion rates, faculty, staff, and financial aid information. For the graduation years 1992 (NELS), 2004 (ELS), and 2013 (HSLS), we generate the average cost of tuition and required fees by type of college (e.g., 4-year public) weighted by enrollment by state. We measure community college costs as enrollment weighted means in the student's county of residence. Costs are measured in 2019 dollars, adjusted using the consumer price index.

We collect IPEDS information on state appropriations and local appropriations for community colleges for each reporting institution to generate state averages in each graduation year of our sample (1992, 2004, 2013). We also include data on state legislation that impacts institution costs through tuition caps and freezes (e.g., Deming & Walters, 2020). To control for

[24] We exclude respondents that enroll in a college, not reporting sector, level, and location information to IPEDS.
[25] We match this tuition information to the student-level data using the school location from the NELS, ELS, or HSLS, when available. When this was not available, we match the high school to the Common Core of Data to obtain the state and county of students' high school. For students without county information, we use state averages.

local labor market conditions that impact enrollment choices, we control for county unemployment rates in the year students graduate high school (e.g., Hemelt & Marcotte, 2011). We obtain this information from the Local Area Unemployment Statistics (LAUS) data by the U.S. Bureau of Labor Statistics.

4 Results

4.1 Descriptive Statistics

In Table 1, we present descriptive statistics for our pooled NELS, ELS, and HSLS data. Each survey consists of almost equal numbers of men and women. The proportion of respondents who are white non-Hispanic falls across the surveys, from 74 percent for the NELS sample to 55 percent among HSLS respondents. The proportion of the samples that are Black remained around eleven to twelve percent across the surveys, while the proportion who were Hispanic increased from nine to 21 percent. A majority of students have parents who are married (75-83%). The measures of parents' education in the NELS, ELS, and HSLS make it impossible to consistently distinguish between high school graduates with no college and those with some college. So, we measure parental education using the only categories that are clearly comparable across all three surveys: whether a parent is a high school dropout or a college graduate. The omitted category includes those who completed high school, whether or not they earned come college credits short of a bachelor's degree. Unsurprisingly, the education level of the parents of students increased over the cohorts: For example, twelve percent of NELS respondents had mothers who did not complete high school, compared to eight percent of HSLS respondents. The percent of mothers who had completed a college degree rose from 26 to 32% over this period.

In terms of family income, we treat four comparable categorical income groups as continuous variables where we take the midpoint of each income bin and adjust to 2019 dollars.

For the highest income categories (i.e., $75,000 or more), we use 1.5 times the lower bound. Median income is highest in the ELS cohort. We report students' standardized scores on a math assessment (mean of 50), which is comparable across surveys.[26]

Across the survey years, college-going rates are comparable, with the rate of post-secondary enrollment reaching 77, 81, and 83 percent for the graduating high school classes of 1992, 2004, and 2013 respectively. The proportions of students enrolling in community college, in-state public 4-year colleges, and other colleges are similar for each cohort, with some evidence of a decline in the proportion enrolling in 2-year schools. We calculate the average in-state cost to attend a 4-year public institution and the average in-district cost of attending a community college; The average price of in-state tuition and fees more than doubles, from $3,602 in the NELS to $7,825 in the HSLS. The cost of in-district tuition and fees increased from $1,973 (NELS) to $3,350 (HSLS), nearly a 70% increase.

4.2 College Enrollment

In Table 2, we present the results of linear probability models of the impact of tuition costs at local 2-year, state 4-year, and private college tuition on the likelihood that members of the NELS, ELS and HSLS cohorts will enroll in college after high school graduation. In columns 1 and 2, we report results of models of college enrollment as a function of the real cost of attending community college, the average cost of public 4-year college, and the average cost of private, not-for-profit college in a student's home state, controlling for student characteristics, family income, measures of achievement in high school and the size of a student's high school and cohort fixed effects. In column 1, we omit state fixed effects, while in column 2, we include them, so this is the specification in Equation (4). In column 3, we report the result from Equation

[26] Standardized math scores are reported for 12th grade in the NELS and ELS cohorts and 11th grade for the HSLS.

(7), including the control functions for the costs of enrollment in a 2-year or 4-year college in a student's county/state during the year of high school graduation.

The coefficients on demographic characteristics and family background are as expected: Students are more likely to enroll in college if they are female and come from families with more educated parents and higher incomes. Interestingly, non-Hispanic students are marginally less likely to enroll in college than comparable students of other races. This relationship disappears if we omit the control for high school math scores.

The coefficients of interest in Table 2 are those on the costs of full-time attendance at the community college in the county where a student attended high school, the enrollment-weighted costs of attending a public 4-year college in a student's state of residence, and the enrollment-weighted costs of attending a private 4-year college in that state. The differences between the coefficients in columns 1 and 2 illustrate the power of state fixed effects and the importance of cross-cohort comparisons of high school graduates to peers within the same state. In column 1, we estimate relatively small effects of community college tuition and a positive relationship between private college tuition and college attendance. These results are inconsistent with the established empirical patterns in post-secondary education, such as the democratizing function of community colleges and a downward sloping demand function.

In column 2, we report the results from the fully specified Equation (4). Relative to a comparable student from the same state in a different cohort who faced different costs of attending a 2-year college – holding constant the costs of attending a 4-year school in the state, we estimate that in states where community college tuition doubled (i.e., the average over the study period), the likelihood of enrolling in post-secondary education fell by 0.059. When we include the control function (Column 3), the impact of community college tuition on post-

secondary enrollment is slightly smaller in magnitude (0.051), but statistically indistinguishable from the results in column 2 (t = 0.31). The mean of the dependent variable is 0.81. We find no significant relationship between changes in the costs of attending public 4-year or private colleges and universities in a high school graduates' state of residence and the likelihood of enrolling in any college.

This finding that community colleges are the only post-secondary institutions whose costs affect aggregate post-secondary enrollment is consistent with the democratizing role that community colleges play in higher education – serving students who otherwise would not attend college. Conditional on costs at other institutions, changes in tuition at public 4-year colleges and private colleges do not limit post-secondary attendance in the aggregate. This is consistent with the possibility that students who enroll in these institutions are less price-sensitive than those enrolling in community college. It is also possible that the relevant marginal student chooses between enrollment at 4-year colleges or community college when faced with higher costs, whereas the marginal student confronting higher community college costs chooses between enrollment or no college at all.

4.3 Discrete Choice Models

In Table 3, we present results for our multinomial logit models of the impact of tuition changes at local public 2-year, in-state public 4-year, and private tuition on whether and where young high school graduates opt to enroll for post-secondary education. The reference outcome is no college enrollment, and the remaining discrete choices are: Enrollment in the local community college; Enrollment in a public 4-year college in the state where the respondent graduated from high school; and, Enrollment in a private, not-for-profit college, or a public 4-year college in another state. As before, these models control for survey wave and state fixed

effects. So, the coefficients are estimated from changes in the enrollment choices of comparable students graduating in the same states in different cohorts, hence facing different tuition prices. In each case, in the odd-numbered columns, we present results from models without control functions for enrollment at respondents' local community and in-state public 4-year colleges – and in the even-numbered columns, we report results from models with the control functions.

While we impose no order on the discrete choices here, the coefficients on parental income and education are consistent with expected patterns: High school graduates whose mothers had completed college are more likely to attend college than those whose mothers did not complete college. We find that this relationship strengthens from community college to public 4-year colleges to private and out-of-state colleges. We see the same pattern with income but a somewhat different pattern for achievement measured in high school. Math achievement in high school significantly increases the likelihood of attending college, with a more modest relationship for community college versus 4-year college enrollment. But, there is no significant difference in high school math achievement between 4-year college enrollees at in-state public and private or out-of-state colleges.

In columns 1 and 2 of Table 3, we estimate that the likelihood a recent high school graduate enrolls in community college falls substantially with tuition costs at community college. Because we include cohort and state fixed effects in all models, the coefficients on costs here are identified off of comparing changes in enrollment choices over time between observationally equivalent students in a state that experienced relatively large increases in the costs of attending community college, relative to public 4-year colleges in the state. The likelihood a high school graduate enrolls in a public 4-year college increases substantially as community college costs

rise. The costs of private colleges have no effect on community college enrollment, suggesting these choices are not common substitutes.

The coefficients on the control functions from the community and 4-year college enrollment models are informative. The coefficients on the 2-year college control function in columns 4 and 6 imply that larger-than-expected tuition increases at community colleges lead to substitution away from enrollment at 4-year colleges. The coefficients on the control functions suggest that discretionary increases in college tuition are related to factors affecting enrollment demand. For example, tuition growth above expectations may reflect investments in college programs and offerings at community colleges that students value.

To interpret the magnitudes of the coefficients from the estimates in Table 3, using the models including the control functions (columns 2, 4, and 6), we calculate marginal effects of changes in local community college and in-state public 4-year tuition costs on the likelihood of each of the four possible outcomes, reported in Table 4. The post-secondary enrollment choice that is clearly most affected by relative costs is community college. A 100 percent increase in the cost of community colleges would reduce the likelihood a high school graduate enrolls in a community college by 0.131 – more than half the unconditional mean. A change in real tuition costs of this magnitude between cohorts is not uncommon. Nonetheless, even if tuition costs increased more modestly, the change in enrollment likelihood would be large in magnitude relative to the mean. Further, increasing community college costs raise the likelihood a high school graduate would forego college by 0.043 and increase the chances of enrollment in a private college.

Changes in the costs of attending the public 4-year colleges within states also affect enrollment choices. We estimate that a doubling of the costs of public 4-year college enrollment

in the state of residence increases the likelihood a high school graduate enrolls in community college by 0.12, and decreases the likelihood of enrolling in an in-state public 4-year colleges by 0.072. Consistent with Table 2, in row 1 we see no evidence that tuition increases at 4-year public schools reduce the likelihood of any college attendance, but they do affect the college attended. Finally, we find no evidence that changes in tuition at private colleges have significant enrollment or substitution effects. This may be due to the relative price insensitivity of students for whom a private college is an option, increased use of tuition discounting, or the possibility that private schools in one's home state are not the right margin on which to assess college choice.

4.4 Heterogeneity Analyses

Next, we assess whether changes in the costs of college have different effects on enrollment decisions of prospective students with different resources and family support. First, we split our samples between respondents from families with real annual incomes less than $50,000 and those with family incomes above that threshold. We then re-estimate our multinomial logit models separately for these groups. In the top panel of Table 5, we present the marginal effects for these groups of changes in tuition at community colleges and in-state public 4-year colleges from the models in which we include institutional cost control functions.

For high school graduates from families with incomes below $50,000, we estimate that a 100 percent increase in costs decreases the likelihood of a student enrolling in community college by over 0.17, compared to an observationally identical student from the same state in previous years. This is much larger than the average marginal effect for all students reported in Figure 2. Further, rising costs at community colleges substantially increase the likelihood that low-income students forego college altogether. Our estimates suggest that holding other

enrollment costs constant, a 100 percent increase in community college tuition would increase the probability that a high school graduate from a low-income family would forego college altogether by 0.149. This is large relative to the mean since the proportion of graduates from low-income families who do not go to college is 0.35. We estimate no significant effects of tuition costs at public 4-year colleges on enrollment choices for low-income high school graduates.

For those from higher-income families, rising costs at community colleges reduce the likelihood of enrolling in community college after high school graduation by 0.092. This is smaller than the change in enrollment we saw for low-income students. And, we see no evidence that increasing community college costs increase the likelihood that high school graduates from higher-income families forego college altogether. Instead, there is evidence that these students substitute away toward private and out-of-state colleges when community college costs rise.

Next, in Panel B of Table 5, we split our sample of high school graduates into those whose mothers had completed college and those whose mothers had not.[27] Parents' education is an important factor in post-secondary enrollment and persistence, and colleges are often mindful of first-generation status among students. We estimate that changes in community college costs have much larger effects on enrollment decisions for those whose mothers had not completed college. We estimate that a 100 percent increase in community college costs in a state between cohorts reduced the likelihood a new high school graduate would enroll by 0.148 if her mother had not completed college, but by only 0.057 if she had. Children of those without a college education were also more responsive to changes in the costs of 4-year college enrollment. We estimate that a 100 percent increase in the costs of 4-year college enrollment between cohorts led

[27] As discussed above, we are unable to distinguish between parents who were high school graduates with no college and those with some college consistently across all three surveys.

to a decline in the likelihood of attending a public in-state 4-year college of 0.10 for this group – and an increase in the likelihood of attending community college by 0.142. We see no statistically significant effects on enrollment patterns among those whose mothers completed college.

5 Conclusions

In this paper, we contribute to the literature on rising costs and enrollment in higher education. We provide an updated national perspective by comparing enrollment decisions from students who graduate high school across three decades. Harmonizing survey data from the National Center for Education Statistics' NELS, ELS, and HSLS datasets, we compare the enrollment decisions of nationally representative samples graduating in the high school classes of 1992, 2004, and 2013. Pooling these surveys, we assess the post-secondary enrollment decisions of students with comparable academic proficiency and family backgrounds. Our primary estimation strategy relies on comparing students from the same states between survey waves.

We find substantially different patterns of tuition growth between states, in absolute and relative terms, and for costs of community college versus public 4-year colleges. Exploiting intertemporal variation in 2- and 4- year costs within states, we estimate that in states where community college tuition doubled (the average over the study period), the likelihood of enrolling in any form of post-secondary education fell by about 0.06, on a mean of about 0.80.

We also find that increases in the costs of enrollment in community college decrease the likelihood of enrolling in community colleges and increase the chances that some students attend public 4-year institutions in their state of residence. Importantly, we find that increasing costs at community colleges significantly reduce the chances that a recent high school graduate attends college at all. This is consistent with the democratizing role these institutions play in higher

education: Community colleges serve students who might otherwise not attend college. We find no evidence that changes in tuition at public 4-year colleges and private colleges limit post-secondary attendance overall. However, rising costs at public 4-year colleges limit enrollment in those colleges and divert students to community college. This diversion is most apparent for students whose parents do not have a college education.

We find some evidence of endogeneity in cost-setting at the institution level. Instrumenting intertemporal changes in institutional costs using state and local appropriations and state policy to cap tuition growth, we find that naïve estimates over-state the impact of cost increases on enrollment at 2- and 4-year colleges. Larger-than-expected tuition increases at community colleges lead to substitution away from 4-year colleges toward 2-year enrollment. This may be because institutional price-setting reflects supply-side investments in community college programs and offerings. It could be due to demand-side factors that induce enrollment at community colleges in labor markets where skills obtained there are in high demand. We see a similar pattern at 4-year colleges: Institutional factors associated with tuition cost increases are positively related to enrollment growth. In states where public 4-year college costs rise above expectations, students are less likely to enroll in private colleges.

Our results are relevant for current policy discussions about reducing college costs, including the push for "free college." Most directly, recent proposals to reduce costs focus substantially on reducing or eliminating the costs of community college, both to benefit those planning to attend 2-year colleges for credit or a credential, but also for those who might start at a community college and then transfer to earn a planned bachelor's degree. Our findings suggest that reducing community college costs will increase college-going by a sizeable amount – more

than five percentage points. Our preferred control function specification finds no evidence that reduced-cost community college would divert students from public 4-year colleges.

Finally, our findings also clarify the hazards of not reining in growing enrollment costs at public 4-year colleges. Increases in the costs of public 4-year education within states increase the chances of enrolling in community colleges, especially among students from low-income families and parents who have not completed college. Together, our findings suggest that increasing costs of public higher education lead to a substitution of community colleges for public 4-year colleges for students on one margin and no enrollment at all rather than community college on another margin.

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Table 1: Descriptive Statistics

	NELS: 1992		ELS: 2004		HSLS:2013	
Variable	Mean	SD	Mean	SD	Mean	SD
Female	0.51	0.50	0.53	0.50	0.52	0.50
White	0.74	0.44	0.65	0.48	0.55	0.50
Black	0.11	0.31	0.12	0.33	0.12	0.32
Hispanic	0.09	0.29	0.13	0.34	0.21	0.41
Parents are married	0.83	0.38	0.81	0.40	0.75	0.43
Mom has less than HS degree	0.12	0.33	0.10	0.30	0.08	0.28
Mom is college grad	0.26	0.44	0.29	0.45	0.32	0.47
Math Score	52.29	9.51	51.20	9.86	52.30	9.97
Attended college?	0.77	0.42	0.81	0.38	0.83	0.37
Enrolled in 4-year in-state?	0.27	0.44	0.28	0.45	0.27	0.44
Enrolled in 2-year in-district?	0.25	0.43	0.26	0.44	0.22	0.41
Enroll in other college?[1]	0.23	0.42	0.25	0.43	0.29	0.45
Part-time enrollment	0.07	0.26	0.08	0.27	0.05	0.22
In-state tuition, public 4-yr	3,602	1,246	5,668	1,848	7,825	1,938
In-district tuition, public 2-yr	1,973	973	2,670	1,078	3,350	1,025
Observations	9,515		11,530		16,556	

[1]Excluding for-profit colleges (see text for exclusion criteria)

Table 2: College Costs and Enrollment within Two Years After High School

	(1) Ever Attend College?	(2) Ever Attend College?	(3) Ever Attend College?
Female	.073***	.074***	.074***
	(.004)	(.004)	(.004)
Black	.056***	.047***	.047***
	(.007)	(.008)	(.008)
Hispanic	.029***	.023***	.023***
	(.007)	(.007)	(.007)
Other	.022***	.017***	.016***
	(.005)	(.006)	(.006)
Mom HS Dropout?	-.104***	-.104***	-.101***
	(.009)	(.009)	(.009)
Mom College Grad?	.065***	.065***	.064***
	(.004)	(.004)	(.004)
Family income, in 1000s	0.003***	0.003***	0.003***
	(0.0003)	(0.0003)	(0.0002)
Std. Math Score	.011***	.011***	.011***
	(0.002)	(0.002)	(0.002)
ln(Comm. College Costs)	-.028***	-.059***	-.051***
	(.005)	(.015)	(.021)
ln(Pub. 4 yr. College Costs)	.009	.033	.03
	(.008)	(.022)	(.029)
ln(Private College Costs)	.022***	-.046	-.061
	(.008)	(.036)	(.037)
Comm. College control fn.			-0.001
			(.0009)
Pub. 4 yr. College control fn.			0.0001
			(0.0007)
State Fixed Effects?	No	Yes	Yes
Observations	32325	32325	32148
R-squared	0.145	0.148	0.148

Huber-White standard errors in parentheses
**** p<.01, ** p<.05, * p<.1*
All models include controls for the size of a student's high school, and cohort fixed effects.

Table 3

Multinomial Logit Estimates of College Costs and College Choice

Dependent Variable: Post-Secondary Enrollment Choice	*Base Outcome: No Post-Sec. Enrollment*					
	Choice 1		*Choice 2*		*Choice 3*	
	Community College		*Public 4-yr. In-state*		*Other 4-yr. College*	
Explanatory Variable	(1)	(2)	(3)	(4)	(5)	(6)
Female	.436***	.44***	.695***	.702***	.746***	.748***
	(.04)	(.041)	(.041)	(.041)	(.042)	(.043)
Black	-.004	-.008	.583***	.588***	.901***	.897***
	(.071)	(.071)	(.072)	(.073)	(.074)	(.074)
Hispanic	.051	.046	.13*	.133*	.154**	.155**
	(.065)	(.065)	(.07)	(.07)	(.073)	(.074)
Asian/Other	.039	.037	.4***	.405***	.149**	.155**
	(.067)	(.067)	(.066)	(.066)	(.069)	(.069)
Mom HS Dropout?	-.467***	-.457***	-.611***	-.596***	-.939***	-.936***
	(.062)	(.062)	(.07)	(.071)	(.088)	(.089)
Mom College Grad?	.355***	.355***	.812***	.813***	1.166***	1.167***
	(.056)	(.056)	(.053)	(.054)	(.053)	(.054)
Family income, in 1000s	.003***	.003***	.005***	.005***	.008***	.008***
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
ln(Comm. College Costs)	-.857***	-.87***	-.338**	-.014	-.02	.087
	(.153)	(.199)	(.159)	(.2)	(.169)	(.213)
ln(Pub. 4 yr. College Costs)	.775***	.837***	.03	-.079	.134	.159
	(.219)	(.268)	(.226)	(.274)	(.238)	(.287)
Std. Math Score	.045***	.045***	.14***	.141***	.144***	.145***
	(.003)	(.003)	(.003)	(.003)	(.003)	(.003)
ln(Private College Costs)	-.214	-.241	-.541*	-.706**	-.455	-.618*
	(.339)	(.348)	(.301)	(.308)	(.315)	(.325)
Comm. College control fn.		0.001		-.032***		-.015*
		(.009)		(.009)		(.009)
Pub. 4 yr. College control fn.		-.005		.004		-.005
		(.007)		(.007)		(.007)
Outcome (Choice) Mean	0.211		0.288		0.303	
First-stage F-statistics, Control fn.estimates	Comm. College *F= 263.50*				Public 4.yr College *F=3388.78*	

Huber-White standard errors in parentheses
**** p<.01, ** p<.05, * p<.10*
All models control for size of high school, county unemployment, and time/cohort fixed effects.

Table 4

Marginal Effects of Tuition Costs on Post-Secondary Enrollment Outcomes

Outcome	E(Outcome)	ln(Community College Tuition) dP(Outcome)/dx		ln(Public 4-yr College Tuition) dP(Outcome)/dx	
No College	0.20	0.043	**	-0.045	
		(0.022)		(0.029)	
Enrolled - Community College	0.211	-0.131	***	0.120	***
		(0.023)		(0.031)	
Enrolled - In-State Public 4-yr College	0.288	0.035		-0.072	**
		(0.025)		(0.035)	
Enrolled - Out-of-State or Private College	0.303	0.053	**	-0.003	
		(0.025)		(0.034)	

Standard errors in parentheses

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

Marginal effects of ln(tuition) change on P(outcome) calculated at control means, using delta method from model results reported in even numbered columns in Table 3

Table 5: College Tuition and Post-Secondary Enrollment, by Family Characteristics

	(1) Did not enroll in college?	(2) Enrolled in Comm. College?	(3) Enrolled in Public 4-yr (in-state)?	(4) Enrolled in Private/ Out-of-State 4-yr?
Panel A: Family Income				
Family Income < $50,000				
Log 2-yr Tuition	0.149*	-0.179***	0.071	-0.041
	(0.061)	(0.053)	(0.054)	(0.052)
Log 4-yr Tuition	-0.096	0. 035	-0.069	0.130
	(0.088)	(0.085)	(0.081)	(0.078)
Family Income > $50,000				
Log 2-yr Tuition	0.028	-0.092***	-0.018	0.082**
	(0.020)	(0.020)	(0.027)	(0.028)
Log 4-yr Tuition	-0.068*	0.067	-0.013	0.014
	(0.031)	(0.035)	(0.042)	(0.043)
Panel B: Mother Education				
Mother does not have a college degree				
Log 2-yr Tuition	0.039	-0.148***	0.060*	0.049
	(0.029)	(0.026)	(0.030)	(0.030)
Log 4-yr Tuition	-0.059	0.143***	-0.110*	0.023
	(0.042)	(0. 043)	(0.044)	(0.042)
Mother has a college degree				
Log 2-yr Tuition	0.020	-0.056*	-0.102*	0.138***
	(0.023)	(0.025)	(0.040)	(0.043)
Log 4-yr Tuition	-0.036	-0.077	0.076	0.036
	(0.036)	(0.047)	(0.067)	(0.070)

Huber-White standard errors in parentheses

**** p<.01, ** p<.05, * p<.10*