Common Choices:

The Effect of the Common Application on Students' College Enrollment and Success

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Abstract

There is little research on how students’ college decisions may be influenced by minor facets of the college admission process such as the relative difficulty of completing college applications. I demonstrate that these theoretically minor concerns are, in fact, quite important to the college enrollment process by studying students’ use of the Common Application to apply to college. I take advantage of the change in colleges that accept the Common Application between the cohorts of students in the nationally representative NELS and ELS data sets and use an instrumental variables approach to explore the causal effect of the Common Application on students’ college enrollment choices and persistence. In theory, the ease of applying to multiple schools through the use of the Common Application has the potential to affect both whether and where students choose to apply to college and, subsequently, the quality of the student-college match. I find evidence that the Common Application does alter students’ enrollment choices and increases their likelihood of staying enrolled in college. Thus, despite the enormity of the college decision, small alterations to steps in the college enrollment process can affect high school students’ behavior. These results suggest that leveraging such changes can be an effective and inexpensive policy tool for improving college outcomes.
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The process of applying to four-year colleges is long and complicated. How this complexity affects students’ college choice is not well understood. In particular, little is known about how the relative ease or complexity of completing and submitting applications to different schools affects students’ decisions about where to apply to and subsequently enroll in college. The traditional view is that students base part of their decision on where to apply on college on the availability of academic programs or social or athletic opportunities. But the complexity of the application process—such as the number of essays required in the application or how many SAT II Subject tests are required—may also contribute to their decision. Because a student can only enroll in a school he or she has applied to, decisions based on application complexity may ultimately affect the type and character of the schools a student can select for matriculation.

This is not just a theoretical concern. In 1975, the Common Application was created to make it easier for students to apply to college. The Common Application reduces the costs and effort students must expend to apply to college by allowing students to apply to multiple colleges while filling out only a single application. Roughly three million college applications were submitted using the Common Application last year. Give this large usage, the Common Application stands as one of the more influential developments in selective college admissions in the past 30 years. This effect may be through its intention of easing the burden of applying to college, or through some other mechanism—very little is known about how the Common Application affects students’ decisions.
Students using the Common Application’s universal form can more easily apply to hundreds of the nation’s colleges and universities than by using multiple unique applications. This ease opens up access to these schools to students who may not have had the savvy or will to navigate the intricacies and particular requirements of varied applications from multiple schools. Despite the Common Application’s popularity and potential impact on student application choices, it has received little scholarly attention, and what exists has focused on its increased strategic adoption by postsecondary institutions and the benefits those institutions reap. While it is important to understand the institutional impact, this focus has drawn scholarly attention away from analyzing the Common Application’s impact on its intended and primary consumer: the student applying to college. The question remains: how does the availability of the Common Application impact individual student's college application behavior and decisions? Does it, for example, alter the type of colleges students consider, apply to, and, therefore, have the option of enrolling in? Answering these questions and describing the dynamics of Common Application usage is crucial to a clear understanding of how students choose whether and where to apply to college. This need is especially clear if we recognize the importance a good student-college match has on the likelihood of college persistence.

In this study I aim to answer two main research questions: (1) Does using the Common Application change the type of schools in which students enroll? And (2) What effect does using the Common Application have on college persistence? To answer these questions I study the two cohorts of high school students represented in the National Education Longitudinal Study of 1988 (NELS) and Education Longitudinal Study of 2002 (ELS). Further, I take advantage of the adoption of the Common Application by a particular set of colleges between the years these two cohorts of students were applying to college. This choice of data allows for the use of a variation
of difference-in-difference methods with instrumental variables to identify the causal effect of Common Application usage on outcomes including the type of schools in which students enroll, and whether they remain enrolled (vs. transferring or dropping out) after two years.

**Background**

**The Importance of the College Application**

The college choice process is necessarily founded on the completion of applications. Where a student chooses to apply to college determines the set of schools in which he or she can choose to enroll. A student can only choose to enroll after he or she has applied. We know that where a student chooses to enroll is important because the qualities of the school a student matriculates at determines how successful that student will be at that school. A long line of research (e.g. Braxton 2000; Cabrera, Castaneda, Nora, & Hengstler 1992; Tinto 1993) has emphasized the importance of both academic and social matches between students and schools—the better students integrate into a school, the more likely they are to persist. Such theories say that a student’s persistence at a college is a function of a student’s background characteristics, his evolving commitments to both an institution and the goal of earning a college degree, and his academic and social integration with an institution (Tinto 1975). In other words the choice of where to enroll determines the quality of “match” between a student and school. A successful match between students and the institutions they attend is vital to ensuring students will remain enrolled in school, that they persist. This process is illustrated in Figure 1. Thus, the choice of where to apply to college can have far-reaching consequences for later college outcomes. This paper is primarily concerned with how features of a college application, unrelated to the potential academic or social match with a college, affect students’ choices of where to enroll and whether they stay enrolled.
Thin Research on College Applications and College Choice

Traditional models of how students choose a college in which to enroll have focused on three main phases: “aspiration,” “search,” and “choice” (Hossler, Braxton, & Coopersmith 1989; Hossler & Gallagher 1987). The aspiration stage encompasses the development of students’ plans to attend college and their preparation to enroll, search refers to students’ activities around gathering information about colleges and, choice describes how students ultimately select a college in which to enroll. While different scholars have chosen to make each of these individual phases the subject of research, the bulk of the college choice research has been directed at examining the aspiration and choice phases of the process, while less research has addressed the search phase (Perna 2006).

Regardless of the phase under consideration, scholars working in this tradition have rarely grappled with how the application process itself fits into this schema or affects the college choice process. Rather, this research tacitly assumes that, given the decision to attend college and a set of schools a student determines would be a good fit, the student’s subsequent challenge will be selecting the school to attend. This view bypasses the entire application process. The extent to which researchers have avoided serious consideration of the application process is made clear when we find researchers who, agreeing on the three-stage choice process, place the completion of applications in different stages (compare, for example, Cabrera and La Nasa (2000) who place application in the choice phase and DesJardins, Ahlburg, and McCall (2006) who consider it part of search). That this lack of agreement occurs without comment indicates both a lack of conceptual clarity in the field and a lack of attention to the way in which the application process shapes the college selection process.
Avoiding rigorous consideration of the application process in this way makes sense only if we believe the application process poses no obstacles between a student’s search and choice activities or if the application process itself was of no consequence to the choice process. The realities of the application process, however, belie the wisdom of this lack of research attention. Completion of a college application is the final step of a long process leading to college enrollment. In fact, the completion of the college application is just one of many barriers to college enrollment that are presented by various steps in the process, but rarely considered in the college choice literature (Klasik 2011; Roderick, Nagaoka, Coca, & Moeller 2008). It is not, for example, to be taken for granted that all students who aspire to college will apply, or even that those who are academically prepared and have taken the SAT or ACT will submit an application (Klasik 2011). Why this disjuncture occurs, including what facets of an application make a student more or less likely to complete it, is poorly understood.

As a barrier to college attendance, college applications vary considerably in difficulty ranging from simple forms requesting basic academic and demographic information, to multi-page ordeals requiring detailed accounting of extracurricular activities and multiple original essays. Though scholars have paid little attention, students and colleges have recognized that the difficult and complex applications can deter students from applying to particular colleges. A page on the University of Arizona admissions webpage, for example, quoted a student encouraging students to apply by sharing his own application experience: “Applying to the [University of Arizona] was very simple…other schools had so many extra forms, recommendations and essays to fill out that the supplemental applications took weeks to complete.”1 The message is clear: a student should apply to the school because it is an easy thing to do. That this student’s comment was publicized on an admissions webpage to encourage

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students to apply makes it clear that colleges believe that the difficulty of an application, independent of the school’s academic and social offerings, can affect where students choose to apply.

Even as the importance of application ease is recognized by colleges and potential applicants, its potential impact is not well understood. It is important for the design of effective college access and choice policy to understand how such dynamics work; how seemingly minor factors such as the difficulty of an application can shape a student’s application choices.

The Common Application

The Common Application (hereafter “CA”) is a standardized application form that collects a set of information that has become typical on most selective college application forms: demographic data, information about extracurricular and leadership activities, lists of awards, and a personal essay. If the CA is not the only form a school accepts for application purposes, then that institution guarantees that admissions officers will give the CA equal consideration to its own application forms in the admissions process. Many colleges, however, abandon their own forms entirely when they adopt the Common Application.

The Common Application was first adopted in 1975 by a collection of 15 colleges and universities and by 2011 was accepted at over 450. In 2011, over three-quarters of a million students submitted nearly three million CAs. Because the Common Application is used by a wide variety of colleges across the country, it presents a good tool to study the importance of college applications in the college choice process.

Although the primary benefit, and stated goal, of the CA is that it streamlines a complicated college admission process for students, the attention it has drawn from academic researchers and journalists has focused on its strategic use by institutions. Conventional wisdom
assumes that schools that adopt the CA see a boost in the total number of applications they receive and thus improve their perceived selectivity. Because selectivity is captured by the US News & World Report college rankings, adopting the CA may be part of a growing trend for institutions to increase their ranking without making substantive changes to their program (Avery, Glickman, Hoxby, & Metrick 2004; Monks & Ehrenberg 1999).

Only one study has attempted to describe the application changes institutions see as a result of adopting the CA. Liu, Ehrenberg, and Mrdjenovic (2007) analyzed both the diffusion of CA membership and its effects on application and enrollment outcomes. They found that CA adoption is, in part, a function of how many peer schools accept the CA, supporting claims that the CA is adopted to maintain an edge with competitor intuitions. They also found that when schools adopted the CA, they saw an increase in the number of applications received, a decrease in yield rate, and an increase in the percentage of students of color that enroll.

Examining the aggregated impact of CA adoption at the institutional level provides little insight into how the CA operates at the student level to affect college application and attendance decisions. While institutions see higher numbers of applications as a result of accepting the CA, it is not clear if these applications are coming from particular populations of students or how applying to a CA school impacts students’ decisions to apply to and enroll at other institutions. A student, for example, could apply more schools than they otherwise would have because those additional schools accept the CA, but applying to these extra schools may not affect where they decide to enroll.

Only one study has examined changes in application behavior from the student perspective. Smith (2012) examines indirectly how the CA affects the likelihood a student enrolls in college through how it affects the number of applications students submit. He finds
that students using the CA submit more applications than other students and that the more applications students submit, the more likely they are to enroll in college.

**The Common Application and College Enrollment and Persistence**

In this paper I test whether the Common Application affects not whether, but *where* a student enrolls in college. The CA can affect the schools to which students apply by either altering the cost of application or simply changing the structure of students’ choices by re-structuring the information students have available to them to make their college application decisions. To the extent that the CA alters the suite of schools to which students submit applications, it then changes their options for where they can enroll, and whether they stay enrolled at their ultimate choice. Further, persistence in college is determined by the quality of match between a student and the school in which she enrolls. To the extent that the CA either affects the college search process or the school a student enrolls in, the CA can also affect persistence. I discuss how each of these mechanisms may work below.

**Application costs.**

Students who face high application costs will submit few applications relative to those students for whom the process of completing multiple applications is less daunting. These high costs have two possible consequences. First, naïve students who face high application costs may submit their few applications to schools for which they are not qualified and are thus unlikely to gain admission. These students risk not being accepted anywhere. Indirect evidence of this was seen in the Chicago Public Schools, where it was found that the fewer applications a student submitted, the less likely she was to gain admission to a four-year college (Roderick, Nagaoka, Coca, & Moeller 2008). Second, more informed students may submit their few applications to schools where admission is likely, at the expense of applying to riskier and perhaps higher
quality schools. Such a mechanism may help explain the academic “undermatching” of students to schools wherein students attend schools with a lower academic profile than the student’s academic achievement would suggest (Bowen, Chingos, & McPherson 2009; Roderick et al. 2008; Roderick, Nagaoka, Coca, & Moeller 2009). Thus, students who are constrained in the number of applications they submit, if they are accepted to college at all, may not able to enroll in colleges that will best serve their academic needs, challenge their intellect, or maximize their future earnings and other life outcomes.

The CA lowers the cost of submitting multiple college applications. Once a student completes one CA form, the only barrier to submitting them to any number of colleges that accept the CA is each individual school’s application fees. For students that find the work associated with completing multiple applications to be a barrier, the CA frees them to submit more—and perhaps wider variety of—applications than they otherwise would have, albeit as long as these go to CA-accepting schools.

Small changes to the cost of step completion, similar to the reduction in the cost of completing multiple applications caused by the CA, have been shown to affect behavior at other stages of the admissions process. Klasik (2012) found that students who were required to take the SAT or ACT made different choices about where to attend college than those who were not—they were generally more likely to enroll in private four-year colleges than students who did not face entrance exam requirements. Pallais (2009) found that a $6 reduction in the cost of submitting four ACT score reports caused students to submit more score reports to a wider

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2 Note that most schools that accept the Common Application also require a supplemental application form that collects information not otherwise on the standard Common Application form. These supplements can range in complexity from asking whether a student has a criminal record to requesting another essay on a particular topic. It is difficult to collect data on the content of the supplements that colleges have used over years so I largely ignore them for the purposes of analysis. To the extent that these forms do not completely eliminate the marginal work cost of submitting an additional Common Application and it is this cost reduction that drives any Common Application effect, I will underestimate the size of that effect.
variety of colleges and connects this to an increase in the likelihood of submitting an additional college application. Focusing on the work costs associated with applying for financial aid, Bettinger, Long, Oreopoulos, and Sanbonmatsu (2009) demonstrated in a randomized trial that helping students complete their Free Application for Federal Student Aid resulted in a 7.7 percentage point increase in the likelihood that those students enrolled in college. Thus, seemingly minor changes in the cost of submitting standardized test scores and applying for financial aid resulted in observable increases in the likelihood that students apply to and enroll in college.

**Choice structure.**

A second path by which the CA might affect students’ decision on where to apply to college is by altering the way that students perceive and interpret their application choice. While the CA does not in any way change the college options from which students can choose, it does highlight a particular subset of colleges—specifically, those that accept the CA. Once a student becomes aware of the CA, it is not much work to discover the full set of colleges that accept it. Thus, from the sea of over 1,600 four-year, degree-granting colleges and universities in the United States, students have their attention drawn to the subset of those colleges that share a common application form.

This kind of attention-focusing has been shown to have a powerful effect on choice behavior in a number of different contexts. Research has shown that individuals choose differently from cafeteria or menu items depending on how they are arranged or presented. Researchers have been able to affect the food items subjects choose from a buffet by altering the placement of those items to make them easier or harder to reach (Rozin et al. 2011). Similarly, individuals choose differently from a menu when items are at the top, middle, or bottom of the
list of available options (Dayan & Bar-Hillel 2011). While food choices may seem trivial relative to the choice of where to attend college, political scientists have consistently found that decisions as consequential as which of a set of political candidates to vote for can be affected by the order in which the candidates are listed on a ballot (e.g. Miller & Krosnick 1998; Taebel 1975). All of these ideas are in line with Thaler and Sunstein’s (2009) “nudge” theory of how small, seemingly irrelevant, adjustments to what they call “choice architecture” can influence the decisions that people make. Thus, by giving some structure to the complex choice of deciding which college to apply to, the CA may influence the decisions students make when making this choice.

Iyengar and Lepper’ (2000) discuss a similar idea in their study of choice overload. They found that the more choices subjects had available to them the harder time they had making a decision. Further, they found when people made a decision from many possible options they were more likely to doubt their subsequent decisions than people who had fewer options. In this way, the CA may make students’ application choices easier by significantly reducing the number of colleges for them to consider. Once a student decides they want to use the CA, their choice set is reduced to the population of colleges that accept the CA (although they are not prevented from also applying to colleges that do not accept the CA).

**Persistence**

Persistence research often focuses on those facets of persistence that can be addressed by postsecondary institutions and take as given the forces that help define the initial commitment to an institution—the initial match and expectations with which a student enters college (St. John, Paulsen, & Starkey 1996). In fact, the college choice process is intimately linked with students’ initial commitment to an institution. St. John, Paulsen, and Starkey (1996) propose that students’ initial commitment to a college is based on their expectations of the academic and social
environment of that college formed during the college search process. Further, students’ persistence at a college is likely a function of the extent to which these pre-matriculation expectations are met. These initial expectations, however, can only be as good as the information students have to form them. The more information students have about colleges from different sources, the more likely students are to report satisfaction with their choice of school (Hamrick & Hossler 1996).

Good matches can be fostered both by students investing time in researching the colleges they apply to and by admissions officers selecting students who fit their institution well. Based on these two ideas, the CA may have unintended, competing effects on persistence.

With respect to the amount of student research done in selecting colleges to apply to, the reduced cost of applying to an additional school as a result of using the CA may reduce the effort students spend learning about that school: in the most extreme case, the search for a school may extend no further than checking off another college on the list of those that accept a student’s already completed CA. Because the marginal cost of submitting an additional application is costless, save for application fees, there is little incentive for students to carefully research each school to which they apply—if they are at all interested in applying to a school it makes sense to submit an application to that school and worry about the details of the match later. This decrease in search effort reduces the likelihood of a good match and thus decreases the likelihood of persistence. It may be that students who use the CA and invest minimally in learning about the colleges to which they apply research these schools after they have been admitted. If a student has many schools to which they were accepted, this may still foster a good match, but students

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3 Note that many schools require students who use the CA to complete school-specific supplemental forms of varying difficulty. Thus, application fees do not entirely capture the marginal cost of applying to an additional college when using the CA. To the extent that supplements do not lower the marginal cost of submitting an additional college application as much as expected, my results will be biased downward.
with small choice sets may have a hard time finding a compatible match among their options. Further, it may be that concepts of academic and social integration become secondary to financial concerns at this stage at which a student has already been admitted to a set of colleges. In other words, once students face the set of colleges to which they have been accepted, the price of attending those colleges may drive their decisions more than whether students feel a school is a good match. In all cases, it is not clear that waiting to gather information about schools after application, but prior to matriculation, can make up for not investing in this search for information prior to applying.

The likelihood of persistence at a college may also decrease with the use of the CA because, consistent with the nudging theories described above, students who use the CA may be nudged away from potentially good matches.

Alternatively, the increase in applications associated with adopting the CA may allow admissions officers at CA schools to make decisions based on information about more students, allowing for the selection of a class that is a better school-student match, increasing the likelihood of student persistence. Further, if the use of the CA increases the number of applications a given student submits (as suggested by Smith 2012), then the odds of a good match increase by a simple increase in the number of matriculation options from which a student can choose. Finally, just as students may be nudged away from good matches, they may also be nudged towards good matches.

**Research Questions and Expectations**

In this study, I aim to answer to main research questions: (1) Does using the Common Application change the type of schools in which students enroll? And (2) What effect does using the Common Application have on college persistence? For purposes of this study I define
persistence in college as whether a student is observed enrolled in their initial college matriculation choice two years after their first enrollment. If a student has transferred or dropped out by this point, they have not persisted.

Based on the way in which the CA affects both the cost of applying to the schools that accept it, and the way in which the CA changes the structure of the college choice for students who use it, it is reasonable to expect that students who use the CA will be more likely to apply to schools that accept the CA. To the extent that this represents a meaningful change in students’ college search behavior, this change in application behavior will be reflected in the choices students make about where to enroll. Thus we can also expect that students who use the CA will be more likely to enroll in schools that accept the CA. This should be observed in an increase in the likelihood that students enroll in the types of colleges that accept the CA—private, selective, and liberal arts colleges.

The story for persistence is less clear. While there is good reason to believe that use of the CA will lead students to enroll in different types of colleges, it is not as easy to predict whether this will result in a better or worse match between students and schools. Therefore the expected direction of the effect of the CA on persistence is ambiguous.

**Data and Empirical Strategy**

**Basic Strategy**

One of the main challenges of studying the causal effect of CA usage is that schools that accept the CA are, as a group, different from colleges that do not accept the CA. As shown in Table 1, CA-accepting schools are more likely to be private or liberal arts colleges and are generally smaller and more selective than other four-year colleges. This means that if I find differences in outcomes between students applying to CA-accepting schools compared to
students who apply to schools that do not accept the CA we cannot be sure the difference is not attributable to some other difference between students who apply to CA schools and those who do not besides the use of the CA.

One hypothetical solution would be to randomly assign students to apply to CA-accepting or non-CA-accepting schools. The problem with this approach is that, regardless of CA use, students are, by definition, more likely to attend the colleges to which they apply so it would be difficult to interpret any differences in enrollment choices that resulted from this experiment. An alternative approach would be to take the students who are applying to at least one CA-accepting school and randomize whether the CA is available to them or not.

This hypothetical experiment is impractical to execute, but provides the underlying rationale for the design that I use to test for effects of CA usage. I take advantage of the gradual adoption of the CA by colleges over time. This allows for the identification of “switching” schools—colleges that at one time point did not accept the CA, but had adopted the CA by a second time point. In this way, time determines whether a student has access to the CA when applying to these switching schools. I can then compare outcomes from the set of students who apply to switching schools to other college applicants between the two time points. This approach yields the general estimating equation:

\[ Y = \beta_0 + \beta_1 AppSwitch + \beta_2 Post + \beta_3 (AppSwitch \times Post) + \varepsilon \]

where \( AppSwitch \) indicates that a student has applied to a switching school, regardless of time period, and \( Post \) indicates that a student is observed in the second time period. Thus \( \beta_3 \) gives the effect of using the CA—the difference in the likelihood of a given outcome for students applying to switching schools in the second period relative to students who applied switching schools in
the first period and how the likelihood of the given outcome changed for college applicants in
general between the two time periods.

Data

The main data for my analyses come from the National Education Longitudinal Study of 1988 (NELS) and the Education Longitudinal Study of 2002 (ELS). These data sets are
nationally representative, longitudinal surveys of cohorts of students scheduled to graduate high
school in 1992 and 2004, respectively. Students were surveyed every two years beginning in
eighth grade from the NELS students and in tenth grade for the ELS students. Data for this paper
comes from the tenth grade survey, the twelfth grade survey, and the survey conducted two years
after high school graduation (sophomore year of college for those students who continued to
college after graduation). For the two cohorts captured in the NELS and ELS data,
there are 4,050 and 5,580 students observed applying to four-year degree-granting colleges,
respectively.\footnote{Because the data is restricted, all sample sizes are rounded to the nearest 10.}
The analysis of whether students stay enrolled in college is based on the survey observations that
occurred in the second year after high school graduation and is limited to the set of students who
applied to four-year colleges and enrolled in college. Data on the adoption of the CA by colleges
over time was provided directly from the Common Application organization.

The main advantage of using this data is that it captures the college application behavior
of students at two distinct time points. Further, there are 121 switching colleges that did not
accept the CA when students from the NELS cohort were applying to college, but did when the
ELS students applied to college, providing a relatively large set of switching schools to study. I
assume that students who are observed applying to a switching school in the second time
period—when those schools accepted the CA—used the CA. This data also has the benefit of being easily linked both to the Common Core of Data, which provides detailed information on a student’s high schools, and the Integrated Postsecondary Education Data System, which provides information describing the schools to which a student applies and enrolls.

Descriptive statistics for key variables of interest are summarized in Table 2. Note that 11.4 percent of the 1992 cohort and 8.7 percent of the 2004 cohort were observed applying to switching schools. As a result, the effect of applying to a switching school is based on roughly approximately 470 observations from each cohort of students. This means that while the overall sample size is large, the small size of the “treated” group of students limits my power to detect statistically significant treatment effects.

Instrumental Variables

In both NELS and ELS, application behavior is imperfectly observed in each data set. In NELS, students were only asked to specifically report the two colleges, of the total set they applied to, that they were “most likely” to attend. The ELS data collection included attempts to get a complete list of schools to which students applied, but even these lists are incomplete. This means that I do not always observe whether a student has applied to a switching school, so the treatment is measured with error, which will bias estimates of the treatment effect toward zero. Further, I am unable to account for how the decision to apply to switching schools may have changed over time, which may bias results in unknown ways. In both cases, an instrumental variables approach can help estimate unbiased causal effects of using the CA.

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5 Even when a school accepts its own form in addition to the CA, students predominantly choose to submit the CA. Based on personal communication with admissions officers at several CA-accepting schools, roughly 70-80% of applicants use the CA. To the extent that students who apply to switching schools in the second period, but do not use the CA, my results will be biased toward zero. Thus I risk underestimating the effect of CA usage.
I use the count of switching schools within a particular radius of a student, to instrument for whether they apply to a switching school. This strategy takes advantage of students’ tendencies to apply to colleges that are close to where they live, which has been well established in the literature (e.g. Long 2004). For this instrument to work, I need that the number of switching schools near a student is unrelated to any of the outcomes I consider except though its impact on a student’s likelihood of applying to a switching school, conditional on a set of control variables. Criticism of similar instruments that use students’ proximity to colleges has noted that students who live near colleges and universities may differ in important ways from students that do not. I avoid this pitfall because I only count the number of switching schools near a student and can therefore control for the total number of four-year colleges and universities within the same radius. Thus, my instrument predicts the likelihood of applying to a switching school based on the number of switching schools within a given geographic radius of a student, conditional on the total number of four-year colleges in the same radius. This assumes that whether a student lives near four-year colleges may be correlated with outcomes of interest; but once I account for whether a student leaves near four-year colleges, whether these colleges adopt the CA between the NELS and ELS cohorts is ignorably assigned with respect to the outcomes of interest.

What I now want to estimate is given by:

\[ \text{AppSwitch} = \gamma_0 + \gamma_1 Z + \gamma_2 Post + \gamma_3 (Z \ast Post) + \gamma_4 \text{NumSwitch} + u \]

\[ Y = \beta_0 + \beta_1 \text{AppSwitch} + \beta_2 Post + \beta_3 (\text{AppSwitch} \ast Post) + \beta_4 \text{NumSwitch} + \epsilon \]

Where \( Z \) is the instrument—the count of switching schools within a given radius of a student and the other variables are defined as before. As shown in Appendix A, however, using instrumental

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6 Specifically, I calculate the distance of colleges from a student’s high school. While ELS contains information about students’ residential zip codes, NELS does not. Both datasets, however, contain information about the location of a student’s high school. This may make more sense than using students’ residential address as most college recruiting occurs based on where students go to high school and not where they live.
variables in this way produces unbiased estimates of $\beta_1$, but not $\beta_3$—the coefficient of interest. To solve this problem, I estimate the effect of applying to a switching school separately for the two cohorts of students, for which I can obtain unbiased results, as described below.

**Formal Model**

I model the following two-stage least squares regression for each of my outcomes, which include enrollment in various types of colleges ("selective" or "more selective" as defined by The Carnegie Foundation, liberal arts, public, and in-state) and whether students transfer or drop out after two years:

$$AppSwitch_{ijt} = y_{0t} + y_{1t}Z_{ijtr} + y_{2t}NumCol_{ijtr} + X_{ijt}y_{3t} + HS_{jt}y_{4t} + u_{ijt}$$

$$Y_{ijt} = \beta_{0t} + \beta_{1t}AppSwitch_{ijt} + \beta_{2t}NumCol_{ijtr} + X_{ijt}\beta_{3t} + HS_{jt}\beta_{4t} + \varepsilon_{ijt}$$

where $i, j, t$, and $r$, index students, schools, time (1992 or 2004), and radius, respectively. $Z_{ijtr}$ is the instrument and reflects the number of switching schools within a given radius around a student. The main results are presented using a radius of 200 kilometers. The variable $NumCol_{ijtr}$ is the total number of any four-year, non-open access college within a given radius of a student. The vectors $X_{ijt}$ and $HS_{jt}$ are included to increase the precision of the estimates. $X_{ijt}$ is a set of student covariates including basic information on students’ race, gender, and socioeconomic status. $X_{ijt}$ also contains a set of more detailed student-level variables that crudely capture a student’s college readiness, or indicators of a student’s preparation for college. This vector includes measures of a student’s college attendance expectations, their SAT scores, their GPA, scores form NELS- and ELS-administered standardized math and language arts assessments, whether they play a sport, and whether they have enrolled in any Advanced Placement courses. Finally, $X_{ijt}$ includes variables that describe whether a student’s parents earned a bachelor’s degree and whether they are native English speakers. The vector $HS_{jt}$ captures a set of school
characteristics including the schools racial composition, the whether the schools are in the top of bottom quartile of schools in the sample in terms of the percentage of students receiving free or reduced-price lunch, the size of the school and twelfth grade class, and the student-teacher ratio.

The effect of using the CA is therefore given by the difference of $\beta_{1,2004} - \beta_{1,1992}$ —the difference in the effect of applying to a switching school on the outcome between when that school accepted the CA and when it did not. Given the instrument is strong enough, this will account for measurement error bias and the selection bias caused by a particular set of students choosing to apply to switching schools. Indeed, as shown in Table 3, the first-stage F-statistics for the excluded instrument are all greater than 10.

**Missing Data**

Both NELS and ELS data suffer from problems relating to missing data, particularly in the set of non-basic student variables. Missing data among the independent variables were accounted for by employing multiple imputation during analysis (Rubin 1987). No data were imputed for dependent variables. Multiple imputation has the advantage over various forms of mean imputation that it accounts for the uncertainty of the imputed values of missing data by combining parameter and standard error estimates from 5 draws of data from a predicted distribution of the missing data variables.

**Results**

I present the results of the two-cohort instrumental variables analyses below. I first the results for the analyses that examined the effect of CA usage on students’ choice of where to enroll and then give the results for whether CA usage affected persistence.

**Enrollment Choice**
The results of regressions predicting changes in students’ enrollment choices are presented in Table 3. There are no detectible differences in the likelihood that a student who uses the CA enrolls in a selective or more selective college, or that they enroll in a liberal arts college. There are, however, significant increases in the likelihood that students enroll at public institutions and in-state institutions for students who use the CA. Calculated for the mean student in the 2004 cohort, the marginal effect of using the CA on the likelihood that a student enrolls in a public or in-state institution increases by 28 and 40 percentage points, respectively.

These results are large and contrary to expectations. One possible explanation is that the introduction of the CA at the switching schools induced a different population of students to apply to these schools than applied when those schools did not accept the CA. To investigate this, I performed a follow up analysis predicting where students applied to school based on their proximity to switching schools. Specifically, I model the OLS regression predicting

\[ Y_{ij} = \beta_0 + \beta_1 \text{NumSwitch}_{ij} + \beta_1 \text{Post}_{ij} + \beta_2 (\text{NumSwitch}_{ij} \ast \text{Post}_{ij}) + X_i \beta_4 + HS_j \beta_5 + \varepsilon_{ij} \]

Where \( \text{NumSwitch}_{ij} \) is the number of switching schools within 200 kilometers of a student (the same as the instrument used in the main analysis), \( \text{Post}_{ij} \) is defined as above, and \( X_i \) and \( \text{HS}_j \) are the vectors of covariates used in the main analysis, including the total number of four-year colleges within 200km of a student. These analyses, presented in Table 4, do not allow for the attribution of causal claims to the CA, but help describe changes in students’ application as a result of CA availability for the focal students in the main analysis.

As shown in Table 4, the increase in likelihood of enrolling at in-state or public schools was not the result of an increase in the likelihood of applying to in-state public schools in general. Specifically, students who lived near switching schools were much more likely to apply to in-state, public \textit{switching} schools rather than to in-state, public schools that did not adopt the
CA. This seems to indicate that this an effect driven not by public institutions, but by the CA itself. Further, this effect was not driven by a change in the likelihood of applying just to in-state switching colleges—there was no increase in the likelihood of applying to in-state, private switching schools, just to in-state public switchers. Thus the increase in likelihood of enrolling in in-state or public colleges seems to be driven by an increase in the likelihood that students applied to in-state public schools that accepted the CA.

**Persistence**

Table 3 also presents the results predicting how the use of the CA affected the likelihood that a student is observed enrolled at their first postsecondary institution two years after matriculating. If a student is not observed at their first institution, it indicates that they have either transferred to another school, or dropped out of college entirely. Use of the CA results in a marginally significant decrease in the likelihood that a student leaves her first institution indicating that it appears to be helping foster a better student-college match than is achieved by students who do not use the CA. For the average student in the 2004 cohort, this represents a 40 percentage point reduction in the marginal effect of using the CA on the likelihood of leaving their first college.

**Robustness to Distance**

In order to ensure that the results are not sensitive to the choice of radius used in the instrument, the analyses were repeated for 100, 300, and 400 kilometers. The results of these analyses are presented in Appendix B. All results are consistent across choice of radius in terms of the direction for the effect of using the CA. Most results that were statistically significant using a radius of 200km also reach conventional levels of significance at other radii. The major exceptions to this are the results for whether students transfer or leave after two years. These
results are only significant for the 200km radius. The choice to transfer or drop out, however, is an infrequent enough occurrence that the data has limited power to detect significant CA effects. That the CA effect for leaving is consistently negative, regardless of significance is strongly suggestive of a CA effect on persistence.

**Generalization**

In instrumental variable analyses the results generalize only to the population of students for which the instrument is predictive of the treatment. This effect is known formally as the local average treatment effect. For the purposes of this paper, this means that the results generalize to the population of students for whom the count of switching schools within 200 kilometers of their high school is predictive of whether they apply to a switching school. Thus these results likely apply to the population of students who pay particular attention to their local colleges when deciding where to apply.

Additionally, because I look at the effect of using the CA by estimating its effect at switching schools, the results—in the most formal sense—do not generalize beyond those schools. However, the switching schools as described in Table 1 generally look similar to the population of CA schools as a whole, so the results presented here may be strongly suggestive of a more generalizable effect of CA use. There is no compelling reason to think that the effect of CA use would be notably different at this particular set of schools than other CA schools, in particular those schools that have adopted the CA since 2004.

**Discussion**

The use of the Common Application affects where students enroll in college. For students who base part of their decision about where to apply on college proximity, use of the CA increases the likelihood they enroll in public and in-state institutions. More importantly, there is
some evidence that use of the CA decreases the likelihood that a student transfers or drops out of college by their second year.

These results are notable because the CA only makes small changes to how a student might approach the application process. Put simply: the CA reduces the work—but not financial—cost associated with submitting multiple college applications, as long as those applications are submitted to colleges that accept it. The effect this has on enrollment and persistence decisions may come from this reduction in cost, or the basic emphasis of the particular colleges that accept the CA. This is an important finding because it indicates that small changes in the way students approach the college application process can affect where students enroll in college and whether they stayed enrolled.

The Increase in Enrollment at Public and In-state Institutions

It was unexpected that students who used the CA were more likely to enroll in public and in-state colleges than they otherwise would have. It appears that part of this increase in likelihood came from an increase in the likelihood that students who lived near switching colleges applied to public, in-state, switching colleges. What is unclear, however, is whether these new applications came from students who were introduced to switching schools for the first time because of the CA, or if they came from students who normally would have limited their college search to the typically private colleges that comprise the bulk of the switching group, but who expanded their search as a result of the CA. If the new applicants came from the latter set of students, then this provides support for the idea that the CA affected the structure of students’ college choices: the inclusion of these public schools on the CA list of mostly private colleges may have provided an implicit “endorsement” of these schools for students who would not have otherwise considered public options. This endorsement may have been helpful to these schools in
particular because many were not the flagship public institution in their state or among the better known public universities in the country.\textsuperscript{7}

Whether the rise in applications to in-state public universities came from new applicants to switching schools or applicants who expanded their search within switching schools, the finding that \textit{enrollment} increases at in-state and public schools may point to the importance of finances in the college choice process. Perhaps the greatest difference between in-state public institutions and any other four-year college, regardless of whether it accepts the CA, is the cost. Because of in-state tuition breaks, tuition is much lower for students who attend public universities within their own state than for those who enroll in private institutions or out-of-state public institutions. For students using the CA, the reality of paying college tuition and the juxtaposition of the cost of attending a public university if it is in-state and attending a another type of college likely makes the cost differences between these schools particularly stark and the decision to attend an in-state public institution easy. This may be particularly true in a situation where the CA has played a role in framing the universe of college’s a student considers. The presentation of both public and private schools on equal terms may have made cost a particularly salient consideration for students.

\textbf{Policy Implications}

The findings of this study have implications for policy related to college application procedures, but they should be implemented with care. Because it appears that the CA improves college persistence, it would be very easy to say that all colleges should adopt some sort of common application form. This would be wrong-headed because this study is not able to say

\textsuperscript{7} The public switching schools in this analysis are Miami University (OH), SUNY Binghamton, University of Delaware, University of Maine, University of Maine at Farmington, University of Southern Maine, University of New Hampshire, University of Vermont, College of William & Mary (VA), and University of Mary Washington (VA)
specifically *why* the CA improves persistence. It may be that persistence improves because students find it easier to apply to more schools and thus explore more potentially good matches. It may also be the structure that the CA gives the college search process that improves students’ ability to decide between schools. If persistence improves because of this second reason then having all colleges accept a common application form eliminates this structure. Thus this policy would make it easy for students to apply to multiple colleges, but negate any effect that comes from the structure the CA applies to admissions choices.

In the absence of a better understanding of why the CA improves persistence, a more promising solution would be to have coalitions of colleges of similar type all accept the same application. For example, “elite liberal arts colleges,” or “Midwest public universities” might accept similar applications as groups. This has the benefit of providing structure to the college choice by highlighting sets of similar colleges and also reducing the cost of applying to multiple colleges within the same set. That is, this system of common applications would both reduce the cost of applying to multiple colleges and also provide structure to the college choice, thus preserving the main features of the CA that likely contribute to an increase in college persistence.

**Conclusion**

In this study I use nationally representative NELS and ELS data, combined with data from the Common Application organization, in a unique way to analyze the causal effect of student use of the Common Application to apply to college on outcomes related to college enrollment and persistence. It is the first study to look specifically at the effect of the Common Application on *student* outcomes. I find evidence that the use of the Common Application increases the likelihood a student enrolls in a public or in-state institution. Further, there is
strongly suggestive evidence that use of the Common Application decreases the likelihood a student will leave their first college after two years.

To the extent that the college application process is not intended to be a barrier to college-going—and even if it is—these results strongly suggest the need for further research in this area and for careful consideration of how application processes are designed, and how small changes to the design impact student application behavior. In particular, a better understanding of the mechanism for how and why the Common Application has these effects needs to be developed. Future research should work to determine whether the effects are due to the reduction in cost of applying to multiple colleges, the change in the structure of students’ choices, or some other set of factors, in particular because it is important to understand how such seemingly small changes to the college application process can have such notable effects on student outcomes.
References


Table 1

*Composition of For-Year Institutions Relative to Common Application-accepting Institutions and Switching Institutions*

<table>
<thead>
<tr>
<th>Sector</th>
<th>All four-year institutions</th>
<th>Common Application institutions</th>
<th>Switching institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>34.16%</td>
<td>9.59%</td>
<td>8.26%</td>
</tr>
<tr>
<td>Private</td>
<td>56.75%</td>
<td>90.41%</td>
<td>91.74%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Selectivity</th>
<th>All four-year institutions</th>
<th>Common Application institutions</th>
<th>Switching institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inclusive</td>
<td>33.74%</td>
<td>6.48%</td>
<td>3.31%</td>
</tr>
<tr>
<td>Selective</td>
<td>44.76%</td>
<td>30.83%</td>
<td>38.85%</td>
</tr>
<tr>
<td>More Selective</td>
<td>21.51%</td>
<td>60.35%</td>
<td>57.03%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>All four-year institutions</th>
<th>Common Application institutions</th>
<th>Switching institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liberal Arts</td>
<td>13.04%</td>
<td>37.67%</td>
<td>29.17%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size</th>
<th>All four-year institutions</th>
<th>Common Application institutions</th>
<th>Switching institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 1,000</td>
<td>15.12%</td>
<td>8.81%</td>
<td>8.26%</td>
</tr>
<tr>
<td>1,000 - 4,999</td>
<td>29.26%</td>
<td>59.07%</td>
<td>52.07%</td>
</tr>
<tr>
<td>5,000 - 9,999</td>
<td>15.18%</td>
<td>17.62%</td>
<td>19.83%</td>
</tr>
<tr>
<td>10,000 - 19,999</td>
<td>10.96%</td>
<td>10.62%</td>
<td>16.53%</td>
</tr>
<tr>
<td>Over 20,000</td>
<td>8.98%</td>
<td>3.89%</td>
<td>3.31%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Locale</th>
<th>All four-year institutions</th>
<th>Common Application institutions</th>
<th>Switching institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>City</td>
<td>46.21%</td>
<td>45.08%</td>
<td>46.28%</td>
</tr>
<tr>
<td>Suburb</td>
<td>22.95%</td>
<td>29.53%</td>
<td>33.88%</td>
</tr>
<tr>
<td>Town</td>
<td>21.03%</td>
<td>17.88%</td>
<td>11.57%</td>
</tr>
<tr>
<td>Rural</td>
<td>9.82%</td>
<td>7.51%</td>
<td>8.27%</td>
</tr>
</tbody>
</table>
Table 2

Sample Descriptive Statistics

<table>
<thead>
<tr>
<th></th>
<th>1992 Cohort</th>
<th></th>
<th>2004 Cohort</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Apply to a turn-CA college</td>
<td>0.114</td>
<td>0.317</td>
<td>0.087</td>
<td>0.281</td>
</tr>
<tr>
<td>Number turn-CA colleges (200km)</td>
<td>5.459</td>
<td>6.920</td>
<td>5.141</td>
<td>6.707</td>
</tr>
<tr>
<td>Number 4-yr colleges (200km)</td>
<td>62.157</td>
<td>62.675</td>
<td>59.540</td>
<td>62.505</td>
</tr>
<tr>
<td><strong>Student characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.445</td>
<td>0.497</td>
<td>0.439</td>
<td>0.496</td>
</tr>
<tr>
<td>Black</td>
<td>0.097</td>
<td>0.296</td>
<td>0.152</td>
<td>0.359</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.096</td>
<td>0.295</td>
<td>0.106</td>
<td>0.308</td>
</tr>
<tr>
<td>Asian</td>
<td>0.111</td>
<td>0.314</td>
<td>0.150</td>
<td>0.357</td>
</tr>
<tr>
<td>SES index</td>
<td>0.205</td>
<td>0.744</td>
<td>0.155</td>
<td>0.711</td>
</tr>
<tr>
<td>Expect 4-yr degree (10th grade)</td>
<td>0.815</td>
<td>0.388</td>
<td>0.845</td>
<td>0.362</td>
</tr>
<tr>
<td>Expect 4-yr degree (12th grade)</td>
<td>0.881</td>
<td>0.324</td>
<td>0.867</td>
<td>0.340</td>
</tr>
<tr>
<td>Math/Eng composite (10th)</td>
<td>55.972</td>
<td>8.399</td>
<td>54.093</td>
<td>9.047</td>
</tr>
<tr>
<td>Math score (12th)</td>
<td>56.056</td>
<td>7.802</td>
<td>53.856</td>
<td>9.093</td>
</tr>
<tr>
<td>GPA</td>
<td>3.038</td>
<td>0.552</td>
<td>3.057</td>
<td>0.627</td>
</tr>
<tr>
<td>HS sport participation</td>
<td>0.604</td>
<td>0.485</td>
<td>0.447</td>
<td>0.489</td>
</tr>
<tr>
<td>Took AP course</td>
<td>0.396</td>
<td>0.483</td>
<td>0.451</td>
<td>0.480</td>
</tr>
<tr>
<td>Parents - no college degree</td>
<td>0.602</td>
<td>0.484</td>
<td>0.522</td>
<td>0.489</td>
</tr>
<tr>
<td>Parents - non-native English</td>
<td>0.157</td>
<td>0.349</td>
<td>0.169</td>
<td>0.356</td>
</tr>
<tr>
<td><strong>HS characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Asian</td>
<td>0.037</td>
<td>0.076</td>
<td>0.060</td>
<td>0.122</td>
</tr>
<tr>
<td>% Black</td>
<td>0.107</td>
<td>0.197</td>
<td>0.174</td>
<td>0.241</td>
</tr>
<tr>
<td>% Hispanic</td>
<td>0.095</td>
<td>0.198</td>
<td>0.122</td>
<td>0.202</td>
</tr>
<tr>
<td>Top quartile free/reduced lunch students</td>
<td>0.220</td>
<td>0.407</td>
<td>0.246</td>
<td>0.410</td>
</tr>
<tr>
<td>Bottom quartile free/reduced lunch students</td>
<td>0.271</td>
<td>0.437</td>
<td>0.264</td>
<td>0.416</td>
</tr>
<tr>
<td>12th grade enrollment</td>
<td>291.403</td>
<td>179.387</td>
<td>315.952</td>
<td>181.378</td>
</tr>
<tr>
<td>Student-teacher ratio</td>
<td>17.450</td>
<td>3.887</td>
<td>17.571</td>
<td>3.601</td>
</tr>
<tr>
<td>Urban</td>
<td>0.260</td>
<td>0.438</td>
<td>0.285</td>
<td>0.452</td>
</tr>
<tr>
<td>Town/rural</td>
<td>0.418</td>
<td>0.493</td>
<td>0.296</td>
<td>0.457</td>
</tr>
</tbody>
</table>
### Table 3

**The Effect of Using the Common Application**

<table>
<thead>
<tr>
<th></th>
<th>Enroll in a &quot;selective&quot; or &quot;more selective&quot;</th>
<th>Enroll in a liberal arts college</th>
<th>Enroll in a public college</th>
<th>Enroll in an in-state college</th>
<th>Leave college after two years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NELS - 1992 cohort</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application to switching college</td>
<td>0.525 (0.730)</td>
<td>0.150 (0.880)</td>
<td>-1.987 *** (0.417)</td>
<td>-2.165 *** (0.412)</td>
<td>0.647 (0.652)</td>
</tr>
<tr>
<td>Marginal Effect</td>
<td>0.268</td>
<td>0.010</td>
<td>-0.592</td>
<td>-0.616</td>
<td>0.224</td>
</tr>
<tr>
<td>First-stage F-statistic: 37.83</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ELS - 2004 cohort</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application to switching college</td>
<td>-0.606 (0.515)</td>
<td>0.474 (0.876)</td>
<td>-0.893 * (0.391)</td>
<td>-0.639 (0.522)</td>
<td>-0.506 (0.331)</td>
</tr>
<tr>
<td>Marginal Effect</td>
<td>-0.230</td>
<td>0.034</td>
<td>-0.312</td>
<td>-0.217</td>
<td>-0.177</td>
</tr>
<tr>
<td>First-stage F-statistic: 49.62</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **F-statistic of difference in estimates** | 0.69 | 0.07 | 3.79 * | 5.39 * | 2.62 + |
| Difference in marginal effects (ELS-NELS) | -0.498 | 0.025 | 0.280 | 0.400 | -0.400 |

*Note. Coefficients represent the results of IV probit estimation. Marginal effects are calculated in each cohort at the mean covariate values of the average student in the 2004 cohort. All regressions contain controls for the total number of four-year colleges within 200 kilometers of a student as well as the full set of covariates described above.*

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001.
Table 4

Change in Application Behavior for Students within 200 Kilometers of Switching Schools

<table>
<thead>
<tr>
<th>Apply to an in-state, public, switching school</th>
<th>NumSwitch x Post</th>
<th>0.167 ** 0.162 ** 0.102</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(0.059) (0.062) (0.065)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Apply to an in-state, public school, non-switching school</th>
<th>NumSwitch x Post</th>
<th>0.036 + 0.021 0.031</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(0.021) (0.023) (0.023)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Apply to an in-state, private switching school</th>
<th>NumSwitch x Post</th>
<th>0.035 0.014 0.040</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(0.035) (0.035) (0.035)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Controls</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Student - Basic</td>
<td>X</td>
</tr>
<tr>
<td>Student - Detailed</td>
<td>X</td>
</tr>
<tr>
<td>High School</td>
<td>X</td>
</tr>
</tbody>
</table>

N=17,580

Note. Results from OLS regression of the likelihood of applying to the indicated type of college among all high school graduates in the 1992 and 2004 cohorts with the indicated set of controls, defined in detail above.

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001.
Figure 1. How Application Choices Affect College Enrollment and Persistence.
Appendix A

In a non-instrumental variables analysis we want to find the effect of a treatment $T$ on some outcome $Y$, relative to a pre-/post-treatment trend according to

$$ Y = \beta_0 + \beta_1 T + \beta_2 \text{post} + \beta_3 (T \ast \text{post}) + \epsilon \quad (1) $$

With instrumental variables, we are only able to estimate

$$ T = \gamma_0 + \gamma_1 Z + \gamma_2 \text{post} + \gamma_3 (Z \ast \text{post}) + u \quad (2) $$

$$ Y = \delta_0 + \delta_1 \hat{T} + \delta_2 \text{post} + \delta_3 (\hat{T} \ast \text{post}) + \nu \quad (3) $$

Where $Z$ is our chosen instrument, which is only related to the outcome through its effect on $T$.

In order to see what this IV analysis is estimating we can substitute equation (2) into equation (3)

$$ Y = \delta_0 + \delta_1 E(T|Z, \text{post}) + \delta_2 \text{post} + \delta_3 E(T|Z, \text{post}) \text{post} $$

$$ Y = \delta_0 + \delta_1 (\hat{y}_0 + \hat{y}_1 Z + \hat{y}_2 \text{post} + \hat{y}_3 Z \ast \text{post}) + \delta_2 \text{post} $$

$$ + \delta_3 (\hat{y}_0 + \hat{y}_1 Z + \hat{y}_2 \text{post} + \hat{y}_3 Z \ast \text{post}) \text{post} $$

With simplification we have that

$$ Y = \delta_1 \hat{y}_0 + (\delta_1 \hat{y}_1) Z + (\delta_2 + \delta_1 \hat{y}_2 + \delta_3 \hat{y}_0 + \delta_3 \hat{y}_2) \text{post} + (\delta_1 \hat{y}_3 + \delta_3 \hat{y}_1 + \delta_3 \hat{y}_3 \text{post}) (Z \ast \text{post}) $$

From this we can see that $\beta_1 T$ is unbiased and estimated by $(\delta_1 \hat{y}_1) Z$. This is what we want because it based only on how the instrument $Z$ is related to $T$ (represented by $\hat{y}_1$), and how this estimate of $T$ is related to the outcome $Y$. On the other hand, the estimate of $\beta_3 (T \ast \text{post})$, our coefficient of interest, contains elements of how both $(Z \ast \text{post})$ and $Z$ are related to $T$ (though $\hat{y}_3$ and $\hat{y}_1$), as well as how both $(\hat{T} \ast \text{post})$ and $\hat{T}$ are related to the outcome (through $\delta_3$ and $\delta_1$).

In order to have an unbiased estimate of $\beta_3$, this term should only contain $\hat{y}_3$ and $\delta_3$ (similar to what we obtained for our estimate of $\beta_1$). Instead, the mixing of terms leaves us without the same unbiased estimation of $\beta_3$ as we obtained for $\beta_1$. 

### Appendix B

#### Table 5

*Robustness to Distance*

<table>
<thead>
<tr>
<th>Enroll in a</th>
<th>Enroll in a</th>
<th>Enroll in an</th>
<th>Leave college</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;selective&quot; or &quot;more selective&quot;</td>
<td>liberal arts college</td>
<td>public college</td>
<td>in-state college</td>
</tr>
</tbody>
</table>

#### 100 kilometers

**NELS - 1992 cohort**

- Application to switching college: 0.379, -0.543, -1.786***, -1.353*, 0.153
  - (0.668), (0.687), (0.436), (0.536), (0.583)

**ELS - 2004 cohort**

- Application to switching college: -0.626, -0.597, -0.767+, 0.130, -0.413
  - (0.620), (0.774), (0.411), (0.497), (0.345)

**F-statistic of difference in estimates:** 1.26, 0.00, 3.00+, 4.27*, 0.73

#### 300 kilometers

**NELS - 1992 cohort**

- Application to switching college: 0.261, -0.018, -1.759**, -2.551***, 0.498
  - (0.814), (1.098), (0.613), (0.364), (0.658)

**ELS - 2004 cohort**

- Application to switching college: -0.716, 0.411, -0.497, -0.661, 0.146
  - (0.613), (1.225), (0.484), (0.626), (0.394)

**F-statistic of difference in estimates:** 0.96, 0.07, 2.73+, 6.9**, 0.22

#### 400 kilometers

**NELS - 1992 cohort**

- Application to switching college: 0.309, -0.179, -2.111***, -2.752***, -0.037
  - (0.875), (1.083), (0.552), (0.290), (0.727)

**ELS - 2004 cohort**

- Application to switching college: -1.251*, -0.686, -0.365, -0.842, -0.174
  - (0.630), (1.328), (0.540), (0.660), (0.529)

**F-statistic of difference in estimates:** 2.19, 0.09, 5.28*, 7.05**, 0.02

*Note.* Coefficients represent the results of IV probit estimation. All regressions contain controls for the total number of four-year colleges within the stated number of kilometers of a student as well as the full set of covariates described above.

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001.