Recruiting Chapter

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1 Introduction

Prior to the pandemic, admissions counselors from colleges and universities traveled to local high schools each year in order to meet prospective students and maintain relationships with guidance counselors at feeder schools (Stevens, 2007). Salazar, Jaquette, & Han (online first) analyzed off-campus recruitiving visits made in 2017 by 15 public research universities. Surprisingly, 12 of the 15 universities made more visits to *out-of-state* high schools than *in-state* high schools. These out-of-state visits focused on public schools in affluent, predominantly white communities. Additionally, most public research universities in our sample made a disproportionate number of visits to out-of-state private high schools. For the University of California-Berkeley, for example, 155 (43%) of the 360 out-of-state high school visits were to private high schools. For the University of Colorado-Boulder, 321 (36%) of the 901 out-of-state high school visits were to private high schools.

Whereas Salazar et al. (online first) primarily analyzed visits to public high schools, this chapter focuses on visits to private high schools. More specifically, we investigate how visits to private high schools by public research universities compare to visits to private high schools by selective private universities.

1.1 Social mobility, social reproduction, and privatization

The sociologist Max Weber is credited for the insight that education has a "dual character," on one hand, serving *social mobility* by redistributing access to privileged positions and, on the other, serving *social reproduction* by granting privileged families disproportionate access to the educational institutions that confer pathways to privileged positions (Stevens, Armstrong, & Arum, 2008).

The mission of selective private colleges and universities is more squarely associated with social reproduction rather than social mobility. Historically, these institutions depend on patronage from philanthropic interests – in connection with business and religious interests – and depend from wealthy households who provide tuition revenue and donations (Stevens & Gebre-Medhin, 2016). In turn, selective private institutions contribute to social reproduction by providing access to their patrons. The "Chetty" data on parental income by college show that the overwhelming majority of students at selective private institutions have parental income in the top quintile (Burd, 2017; Chetty, Friedman, Saez, Turner, & Yagan, 2020). A significant caveat is that religiously affiliated universities may prioritize enrollment opportunities for students of the same faith regardless of wealth, but even here the mission is to benefit families from a particular cultural status group [CITE].

The traditional, albeit mythologized, public good mission of public research universities is tied to social mobility and development of the state (Haycock, Mary, & Engle, 2010; Kezar, Chambers, & Burkhardt, 2005). Public research universities are designated the unique responsibility of educating the future civic, professional, and business leaders of the state. Quoting 19th century University of Michigan President James Angell, these institutions contribute to social mobility by providing "an uncommon education for the common man" (as cited in Rudolph, 1962, p. 279) who could not afford tuition at elite private institutions.

We argue that the recruiting behavior of colleges and universities is an indicator of organizational enrollment priorities and, in turn, the extent to which enrollment priorities serve social mobility or social reproduction. Recruiting visits to private high schools are consistent with the social reproduction mission of selective private universities, regardless of whether the university is targeting a particular high school because of its academic reputation, religious affiliation, or the affluence of its student body. By contrast, for public research universities, visits to private high schools – particularly out-of-state schools – are antithetical to mission of social mobility for high-achieving, low-income state residents.

Analyses of recruiting visits to private high schools can contribute novel insights about the "privatization" of public research universities. Within the scholarly literature on privatization, one strand of scholarship conceptualizes privatization as a process whereby declines in government funding

cause public institutions to grow alternative revenue sources, particularly revenue from tuition and research commercialization (McClure, Barringer, & Brown, 2019@; Slaughter & Leslie, 1997). Of relevance to this chapter, public research universities responded to declines in state appropriations by growing enrollment from nonresident students (Jaquette & Curs, 2015), who typically pay two- to three-times more than resident students. A second strand within the privatization literature conceptualizes privatization as a process whereby public institutions become more similar – in terms of characteristics or behavior – to for-profit or private non-profit organizations (McClure et al., 2019). A weakness of this literature is that few empirical studies analyze public institutions on a behavior associated with private institutions.

Therefore, this chapter compares public research universities to selective private universities on the dimension of recruiting visits to private high schools, a behavior associated with the social reproduction orientation of selective private universities. Our primary goal is to learn about public research universities, using the behavior of private universities as a benchmark to develop more thoughtful insights about public research universities. We analyze recruiting visits made in 2017 calendar year by a sample of 15 public research universities, 14 selective private universities, and 12 selective private liberal arts colleges.

Because little is known about recruiting at private high schools by public universities, we conduct descriptive analyses that seek to identify basic patterns and relationships. Because a recruiting visit to a private high school is an indicator of a relationship between two actors, we also utilize social network methods in order to compare the recruiting networks of public universities to those of private universities. Analyses are informed by the following three research questions:

1. How does the scale of visits to private high schools by public research universities compare to the scale of visits to private high schools by selective private universities?
2. How do the characteristics of private high schools visited by public research universities compare to the characteristics of private high schools visited by selective private universities?
3. To what extent do public research universities and selective private universities visit overlapping sets of private high schools?

SHORT PARAGRAPH GIVING OUTLINE OF CHAPTER

2 What do we know about off-campus recruiting visits

This section provides context for our analyses. First, we situate off-campus recruiting within the broader set of marketing and recruiting interventions in higher education and review what market research says about off-campus recruiting. Second, we review empirical scholarship from sociology that considers off-campus recruiting, emphasizing scholarship that considers the relational aspects of recruiting visits and scholarship that considers private high schools.

2.1 Situating Off-Campus Recruiting Within Enrollment Management

The "enrollment funnel" – depicted in Figure 1 – is a conceptual heuristic that identifies stages in the student recruitment process (prospects, inquiries, applicants, accepted applicants, and enrolled students). "Prospects" are "all the potential students you would want to attract to your institution" (Campbell, 2017). "Inquiries" are prospects that contact the institution, including those who respond to a solicitation and those who reach out on their own. The enrollment management industry uses the enrollment funnel to inform marketing and recruiting interventions that target specific stages. Most scholarship on enrollment management focuses on the final stages of the enrollment funnel, specifically which applicants are admitted and the use of financial aid "leveraging" to convert admits to enrollees (e.g., Alon, 2009; Doyle, 2010; Karabel, 2005; Karen, 1990; McPherson & Schapiro, 1998; Posselt, 2016; Waddell & Singell, 2011). By contrast, the enrollment management industry expends substantial resources on marketing/recruiting activities that target earlier stages of the enrollment funnel (Noel-Levitz, 2020).

INSERT FIGURE 1 ABOUT HERE

Institutions identify undergraduate "prospects" by purchasing "student lists" – containing contact, demographic, and academic achievement information – from College Board, ACT, and other vendors. Universities control which prospects are contained within a list by filtering on criteria such as zip code, test scores, and high school GPA. Once prospects and inquiries are identified, they are targeted with remote and face-to-face recruiting interventions designed to solicit applications and deepen engagement. Remote recruiting interventions include postcards, brochures, emails, text messages, and targeted social media. Face-to-face recruiting interventions include on-campus

visits by prospects and off-campus recruiting visits by admissions representatives to high schools, community colleges, college fairs, etc. Institutions utilize advertising (traditional and digital) and social media to solicit inquiries and to create positive "buzz" amongst prospects (Dupaul & Harris, 2012). Given the the rise in "stealth applicants" who do not inquire before applying (Dupaul & Harris, 2012), advertising and social media enables universities to tell their story to prospects who do not wish to be contacted.

What do we know about off-campus recruiting from previous research? As is true for most aspects of enrollment management, much of what we know about off-campus recruiting comes from consulting firms (e.g., Ruffalo-Noel Levitz, EAB), professional associations (e.g., NACAC), and from practitioner-oriented publications. Market research describes off-campus recruiting visits as a means of identifying prospects and deepening engagement with prospects already being targeted through mail/email (Clinedinst & Koranteng, 2017; Noel-Levitz, 2020; Ruffalo Noel-Levitz, 2018).

Ruffalo Noel-Levitz (2018) documents the self-reported efficacy of marketing/recruiting interventions. For the median private 4-yr institution, off-campus visits were the second highest source of inquiries (after student list purchases), accounting for 17% of inquiries. Off-campus visits were tied with student list purchases as the highest source of enrollees, accounting for 18% of enrollees. For the median public institution, off-campus visits accounted for 19% of inquiries (second only to student list purchases) and accounted for 16% of enrollees (ranked third after stealth applicants and on-campus visits).

With respect to expenditure, Table 1, reproduced from Noel-Levitz (2020), shows the percentage of undergraduate recruitment budget allocated to different marketing and recruiting activities.[1] The average public university spent 16% of its recruiting budget on off-campus recruiting visits, compared to 12% of its budget on purchasing student lists and 17% of its budget on "prospective student communications" (e.g., mail, email, text, social media) targeting prospects and inquiries. An emergent trend over the past decade – partially a response to public universities seeking non-resident students – has been the growth of "regional recruiters" who target specific metropolitan areas in the US and abroad (Whitney & Schmidt, 2015). These regional recruiters may be college/university employees or they may be independent contractors who live in the metropolitan

[1]Table drawn directly from Noel-Levitz (2020) Figure 9, which is based on a convenience sample of 45 four-year non-profit institutions and 21 four-year public institutions.

area they recruit.

2.2 Empirical Scholarship from Sociology

Empirical academic scholarship on off-campus recruiting is mostly limited to a modest number of sociological case studies, which typically analyze off-campus recruiting as part of a broader analysis of enrollment management (e.g., Holland, 2019; Cottom, 2017; Khan, 2011; Posecznick, 2017; Stevens, 2007). Holland (2019) analyzes visits from the perspective of students at two racially and socioeconomically diverse public high schools. Holland (2019) found that high school visits – including college fairs, instant decision events, and small-group representative visits – influenced where students applied and where they enrolled. This finding was strongest for first-generation students and under-represented students of color, who often reported that "school counselors had low expectations for them and were too quick to suggest that they attend community college" (p. XXX) This trust vacuum created an opportunity for colleges because these students were drawn to colleges that connected with them and made them feel wanted. For example, Holland (2019) describes a high-achieving, first-generation, African American student who was admitted by a highly selective liberal arts college but chose to attend a less selective college that "seemed to want him more" (p. XXX). By contrast, affluent students with college educated parents were less taken by such overtures and more concerned with college prestige.

Stevens (2007), an ethnography of the admissions office at a selective private liberal arts college, highlights the relational function of off-campus recruiting visits. Stevens (2007, p. 54) states that "the College's reputation and the quality of its applicant pool are dependent upon its connections with high schools nationwide." Therefore, during the autumn "travel season," admissions officers visit selected high schools across the country "to spread word of the institution and maintain relationships with guidance counselors" (p. 53-54). The College tended to visit the same "feeder" schools year after year because recruiting depends on long-term relationships with high schools. The high schools they visited tend to be affluent schools – in particular, private schools – that enroll high-achieving students who can afford tuition and had the resources and motivation to host a successful visit. Whereas Ruffalo Noel-Levitz (2018) highlights the effect of recruiting visits on inquiries and enrollees, findings from Stevens (2007) suggest that the College may have valued recruiting visits

primarily as a means of maintaining relationships with guidance counselors. From this perspective, recruiting visits may affect outcomes such as inquiries, applications, and matriculation through their affect on high school guidance counselors. The logic is that a guidance counselor who views a college favorably will steer students to the college.

Although not about recruiting visits per se, Khan (2010, 2011) is centrally important for our study because he lays out a conceptual explanation of why colleges and private high schools develop relationships with one another (i.e., what is each trying to obtain from the other). Khan (2010) analyzed recruiting from the perspective of an elite private boarding school in order to understand "how such schools continue to get comparatively under-qualified students into top colleges and universities" (p. 98). The answer begins by considering the goals of colleges, which are represented by admissions officers, and the goals of private high schools, which are represented by guidance counselors. Colleges want high-achieving students who can pay tuition and donate. They want low acceptance and high yield rates, which are important for rankings. Colleges also want a class composed of "interesting characters" whose curricular and extracurricular strengths meet the needs of important campus constituents (e.g., academic majors, the athletic department, clubs, etc.). Elite private high schools want to send *all* students to the best college possible. Here, high school guidance counselors face "the pressure of making sure their school seems worth it – that . . . paying some $40,000+, really does aid students in the college process" (Khan, 2010, p. 105).

The challenge faced by high school counselors at elite private schools is that "some of these students are slightly better than others. These students will likely get into more than one school – but they can only attend one. And this will lower the chances of your 'second-best' students getting into top schools" (Khan, 2011, pp. 173–174). "Luckily," Khan (2010, p. 105) writes, "the problem for elite boarding schools matches up quite nicely with the problem faced by elite colleges." That is, although college admissions officers receive applications from many outstanding students,

> These outstanding students will also be outstanding to Princeton, Yale, Stanford, and everywhere else. How do you know the ones you pick will attend your school? You can't quite trust applicants, as they are all likely to tell you how much they want to go to your school. And if students you accept go somewhere else, there's not much you can do. But you can get better information – information you want – from their high

> school. And you can reward that school for good information and sanction it for bad information (Khan, 2011, p. 173).

This desire by colleges for trustworthy information about applicant intentions creates an opportunity for high school counselors to advocate on behalf of their students. This opportunity depends on guidance counselors having personal relationships with university admissions offices and on having small enough caseloads to advocate for each student individually.

To explain how high school counselors capitalize on this opportunity, Khan (2011) describes two hypothetical students – Susan and Billy – who both apply to Harvard and Yale. Susan is a shoo-in at both universities, but wants to attend Harvard. Billy has a weaker academic record than most Ivy League students, but has strong extracurricular activities. The guidance counselor tells Harvard that Susan wants to attend Harvard. Next, he informs Yale that Susan will choose Harvard, but Billy loves Yale and has great "character" and extracurricular activities. In the end, Harvard rejects Billy and accepts Susan, thereby, decreasing acceptance rate and increasing yield. Yale rejects Susan and accepts Billy, thereby, also decreasing acceptance rate and increasing yield.

The horsetrading described by Khan (2011) depends on a relationship where the college can trust statements made by the high school counselor and vice-versa. This relationship is the product of repeated interactions over many years. A high school that makes false statements about applicant intentions faces consequences. The college "might stop taking these telephone calls and ignore the information provided. They may even start accepting fewer students from the school, thinking it is less than an honest" (Khan, 2010, p. 106). Because the college and the high school are mutually dependent, however, both "have an incentive to continue with a strong, honest relationship" (Khan, 2010, p. 106). Although, such horsetrading may be less pervasive now than it was in prior decades and may be less common at non-elite private schools. Additionally, college admissions officers from public universities likely have less authority to engage in these tacit negotiations because admissions criteria at public universities face greater public scrutiny than admissions criteria at private colleges and universities.

2.2.1 Visits as an indicator of a social relation

Stevens (2007) and Khan (2010, 2011) suggest that strong relationships are mutually important for the college and for the private high school. Strong relationships enable colleges and schools to negotiate and send trustworthy information to one another. Without a strong relationship, it unlikely that a college admissions counselor will "take the call" of a high school guidance counselor (Khan, 2010, 2011). Even in the absence of horsetrading described by Khan (2011), relationships enable the college admissions counselor and the high school guidance counselor to tell one another "their story" and relay that story to constituents (Stevens, 2007). The college admissions counselor explains why the college/university is a "special place" that high school students should want to attend (Stevens, 2007). The guidance counselor explains why the high school is a special place, that even students with lower grades have outstanding extracurricular strengths that will benefit the college (Khan, 2010).

The presence of a recruiting visit between a college and a private high school is an indicator that the college and the high school have a relationship. From an empirical perspective, Stevens (2007) finds that off-campus recruiting visits are important for the maintenance of strong relationships between a college and a high school. From a logical perspective, we argue that, first, the fact that the college made the effort to visit suggests that the college wants to enroll students from the high school. Second, the fact that the high school hosted the visit suggests that the high school likely views the college as a desirable destination for some of its students. Third, the presence of the recruiting visit suggests the probability of additional interactions (e.g., phone calls).

Conceptualizing a recruiting visit as an indicator of a relationship between a college and a high school motivates the use of social network methods, which analyze the network defined by "network ties" (i.e., visits) between actors (colleges and high schools). Prior research has not used social network methods to analyze recruiting visits from colleges to high schools. Analyzing the network of recruiting visits to high schools enables us to investigate the extent to which public research universities are visiting similar sets of private high schools as private colleges and universities, and also the extent to which they are visiting the same private high schools. In turn, we hope these analyses yield novel insights to scholarship on the privatization of public higher education.

3 Social network analysis concepts

Having conceptualized a recruiting visit as an indicator of a social relation, this section introduces basic concepts from social network analysis and motivate the research questions that guide empirical analyses.

A social network consists of a set of actors – referred to as "vertices" – and the connections – referred to as "network ties" or "edges" between these actors. "One-mode" networks consist of vertices of a "type." For example, the social network of Facebook consists of users (vertices) who are connected to one another via friendship ties (edges). Similarly, the social network of Twitter consists of handles (vertices) who are connected to one another by following or being followed.

Whereas "one-mode" networks consist of vertices of the same "type" (e.g., in a publication network each vertex is an author), "two-mode" networks consist of vertices associated with one type of actor/entity having connections to vertices of another type. For example, an actor-movie network consists of actors (mode 1) who appear in movies (mode 2), and an actor shares an edge with a movie if the actor appears in the movie. The most commonly analyzed two-mode network in social networks literature is a corporate board-director network (e.g., Davis, Yoo, & Baker, 2003). These networks consists of directors (mode 1) and organizational boards (mode 2) and a particular director shares an edge with a particular organizational board if they sit on that board. Similarly, our recruiting visit data form a two-mode network, consisting of private high schools (mode 1) and college (mode 2). An off-campus recruiting visit from a college/university to a private high school is the "edge" that connects two particular vertices. In this network, edges can only occur between vertices of a different type; that is a college can visit a high school, but colleges cannot visit other colleges and high schools cannot receive visits from other high schools.

To reduce complexity, two-mode network graphs are often analyzed as one-mode networks (Borgatti, 2008; Davis et al., 2003). Our two-mode college-school network can be transformed into a one-mode college network in which each vertex is a college/university and two colleges share an edge if both colleges visited at least one high school in common. The *weight* of an edge indicates the number of high schools that both colleges visited. For example, if there are 200 private high schools that received a visit from both Notre Dame and Villanova, the weight of the edge between Notre Dame

and Villanova is 200.

3.1 RQ1: Degree centrality

In social network analysis, *centrality* refers to the importance or prominence or "being in the middle of things" of an actor/vertex in a social network [CITE]. Many alternative measures of centrality have been developed. All measures agree that centrality is an actor/vertex-level construct (e.g., each college in our network will have a centrality value, regardless of which centrality measure we use). However, different measures of centrality are based on different theoretical conceptualizations – for example, being directly connected to the most actors versus being the intermediary between otherwise disconnected actors – and are operationalized using different mathematical algorithms.

The simplest measure of centrality, *degree centrality* measures the number of edges directly connected to a vertex. For each college in our network, degree centrality is simply the number of different private high schools visited by the college. For each high school in our network, degree centrality is simply the number of colleges in our network that visited the high school. Social network theory conceptualizes degree centrality as a measure of "local" centrality, capturing the number of direct connections for each actor/vertex. For our empirical context, we conceive of degree centrality as a measure of scale of the number of private high schools a college visits and, equivalently, the number of private high schools we observe haging a social relation with each college. Given that we conceptualize visits to private high schools as a behavior consistent with the social reproduction orientation of selective private colleges/universities, we are interested in comparing how scale differs between public and private colleges/universities. This interest motivates research question 1, "how does the scale of visits to private high schools by public research universities compare to the scale of visits to private high schools by selective private universities?" We answer this research question by comparing degree centrality across universities.

Degree is a limited measure of centrality in that only identifies direct connections. By contrast, *k-path centrality* centrality measures the extent to which an actor/vertex is indirectly connected to others, *betweenness centrality* measures the extent to which a vertex is an intermediary between otherwise disconnected groups of actors, and *eigenvector centrality* measures the extent to which a vertex is connected to highly connected others. Betweenness centrality tends to be relevant

for empirical contexts (e.g., which manager gets credit for an idea) where an actor who occupies a position between groups can benefit by being a broker of information/ideas (Burt, 1992). By contrast, this chapter is more concerned with whether a particular college tends to have indirect connections with some colleges but not others, and what is the subset of high schools this group of colleges tends to visit. Research question 3, motivated below, explores these ideas.

3.2 RQ2: Ego networks and homophily

Because the data structure of networks is complicated, a useful first step is to analyze "ego networks" rather than the entire social network. An "ego" is a single "focal" node (e.g., The University of Notre Dame). An ego network consists "of a focal node ('ego') and the nodes to whom ego is directly connected to (these are called 'alters') plus the ties, if any, among the alters" (p. XXX). For example, the University of Notre Dame ego network consists of all private high schools that received at least one visit from Notre Dame. Additionally, for each high school visited by Notre Dame, the ego network may include all colleges/universities in our sample that also visited the high school. This chapter analyzes recruiting visits to private high schools by 41 colleges and universities, which we can think of as 41 ego networks.

A common finding in social networks research is that actors are more likely to form connections with actors who are are similar to them (McPherson, Smith-Lovin, & Cook, 2001). Said differently, ego networks are biased towards "homophily" rather than "heterophily." Homophily is the idea that two vertices are more likely to be connected if they have similar characteristics (e.g., two people are more likely to be friends on Facebook if they have similar political ideologies). Heterophily, the opposite of homophily, is when pairs of connected vertices have different characteristics from one another.

In our analyses of recruiting visits from colleges to private high schools, we are interested in the existence of homophily versus heterophily for two reasons. First, prior scholarship suggests that private colleges and private high schools are more likely to have a relationship when they share common ideologies or view themselves as belonging to the same echelon (Khan, 2010, 2011; Stevens, 2007). Second, with respect to our substantive interest the behavior of public research universities, the characteristics of visited private high schools have consequences for subsequent enrollment

composition of public research universities. Therefore, we are interested in whether universities tend to visit high schools that are similar to them on certain characteristics. Additionally, we are interested in whether public research universities favor high schools with certain characteristics, independent of homophily. These interests motivate research question 2, "How do the characteristics of private high schools visited by public research universities compare to the characteristics of private high schools visited by private universities?"

Decisions about which private school characteristics to analyze were informed by prior research (e.g., Murnane & Reardon, 2018; Graham, 1999; Khan, 2010; Purdy, 2018; Stevens, 2007). In particular, Murnane & Reardon (2018) used data from several national surveys to analyze long-term trends in private school enrollment by family income. The percentage of American (elementary school) students attending private school declined from 15% in the mid-1960s to 10% in the mid-1970s, and declined gradually from 11% in 1999 to 9% in 2015. With respect to family income, the private school enrollment rate of high-income families (around 17%) and low-income families (around 4%) remained stable over time, but the enrollment rate for middle-income families declined from 12% in 1968 to 6% in 2013. These declines were substantially driven by declines in the number of students attending Catholic school, which represented 89% of private school enrollment in 1965 and 42% of enrollment in 2013. Private school enrollment rates are higher for families located in urban areas than those in suburban areas. With respect to race, in 2013, 11% of white students attended private school compared to 5% of Black students, and 3% of Hispanic students. However, for high income families, rates of private school enrollment do not differ substantially across race. In the South, there has been a long-term increase in private school enrollment, driven by growing enrollment in Christian private schools by middle-income families and growing enrollment in nonsetarian private schools by high-income families.

Based on these findings and logical argument (and also data limitations), our analyses focus on the following private school characteristics: geographic region, religious affiliation, academic reputation, racial composition, and enrollment size. We analyze geographic region because, for most colleges and universities, enrollment demand is likely to be stronger at high schools in the same geographic region, but nationally prestigious colleges and universities may experience high demand throughout the country. We analyze religious affiliation because private colleges are more likely to

have a relationship with private high schools with a similar religious affiliation. Although public universities are formally secular, we are interested in whether particular public universities tend to target religiously affiliated private high schools. We analyze academic reputation based on the idea that more highly ranked colleges are likely to target highly ranked private high schools. Racial composition is of substantive interest because the racial composition of visited high schools has consequences for the rational composition of colleges and universities. Given our interests in social reproduction versus social mobility, we would also analyze tuition price and household income, but these data are not avalable for private high schools.

3.3 RQ3: Network similarity and community detection

This chapter conceptualizes recruiting visits to private high schools as a behavior consistent with the social reproduction orientation of selective private colleges and universities. We are interested in how similar the recruiting networks of public research universities are to those of private colleges and universities, thereby motivating research question 3: to what extent do public research universities and private universities visit overlapping sets of private high schools?

We address RQ3 by graphing the recruiting network and by identifying "clusters" of universities that have similar recruiting networks. First, network graphs show vertices (e.g., universities) as circles, with vertices that share many connections located close together and vertices that are very "central" – many direct and indirect connections to other nodes in the network – are located near the center of the graph. In addition to network graphs, network scholarship often uses cluster analysis methodologies to identify vertices that share common structure, based purely on patterns of network ties.

4 Data and Methods

4.1 Data

Our broader project collected data on off-campus recruiting visits made by a convenience sample of colleges and universities during the 2017 calendar year. The data collection sample comes from three

different lists of postsecondary institutions: all public research-extensive universities as defined by the 2000 Carnegie Classification (N=102); all private universities in the top 100 of U.S. News and World Report National Universities rankings (N=58); and all private colleges in the top 50 of U.S. News and World Report Liberal Arts Colleges rankings (N=47). For each of these institutions, we investigated their admissions website for pages that posted their upcoming off-campus recruiting visits. For institutions that posted such pages, we scraped the pages once per week throughout 2017. Many colleges and university only posted certain kinds of events (e.g., hotel receptions and national college fairs) but not others (e.g., day-time visits to high schools). These institutions are excluded from the analyses. Our final analysis sample consists of 15 public research universities, 14 private research universities, and 12 private liberal arts colleges.

INSERT TABLE 2 ABOUT HERE

Table 2 shows selected characteristics for universities in our analysis sample. Given that we collected recruiting data for private universities ranked in the top 100 of US News and World Report, one concern is whether it makes sense to compare public research universities not ranked in the top 100 to private universities ranked in the top 100. However, the columns in Table 2 for 25th and 75th percentile SAT score of enrolled freshmen suggest that private universities ranked lower than 75 have test score ranges that are fairly similar to public research universities not ranked in the top 100. The five public research universities ranked 124 or below have score ranges that are modestly lower, particularly the University of Nebraska-Lincoln, but remain comparable to private universities ranked 75 to 100. One exception is that Stevens Institute of Technology (rank 80) has substantially higher test scores.

CRYSTAL - ADD ONE BRIEF PARAGRAPH LISTING THE DIFFERENT SECONDARY DATA SOURCES WE USED

4.2 Methods

5 Results

5.1 Research question 1: scale of visits

Research question 1 asks, how does the scale of visits to private high schools by public research universities compare to the scale of visits to private high schools by selective private universities? This question can be answered by counting the number of visits to private high schools, which equivalent to calculating degree centrality for each university. In addition to scale, we are also interested in the relative scale of visits to private high schools. That is, the number of visits to private high schools as a proportion of all off-campus recruiting visits, or as a proportion of all recruiting visits to high schools.

Appendix Figures 12 and 13 show the number of visits by "type" (public high school, private high school, community college, other), respectively, for public research universities and selective private universities. On average, the 15 public research universities in our sample conducted 1,568 off-campus recruiting events in 2017, ranging from a low of 914 for the University of Georgia to a high of 4,466 for the University of Alabama. By contrast, the 14 selective private universities in our sample conducted an average of 959 events, ranging from a low of 560 by Stevens Institute of Technology (located in Hoboken, NJ) to a high of 1,432 to Marquette University (located in Milwaukee, WI). Across all public research universities, 81.3% of visits were to a public or private high school, whereas for selective private universities 86.2% of all visits were to a public or private high school. The lower percentage for public research universities is because many public research universities made a substantial number of visits to community colleges whereas private universities did not.

Figures 2 and 3 show the number of visits to private high schools and public high schools for for public research universities (Figure 2) and selective private universities (Figure 3), with separate bars for in-state and out-of-state visits. Only three of the 15 public research Universities – UC-Berkeley, UC-San Diego, and UC-Riverside – made more in-state than out-of-state high school visits. Notably, the University of California voluntarily adopted a nonresident enrollment cap in 2017, following pressure from state legislators who had issued a bill to cap nonresident enrollment. Of the 14 selective private universities in our sample, only Baylor University (Waco, TX) made more in-state than out-of-state high school visits.

INSERT FIGURE 2 AND FIGURE 3 ABOUT HERE

With respect to research question 1, the scale of visits to private high schools by public research universities ranged from a low of 100 visits by UC-Riverside to a high of 1,039 visits by the University of Alabama (which accounted for 21.9 of all visits to private schools by public research universities in our sample), with the median university, The University of Pittsburgh, making 267 visits. Across all public research universities, 83.2% of private high school visits were to out-of-state schools while 64.4% of public high school visits were to out-of-state schools. This result is consistent with the notion that public research universities placed more value on out-of-state private high school students than in-state private high school students because out-of-state students generate substantially more tuition revenue.

For selective private universities, the number of visits to private high schools ranged from a low of 181 by Stevens Institute of Technology to a high of 723 by Notre Dame, with the median universities – Boston College and Northwestern University – visiting 349 and 390 private high schools, respectively. Thus, for the universities in our sample, the scale of visits to private high schools tended to be higher for selective private universities than public research universities. That said, several public research universities in our sample – University of Colorado-Boulder (402 visits), University of South Carolina (498 visits), and University of Alabama (1,039 visits) – made a relatively high number of private high school visits even when compared to the selective private universities in our sample.

The relative scale of visits to private high schools – defined as private high school visits as a percentage of all high school visits – also tended to be substantially higher at selective private universities than at public research universities. Across all selective private universities in our sample, 48.8% of high school visits were to private high schools, compared to 24.8% for public research universities. However, the relative emphasis on private high schools was a bit closer for out-of-state visits; across all selective private universities, 52.9% out-of-state high school visits were to private schools, compared to 29.9% for public research universities.

Although selective private universities tend to emphasize visits to private high schools more than public research universities, both groups visited private high schools at a much higher rate than public high schools.

- DISCUSS TABLE COMPARING ACTUAL TO PROPORTIONAL VISITS; main point is that while private universities visit private high schools at a higher rate than public research universities, both groups visit private high schools at a higher rate than they do public high schools; note the exceptions to this statement and note that public research universities that are closer to the behavior of private universities (e.g., university of Georgia)

5.2 Research question 2: characteristics of visited schools

Figures 4 through 8 address research question 2, how do the characteristics of private high schools visited by public research universities compare to the characteristics of private high schools visited by selective private universities?

Figure 4 shows the geographic region – Northeast, Midwest, South, and West – of visited private high schools, separately for public research universities (top panel) and selective private universities (bottom panel). Scholarship on the relationship between geographic proximity and student demand tends to find that nationally prestigious universities enjoy strong demand across the nation, while less prestigious universities rely primarily on demand from students located nearby (e.g., Hoxby, 1997). The visit patterns for private universities are consistent with this finding; less prestiguous universities tended to focus on private high schools in their home region, while more prestigious universities tended to visit many private high schools outside their home region. Similarly, scholarship on student demand for out-of-state public universities finds that most public universities rely on demand from out-of-state students living in nearby states (Mak & Moncur, 2003; Mixon & Hsing, 1994; Zhang, 2007). Most public research universities in our sample visited a disproportionate number of private high schools in their home geographic region. UC-Berkeley and CU Boulder – universities with strong national brand recognition – visited a large number of private high schools outside their home region.

INSERT FIGURE 4 ABOUT HERE

In the universe of all private high schools (top row of Figure 4), there are more schools located in the South than any other geographic region, consistent with the finding from Murnane & Reardon (2018) about the long-term growth in private school enrollment in the South. Universities

not located in the South tended to visit more private high schools in the South than any other region, except their home region. This finding emerged for both the public universities and private universities in our sample.

Figure 5 shows the religious affiliation – Catholic, Christian, Nonsectarian, and Other – of visited private high schools. The results for selective private universities (bottom panel) follow expectations: Nonsetarian universities tended to visit a higher proportion of nonsectarian private high schools; Catholic universities visited a higher proportion of Catholic high schools; and Christian universities tended to visit a relatively higher share of Christian high schools.

INSERT FIGURE 5 ABOUT HERE

Results for public research universities (top panel) are more interesting. Despite being nonsectarian, the majority of public research universities visited a high share of religiously affiliated private high schools, particularly Catholic schools. Surprisingly, Catholic schools represented at least 40% of private high school visits for 10 of the 15 public research universities in our sample. By contrast, Catholic schools represented at least 40% of visits for only 6 of the 14 selective private universities in our sample (the four Catholic universities and also Texas Christian University and Stevens Institute of Technology). For public research universities, the emphasis on visiting Catholic and Christian high schools rather than nonsectarian private high schools tended to be stronger at less prestigious institutions.

Figure 6 shows the academic reputation – defined by the Niche private high school ranking – of visited private high schools. For the private universities in our sample, we see the predictable pattern that more highly ranked universities tend to visit a higher share of private high schools that are ranked in the top 200 nationally or are rated "A+" whereas less prestigious universities visted a higher share of private high schools rated "A" or "A- or below." Notre Dame University is a notable exception to this pattern. A potential explanation is that Notre Dame has developed a strategy of targeting the very top students at relatively less-prestigious Catholic high schools, believing that these students will choose Notre Dame because of its status as the preeminent Catholic University.

INSERT FIGURE 6 ABOUT HERE

A similar pattend emerged for the public research universities in our sample; more highly ranked

universities tended to visit a higher share of higly rated private high schools than lower ranked universities. In comparison to the private universities in our sample, the public universities in our sample tended to visit a higher share of private high schools that were not highly rated. To a great extent, this finding is merely a consequence of our sampling strategy; we attempted to collected recruiting visit data from all public research universities but we only collected recruiting visit data from private universities ranked in the top 100 of US News and World Report. That said, the finding that public research universities visited a large share of low-rated private high schools is consistent with the idea that many public research universities visit private high schools in search of full-pay students rather than academic superstars.

Figure 7 shows the 12th grade enrollment of visited private high schools. Compared to the universe of private high schools, the universities in our sample tended to visit schools that enrolled more 12th graders. Generally, the findings were pretty similar across universities public and private universities; for must universities, more than half of private school visits were to schools that enrolled at least 100 12th graders. However, public universities tended to visit a slightly larger share of high schools with fewer than 50 12th graders and private universities tended to visit a higher share of high schools with 12th grade enrollment of 50-100.

INSERT FIGURES 7 AND 7 [the one for public high schools] ABOUT HERE

Figure X shows the 12th grade enrollment of visited private high schools to the 12th grade enrollment of visited public high schools for the public research universities in our sample. DISCUSS RESULTS; MAIN TAKEAWAY IS THAT, COMPARED TO THE PUBLICH HIGH SCHOOLS THEY VISIT, PUBLIC UNIVERSITIES SEEM TO BE WILLING TO VISIT PRIVATE SCHOOLS THAT ENROLL FAR FEWER 12TH GRADERS.

Figure 8 shows the percentage of 12th graders who identify as Black, Latinx, or Native at visited private high schools. Consistent with Murnane & Reardon (2018), most private high schools enroll relatively few students from historically underrepresented race/ethnicity groups. For about 70% [CRYSTAL - CHECK THIS] of schools in the universe of private high schools (top row of Figure 8), Black/Latinx/Native students comprise less than 20% of enrolled students. Therefore, even if universities visited schools with racial composition on par with the universe of private high schools, most visited schools would enroll relatively few Black/Latinx/Native students. Figure 8

shows that for most universities in our sample, the set of visited private high schools enrolled *fewer* Black/Latinx/Native students than the universe of private high schools. For public universities, exceptions to this finding were were UC-San Diego, UC-Riverside, and – to a lesser extent – SUNY Stony Brook. For private universities, Marquette was the only exception to this finding.

Several studies suggest that universities – particularly elite private universities – pursue racial diversity by recruiting non-white students who attend predominantly white private high schools (e.g., Jack, 2019). Additionally, scholarship that engages with enrollment in private schools by Black students suggests that many high-income Black families began sending their children to elite, predominantly white private schools once these schools were willing to enroll Black students (Graham, 1999). Therefore, universities may visit predominantly white private high schools in search of non-white students. Once concern about this practice is that non-white students at elite private schools may be in high demand by many universities, but similarly achieving non-white students at predominantly non-white public schools might be ignored.

INSERT FIGURE 8 ABOUT HERE

Figure X compares the racial composition of private high schools visited by public research universities to the racial composition of public high schools visited by these universities. [TAKEAWAY: the private high schools visited are much less racially diverse that the public high schools they visit, so recruiting aggresively from private schools may shift the racial composition of public research universities away from black/latinx/native]

5.3 Research question 3: overlapping network structure

Research question 3 asks, to what extent do public research universities and selective private universities visit overlapping sets of private high schools? In contrast to RQ1 and RQ2, answering RQ3 requires social network analysis techniques.

Appendix X describes how we constructed social network data. Briefly, we began by constructing a two-mode social network of visits to private high schools (mode 1) by universities (mode 2). Each university and each private high school is a "vertex." A visit from a university to a school is an "edge." Because large two-mode networks like our school-university network are difficult to

visualize, two-mode networks are often analyzed as one-mode networks (Borgatti, 2008; Davis et al., 2003). We transformed our two-mode school-university network into a one-mode university network in which each university is a vertex and two universities share an edge if both universities visited at least one high school in common. The *weight* of an edge indicates the number of high schools that both universities visited. For example, if there are 200 private high schools that received a visit from both Notre Dame and Villanova, the weight of the edge between Notre Dame and Villanova is 200. We created three separate one-mode university networks: a public university network; a private university network; a public and private university network.

We answer research question 3 by, first, analyzing overlap in the recruiting network of public universities (the public university network), second, analyzing overlap in the network of private universities (the private university network), and third, analyzing overlap amongst public and private universities (the public and private university network).

5.3.1 Public university network

Tables 3 and 4 provides a tabular representation of the extent to which public universities visited overlapping sets of private high schools. For each pair of public universities (e.g., University of Alabama and University of South Caroline, Table 3 shows the number of high schools that were visited by both universities. For example, column 1 shows that of of the 1,039 private

Table 3 shows the number of different high schools

DESCRIBE HOW TO READ TABLE AND WHAT THE RESULTS SHOW

INSERT TABLE 3 AND TABLE 4 ABOUT HERE

INSERT TABLE X ABOUT HERE

Figure 9 graphs the one-mode public university network. Generally – whether graphing one-mode or two-mode networks – network graphs show vertices as circles and edges as lines connecting pairs of vertices. In our one-mode public university network, each circle represents a public university and two universities share an edge – represented by a dotted line – if both universities visit at least one high school in common.

For our one-mode public

We address RQ3 by graphing the recruiting network and by identifying "clusters" of universities that have similar recruiting networks. First, network graphs show vertices (e.g., universities) as circles, with vertices that share many connections located close together and vertices that are very "central" – many direct and indirect connections to other nodes in the network – are located near the center of the graph. In addition to network graphs, network scholarship often uses cluster analysis methodologies to identify vertices that share common structure, based purely on patterns of network ties.

Network graphs show vertices as nodes and edges as lines connecting two nodes. Conceptually, we think of nodes as repelling one another and edges as pulling nodes together. Therefore, nodes that share few connections are located apart and nodes that share many connections are located close together. Nodes that are very "central" – many direct and indirect connections to other nodes in the network – are located near the center of the graph, while nodes that are relatively disconnected are located at the periphery of the graph. In the analyses below, we graph the one-mode college network, using relative proximity of nodes to convey whether a pair colleges have a similar network structure.

We also address research question 3 by using cluster analysis to identify colleges/universities that share common network structure. Many social network analyses utilize data-driven "community detection" algorithms to categorize vertices into a small number of groups (or cluster) based purely on patterns of network ties. Generally, groups are chosen to maximize the number of within-group ties while minimizing ties between members of different groups. We performed hierarchical cluster analysis to allocate colleges and universities into clusters based on their private high schools visits

INSERT FIGURE 9 ABOUT HERE

5.3.2 Private university network

INSERT TABLE 5 ABOUT HERE

INSERT FIGURE 10 ABOUT HERE

5.3.3 Public and private university network

INSERT FIGURE 11 ABOUT HERE

6 References

Alon, S. (2009). The evolution of class inequality in higher education: Competition, exclusion, and adaptation. *American Sociological Review*, *74*(5), 731–755.

Borgatti, S. P. (2008). 2-mode concepts in social network analysis. In *Encyclopedia of complexity and system science*.

Burd, S. (2017). *Moving on up? What a groundbreaking study tells us about access, success, and mobility in higher ed*. Washington, DC: New America. Retrieved from https://newamerica.org/documents/2009/Moving-on-Up.pdf

Burt, R. S. (1992). *Structural holes: The social structure of competition*. Cambridge, MA: Harvard University Press.

Campbell, A. (2017). Higher education marketing: How to master your admissions funnel. Retrieved from https://hop-online.com/blog/higher-education-marketing-admissions-process/

Chetty, R., Friedman, J. N., Saez, E., Turner, N., & Yagan, D. (2020). Income segregation and intergenerational mobility across colleges in the united states. *The Quarterly Journal of Economics*, *135*(3), 1567–1633. https://doi.org/10.1093/qje/qjaa005

Clinedinst, M., & Koranteng, A.-M. (2017). *2017 state of college admission*. National Association of College Admissions Officers.

Cottom, T. M. (2017). *Lower ed: The troubling rise of for-profit colleges in the new economy* (p. 228 pages). The New Press.

Davis, G. F., Yoo, M., & Baker, W. E. (2003). The small world of the american corporate elite, 1982-2001. *Strategic Organization*, *1*(3), 301–326. https://doi.org/10.1177/14761270030013002

Doyle, W. R. (2010). Changes in institutional aid, 1992-2003: The evolving role of merit aid. *Research in Higher Education*, *51*(8), 789–810.

Dupaul, S., & Harris, M. S. (2012). Secret shoppers: The stealth applicant search for higher education. *Journal of College Admission*, (Spring 2012), 8–16. Journal Article.

Graham, L. (1999). *Our kind of people: Inside america's black upper class* (1st ed., pp. xii, 418pages, 16unnumbered pages of plates). New York: HarperCollins.

Haycock, K., Mary, L., & Engle, J. (2010). *Opportunity adrift: Our flagship universities are straying from their public mission.* Education Trust.

Holland, M. M. (2019). *Divergent paths to college: Race, class, and inequality in high schools.* Rutgers University Press. https://doi.org/10.36019/9780813590288

Hoxby, C. M. (1997). *How the changing market structure of u.s. Higher education explains college tuition* (No. Working Paper 6323). National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/W6323.pdf

Jack, A. A. (2019). *The privileged poor: How elite colleges are failing disadvantaged students* (p. 276). Cambridge, Massachusetts: Harvard University Press, Retrieved from Restricted%20to%20UCLA.%20Limited%20to%20three%20concurrent%20users.%20Try%20again%20later%20if%20unavailable.%20http://openurl.cdlib.org?sid=UCLA:CAT&genre=book&___char_set=utf8&isbn=9780674239647

Jaquette, O., & Curs, B. R. (2015). Creating the out-of-state university: Do public universities increase nonresident freshman enrollment in response to declining state appropriations? *Research in Higher Education*, *56*(6), 535–565. https://doi.org/10.1007/s11162-015-9362-2

Karabel, J. (2005). *The chosen: The hidden history of admission and exclusion at harvard, yale, and princeton* (pp. viii, 711p., [16]p. of plates). Boston, MA: Houghton Mifflin Co.

Karen, D. (1990). Toward a political-organizational model of gatekeeping: The case of elite colleges. *Sociology of Education*, *63*(4), 227–240.

Kezar, A. J., Chambers, T. C., & Burkhardt, J. (2005). *Higher education for the public good: Emerging voices from a national movement.* San Francisco: Jossey-Bass.

Khan, S. R. (2010). *Getting in: How elite schools play the college game* (pp. 97–113). Rowman & Littlefield.

Khan, S. R. (2011). *Privilege: The making of an adolescent elite at st. Paul's school* (p. 232 pages). Princeton, N.J.: Princeton University Press.

Mak, J., & Moncur, J. E. T. (2003). Interstate migration of college freshmen. *Annals of Regional Science*, *37*(4), 603–612. https://doi.org/10.1007/s00168-003-0130-4

McClure, K. R., Barringer, S. N., & Brown, J. T. (2019). Privatization as the new normal in higher education. In L. W. Perna (Ed.), *Higher education: Handbook of theory and research: Volume 35* (pp. 1–78). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-11743-6_13-1

McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a feather: Homophily in social networks. *Annual Review of Sociology*, *27*, 415–444. Journal Article. Retrieved from %3CGo%20to%20ISI%3E://000170748100017

McPherson, M. S., & Schapiro, M. O. (1998). *The student aid game*. Princeton, NJ: Princeton University Press.

Mixon, F. G., & Hsing, Y. (1994). The determinants of out-of-state enrollments in higher education: A tobit analysis. *Economics of Education Review*, *13*(4), 295–335.

Murnane, R. J., & Reardon, S. F. (2018). Long-term trends in private school enrollments by family income. *AERA Open*, *4*(1), 1–24. https://doi.org/10.1177/2332858417751355

Noel-Levitz, R. (2020). *2020 cost of recruiting an undergraduate student report* (Report). Ruffalo Noel-Levitz. Retrieved from https://learn.ruffalonl.com/rs/395-EOG-977/images/2020_CostRecruiting_Report.pdf

Posecznick, A. (2017). *Selling hope and college merit, markets, and recruitment in an unranked school*. Cornell University Press. https://doi.org/10.7591/9781501708404

Posselt, J. R. (2016). *Inside graduate admissions: Merit, diversity, and faculty gatekeeping* (pp. x, 250pages). Cambridge, MA: Harvard University Press.

Purdy, M. A. (2018). *Transforming the elite: Black students and the desegregation of private schools* (pp. 1–243). https://doi.org/10.5149/northcarolina/9781469643496.001.0001

Rudolph, F. (1962). *The american college and university: A history* (1st ed., p. 516 p.). New

York: Alfred A. Knopf.

Ruffalo Noel-Levitz. (2018). *2018 marketing and student recruitment report of effective practices*. Ruffalo Noel-Levitz. Retrieved from http://learn.ruffalonl.com/rs/395-EOG-977/images/RNL_2018_Student_Recruitment_Marketing_Report_EM-19.pdf

Salazar, K. G., Jaquette, O., & Han, C. (online first). Coming soon to a neighborhood near you? Off-campus recruiting by public research universities. *American Educational Research Journal*, *0*(0). https://doi.org/10.3102/00028312211001810

Slaughter, S., & Leslie, L. L. (1997). *Academic capitalism: Politics, policies, and the entrepreneurial university* (pp. ix, 276p.). Baltimore: Johns Hopkins University Press.

Stevens, M. L. (2007). *Creating a class: College admissions and the education of elites* (p. 308 p.). Cambridge, MA: Harvard University Press.

Stevens, M. L., Armstrong, E. A., & Arum, R. (2008). Sieve, incubator, temple, hub: Empirical and theoretical advances in the sociology of higher education. *Annual Review of Sociology*, *34*, 127–151. https://doi.org/10.1146/annurev.soc.34.040507.134737

Stevens, M. L., & Gebre-Medhin, B. (2016). Association, service, market: Higher education in american political development. *Annual Review of Sociology*, *42*, 121–142. https://doi.org/10.1146/annurev-soc-081715-074240

Waddell, G. R., & Singell, J., Larry D. (2011). Do no-loan policies change the matriculation patterns of low-income students? *Economics of Education Review*, *30*(2), 203–214.

Whitney, D., & Schmidt, J. (2015). Regional recruiters: What's all the buzz about. Presented at the 2015 National Association for College Admissions Counseling National Conference.

Zhang, L. A. (2007). Nonresident enrollment demand in public higher education: An analysis at national, state, and institutional levels. *Review of Higher Education*, *31*(1), 1–25. https://doi.org/10.1353/rhe.2007.0057

7 Social network data appendix

A social network consists of a set of actors – referred to as "vertices" – and the connections – referred to as "network ties" or "edges" between these actors. "One-mode" networks consist of vertices of a "type." For example, the social network of Facebook consists of users (vertices) who are connected to one another via friendship ties (edges). "Two-mode" networks consist of vertices associated with one type of actor/entity having connections to vertices of another type. Data on recruiting visits by universities to high schools yields a two-mode network, in which an edge – a recruiting visit – occurs between a high school (mode 1) and a university (mode 2).

Constructing two-mode network We describe construction of social network data with reference to "corporate board-director" networks – the most commonly analyzed two-mode network – which consist of directors (mode 1) who serve on organizational boards (mode 2). In our school-university two-mode network, the vertices are private high schools (mode 1) and universities (mode 2), and an edge is defined as an off-campus recruiting visits made between the two (e.g., high school i shares an edge with university j if high school i receives at least one visit from university j). Visits can only occur between a school-university pair (not a school-school pair or a university-university pair). This (weighted) network can be represented as a school-by-university matrix (e.g., a 500×40 matrix if our network contains 500 high schools and 40 universities) in which matrix cell $a_{i,j}$ identifies the number of visits high school i received from university j.

Transforming two-mode network to one-mode networks Two-mode networks are often analyzed as one-mode networks (Borgatti, 2008). Davis et al. (2003) states that "overlapping groups such as boards of directors form a two-mode membership network in which one can conceive of directors as nodes [vertices] connected by a tie of common board membership, or boards as nodes connected by a tie of one or more shared directors" (p. XXX). Thus, a two-mode board-director network can be transformed into two one-mode networks. A weighted one-mode director network can be created as follows: create a director-by-director matrix (e.g., a 100×100 matrix if there are 100 directors in the network); two directors share an edge if they serve together on a board; matrix cell $a_{i,j}$ identifies the number of boards that include both director i and director j (e.g., $a_{i,j} = 0$ if directors i and j do not serve on any of the same boards and $a_{i,j} = 3$ if directors i and j serve on

three boards together). Similarly, a one-mode board network is created based on a board-by-board matrix in which two boards share an edge if a director sits on both boards and matrix cell $a_{i,j}$ identifies the number of directors that serve on both board i and board j.

Following this approach, we create a one-mode high school network in which two private high schools share an edge if they both receive a visit by the same university. Cell $s_{i,j}$ of the school-by-school matrix S indicates the number of universities that visited both school i and school j. Similarly, we create a one-mode university network in which two universities share an edge if both universities visited the same high school. Cell $c_{i,j}$ of the university-by-university matrix C indicates the number of private high schools that received at least one visit from both university i and university j.

The social network analyses presented in this chapter – particularly for research question 3 – are primarily based on analysis of one-mode university networks. We created separate one-mode university networks for: public universities; private universities; both public and private universities.

Table 1: Percentage of budget allocated to marketing/recruiting activities by private non-profit 4yr and public 4yr institutions

Activity	Private	Public
Travel	17	16
Student search (purchased lists)	14	12
Prospective student communications	13	17
Events	12	11
Recruitment publications	11	15
Web services and digital advertising	11	13
Traditional advertising	6	6
International recruitment	5	3
Transfer recruitment	4	4
Other	8	3

Table 2: Characteristics of universities in analysis sample

classification	univ_abbrev	rank	satactcomp25	satactcomp75	tfuginst	tfugoutst	ugftptfreshtot	freshoutstpct	pgrnt_p	pctfreshwh	pctfreshbl	pctfreshap	pctfreshhi	pctfreshal
public_research	UC Berkeley	22	1315.8741	1527.489	13806.628	41076.48	6252	0.2436021	19.448523	25.62380	1.759437	42.722329	13.819578	9.2930262
	UC San Diego	35	1192.6296	1454.526	13945.624	41215.48	5748	0.2649617	30.731537	15.46625	1.513570	34.446764	20.633264	21.6249130
	U of Georgia	47	1164.7026	1359.762	11890.318	30501.52	5433	0.1233204	20.329569	67.95509	8.098656	12.350451	5.761090	1.6197313
	U of Pitt	58	1201.5671	1395.423	19028.189	30413.62	5644	0.3061658	20.273389	68.46208	7.317505	9.337349	4.323175	3.5790220
	Rutgers	63	1110.0000	1350.000	14688.642	30684.46	6465	0.1780356	26.996904	35.45244	5.955143	31.291570	12.126837	10.3789637
	UMass Amherst	66	1134.9703	1332.485	15300.839	32913.51	4679	0.2690746	21.511130	61.01731	3.782860	12.502671	6.026929	8.1213935
	UC Riverside	88	956.4182	1199.851	13880.214	41150.07	5358	0.0222098	56.594949	10.13438	4.012691	31.093692	47.200448	2.5009332
	SUNY Stony Brook	88	1162.5096	1373.127	9197.265	26817.09	2934	0.2583504	34.561583	27.84594	5.896387	28.766189	11.042945	16.4621677
	CU Boulder	103	1126.4928	1331.185	11785.049	35851.86	6421	0.4720449	14.565695	66.28251	1.479520	5.622177	12.536988	7.4754711
	U of S.Carolina	118	1135.3982	1320.531	11706.353	31562.39	5110	0.5320939	15.435847	82.09393	4.990215	3.033268	4.266145	1.2133072
	U of Kansas	124	1070.0000	1300.000	10781.414	26503.33	4233	0.4275927	23.438257	72.10017	4.299551	4.535790	8.669974	4.6302858
	UNL	133	1026.9377	1261.531	8725.086	23557.83	4860	0.2993827	23.856818	75.57613	3.065844	2.530864	7.242798	6.2962963
	U of Alabama	143	1052.5409	1350.901	10700.673	27543.76	7559	0.6809102	16.986155	80.55298	7.977246	1.270009	5.304934	0.7805265
	U of Cincinnati	143	1063.2927	1265.030	11242.350	26914.19	6913	0.1306235	26.655579	74.85896	9.012006	3.833357	3.515116	2.4157385
	U of Arkansas	160	1057.2655	1283.021	9014.320	23678.43	4972	0.5102574	19.501823	78.70072	3.921963	2.614642	8.487530	1.0458568
private_national	Northwestern	9	1413.0637	1527.341	51975.430	51975.43	1985	0.6977330	17.783375	46.14610	5.037783	16.725441	13.602015	9.6725441
	Notre Dame	19	1395.1492	1552.900	50779.652	50779.65	2046	0.9447703	11.876833	67.79081	4.496579	5.327468	10.654936	5.8651026
	Emory	21	1313.4745	1481.220	49010.516	49010.52	1358	0.8549337	17.452136	40.94256	7.142857	18.777614	10.824742	16.1266568
	Tufts	30	1375.1345	1514.865	53585.129	53585.13	1336	0.8023952	10.209993	54.86527	4.790419	13.398204	6.661677	11.3772455
	Boston Coll.	35	1296.5361	1460.000	52426.145	52426.14	2254	0.7657498	12.840467	61.35759	2.795031	10.692103	11.135759	6.8322981
	Tulane	41	1276.5323	1416.089	52133.844	52133.84	1856	0.8760776	7.758621	75.96983	4.256466	5.711207	5.818966	4.2564655
	Case Western Res.	42	1314.1865	1501.396	47019.598	47019.60	1265	0.7573122	9.968354	48.14229	4.268775	19.604743	6.245059	15.5731225
	Villanova	53	1279.7854	1420.000	50365.727	50365.73	1678	0.8313469	9.725537	76.04291	4.707986	5.542312	6.853397	1.4898689
	SMU	66	1244.0140	1416.004	51467.480	51467.48	1522	0.6156373	10.190664	66.42576	5.584757	5.913272	11.038108	6.3074901
	Baylor	76	1163.3229	1328.567	42931.469	42931.47	3503	0.3531259	17.362700	65.40108	6.166143	5.538110	15.272623	2.9403369
	U of Denver	80	1165.7943	1358.820	47444.762	47444.76	1399	0.6754825	14.596950	73.48106	2.001430	4.288778	9.792709	5.5754110
	TCU	80	1124.5416	1320.906	43610.098	43610.10	1888	0.5662076	11.234764	72.88136	4.661017	3.125000	13.294491	3.6546610
	Stevens Ins. Tech	80	1273.6338	1446.817	49913.988	49913.99	737	0.3880597	15.468114	65.40027	2.713704	14.654003	10.040706	4.6132972
	Marquette	88	1101.1530	1296.208	39317.562	39317.56	2005	0.7142144	18.981019	68.02993	4.887780	8.129676	13.316708	2.4937656
private_libarts	Williams	1	1350.9877	1527.407	52931.027	52931.03	553	0.8788427	21.157324	53.70705	7.775768	13.381555	13.019891	7.4141049
	Swarthmore	3	1319.6681	1521.618	50185.852	50185.85	415	0.9084337	19.277108	42.40964	7.710843	13.975904	13.493976	12.0481928
	Middlebury	9	1310.1361	1477.421	51165.980	51165.98	606	0.9554455	13.201320	62.87129	4.125413	6.435644	10.066007	9.2409241
	Smith	15	NA	NA	48959.414	48959.41	654	0.8654434	19.113150	47.09480	7.492355	9.633028	11.009174	13.9143731
	Harvey Mudd	25	1420.0000	1571.032	53826.328	53826.33	214	0.6261683	13.425926	34.11215	3.271028	17.757009	21.962617	5.1401869
	Colorado Coll.	25	NA	NA	52013.242	52013.24	533	0.8724203	8.067542	63.78987	2.814259	4.127580	9.193246	10.1313321
	Macalester	27	1282.4338	1473.175	51754.668	51754.67	506	0.8616601	15.612648	60.47431	3.359684	8.498024	7.312253	15.0197628
	Scripps	28	1275.1476	1430.098	52105.227	52105.23	270	0.5962963	12.222222	58.51852	5.185185	17.777778	10.370370	4.4444444
	Oberlin	36	1273.7423	1454.748	53147.699	53147.70	762	0.9317585	10.761155	62.59843	4.986877	5.249344	7.217848	10.7611549
	Occidental	40	1228.1915	1401.206	52195.164	52195.16	502	0.6135458	20.119522	50.19920	6.374502	14.741036	12.151394	7.7689243
	Sewanee	47	NA	NA	39671.188	39671.19	514	0.8307393	16.926070	82.10117	4.669261	1.556420	5.252918	3.5019455
	Conn Coll.	51	NA	NA	52062.301	52062.30	472	0.8665254	17.372881	67.58475	3.389830	5.084746	10.169491	8.0508475

Table 3: One-mode public university count matrix

	U of Alabama (N=1039)	U of S.Carolina (N=498)	CU Boulder (N=402)	Rutgers (N=320)	UMass Amherst (N=311)	U of Georgia (N=307)	U of Cincinnati (N=295)	U of Pitt (N=267)	U of Kansas (N=240)	U of Arkansas (N=228)	UC Berkeley (N=218)	UC San Diego (N=209)	UNL (N=164)	SUNY Stony Brook (N=148)	UC Riverside (N=100)
U of Alabama	0	284	210	120	149	169	124	125	93	100	112	100	31	43	34
U of S.Carolina	284	0	155	74	108	140	110	99	58	57	84	59	20	27	19
CU Boulder	210	155	0	76	115	88	69	92	74	51	77	98	25	21	28
Rutgers	120	74	76	0	93	24	35	74	20	5	41	43	10	48	10
UMass Amherst	149	108	115	93	0	57	27	56	18	14	45	57	4	57	18
U of Georgia	169	140	88	24	57	0	73	48	39	59	64	38	13	7	16
U of Cincinnati	124	110	69	35	27	73	0	56	29	37	33	24	18	5	8
U of Pitt	125	99	92	74	56	48	56	0	32	26	41	28	15	27	11
U of Kansas	93	58	74	20	18	39	29	32	0	62	30	29	61	0	8
U of Arkansas	100	57	51	5	14	59	37	26	62	0	26	22	24	1	9
UC Berkeley	112	84	77	41	45	64	33	41	30	26	0	61	8	9	20
UC San Diego	100	59	98	43	57	38	24	28	29	22	61	0	3	11	35
UNL	31	20	25	10	4	13	18	15	61	24	8	3	0	0	0
SUNY Stony Brook	43	27	21	48	57	7	5	27	0	1	9	11	0	0	4
UC Riverside	34	19	28	10	18	16	8	11	8	9	20	35	0	4	0

Table 4: One-mode public university percent matrix

	U of Alabama (N=1039)	U of S.Carolina (N=498)	CU Boulder (N=402)	Rutgers (N=320)	UMass Amherst (N=311)	U of Georgia (N=307)	U of Cincinnati (N=295)	U of Pitt (N=267)	U of Kansas (N=240)	U of Arkansas (N=228)	UC Berkeley (N=218)	UC San Diego (N=209)	UNL (N=164)	SUNY Stony Brook (N=148)	UC Riverside (N=100)
U of Alabama	0.0	57.0	52.2	37.5	47.9	55.0	42.0	46.8	38.8	43.9	51.4	47.8	18.9	29.1	34
U of S.Carolina	27.3	0.0	38.6	23.1	34.7	45.6	37.3	37.1	24.2	25.0	38.5	28.2	12.2	18.2	19
CU Boulder	20.2	31.1	0.0	23.8	37.0	28.7	23.4	34.5	30.8	22.4	35.3	46.9	15.2	14.2	28
Rutgers	11.5	14.9	18.9	0.0	29.9	7.8	11.9	27.7	8.3	2.2	18.8	20.6	6.1	32.4	10
UMass Amherst	14.3	21.7	28.6	29.1	0.0	18.6	9.2	21.0	7.5	6.1	20.6	27.3	2.4	38.5	18
U of Georgia	16.3	28.1	21.9	7.5	18.3	0.0	24.7	18.0	16.2	25.9	29.4	18.2	7.9	4.7	16
U of Cincinnati	11.9	22.1	17.2	10.9	8.7	23.8	0.0	21.0	12.1	16.2	15.1	11.5	11.0	3.4	8
U of Pitt	12.0	19.9	22.9	23.1	18.0	15.6	19.0	0.0	13.3	11.4	18.8	13.4	9.1	18.2	11
U of Kansas	9.0	11.6	18.4	6.2	5.8	12.7	9.8	12.0	0.0	27.2	13.8	13.9	37.2	0.0	8
U of Arkansas	9.6	11.4	12.7	1.6	4.5	19.2	12.5	9.7	25.8	0.0	11.9	10.5	14.6	0.7	9
UC Berkeley	10.8	16.9	19.2	12.8	14.5	20.8	11.2	15.4	12.5	11.4	0.0	29.2	4.9	6.1	20
UC San Diego	9.6	11.8	24.4	13.4	18.3	12.4	8.1	10.5	12.1	9.6	28.0	0.0	1.8	7.4	35
UNL	3.0	4.0	6.2	3.1	1.3	4.2	6.1	5.6	25.4	10.5	3.7	1.4	0.0	0.0	0
SUNY Stony Brook	4.1	5.4	5.2	15.0	18.3	2.3	1.7	10.1	0.0	0.4	4.1	5.3	0.0	0.0	4
UC Riverside	3.3	3.8	7.0	3.1	5.8	5.2	2.7	4.1	3.3	3.9	9.2	16.7	0.0	2.7	0

Table 5: One-mode private university percent matrix

	Notre Dame (N=723)	Villanova (N=636)	SMU (N=590)	TCU (N=504)	Tulane (N=458)	Marquette (N=415)	Northwestern (N=390)	Boston Coll. (N=349)	Tufts (N=315)	U of Denver (N=298)	Emory (N=288)	Baylor (N=269)	Case Western Res. (N=229)	Stevens Ins. Tech (N=181)
Notre Dame	0.0	53.1	49.7	50.2	48.7	55.7	57.4	67.3	56.2	55.0	50.3	36.8	58.1	43.6
Villanova	46.7	0.0	49.3	44.4	47.6	49.4	54.9	59.6	51.1	48.0	51.0	37.5	62.0	56.9
SMU	40.5	45.8	0.0	57.5	60.0	36.4	62.3	62.5	60.0	59.4	61.1	57.2	58.5	48.6
TCU	35.0	35.2	49.2	0.0	43.4	36.1	45.4	48.1	44.8	50.7	42.4	49.4	42.8	36.5
Tulane	30.8	34.3	46.6	39.5	0.0	24.8	56.2	49.6	60.3	47.7	49.7	29.4	57.2	30.9
Marquette	32.0	32.2	25.6	29.8	22.5	0.0	29.2	38.1	24.4	32.6	18.1	23.0	28.8	23.8
Northwestern	31.0	33.6	41.2	35.1	47.8	27.5	0.0	49.3	53.7	46.6	44.4	27.9	53.3	30.4
Boston Coll.	32.5	32.7	36.9	33.3	37.8	32.0	44.1	0.0	50.2	45.3	39.2	23.8	43.7	33.1
Tufts	24.5	25.3	32.0	28.0	41.5	18.6	43.3	45.3	0.0	38.3	40.6	19.3	47.2	36.5
U of Denver	22.7	22.5	30.0	30.0	31.0	23.4	35.6	38.7	36.2	0.0	28.5	21.2	31.4	24.3
Emory	20.1	23.1	29.8	24.2	31.2	12.5	32.8	32.4	37.1	27.5	0.0	14.5	42.8	23.2
Baylor	13.7	15.9	26.1	26.4	17.2	14.9	19.2	18.3	16.5	19.1	13.5	0.0	21.8	12.7
Case Western Res.	18.4	22.3	22.7	19.4	28.6	15.9	31.3	28.7	34.3	24.2	34.0	18.6	0.0	22.7
Stevens Ins. Tech	10.9	16.2	14.9	13.1	12.2	10.4	14.1	17.2	21.0	14.8	14.6	8.6	17.9	0.0

Figure 1: The enrollment funnel

Figure 2: Number of visits to public and private high schools by public research universities

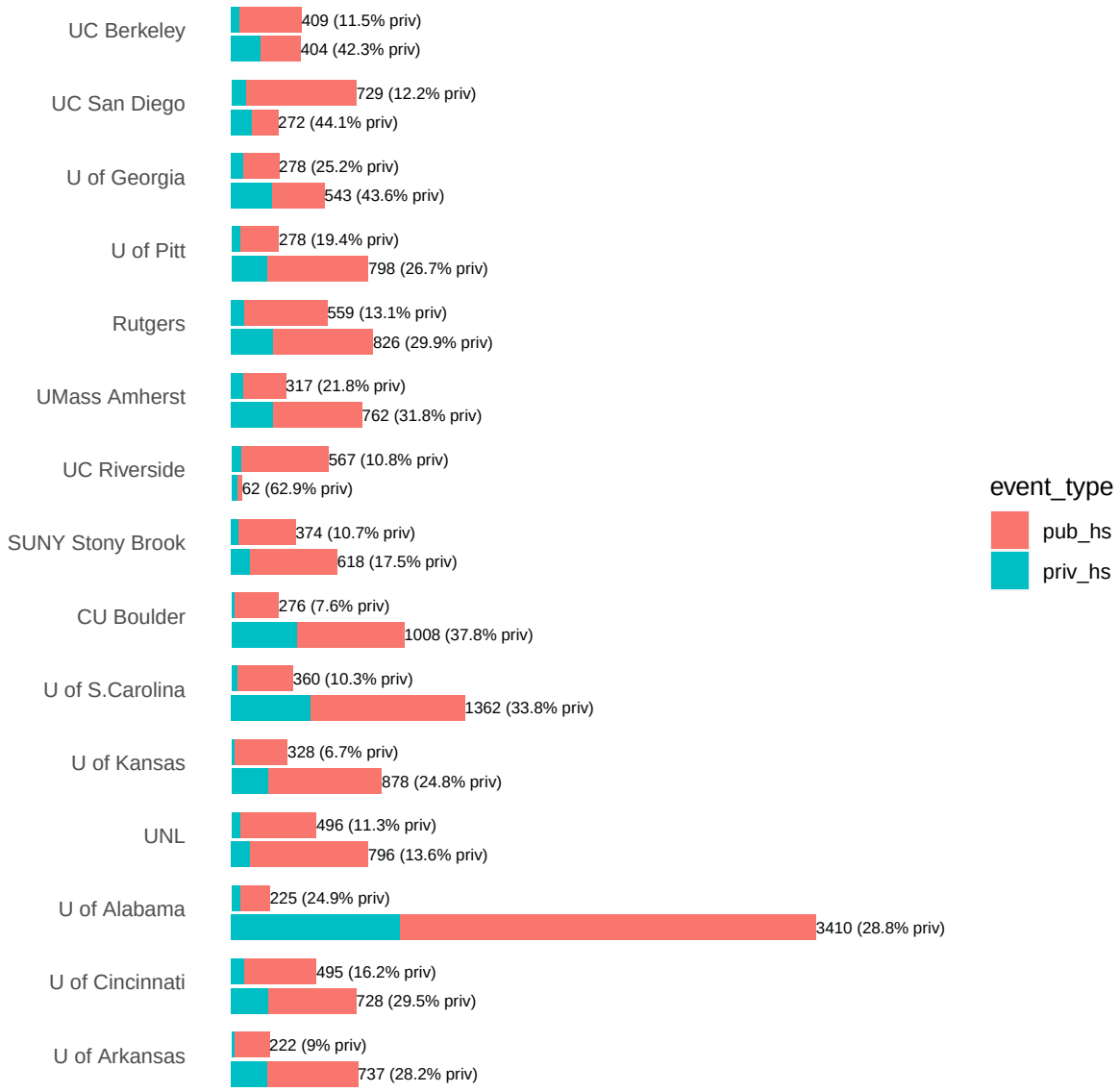


Figure 3: Number of visits to public and private high schools by selective private universities

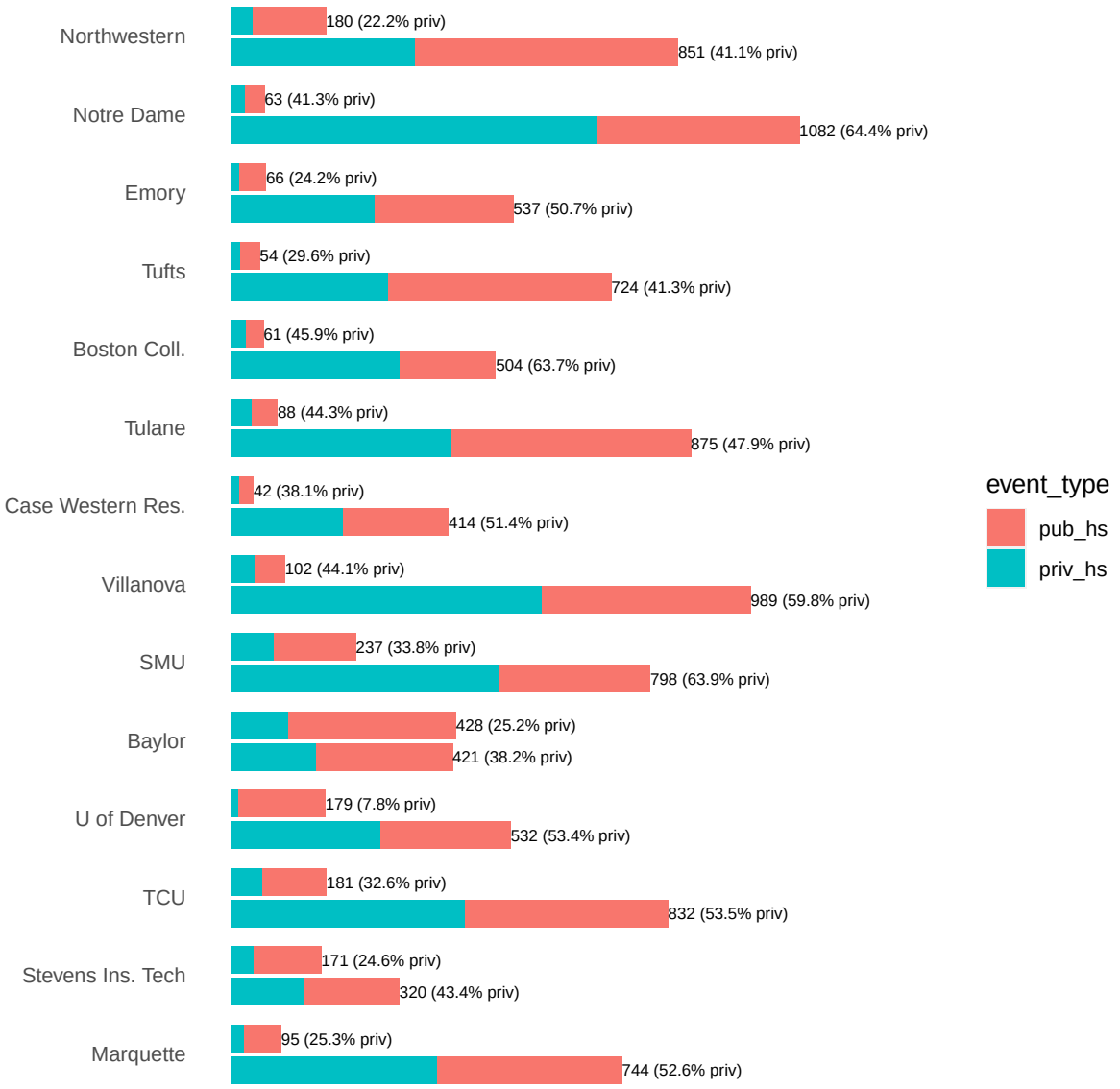


Figure 4: Geographic region of visited private high schools

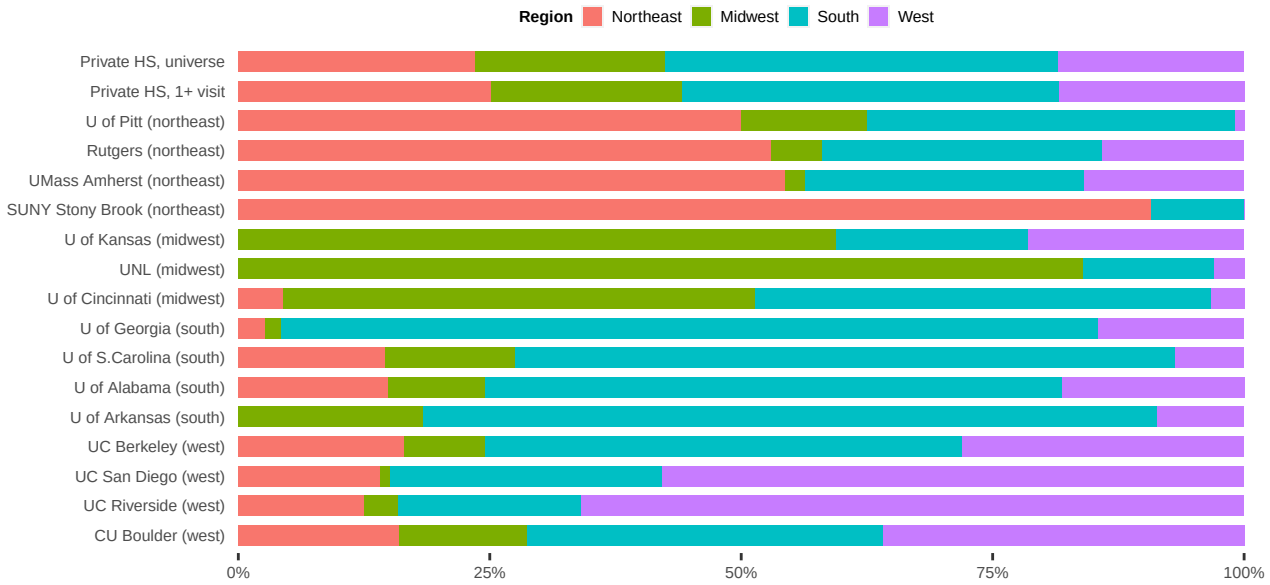
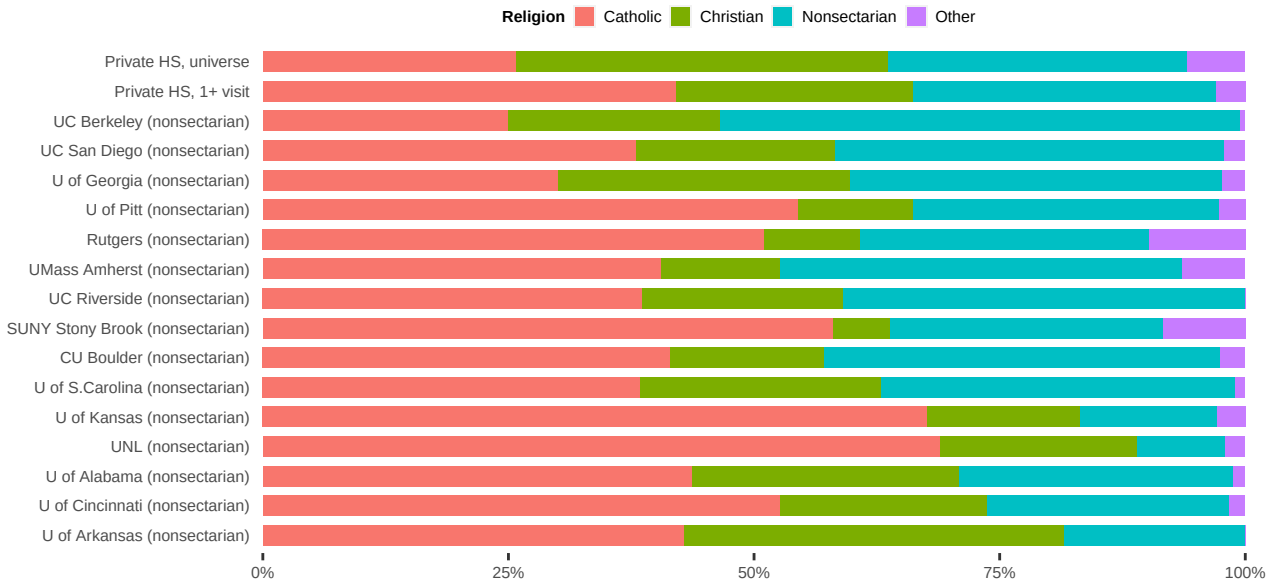


Figure 5: Religious affiliation of visited private high schools



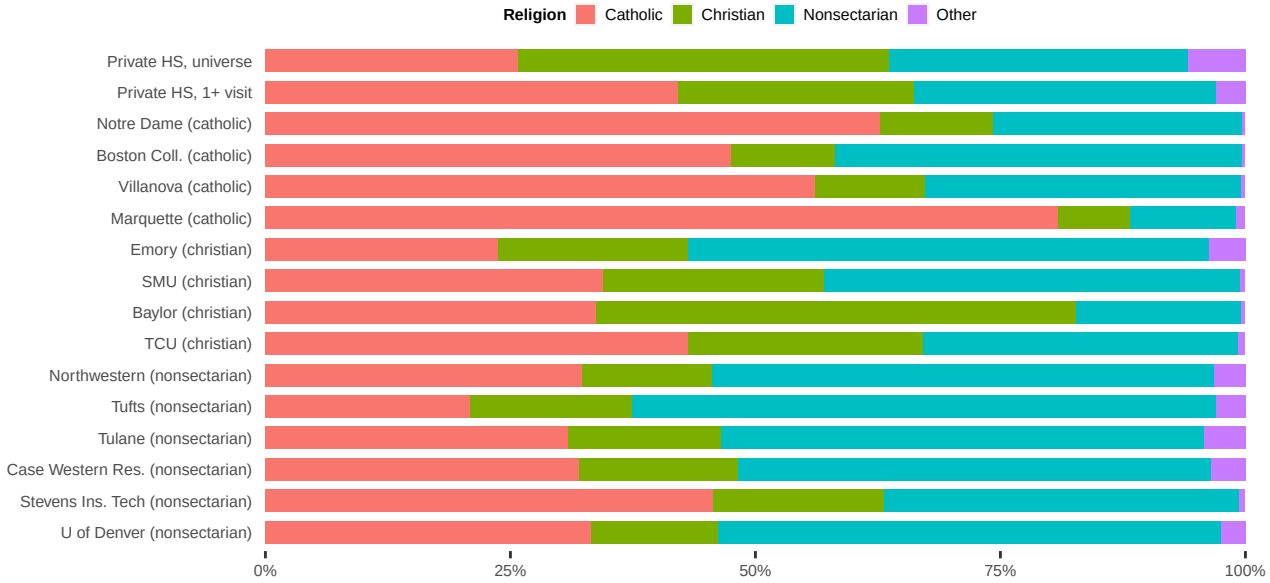
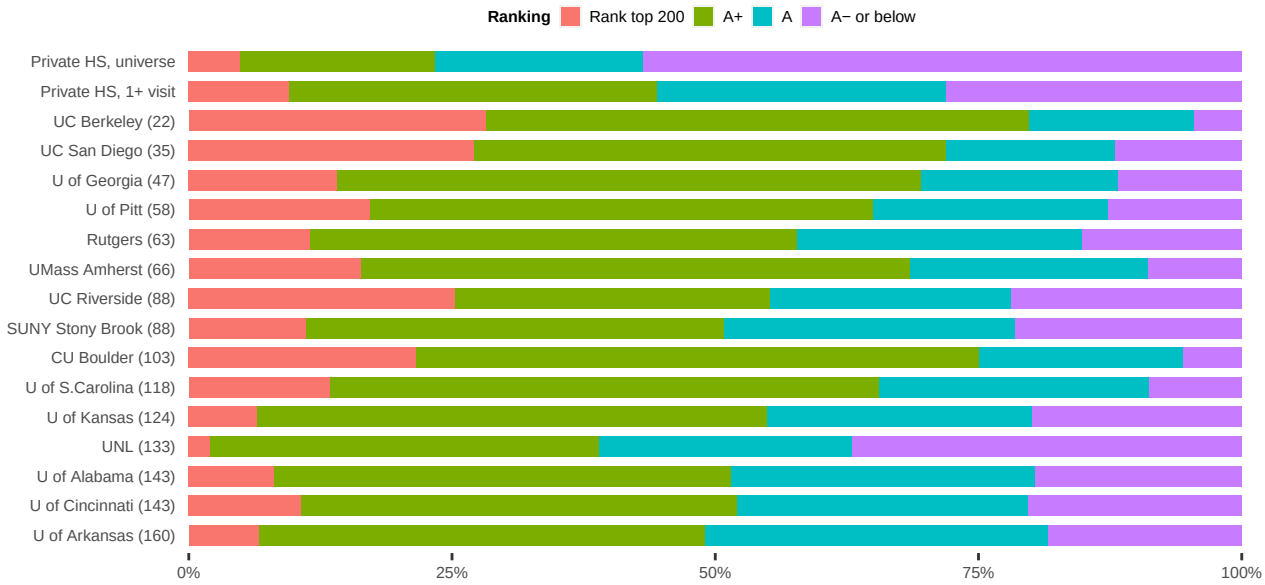


Figure 6: High school rank of visited private high schools



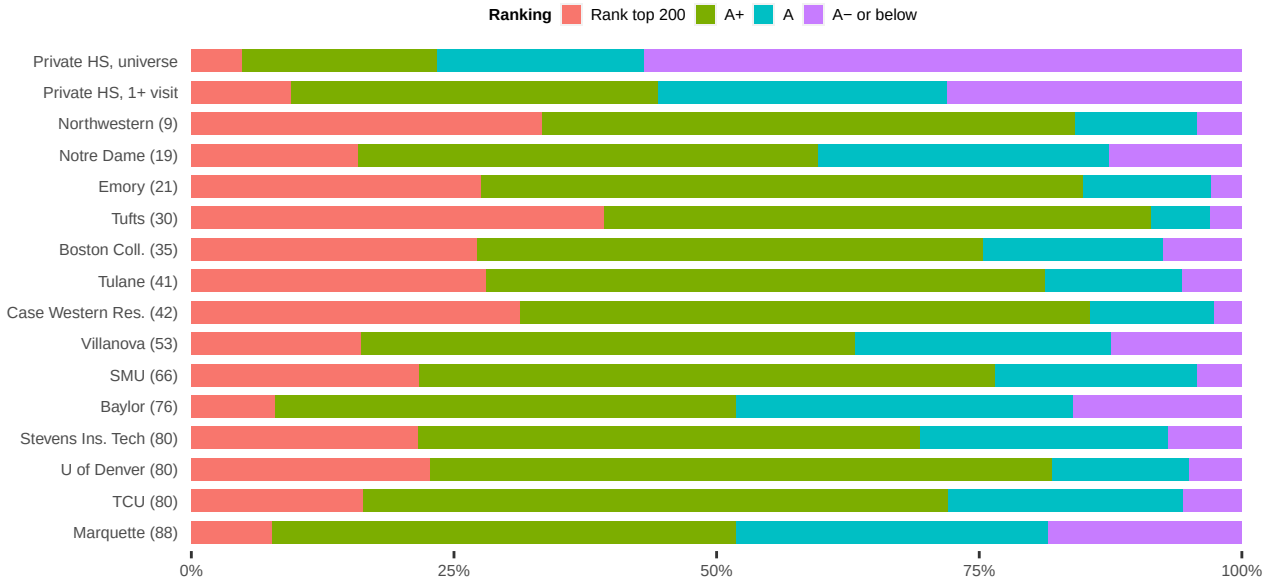
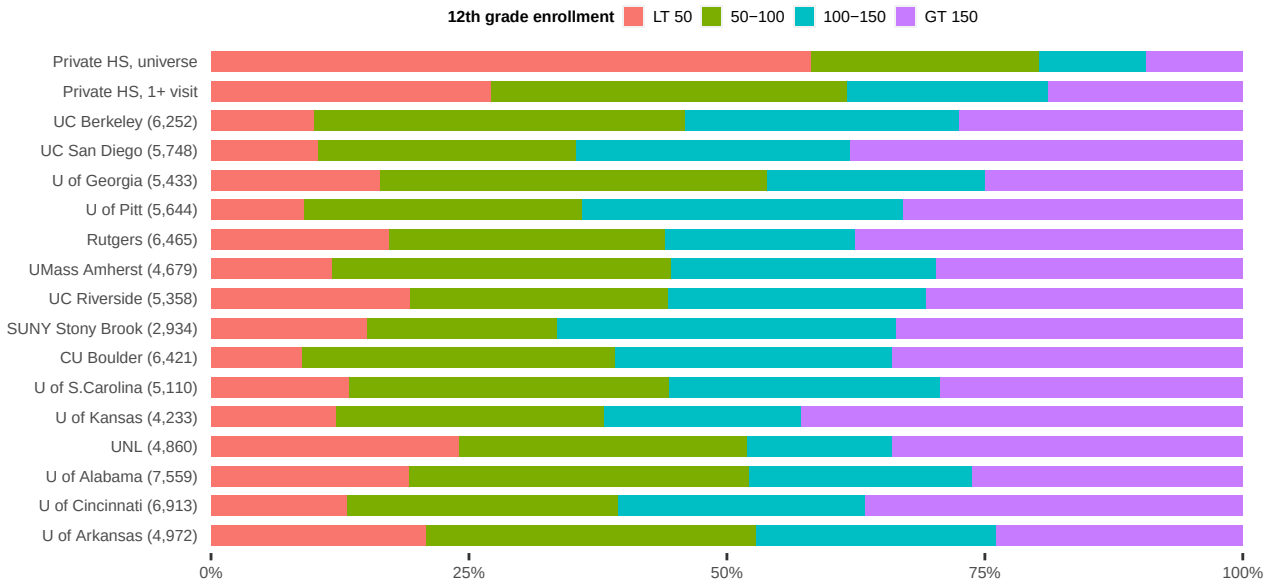


Figure 7: 12th grade enrollment of visited private high schools



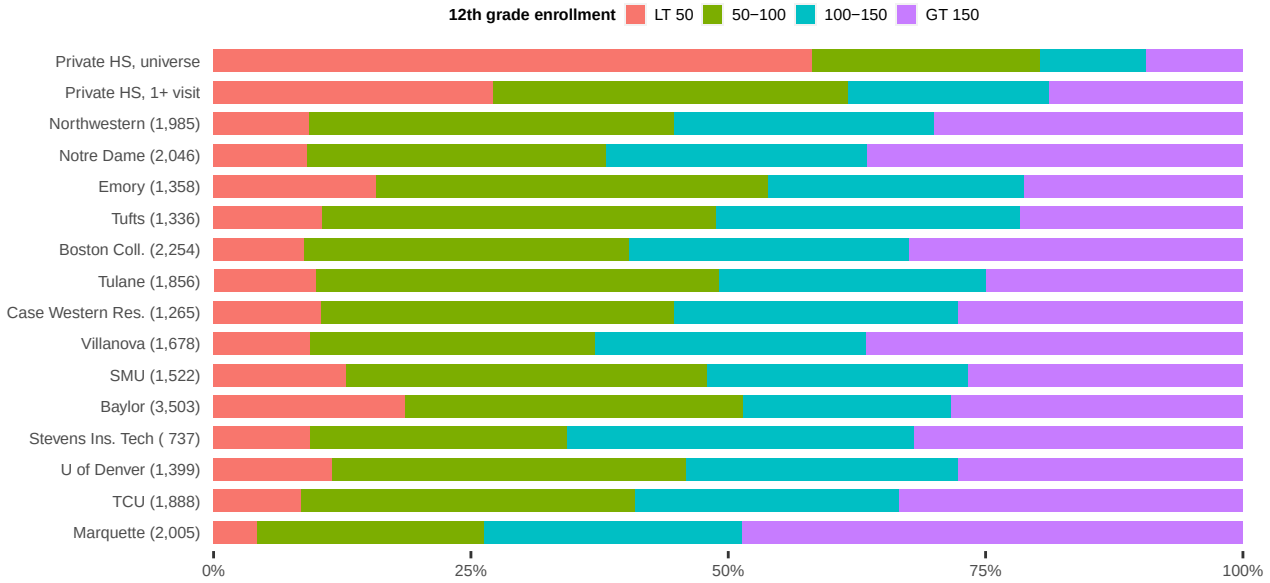
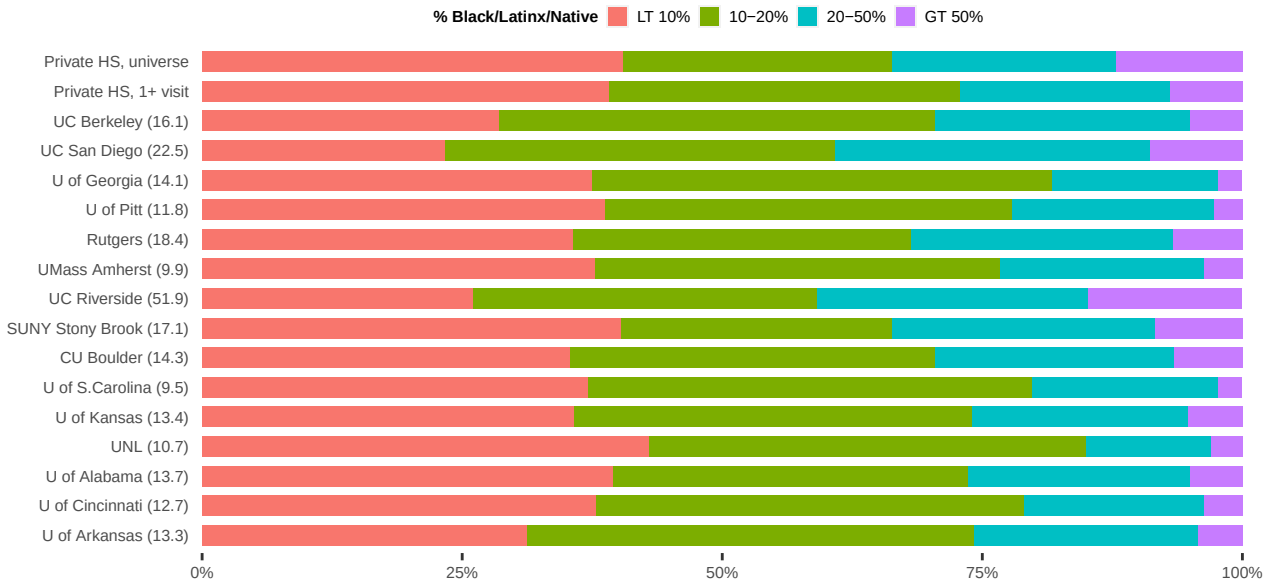


Figure 8: Percentage of students who identify as Black, Latinx, or Native at visited private high schools



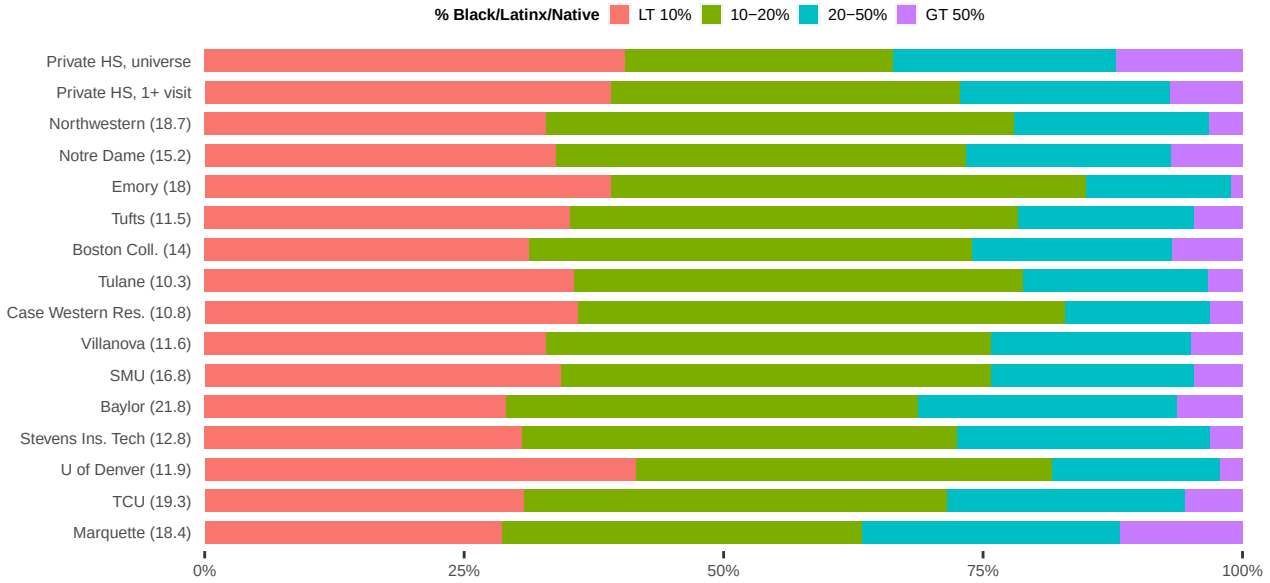


Figure 9: One-mode network for public institutions, colored by cluster

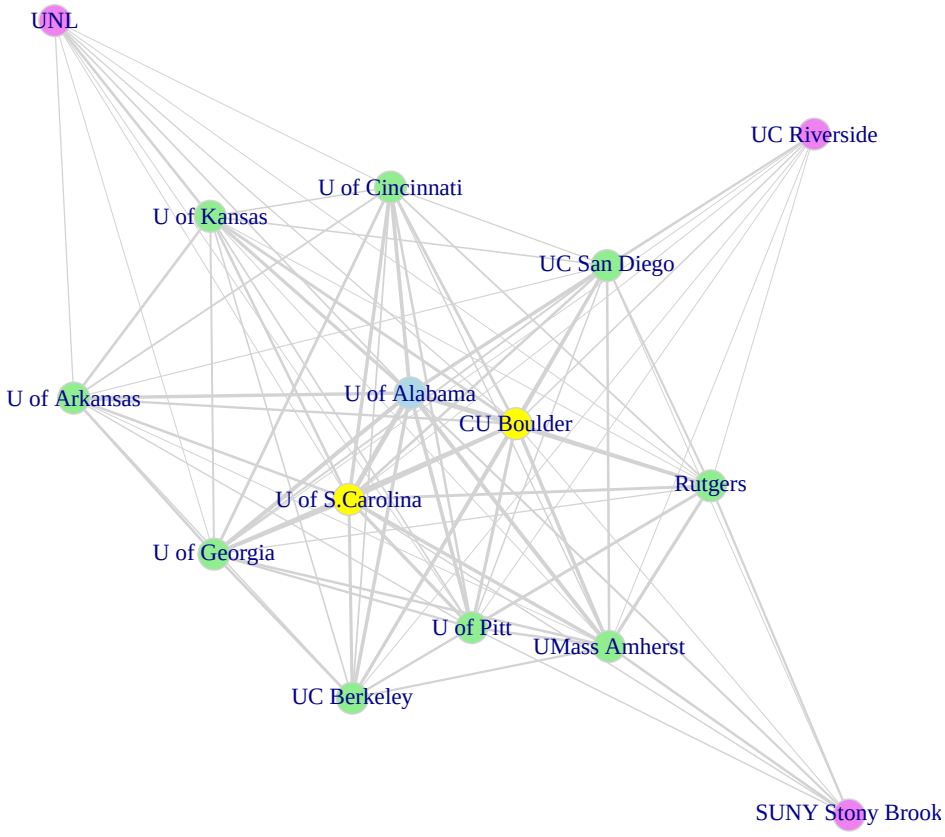


Figure 10: One-mode network for private universities, colored by cluster

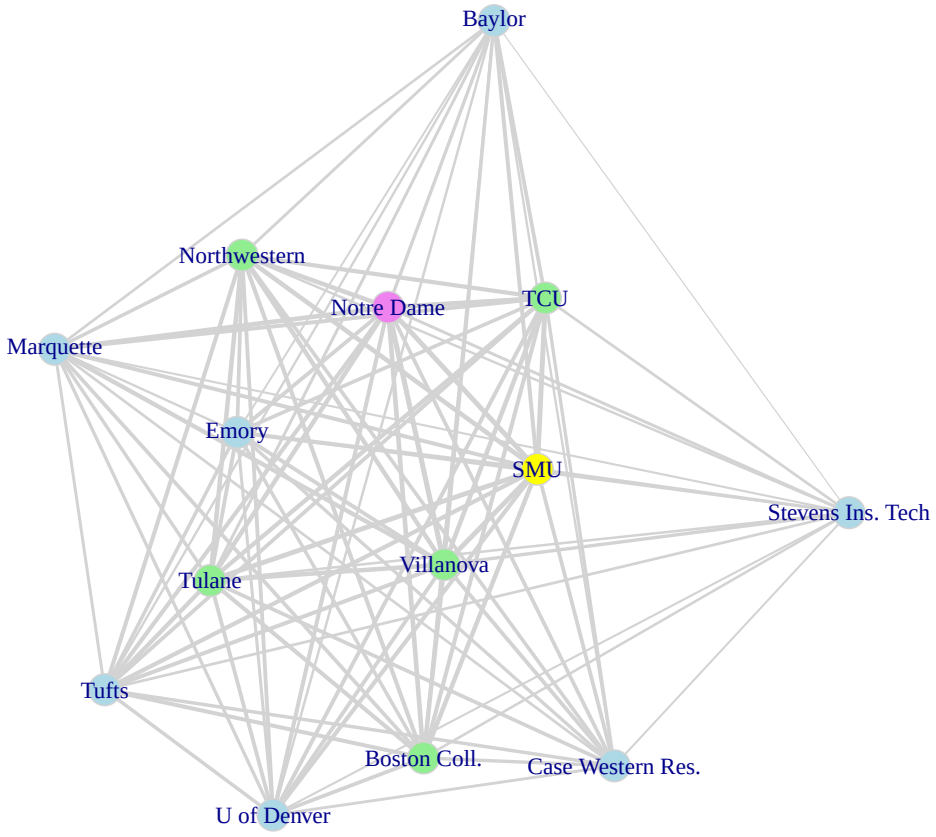


Figure 11: One-mode network for public and private universities, colored by cluster, five clusters

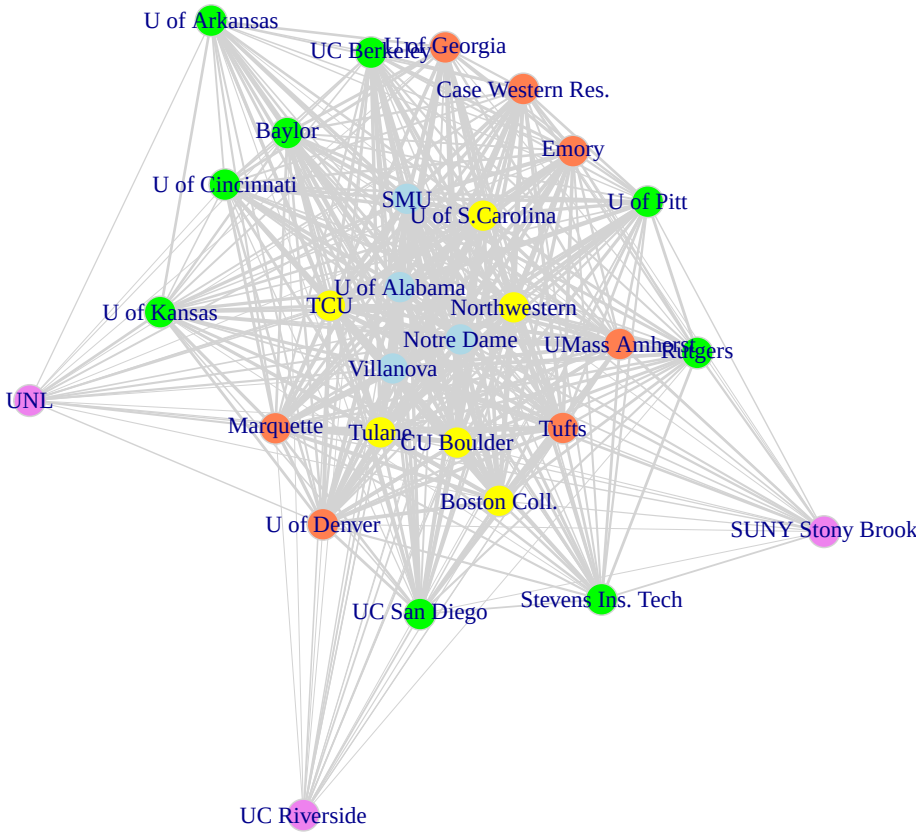


Figure 12: Number of visits by type and in-state vs. out-of-state, public research universities

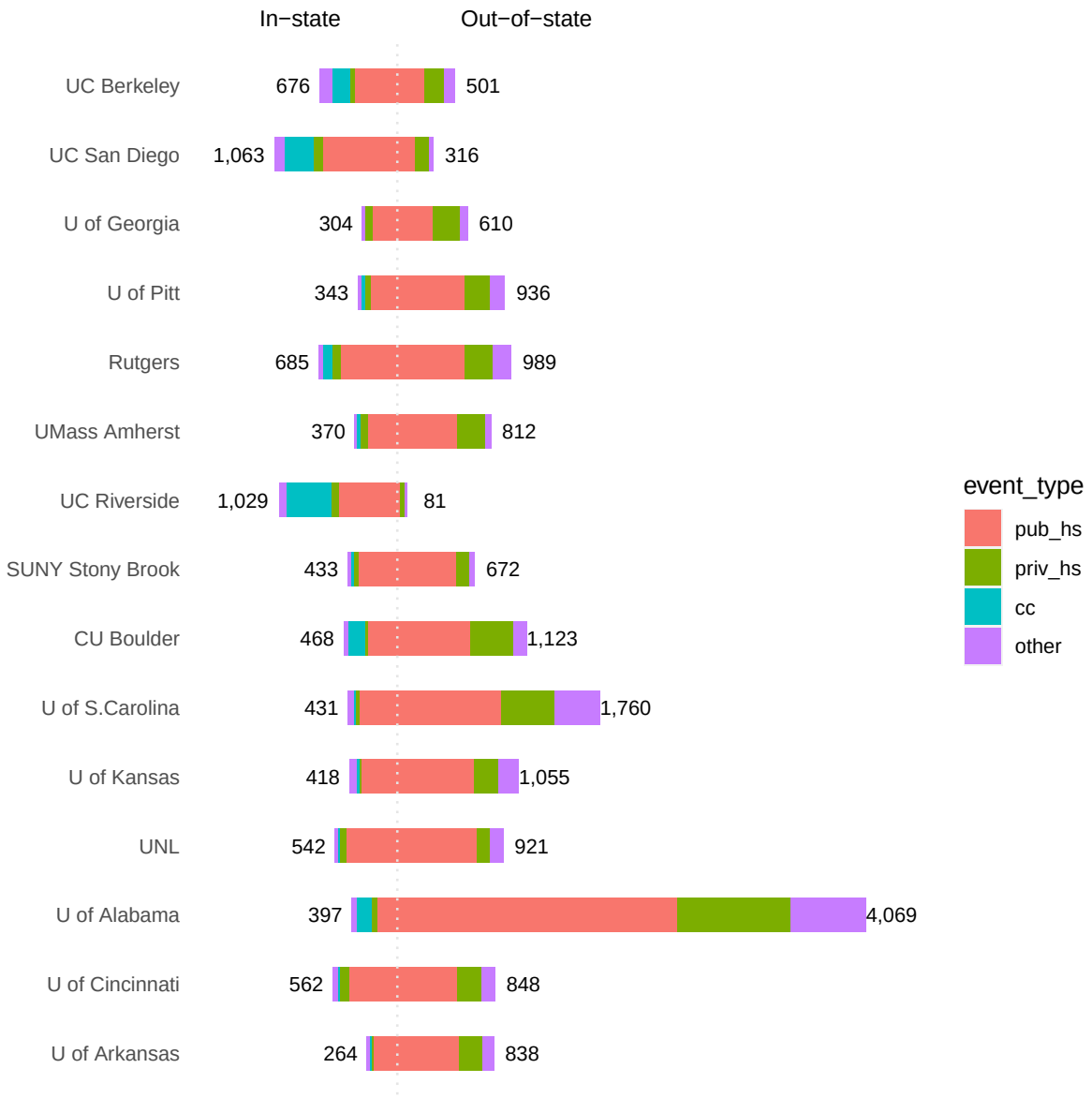


Figure 13: Number of visits by type and in-state vs. out-of-state, selective private universities