

# Recruiting Chapter

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## 1 Introduction

Colleges and universities visit high schools that enroll desirable prospects, while high schools accept visits from colleges and universities that offer enrollment opportunities valued by some segment of the class. Drawing from a pair of papers by Mitchell Stevens (Stevens, Armstrong, & Arum, 2008; Stevens & Gebre-Medhin, 2016), we argue that analysis of which high schools receive visits from which colleges and universities provides an opportunity how K-12 and postsecondary organizations form relationships that serve social reproduction.

Stevens et al. (2008) synthesizes how sociology conceives the functions of higher education by introducing the metaphors “sieve,” “incubator,” “temple,” and “hub.” As a sieve - an instrument that strains and separates - higher education allocates people to occupational and social positions. The sieve metaphor builds on “Max Weber’s core insight that education has a dual character” (Stevens et al., 2008, p. 129), 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 universities that confer privileged positions. The extent to which higher education serves reproduction versus redistribution is sensitive to the external funding environment because universities depend on “patronage as a primary revenue source” (Stevens et al., 2008, p. 138).

Figure 1 shows the “enrollment funnel,” a conceptual heuristic used by the enrollment management industry, which describe the stages in the student recruitment process (e.g., prospects, inquiries, applicants, accepted applicants, and enrolled students). For example, “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 interventions that target specific stages of the funnel.

Table X, reproduced from Noel-Levitz (2020), shows the the percentage of undergraduate recruitment budget allocated to different marketing and recruiting activities.<sup>1</sup> Institutions identify undergraduate prospects largely by purchasing “student lists” from College Board, ACT, and other vendors. Institutions utilize advertising (traditional and digital) and social media to solicit inquiries and to create positive “buzz” amongst prospects (Dupaul & Harris, 2012)[CITE OTHER]. 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. Once prospects and inquiries are identified, they are targeted with face-to-face and remote recruiting interventions designed to solicit applications and deepen engagement. 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. Remote recruiting interventions include postcards, brochures, email, text messages, and targeted social media.

Each of these marketing/recruiting interventions – and dozens of other interventions described in this book – represent organizational behaviors that could be the subject of empirical research. However, the vast majority of research on enrollment management behaviors 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.] . By contrast, the enrollment management industry expends substantial resources on marketing/recruiting activities that target earlier stages of the enrollment funnel (Noel-Levitz, 2020) [GIVE SOME CONCRETE BUDGET NUMBERS INDICATING BALL PARK SPENDING?]. When we consider descriptions of enrollment management practice from investigative journalism [e.g., ], from enrollment management consulting firms and from this volume [e.g., ], it becomes apparent that – with the notable exception of a small sociological case-study literature [e.g., ] – the research community has ignores a great number of enrollment management practices that plausibly affect access to higher education. As a consequence, enrollment management remains an opaque industry to policymakers and the public. We argue that developing thoughtful policies about enrollment management depends on researchers collectively developing empirical literatures that document enrollment management practices and evaluate the effects of these practices on opportunities for students.

Access to concrete data about marketing and recruiting behaviors has been a persistent barrier to empirical research. To the extent that marketing/recruiting behaviors are inconsistent with public relations rhetoric (e.g., “our commitment to access”), colleges and universities may have incentive to withhold data from researchers. Therefore, conventional data collection methods such as surveys and even interviews should be appraised with healthy skepticism. We argue that pushing forward an empirical research agenda on marketing/recruiting behaviors depends on different modes of data collection – including public records requests and “data science” methodologies, such as web-scraping and streaming social media data – that record actual behaviors (e.g., contracts, transactions, records of expenditure) as opposed to statements by colleges/universities about their behavior.

We present this chapter as an example of empirical research about marketing/recruiting behavior. This chapter analyzes off-campus recruiting visits by a sample of public research universities and a sample of selective private colleges and universities in 2017. We collected visit data by “scraping” URLs (e.g., “Coming to a neighborhood near you”) once per week from college/university admissions websites and – for the sample of public research universities – by issuing public records requests. Our analyses to date have focused on public research universities. As described in more detail below, 12 of the 15 [FIX NUMBERS, IT’S 17 PUBLICS] public research universities in our sample made far more out-of-state visits than in-state visits, a

<sup>1</sup>table drawn directly from Noel-Levitz (2020) figure 9; based on a convenience sample of 45 four-year non-profit institutions and 21 four-year public institutions

finding antithetical to the stated mission of most public research universities. These out-of-state visits focused on wealthy, predominantly white schools and communities. Additionally, most public research universities made a disproportionate number of out-of-state visits to private schools, but visited few in-state private schools.

Building on these findings, this chapter analyzes off-campus visits to private high schools by public research universities and by selective private colleges and universities. We utilize social network methods and emphasize comparisons within and between public and private postsecondary institutions. Analyses are informed by two broad, related questions. First, which types of private high schools receive visits from which types of colleges and universities? Second, to what extent colleges and universities visit private high schools that share similar characteristics with the college (e.g., geographic region, religious affiliation, academic reputation, and racial composition)?

The motivation for comparing the behavior of public and private colleges/universities is based on the idea that (out-of-state) visits to private high schools are antithetical to the stated mission of public research universities. By contrast, recruiting visits to private high schools are consistent with the mission of private colleges and universities. From this perspective, out-of-state visits to private schools by public research universities is one example of “privatization.” A weakness of the privatization literature is that few empirical studies compare the public and private institutions with respect to particular behaviors associated with privatization (McClure, Barringer, & Brown, 2019). Therefore, by comparing the (mostly out-of-state) visits to private high schools by public research universities to those of private colleges and universities, we hope to develop new insights about the privatization of public higher education.

We use social network analysis (SNA) to analyze off-campus recruiting visits. The motivation for using SNA is that SNA privileges relationships between actors. Qualitative scholarship on private high schools finds that college access is substantially determined by the quality of the relationship between a particular college and a particular private high school (Khan, 2010, 2011). An off-campus recruiting visit is an indicator of a relationship between a college and a school that can be analyzed using standard tools of SNA.

[ADD ONE-PARAGRAPH OUTLINE?]

## 2 What Do We Know About Off-campus Recruiting?

Our research analyzes off-campus recruiting visits by college and university admissions staff. So what do we know about off-campus recruiting? 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 conceives of off-campus recruiting visits as a means of identifying prospects, deepening engagement with prospects already being targeted through mail/email, and maintaining relationships with guidance counselors at “feeder schools” (Clinedinst & Koranteng, 2017; Noel-Levitz, 2020; Ruffalo Noel-Levitz, 2018). With respect to expenditure, Noel-Levitz (2020) found that private (non-profit) 4-yr institutions spent an average of 17% of their undergraduate marketing/recruiting budget on “travel” to high schools and college fairs (as shown in Table X), a higher percentage of budget allocation than any other marketing/recruiting activity. Public institutions spent an average of 16% of their budget on travel, second only to “prospective student communications” at 17%. An emergent trend over the past decade – partially a response to public universities seeking nonresident students – has been the growth of “regional recruiters” who target specific metropolitan areas in the US and abroad. These regional recruiters may be college/university employees or they may be independent contractors who live in the metropolitan area they recruit.

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).

A sociological case-study literature develops helpful insights about the mechanisms and functions of off-campus recruiting visits. 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.” This trust vacuum created an opportunity for colleges because these students were drawn to colleges that connected with them and “made them feel wanted.” 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.” By contrast, affluent students with college educated parents were less taken by such overtures and more concerned with college prestige.

Of particular importance for this chapter, Stevens (2007) and Khan (2010);Khan (2011) highlight the relational function of visits. Stevens (2007) provides an ethnography of the admissions office at a selective private liberal arts college, highlights the relational function of visits. During the autumn “travel season,” admissions officers visited selected high schools across the country “to spread word of the institution and maintain relationships with guidance counselors” (p. 53-54) because “the College’s reputation and the quality of its applicant pool are dependent upon its connections with high schools nationwide” {Stevens (2007)} [p. 54]. The College tended to visit the same 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.

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.” The answer to this question begins by thinking about 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. Additionally, drawing from @Stevens (2007), colleges want a class composed of “interesting characters” whose curricular and extracurricular strengths meet the needs of different campus constituents (e.g., academic majors, the athletic department, clubs, etc.). Colleges also want low acceptance and high yield rates to move up the rankings. 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” [FROM CHAPTER. FIND PG NUMBER] The challenge counselors face is “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) [p. 173-174].

“Luckily,” Khan (2010 pg. xx) writes, “the problem for elite boarding schools matches up quite nicely with the problem faced by elite colleges.” Specifically, college admissions officers receive applications from many outstanding students. But “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” (Khan, 2011) [pg. 173?].

Khan (2011) argues that the 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 the process works, 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 (decreasing acceptance rate, increasing yield). Yale rejects Susan and accepts Billy (decreasing acceptance rate, 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. Khan (2011) writes that colleges “can reward that [high] school for good information and sanction it for bad information” [p. 173]. 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 place.” [CITE BOOK CHAPTER; PG NUMBER]. Because the college and the high school are mutually dependent, however, both “have an incentive to continue with a strong, honest relationship” [CITE BOOK CHAPTER; PG NUMBER]. Such horsetrading may be less pervasive than now than it was in prior decades, less common at non-elite private schools, and also public university admissions officers likely have less authority to engage in these tacit negotiations.

Nevertheless, maintaining a strong relationships is mutually important for the college and the high school. Both the college admissions counselor and the high school guidance counselor need to tell one another “their story” and relay that story to constituents. The college admissions counselor explains why the college/university is a “special place” that high school students should want to attend. 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. [CITES FOR THIS PARAGRAPH]

Circling back to the focus of this chapter, off-campus recruiting visits are necessary for the maintenance of strong relationships that enable colleges and high schools to negotiate and send trustworthy information to one another. Without face-to-face visits, it is less likely that that a college admissions counselor will “take the call” of a guidance counselor. Simultaneously, a recruiting visit between a college and a high school can be conceived as an indicator. First, the fact that the college took time and effort to make the 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 indicates that the high school and the college have a relationship and suggests the probability of additional interactions (e.g., phone calls).

Our project collected data about off-campus recruiting visits made in 2017 by a convenience sample of colleges universities. Our analysis sample is based on three different lists of postsecondary institutions: first, the set of public research universities (which category) as defined by the YYYY Carnegie Classification; second, private universities in the top 100 of USNWR YYYY “national universities”; and, third, private colleges in the top 50 of USNWR YYYY “national liberal arts colleges” rankings. For each of these institutions, we investigated their admissions website for pages that provided the details of upcoming off-campus recruiting visits. For institutions that posted such pages, we scraped the pages once per week throughout the 2017 calendar year. 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 X public research universities, X private research universities, and X private liberal arts colleges. [MAYBE ADD TABLE/FIGURE OR APPENDIX TABLE/FIGURE ON CHARACTERISTICS OF INSTITUTIONS IN OUR SAMPLE?]

Our analyses to date have focused only on visits by public research universities [CITE]. The big-picture takeaways are as follows. Most public research universities in our sample made more out-of-state than in-state recruiting visits. The exceptions were UC-Berkeley, UC-Irvine, and North Carolina State University, three institutions with relatively generous state appropriations and the only three public universities in our sample that faced strong nonresident enrollment caps. Accross all universities, out-of-state visits systematically targeted affluent, predominantly white schools and communities, usually within populous metropoitan areas. Most public universities also made a disproportionate number of out-of-state visits to private high schools.

Analyses of in-state visits also found that public high schools in affluent communities were more likely to receive a visit, but this relationship was modest compared to the income disparity between visited and not visited out-of-state public schools. Furthermore, in-state visits did not consistently indicate preferences for majority white high schools or for private high schools.

Tables/Figures X and X show simple counts and descriptive statistics of off-campus recruiting visits by colleges and universities in our sample. TEXT BRIEFLY DESCRIBING FINDINGS FROM DESCRIPTIVE TABLES. . . . Table/Figure X demonstrates the disproportionate number of visits to private high schools. The goal of this chapter is to investigate off-campus recruiting visits to private high schools. Which types of private high schools receive visits from which types of colleges and universities? Additionally, to what extent were visits a college/university to a private high school more likely if the two organizations were similar to one another on key characteristics? Our analyses focus on the characteristics of academic reputation, geographic region, religious affiliation, and racial composition. WHAT TO SHOW IN TABLES/FIGURES:

[PARAGRAPH ABOUT TABLE THAT DESCRIBES CHARACTERISTICS OF VISITED VS. NON-VISITED PRIVATE SCHOOLS] Before proceeding to network analyses, Table/Figure X compares the characteristics of private high schools that received at least one recruiting visit from a college/university in our sample to those of private high schools that did not receive a visit. WHICH CHARACTERISTICS TO SHOW: geographic region; religious affiliation; academic reputation; racial composition; enrollment size.

### 3 Network Methods and Data

We utilize network methods rather than conventional descriptive statistics for two, related reasons. First, social network analysis privileges the relationship between actors. The discussion of Stevens and Khan suggests that for private school students, “it is not just the quality of the students that gets them into college but the quality of the relationship between elite high schools and colleges” (Khan, 2011) [pg. 175]. Second, a visit from a college/university admissions counselor to a high school can be conceived as a “network tie” connecting two actors in a social network.

We briefly define essential social network analysis concepts and their operationalization in our analyses. A social network consists of a set of actors – referred to as “vertices” – and the connections – referred to as “edges” between these actors. 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 social network analyzed in this chapter is a two-mode network, where vertices consist of colleges/universities (mode 1) and high schools (mode 2) and an “edge” is defined as a visit from a college/university to a private high school [DELETE THIS SENTENCE OR THE REDUNDANT ONE IN BELOW PARAGRAPH].

Our analyses draw from analyses of “corporate board-director” networks because these are the most commonly analyzed two-mode networks in the social networks literature [e.g.] (Davis, Yoo, & Baker, 2003). Board-director networks consist of directors (mode 1) who serve on organizational boards (mode 2). Our school-college network is a two-mode network composed of two sets of vertices, private high schools (mode 1) and colleges/universities (mode 2). Off-campus recruiting visits are edges (e.g., high school  $i$  shares an edge with college  $j$  if high school  $i$  receives at least one visit from college  $j$ ) and visits can only occur between a school-college pair (not a school-school pair or a college-college pair). Our school-college network is a two-mode network composed of high schools (mode 1) who are visited by colleges and universities (mode 2). This (weighted) network is represented as a school-by-college matrix (e.g., a  $500 \times 40$  matrix if our network contains 500 high schools and 40 colleges/universities) in which matrix cell  $a_{i,j}$  identifies the number of visits that high school  $i$  received from college/university  $j$ . [SHOW AN EXCERPT OF THE TWO MODE ADJACENCY MATRIX, LIKE 4 BY 3 OR SOMETHING] [DEFINE WEIGHTED VS. UNWEIGHTED SOMEWHERE]

### 3.1 Two-mode vs. 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” [pg. xx]. 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  $100 \times 100$  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  $j$  do not 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 both receive a visit by the same college/university and cell  $s_{i,j}$  of the school-by-school matrix  $S$  indicates the number of colleges/universities that visited both school  $i$  and school  $j$  [SHOW EXCERPT OF ONE-MODE SCHOOL BY SCHOOL MATRIX, LIKE 3 BY 3 OR SOMETHING]. Similarly, we create a one-mode college/university network (herein the college network) in which two colleges share an edge if both colleges visited the same high school and cell  $c_{i,j}$  of the college-by-college matrix  $C$  indicates the number of private high schools that received at least one visit from both college  $i$  and college  $j$  [SHOW EXCERPT OF ONE-MODE COLLEGE BY COLLEGE MATRIX, LIKE 3 BY 3 OR SOMETHING].

### 3.2 Ego networks

A limitation of our data collection is that we collected off-campus visit data only from a convenience sample of  $X$  colleges and universities, as described above. Thus, for each college and university in our sample, we know all the private high schools they visited (assuming no measurement error). However, for each private high school in our sample, we only know visits they received from the set of  $X$  colleges/universities in our sample. Given this limitation, it may be useful to think of our data collection as resulting in  $X$  “ego networks.” 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” [from <http://www.analytictech.com/networks/egonet.htm#:~:text=Ego%20networks%20consist%20of%20a,form%20The%20human%20social%20network> ]. 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.

When analyzing ego networks, researchers often investigate the extent of “homophily” versus “heterophily” (McPherson, Smith-Lovin, & Cook, 2001). 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. Analyses investigate the extent to which network ties are homophilous or heterophilous, focusing on the vertex characteristics of

### 3.3 Community detection

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 used XYZ community detection approach [add footnote w/ details?] to allocate private colleges and universities [? and private high schools] to clusters.

## 4 Network Analyses of Off-Campus Recruiting Visits

This section presents network analyses of visits by colleges and universities to private high schools. Analyses are motivated by two, related research questions. First, which types of private high schools receive visits from which types of colleges and universities? Second, to what extent do off-campus recruiting visits by colleges and universities to private high schools exhibit homophily versus heterophily with respect to the vertex characteristics of geographic region, religious affiliation, academic reputation, and racial composition?

Figure 2 plots the two-mode network of visits to private high schools by all colleges and universities in our sample, with large vertices indicating a college/university, small vertices indicating private high schools and with vertex color determined by geographic region (Northeast, Midwest, South, West). The graph layout places vertices closer together if they are similar to one another in terms of network structure. [SAY WHAT THIS MEANS, DRAWING FROM NOTES FROM RUSS]. Figure 2 suggests a modest relationship between geographic region and network structure. For instance, the high school vertices closest to University of Alabama and University of Arkansas tend to be located in the south. Further, universities located in the same geographic region (e.g., SUNY Stony Brook and Rutgers) tend to be closer to one another than universities located in other regions. However, this relationship is not consistent, for example, Scripps College located in CA is closest to University of Pittsburgh (PA) and Stevens Institute of Technology (NJ). Moreover, the network depicted by 2 is too large to detect nuanced patterns of network structure.

We present results in three steps: First, visits by private colleges and universities; second, visits by public research universities; and, third, comparisons of visits by public research universities to visits by private colleges and universities.

### 4.1 Visits by Private Colleges and Universities

Figure 3 plots the one-mode network of visits by private colleges and universities. Here, the number of ties between a pair of universities (e.g., Sewanee and Texas Christian University) equals the number of private high schools visited by both universities. The graph layout places colleges/universities closer together if they have similar network structure [MAYBE SAY WHAT THIS MEANS IF YOU HAVEN'T YET]. Additionally, vertex color is determined by hierarchical cluster analysis specified to create  $k = 4$  clusters. Although the process of placing vertices was separate from the process of determining community cluster, vertices within the same cluster tend to be closer to one another than those of different clusters.

One cluster consists of Notre Dame, Villanova, Tulane, and Southern Methodist University. Each of these four universities made a relatively high number of visits to private high schools and are relatively centrally located in Figure 3.

Addressing our two motivating research questions – which schools receive visits from which colleges/universities and the extent to which visits are more likely to occur between organizations that share certain characteristics – requires analyses that are more granular than Figure 3. Figure 4 shows characteristics of private high schools visited our sample of private colleges and universities, specifically, geographic region, religious affiliation, academic reputation, and racial composition.

Figure 4 indicates that Notre Dame, Villanova, Tulane, and Southern Methodist University made a large share of visits in the South and the Northeast. With respect to religious affiliation, Notre Dame and Villanova – both Catholic universities – predictably focused visits on Catholic Schools. However, Tulane and SMU also visited a higher share of Catholic schools than most other private colleges and universities. These four universities also visited a lower share of private schools ranked in the top 200 nationally by Niche.

Figure 4 was created from the ego network of each private college and university. Ego networks consist of an ego (e.g., a single college or university), the set of high schools the ego visited (one degree of separation from the ego), and the set of colleges/universities that also visited high schools visited by the ego (two degrees of separation from the ego). Figure 5 plots the ego network of Villanova University, with vertex color determined by religious affiliation. About 50% of Villanova's visits were to Catholic schools, a percentage [?percent?] much higher than most colleges and universities shown in Figure 4, and second only to Notre



Dame University. In Figure 5, Notre Dame is closer to Villanova than any other college/university in the Villanova ego network, suggesting that Villanova and Notre Dame visit substantially overlapping sets of schools. Boston College, another Catholic university, is situated a bit further away from Villanova in the clump of colleges that includes Case Western, Tulane, Sewanee, Southern Methodist, and TCU, most of which visit relatively high share of Catholic high schools. By contrast, Villanova is far from nonsectarian liberal arts colleges (e.g., Swarthmore, Smith, Colorado College) which visit fewer Catholic high schools.

A second cluster consists of Boston College, Colorado College, Connecticut College, Emory University, Middlebury, Northwestern Oberlin, Sewanee, Texas Christian University, Tufts, and the University of Denver. These institutions also tend to be located relatively centrally in Figure 3, indicating that many of the high schools they visit are also visited by many private colleges and universities in our sample. Compared to the first cluster, these institutions have a stronger focus on nonsectarian private high schools, with the exception of Boston College, Texas Christian, and Sewanee. They also tended to visit schools with relatively strong academic reputations.

Figure 6 shows the ego network of Emory University, with vertex color determined by geographic region. Located in Atlanta, about 47% of Emory’s visits were to schools in the South. Figure 6 indicates that Emory’s network structure is similar to several other southern universities – including Tulane, TCU, SMU, and Sewanee, but is dissimilar from Baylor University which made about 56% of visits in the South, but with a focus on schools with a Christian religious affiliation. Figure 6 also suggests that the set of schools visited by Emory overlaps substantially with several institutions located in the Northeast (e.g., Villanova, Boston College, Middlebury) and the Midwest (e.g., Case Western Reserve, Northwestern, Notre Dame).

A third cluster consists of Case Western Reserve, Macalester, Occidental, Smith, Swarthmore, and Williams. These institutions made relatively fewer visits than institutions in the first two clusters and are located relatively peripherally in the one-mode network, as shown in Figure 3. With the exception of Case Western Reserve, these institutions are liberal arts colleges rather than research universities. They tended to visit a high share of nonsectarian private high schools and also a high share of schools ranked in the top 200 nationally by Niche.

The final cluster consists of Baylor, Harvey Mudd, Scripps, and Stevens Institute of Technology. Figure 3 indicates that all four institutions are rather peripheral to the network. Harvey Mudd, Scripps, and Stevens made relatively few visits to private high schools. By contrast, Baylor visited a fundamentally different set of schools than other private colleges and universities in that Baylor visited a large number of Christian private schools that were not visited by other private colleges and universities in the sample. Overall, these four institutions form a group more because they are peripheral to the overall network as opposed to having similar network structures to one another.

Finally, we comment on the racial composition – defined here as the percent of students who identify as Black, Latinx, or Native – of private high schools visited by private colleges and universities in our sample. Figure 4 shows substantial variation across and within clusters in the geographic region, religious affiliation, and academic reputation of visited private schools. By contrast, the racial composition of visited private high schools was remarkably similar. On average, about one-third of visits were to schools where Black/Latinx/Native students comprised less than 10% of the student body, about 50% of visits were to schools where Black/Latinx/Native students comprised between 10% and 25% of the student body, and about 15% of visits were to schools where Black/Latinx/Native students comprised more than 25% of the student body. Some colleges (e.g., Williams and Swarthmore) were better than others (e.g., Emory, Sewanee) at visiting schools where Black/Latinx/Native students comprised more than 50% of the population, but these visits to very diverse private schools represented a small share of all visits to private schools. The overall results suggest that when private colleges and universities visit private high schools, they are usually visiting schools that enroll few Black, Latinx, or Native students.

[HOW DOES RACIAL COMPOSITION OF VISITED PRIVATE HIGH SCHOOLS COMPARE TO RACIAL COMPOSITION OF ALL PRIVATE HIGH SCHOOLS? CUT/REVISE TEXT DEPENDING ON ANSWER TO THIS QUESTION] Private high schools tend to have a higher share of White students than public high schools. Moreover, the private high schools that were visited by private colleges and universities in our sample had a lower share of Black/Latinx/Native students, on average, than the population of private

high schools. Our findings suggest that the low number of Black/Latinx/Native students at private colleges and universities may be driven by these institutions explicitly recruiting from private high schools that enroll few Black/Latinx/Native students.

[NEED TRANSITION TO FOCUS NOW ON HIGH SCHOOLS] Which private high schools received the most visits from private colleges and universities in our sample? Table 2 shows characteristics of the 20 private high schools that were visited by the most private colleges and universities. The last two columns of Table 2 are “degree” and “strength,” which are related measures of vertex “centrality.” Measures of centrality attempt to identify the most important or influential actors in a social network. “Degree” is defined as the number of edges directly connected to a vertex. In Table 2, the degree of a high school is the number of private colleges and universities in our sample that visited. The concept “strength” is generally defined as a weighted measure of degree. In our study, colleges often made more than one visit to the same high school in 2017. Thus, Table 2 defines strength as the total number of visits from private colleges and universities in our sample.

The Kent Denver School, the top ranked school in 2, was visited by 23 of the 26 private colleges and universities in our sample. Choate Rosemary Hall was visited by 21 colleges and universities, but these 21 institutions made 34 total visits. Most schools in Table 2 are mostly nonsectarian. Although all received a Niche grade of “A+”, they are not uniformly in the upper-echelon of schools ranked in the top 100 nationwide. With the exception of St. Ignatius Prep in Chicago and the Maret School in Washington DC, students who identify as Black, Latinx, or Native comprise less than 20% of all students.

Table 3 shows the characteristics of private high schools by degree band (e.g., visits from 15+, 10-14, etc). Schools that received visits from 4 or fewer private colleges and universities enrolled a greater share of Black/Latinx/Native students. These schools were also disproportionately Catholic schools and were more likely to receive a grade of “A” or lower from Niche.

Whereas Tables 2 and 3 examine centrality, they do not assess the extent to which high schools cluster into groups, with some high schools visited by nearly all colleges and universities and other groups of high schools only receiving visits from a particular subset of colleges and universities. [THIS IS WHERE THE DIRECT VS. INDIRECT CONNECTION ANALYSIS RECOMMENDED BY RUSS WOULD GO. WE MIGHT ADD THIS TO BURD CHAPTER OR DO AFTER BURD CHAPTER SUBMITTED]

## 4.2 Visits by Public Research Universities

Figure 7 plots the one-mode network of visits by 17 public research universities, with vertex color determined by hierarchical cluster analysis specified to create  $k = 4$  clusters. Accompanying Figure 7 and created from the respective ego networks of each university is Figure 8, which shows the characteristics of private high schools visited by these public research universities.

We briefly sketch broad findings before discussing each cluster. First, for most public research universities in our sample, the vast majority of private school visits were to out-of-state schools [WHICH FIGURE/TABLE SHOWS THIS], which is consistent with the idea that public research universities pursue students from affluent households who can afford nonresident tuition price. Second, Figure 8 indicates that public research universities tended to visit private high schools with weaker academic reputation than the set of schools visited by private colleges and universities [LATER, SAY GOING AFTER MONEY WITHOUT ACADEMIC REP]. Third, despite being nonsectarian, most public research universities visited a higher share of private high schools that were Catholic or Christian than those visited by private colleges and universities. Fourth, racial composition of schools visited by public research universities was similar to the set of schools visited by private colleges and universities. A few public research universities appear (e.g., UC Irvine, UC Riverside) appear to visit a more racially diverse set of schools, but these institutions visited very few private schools.

The University of Alabama is a cluster unto itself and is centrally located in the network graph in Figure 7. In 2017, the University of Alabama made 985 visits to U.S. private high schools. This number was more than double the 486 visits made by the University of South Carolina, which ranked second amongst public research universities in terms of number of private school visits, and substantially more than the 687 visits

made by Notre Dame, which ranked first amongst private colleges and universities. Drawing from Figure 8, more than 50% of visits by the University of Alabama were in the South. With respect to religious affiliation, nearly 50% of visits were to Catholic schools and about 25% of visits were to Christian schools. In contrast to the majority of private colleges and universities in our sample, the University of Alabama made nearly 50% of its visits at schools that received a grade of less than “A+” by Niche. At the same time 80% of visited schools enrolled fewer than 25% of students who identified as Black, Latinx, or Native.

A second cluster, located nearly as centrally in Figure 7 as the University of Alabama, consists of the University of South Carolina (486 visits) and the University of Colorado-Boulder (379 visits). These institutions ranked second and third amongst public universities in our sample in terms of number of visits. Geographically, both universities recruiting nationally but concentrated on some regions more than others. For both universities, the Northeast and Midwest accounted for about 25% of visits. The University of South Carolina concentrated visits in its home region, the South. CU-Boulder made X% of visits in its home region, the West, and made X% of visits in the South. Both universities made more than 60% of visits at Catholic or Christian affiliated schools. In terms of academic reputation, CU-Boulder visited a slightly stronger set of schools than the University of South Carolina and both universities visited a stronger set of schools than the University of Alabama.

Third, the largest cluster – at nine universities – and the most diverse in terms of geographic location and academic reputation consists of three universities from the Northeast (Rutgers, UMass Amherst, University of Pittsburgh), two Midwest universities (University of Cincinnati, University of Kansas), two universities in the South (University of Arkansas, University of Georgia), and two universities from the West (UC Berkeley, UC San Diego). Located between the center and periphery in Figure 7, these universities made a moderate number of private school visits, ranging from 197 by UC-San Diego to 302 and 303, respectively, by the University of Georgia and Rutgers.

These universities differ in the extent to which visits were concentrated in their home geographic region. At the high end, the University of Georgia – 47th in YYYY US News rankings – and the University of Arkansas – 160th in US News rankings – are located in the South and made at least 75% of visits in the South. The remaining seven universities generally made more visits in their home geographic than other regions but while also making substantial visits outside their home region, particularly in the South. For example, three highly ranked universities – University of Pittsburgh (ranked 58), UC-Berkeley (ranked 22), and UC-San Diego (ranked 35) each made a substantial share of visits in the South. In contrast to private colleges and universities, several public research universities in this cluster largely ignored particular geographic regions altogether. For example, the University of Kansas and the University of Arkansas did not visit the Northeast. The University of Georgia, UC-San Diego, and UMass Amherst largely ignored the Midwest, while the University of Pittsburgh did not visit the West.

With the exception of UC-Berkeley, the universities in this cluster made more than 50% of visits to sectarian Catholic or Christian affiliated schools. Universities that made a substantial share of visits to Christian affiliated schools also tended to make a large share of visits in the South [OVERLAP BETWEEN SOUTH AND CHRISTIAN]. Finally, with the exception of UC-Berkeley, UC-San Diego, and to a lesser extent the University of Georgia – three highly ranked universities – the academic reputation of schools visited by this cluster was substantially lower than those visited by the majority of private colleges and universities in our sample. These results suggest that non-prestigious public research universities visit a large number non-elite private high schools that generally did not receive visits from selective private colleges and universities.

The final cluster consists of five universities – University of Nebraska-Lincoln (159 visits, 104 out-of-state), SUNY Stony Brook (146 visits, 107 out-of-state), UC Riverside (87 visits, 32 out-of-state), UC Irvine (60 visits, 40 out-of-state), North Carolina State University (23 visits, 20 out-of-state). These universities made fewer private school visits than the other public research universities, made a relatively higher share of in-state visits, and generally concentrated visits within their home geographic region. As such, they are located on the periphery of the network in Figure 7.

Transitioning from the focus on public research universities to a focus on the private high schools they visit, Table 4 shows the characteristics of the 20 private high schools that received visits from the greatest number

of public research universities in our sample.

The top five high schools in Table 4 each received visits from 11 (i.e., “degree” equals 11) of the 17 public research universities in our sample. Notably, all five schools were located in either California and Texas. Four of these schools are Catholic and one – The Greenhill School – is nonsectarian. These five schools differed in terms of the number of visits received. For example, both Jesuit College Prep in Dallas, TX and Santa Margarita Catholic High School in Rancho Santa Margarita, CA received 19 visits from 11 public research universities, while Cathedral Catholic High School in San Diego, CA received 13 visits from 11 public research universities [SAY SOMETHING ABOUT WHICH PUBLIC [OR PRIVATE] UNIVERSITIES VISITED THESE HIGH SCHOOLS? THIS CODE BELOW DOES THAT WORK IF YOU WANT TO INCLUDE IT; MAYBE SHOW EGO NETWORK OF A COUPLE HIGH SCHOOLS?]

The set of schools visited by the greatest number of public research universities from our sample differs substantially from the schools visited by the greatest number of private colleges and universities. Only four of the 20 schools in 4 were also in the analogous table for private colleges and universities (Table 2), specifically the Greenhill School in Addison, TX, Episcopal High School in Alexandria, VA, St. Ignatius College Prep in Chicago, IL, and the McDonogh School in Owings Mills, MD. Compared the top 20 private schools most visited by private colleges and universities, the 20 most-visited schools by public research universities were more likely to be Catholic schools and they had substantially lower academic reputations. Of the 20 schools in Table 4, only one – The Greenhill School in Addison, TX, ranked 64 – was ranked in the top 100 nationally by Niche. By contrast, of the 20 schools most visited by private colleges and universities, nine were ranked in the top 100 by Niche.

The top 20 most-visited schools by public research universities enrolled a somewhat higher percentage of students who identify as Black/Latinx/Native than the schools most-visited by private colleges and universities. For example, of the top-20 schools most visited by public research universities, there were five schools where students who identify as Black, Latinx, or Native represent at least 30% of student enrollment. By contrast, none of the top-20 schools most visited by private colleges and universities enrolled at least 30% of students who identify as Black, Latinx, or Native.

Table 5 shows the characteristics of private high schools by number of public research universities that visited (e.g., 6+, 5, 4, etc.). Compared to schools that received visits from three or fewer public research universities, schools that received visits from several public research universities were disproportionately located in the South, were more likely to be Catholic schools than Christian or nonsectarian, and were likely to be ranked in the top 200 by Niche or be graded as “A+” by Niche.

### 4.3 Comparison of Public Versus Private Colleges and Universities

We conclude by comparing the off-campus recruiting visits to private high schools by public research universities to those of private colleges and universities.

For these analyses, we include both in-state and out-of-state visits made by private colleges and universities but we exclude in-state visits by public research universities but we do not exclude. The motivation for this decision is as follows. For most public research universities in our sample, the overwhelming majority of visits to private schools are to out-of-state private schools. Prior research suggests that nonresident enrollment growth by public research universities is substantially motivated by the goal of growing tuition revenue [CITE]. Typically, nonresident tuition price at public research universities is substantially higher than resident tuition price but lower than the price charged by selective private colleges and universities (e.g., in 2018-19 fulltime annual resident tuition price at the University of Colorado-Boulder was \$10,728, compared to nonresident tuition price of \$35,482, compared to tuition price of \$54,120 at Northwestern University). We argue that the pursuit of out-of-state students by public universities is an example of “privatization” because out-of-state enrollment is antithetical to the traditional mission of public universities but is consistent with the mission of private colleges and universities. Furthermore, we argue that out-of-state recruiting efforts by public research universities focus on affluent households who are also considering private colleges and universities. Therefore, comparing recruiting visits by private colleges and universities to out-of-state visits by public research universities provides a helpful test of the extent to which public institutions are mimicking

the behavior of private institutions. Figure 7 plots the one-mode network of visits by the 42 public and private colleges and universities in our sample, with vertex color determined by hierarchical cluster analysis specified to create  $k = 4$  clusters. Figure ?? shows the characteristics of private high schools visited by these 42 institutions, sorted by cluster. Of the four clusters from Figures 7 and ??, one contains solely of public research universities, one contains solely of private colleges and universities, and two contain a mix of private and public institutions.

The public-only cluster consists of five institutions: North Carolina State University, SUNY Stony Brook, UC Irvine, UC Riverside, and the University of Nebraska-Lincoln. These universities made relatively few (out-of-state) visits to private high schools – ranging from 20 by NC State to 107 by SUNY Stony Brook – and, thus, are located on the periphery of the network in Figure 7. The private-only cluster consists of 13 institutions: Case Western Reserve, Colorado College, Connecticut College, Emory University, Macalester, Middlebury, Oberlin, Occidental, Smith, Swarthmore, Tufts, University of Denver, Williams. This cluster contains nine liberal arts colleges and four universities (U of Denver, Emory, Tufts, Case Western Reserve). Geographically, six of these institutions are located in the Northeast, three in the Midwest, two in the West, and one in the South. Compared to other postsecondary institutions in our sample, the colleges in this cluster made a moderate number of private school visits, ranging from 164 visits by Smith to 337 by Oberlin. Drawing from ??, visits were spread out geographically rather than concentrated in a particular region. The majority of visits were to nonsectarian schools. Compared to other clusters, these colleges visited schools with strong academic reputations.

We devote more attention to the two clusters that contain a mix of public and private postsecondary institutions. The first of these contains 11 institutions, including eight private universities (Boston College, Northwestern University, Notre Dame, Sewanee, Southern Methodist, Texas Christian University, Tulane, Villanova) and three public research universities (University of Alabama, University of Colorado-Boulder, University of South Carolina). The universities in this cluster made, relatively, a very high number of private school visits – ranging from 333 by Boston College to 931 (out-of-state) visits by the University of Alabama – and are located in the center of the network in Figure 7. Geographically, five of these institutions are located in the South, two in the Northeast, two in the Midwest, and one in the West. ?? shows that most of these institutions – even those not located in the South – made a disproportionate number of recruiting visits in the South. This cluster contains three private Catholic universities (Notre Dame, Villanova, Boston College), which visited a relatively high share of Catholic Schools, and X private Christian universities (Sewanee, Southern Methodist, Texas Christian), which visited a relatively high share of Christian affiliated schools. More notable, however, is the extent to which the three public research universities focused visits on Catholic or Christian private schools. Finally, the universities in this cluster – albeit to a less extent for Boston College, Northwestern, and Tulane – visited private high schools with weaker academic reputations than those visited by the cluster of 13 private colleges and universities. The weak academic reputation of schools visited by Notre Dame – similar to those visited by the University of Alabama and the University of South Carolina – is surprising given that Notre Dame is ranked 19th by US News.

The final cluster contains 13 institutions, including nine public research universities (U. of Arkansas, U. of Cincinnati, U. of Georgia, U. of Kansas, U. of Pittsburgh, UC-Berkeley, UC-San Diego, and UMass Amherst) and four private institutions (Harvey Mudd, Scripps, Stevens Institute of Technology, and Baylor). The universities in this cluster made a moderate number of private school visits – ranging from 111 by Scripps to 257 by Baylor – and are located between the center and the periphery of the network in Figure 7. Whereas, the public and private institutions in the previous cluster (e.g., University of Alabama and Notre Dame) were clearly similar to one another in recruiting patterns, the similarities between public and private institutions in this cluster are less clear. Interestingly, in our analyses of visits by private colleges and universities (above), these four private institutions were their own cluster and were on the periphery of the network. Geographically, these institutions are spread across the country, with recruiting visits concentrated in their home region and often in the South. [COMMENT ON SIMILARITIES BETWEEN PUBLIC AND PRIVATE W/ RESPECT TO REGION/RELIGION, ACADEMIC REPUTATION]



## 5 Summary and Discussion

[ADD SUCCINCT, CONCRETE SUMMARY FOCUSING ON BIG FINDINGS AND THEMES; VERY BRIEF DISCUSSION]

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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: The 20 most central private high schools with respect to visits from private colleges and universities

school_name	city	state_code	region	religion	pct_blacklatinxnative	ranking	ranking_numeric	degree	strength
KENT DENVER SCHOOL	ENGLEWOOD	CO	west	christian	6.370370	A+	122	23	24
HARVARD-WESTLAKE SCHOOL	STUDIO CITY	CA	west	christian	16.708385	A+	6	21	22
CHOATE ROSEMARY HALL	WALLINGFORD	CT	northeast	nonsectarian	15.882353	A+	8	20	32
THE LAWRENCEVILLE SCHOOL	LAWRENCEVILLE	NJ	northeast	nonsectarian	15.911873	A+	10	20	22
DALTON SCHOOL	NEW YORK	NY	northeast	nonsectarian	12.718964	A+	32	19	24
ST IGNATIUS COLLEGE PREP	CHICAGO	IL	midwest	catholic	24.253460	A+	298	19	23
ALBUQUERQUE ACADEMY	ALBUQUERQUE	NM	west	nonsectarian	15.862069	A+	83	19	21
UNIVERSITY PREP	SEATTLE	WA	west	nonsectarian	9.683099	A+	249	19	21
THE BISHOP'S SCHOOL	LA JOLLA	CA	west	christian	0.000000	A+	43	19	19
MARET SCHOOL	WASHINGTON	DC	south	nonsectarian	23.112481	A+	100	19	19
THE BRYN MAWR SCHOOL	BALTIMORE	MD	south	nonsectarian	18.491124	A+	98	19	19
GREENHILL SCHOOL	ADDISON	TX	south	nonsectarian	16.679718	A+	64	19	19
EPISCOPAL HIGH SCHOOL	ALEXANDRIA	VA	south	christian	16.447368	A+	141	18	31
THE HOTCHKISS SCHOOL	LAKEVILLE	CT	northeast	nonsectarian	14.006515	A+	17	18	29
PHILLIPS ACADEMY	ANDOVER	MA	northeast	nonsectarian	11.759505	A+	3	18	28
THE KINKAID SCHOOL	HOUSTON	TX	south	nonsectarian	8.654545	A+	89	18	20
THE ATHENIAN SCHOOL	DANVILLE	CA	west	nonsectarian	12.213741	A+	106	18	19
ALEXANDER DAWSON SCHOOL	LAFAYETTE	CO	west	nonsectarian	9.090909	A+	575	18	18
WILMINGTON FRIENDS SCHOOL	WILMINGTON	DE	south	christian	18.827161	A+	556	18	18
MCDONOGH SCHOOL	OWINGS MILLS	MD	south	nonsectarian	22.320769	A+	311	18	18



Table 3: characteristics of high schools by degree band, private colleges and universities

degree_band	count	midwest	northeast	south	west	catholic	christian	nonsectarian	other	c1_lt10	c2_10to25	c3_25to50	c4_50+	c1_top200	c2_A+	c3_A	c4_ltA	<NA>
6+	403	11.9%	26.1%	37.2%	24.8%	33.0%	13.6%	52.6%	0.7%	34.7%	51.9%	10.7%	2.7%	30.5%	56.3%	10.4%	1.5%	1.2%
5	73	13.7%	28.8%	28.8%	28.8%	42.5%	23.3%	30.1%	4.1%	35.6%	46.6%	12.3%	5.5%	1.4%	67.1%	28.8%	NA	2.7%
4	93	12.9%	28.0%	43.0%	16.1%	60.2%	17.2%	18.3%	4.3%	39.8%	43.0%	11.8%	5.4%	1.1%	50.5%	40.9%	5.4%	2.2%
3	112	26.8%	25.9%	39.3%	8.0%	54.5%	17.9%	25.0%	2.7%	31.2%	50.0%	12.5%	6.2%	NA	36.6%	47.3%	12.5%	3.6%
2	173	21.4%	28.3%	34.7%	15.6%	55.5%	22.0%	19.7%	2.9%	39.9%	33.5%	19.1%	7.5%	1.2%	25.4%	43.9%	27.2%	2.3%
1	283	22.3%	22.3%	40.6%	14.8%	54.4%	26.9%	15.9%	2.8%	31.4%	39.6%	18.0%	11.0%	0.4%	21.9%	34.6%	38.5%	4.6%

Table 4: The 20 most central private high schools with respect to visits from public research universities

school_name	city	state_code	region	religion	pct_blacklatinxnative	ranking	ranking_numeric	degree	strength
JESUIT COLLEGE PREP SCHOOL	DALLAS	TX	south	catholic	18.140794	A+	235	11	19
SANTA MARGARITA CATHOLIC HIGH SCHOOL	RANCHO SANTA MARGARITA	CA	west	catholic	11.600928	A+	475	11	19
NOTRE DAME HIGH SCHOOL	SHERMAN OAKS	CA	west	catholic	31.163548	A+	642	11	15
CATHEDRAL CATHOLIC HIGH SCHOOL	SAN DIEGO	CA	west	catholic	10.384615	A+	536	11	13
GREENHILL SCHOOL	ADDISON	TX	south	nonsectarian	16.679718	A+	64	11	12
FORT WORTH COUNTRY DAY SCHOOL	FORT WORTH	TX	south	nonsectarian	86.909091	A+	327	10	22
JSERRA CATHOLIC HIGH SCHOOL	SAN JUAN CAPISTRANO	CA	west	catholic	13.963211	A+	656	10	18
EPISCOPAL HIGH SCHOOL	ALEXANDRIA	VA	south	christian	16.447368	A+	141	10	17
ST IGNATIUS COLLEGE PREP	CHICAGO	IL	midwest	catholic	24.253460	A+	298	10	14
URSULINE ACADEMY OF DALLAS	DALLAS	TX	south	catholic	23.174971	A+	344	10	14
SERVITE HIGH SCHOOL	ANAHEIM	CA	west	catholic	49.529412	A	NA	10	13
NOLAN CATHOLIC HIGH SCHOOL	FORT WORTH	TX	south	catholic	35.213033	A	NA	9	22
STRAKE JESUIT COLLEGE PREP SCHOOL	HOUSTON	TX	south	catholic	29.076621	A+	191	9	18
MCDONOGH SCHOOL	OWINGS MILLS	MD	south	nonsectarian	22.320769	A+	311	9	9
TRINITY CHRISTIAN ACADEMY	ADDISON	TX	south	christian	8.648256	A+	460	8	22
BOSTON COLLEGE HIGH SCHOOL	DORCHESTER	MA	northeast	catholic	9.757695	A+	522	8	14
TRINITY VALLEY SCHOOL	FORT WORTH	TX	south	nonsectarian	10.714286	A+	307	8	14
JOHN PAUL II HIGH SCHOOL	PLANO	TX	south	catholic	19.338422	A+	781	8	14
MATER DEI HIGH SCHOOL	SANTA ANA	CA	west	catholic	39.033457	A+	910	8	13
COLLEGIATE SCHOOL	RICHMOND	VA	south	nonsectarian	8.215818	A+	336	8	13

Table 5: characteristics of high schools by degree band, public research universities

degree_band	count	midwest	northeast	south	west	catholic	christian	nonsectarian	other	c1_lt10	c2_10to25	c3_25to50	c4_50+	c1_top200	c2_A+	c3_A	c4_ltA	<NA>
6+	114	6.1%	12.3%	64.0%	17.5%	50.9%	16.7%	31.6%	0.9%	25.4%	56.1%	15.8%	2.6%	23.7%	64.0%	9.6%	1.8%	0.9%
5	70	14.3%	20.0%	48.6%	17.1%	48.6%	15.7%	32.9%	2.9%	32.9%	52.9%	12.9%	1.4%	11.4%	52.9%	28.6%	5.7%	1.4%
4	117	17.9%	24.8%	38.5%	18.8%	48.7%	18.8%	30.8%	1.7%	36.8%	44.4%	15.4%	3.4%	13.7%	49.6%	33.3%	3.4%	NA
3	185	11.4%	28.6%	40.5%	19.5%	44.3%	20.0%	30.3%	5.4%	35.7%	47.6%	11.4%	5.4%	11.4%	49.2%	28.6%	10.8%	NA
2	286	17.5%	25.9%	37.8%	18.9%	44.4%	18.2%	33.2%	4.2%	43.7%	40.6%	12.2%	3.5%	10.1%	35.0%	32.9%	18.2%	3.8%
1	484	25.0%	25.2%	32.0%	17.8%	45.5%	31.0%	20.5%	3.1%	41.7%	35.3%	13.4%	9.5%	3.3%	17.4%	28.7%	46.5%	4.1%

Table 6: most central private high schools, public and private colleges and universities

school_name	city	state_code	region	religion	pct_blacklatinxnative	ranking	ranking_numeric	degree	strength
GREENHILL SCHOOL	ADDISON	TX	south	nonsectarian	16.679718	A+	64	30	31
ST IGNATIUS COLLEGE PREP	CHICAGO	IL	midwest	catholic	24.253460	A+	298	29	37
KENT DENVER SCHOOL	ENGLEWOOD	CO	west	christian	6.370370	A+	122	29	31
EPISCOPAL HIGH SCHOOL	ALEXANDRIA	VA	south	christian	16.447368	A+	141	28	48
JESUIT COLLEGE PREP SCHOOL	DALLAS	TX	south	catholic	18.140794	A+	235	28	46
HARVARD-WESTLAKE SCHOOL	STUDIO CITY	CA	west	christian	16.708385	A+	6	27	28
MCDONOGH SCHOOL	OWINGS MILLS	MD	south	nonsectarian	22.320769	A+	311	27	27
CHOATE ROSEMARY HALL	WALLINGFORD	CT	northeast	nonsectarian	15.882353	A+	8	26	40
URSULINE ACADEMY OF DALLAS	DALLAS	TX	south	catholic	23.174971	A+	344	26	30
STRAKE JESUIT COLLEGE PREP SCHOOL	HOUSTON	TX	south	catholic	29.076621	A+	191	25	44
PHILLIPS ACADEMY	ANDOVER	MA	northeast	nonsectarian	11.759505	A+	3	25	35
THE KINKAID SCHOOL	HOUSTON	TX	south	nonsectarian	8.654545	A+	89	25	30
ST MARK'S SCHOOL OF TEXAS	DALLAS	TX	south	christian	13.584475	A+	2	24	30
THE BRYN MAWR SCHOOL	BALTIMORE	MD	south	nonsectarian	18.491124	A+	98	24	25
FORT WORTH COUNTRY DAY SCHOOL	FORT WORTH	TX	south	nonsectarian	86.909091	A+	327	23	40
REGIS JESUIT HIGH SCHOOL	AURORA	CO	west	catholic	14.073634	A+	552	23	32
BROPHY COLLEGE PREPARATORY	PHOENIX	AZ	west	catholic	32.099644	A+	335	23	30
GEORGETOWN PREPARATORY SCHOOL	NORTH BETHESDA	MD	south	catholic	17.741936	A+	162	23	30
PINE CREST SCHOOL	FORT LAUDERDALE	FL	south	nonsectarian	10.000000	A+	52	23	29
LAKE FOREST ACADEMY	LAKE FOREST	IL	midwest	nonsectarian	12.183908	A+	126	23	29

Table 7: characteristics of high schools by degree band, public and private colleges and universities

degree_band	count	midwest	northeast	south	west	catholic	christian	nonsectarian	other	c1_lt10	c2_10to25	c3_25to50	c4_50+	c1_top200	c2_A+	c3_A	c4_ltA	<NA>
6+	601	12.6%	26.3%	38.3%	22.8%	41.1%	15.5%	41.3%	2.2%	35.8%	49.9%	11.3%	3.0%	20.6%	54.4%	20.6%	2.8%	1.5%
5	80	22.5%	32.5%	37.5%	7.5%	57.5%	18.8%	20.0%	3.8%	33.8%	37.5%	22.5%	6.2%	1.2%	42.5%	37.5%	17.5%	1.2%
4	103	11.7%	29.1%	47.6%	11.7%	46.6%	24.3%	24.3%	4.9%	35.9%	43.7%	13.6%	6.8%	1.0%	37.9%	41.7%	17.5%	1.9%
3	128	18.8%	24.2%	39.8%	17.2%	50.8%	23.4%	23.4%	2.3%	35.9%	44.5%	10.9%	8.6%	NA	26.6%	43.0%	27.3%	3.1%
2	199	27.6%	20.1%	35.2%	17.1%	50.8%	25.1%	20.1%	4.0%	39.7%	32.7%	19.6%	8.0%	0.5%	20.1%	41.2%	33.7%	4.5%
1	378	27.8%	22.5%	34.9%	14.8%	46.3%	36.0%	14.0%	3.7%	42.3%	32.3%	12.7%	12.7%	0.3%	8.7%	23.8%	61.9%	5.3%



Figure 1: The enrollment funnel

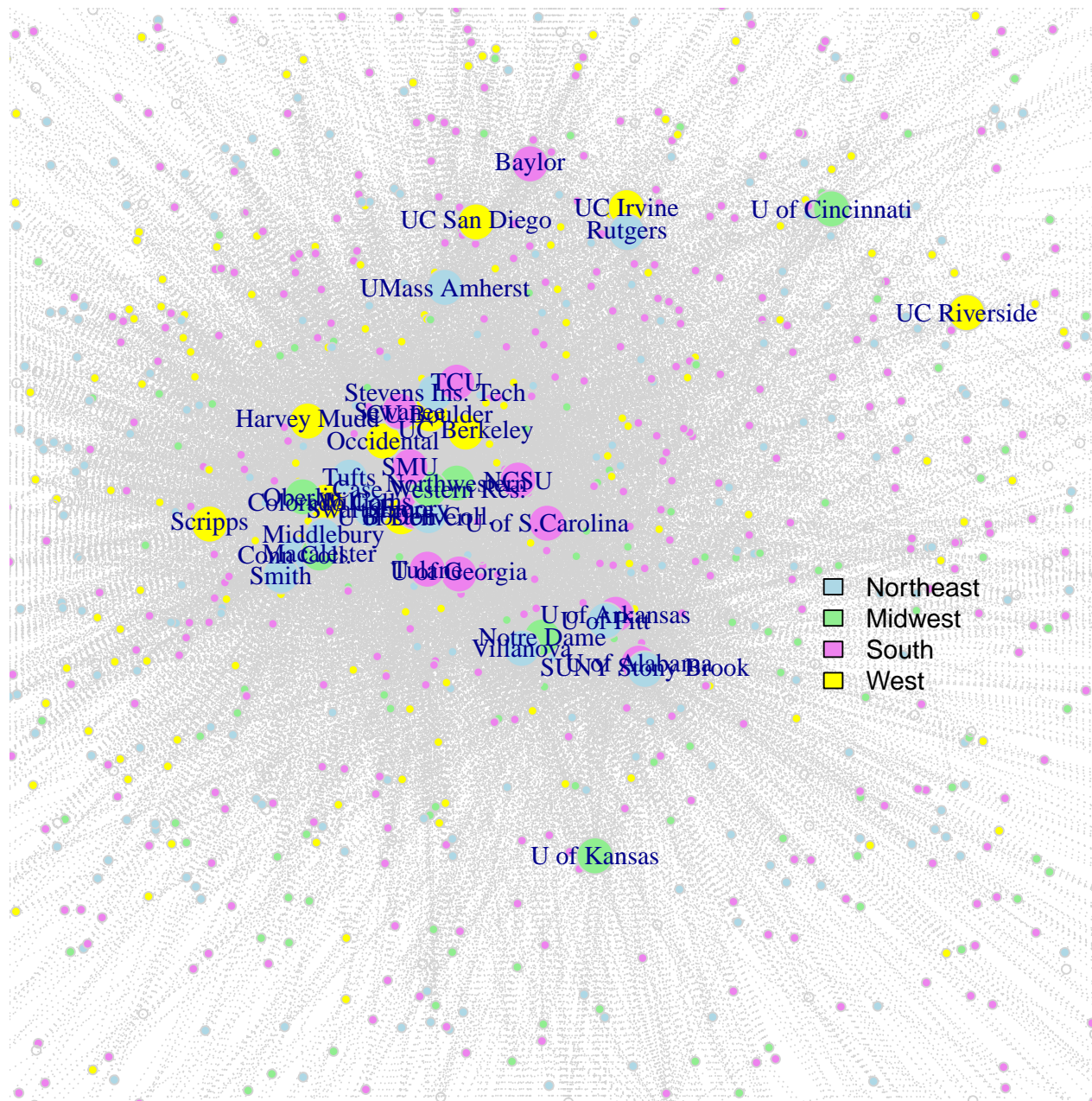


Figure 2: caption of 2 mode graph

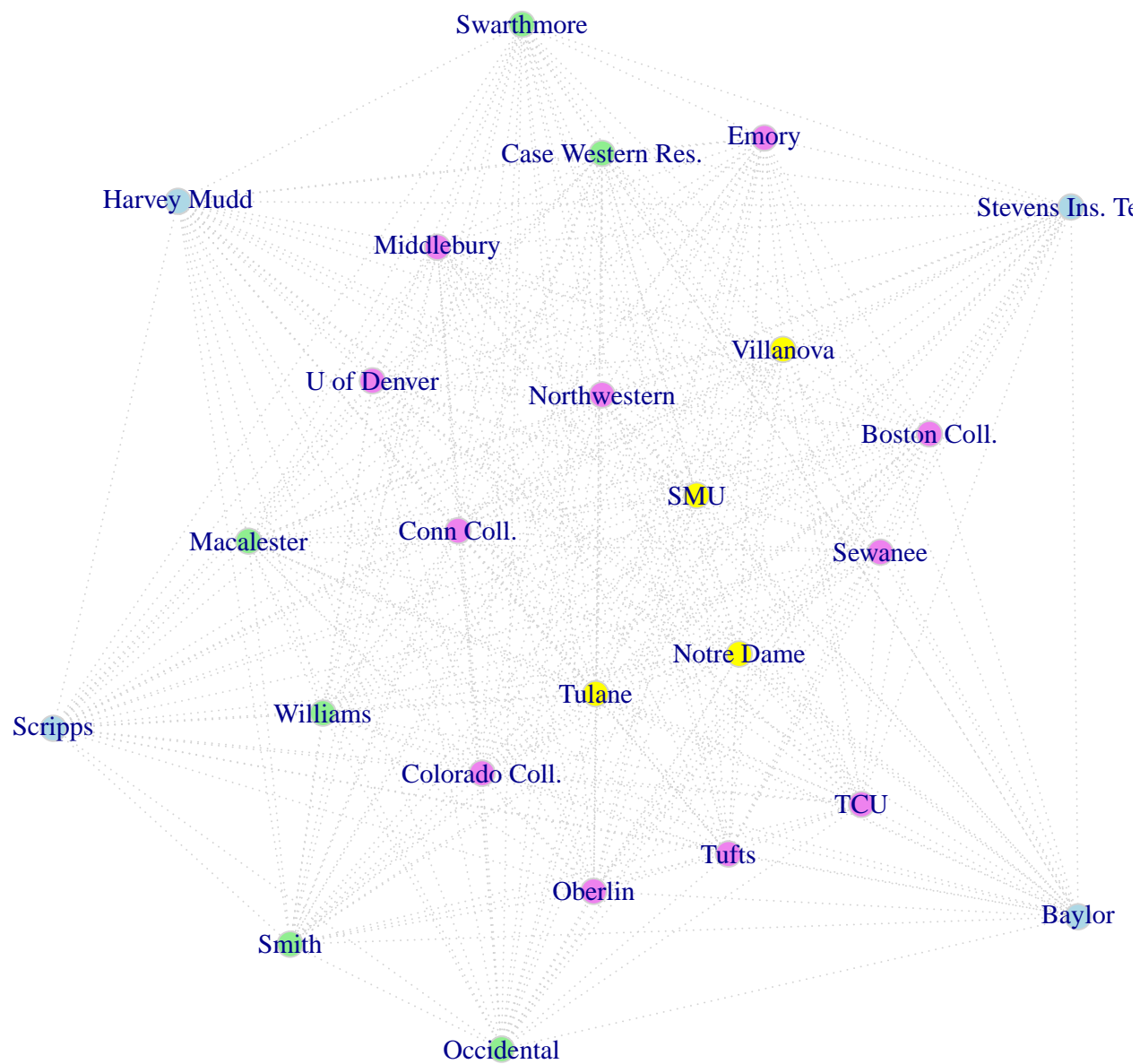


Figure 3: caption plot-1mode-privu



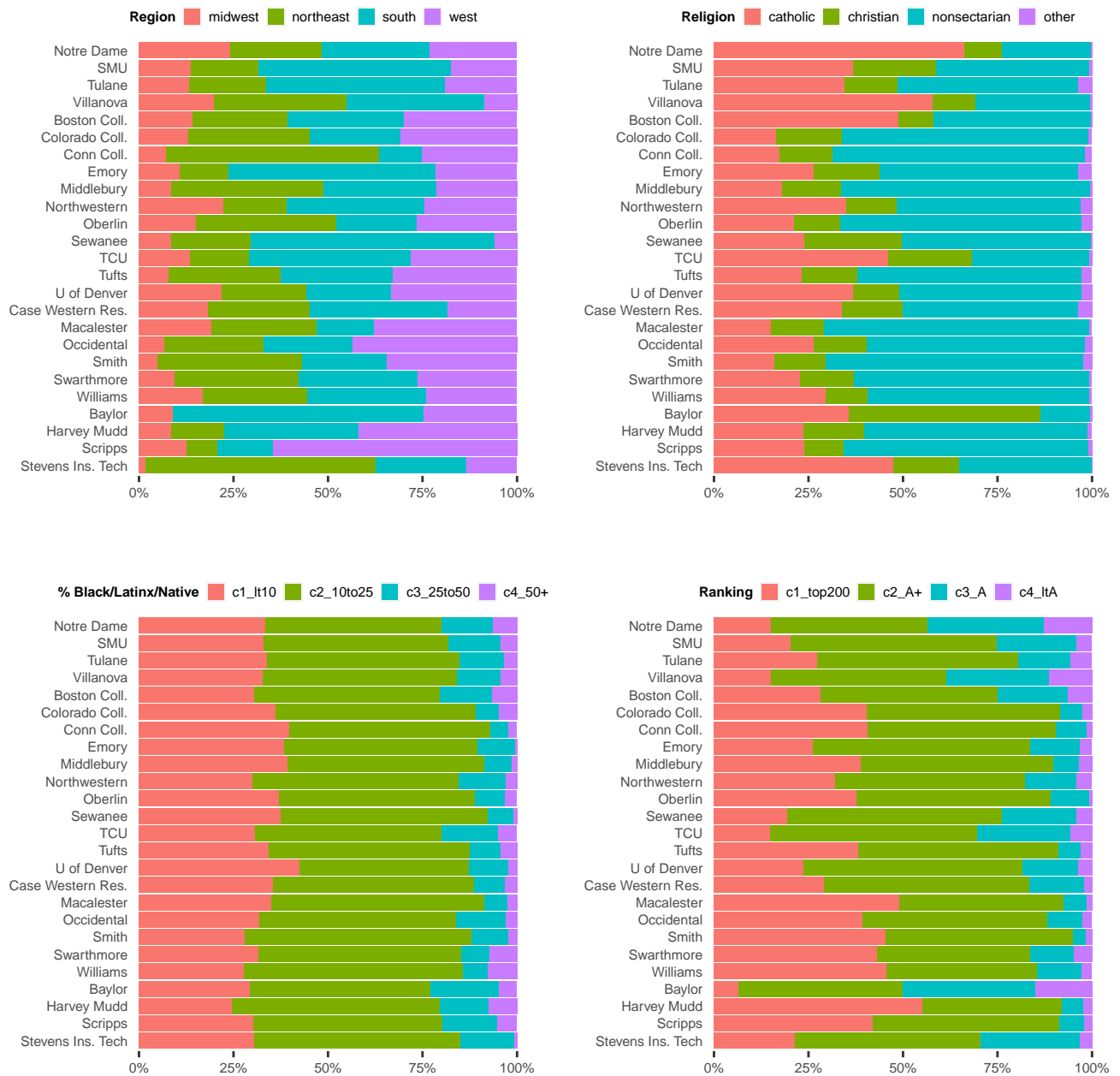


Figure 4: characteristics of private high schools visited by private colleges and universities

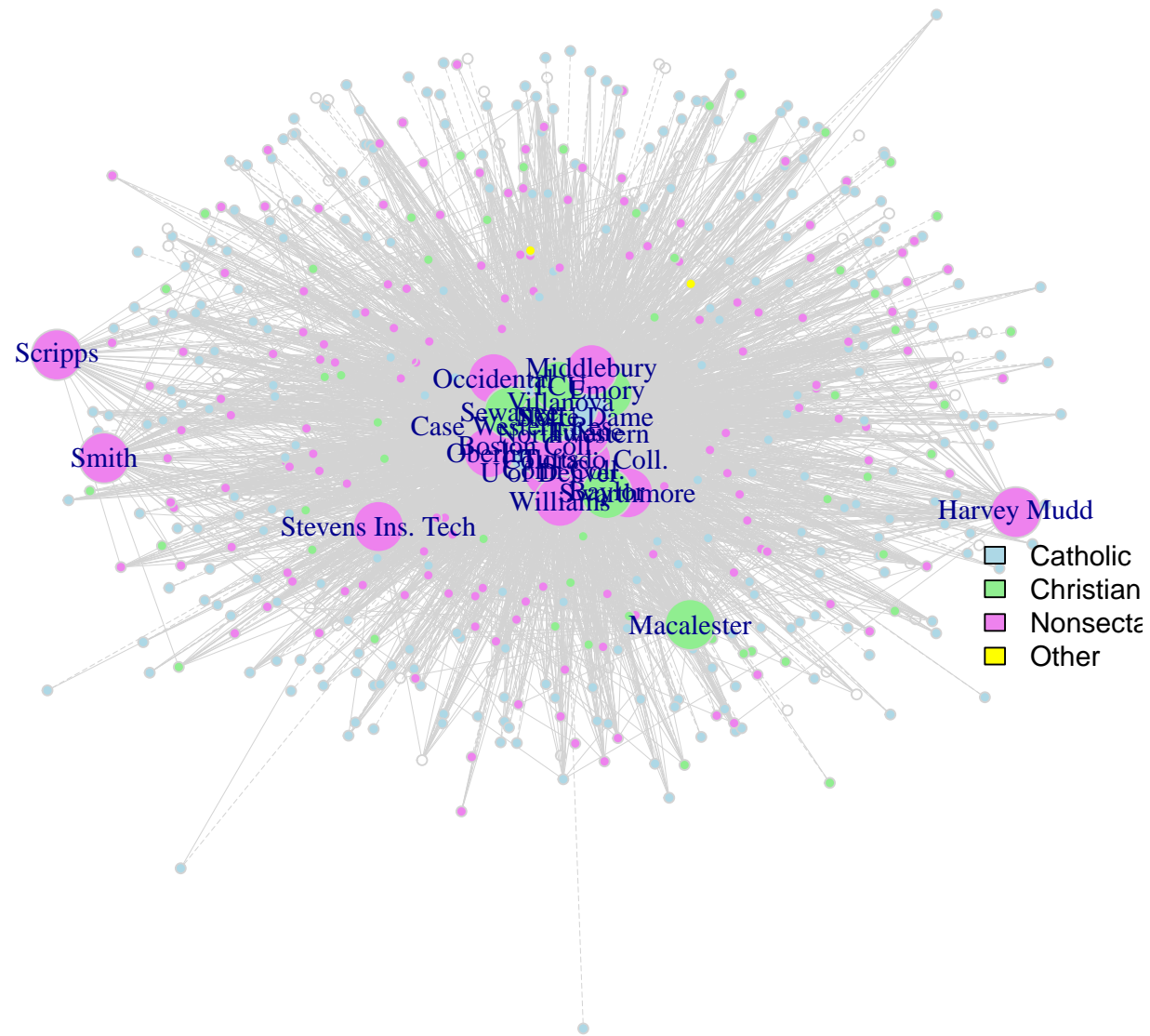


Figure 5: Ego network of Villanova University, with religious affiliation



Figure 6: Ego network of Emory University, with geographic region

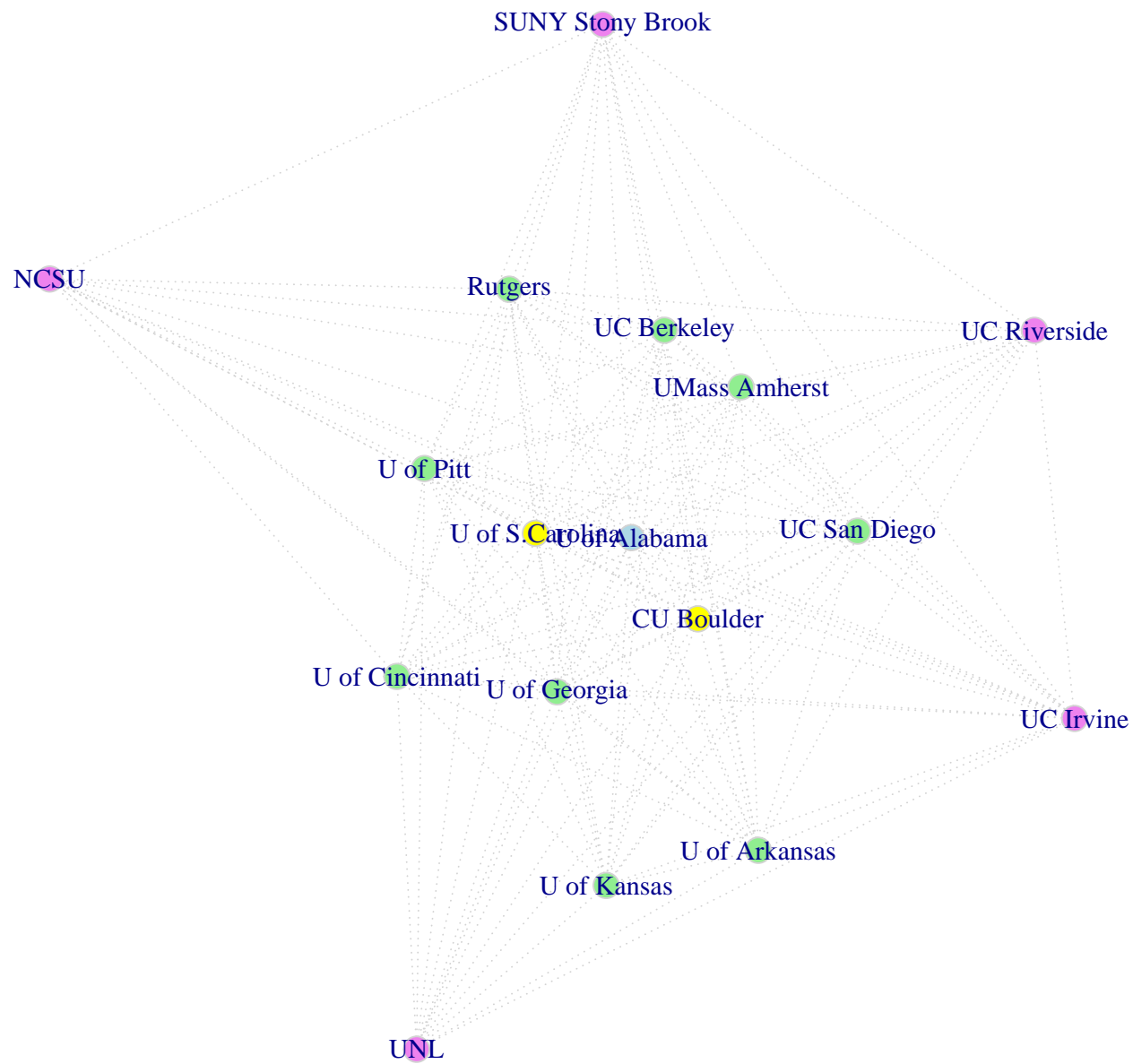


Figure 7: caption plot-1mode-pubu

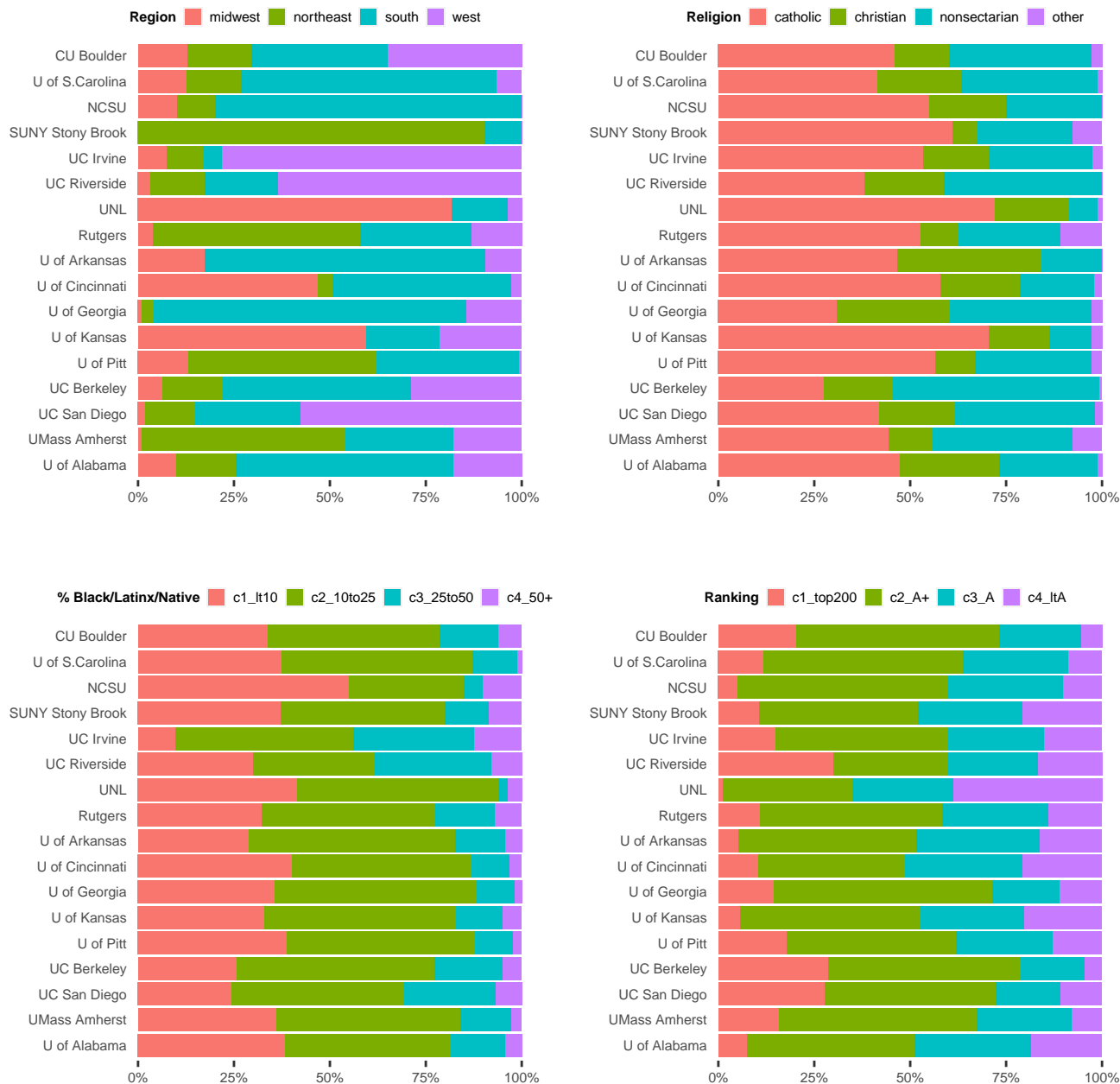


Figure 8: characteristics of private high schools visited by public research universities

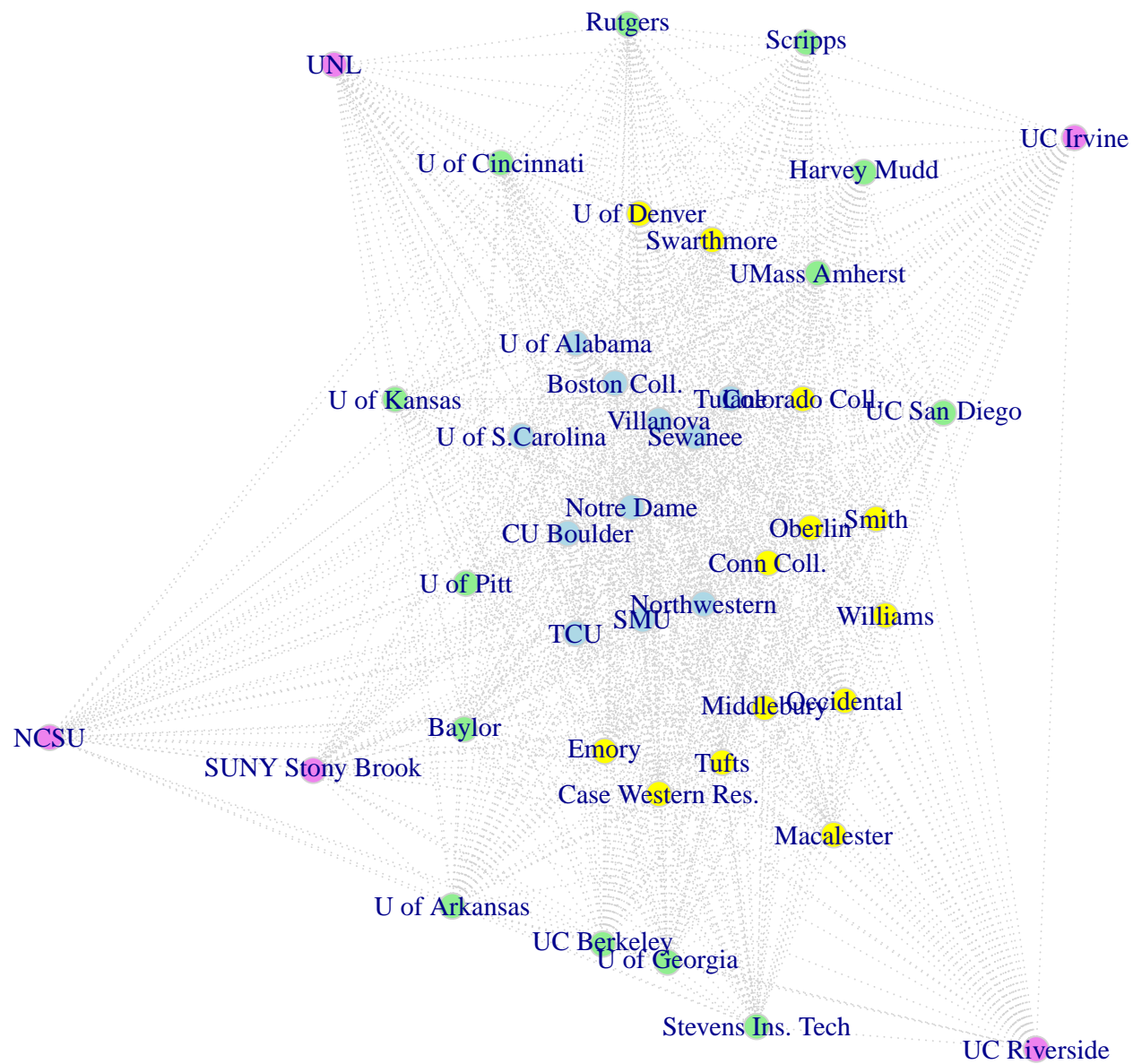


Figure 9: caption plot-1mode-all, out-of-state visits only for public universities

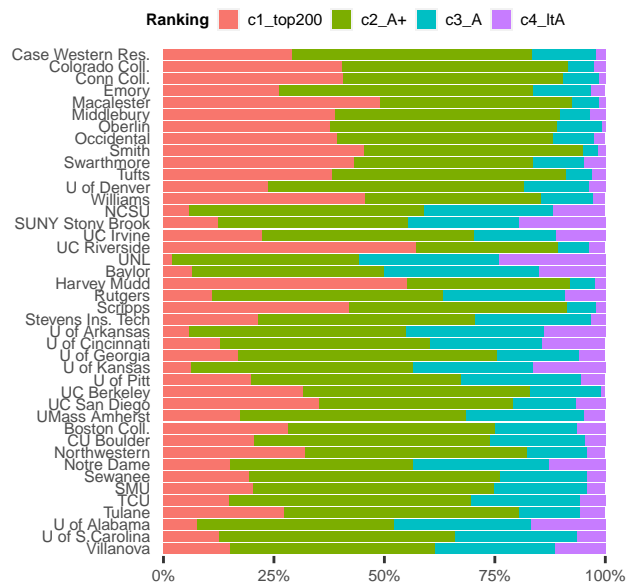
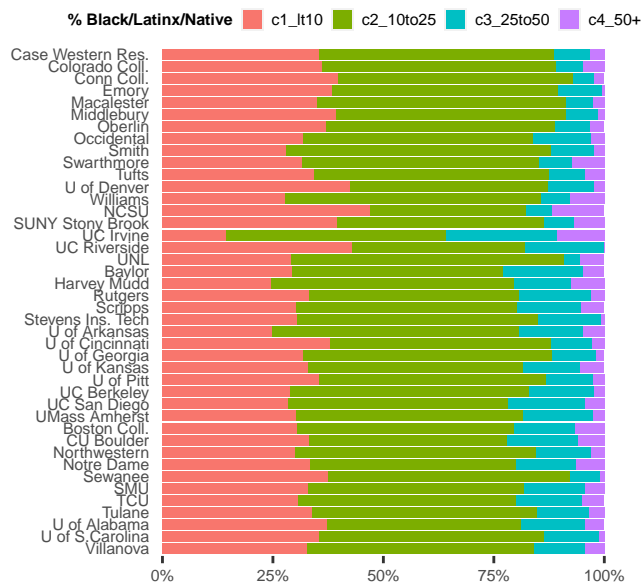
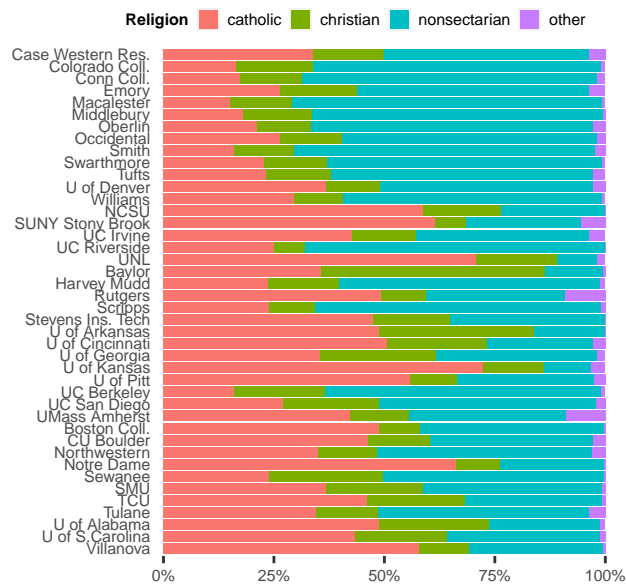
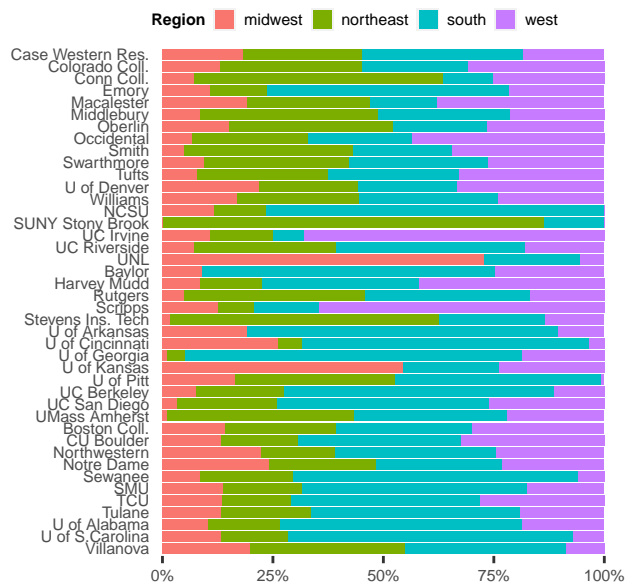


Figure 10: characteristics of private high schools visited by public and private colleges and universities, out-of-state visits only for public universities