Structuring College Access: The Market Segment Model and College Board Geo-markets

Ozan Jaquette (UCLA) Karina Salazar (University of Arizona)

1 Introduction

In 1983, Robert Zemsky and Penney Oedel authored *The Structure of College Choice*. Based on an analysis of 1980 SAT score-sending behavior and published by *The College Board*, Zemsky & Oedel (1983) developed the Market Segment Model to help colleges recruit students. The underlying idea of the Market Segment Model is that student demand for your institution is fundamentally a function of class. Therefore, the key to recruitment is identifying territories where large numbers of your class live. Zemsky & Oedel (1983, p. 11) describe the Market Segment Model as an effort to "quantify" the knowledge that college admissions officers have about the geography of student demand:

> A good recruiter knows where to look for prospective applicants, as seen in the students' willingness or eluctance to travel. It is necessary to identify not only the most promising communities or poools, but also the specific neighborhoods within those communities – hence the recruiter's emphasis on feeder high schools. From the beginning, we have sought to mold our research to these concepts, to capture and quantify the phenomenon behind the folklore. Thus, it is the admissions officers' notion of admissions pools that dictates the geographic units of our analysis." [p. 11]

Zemsky & Oedel (1983) also created local "community based markets" (p. 14) – later known as "Geomarkets." Geomarkets are geographic borders that disaggregate states and large metropolitan areas for recruiting purposes. **?@fig-nyc-geomarkets** shows New York City area Geomarkets. In defining Geomarkets, Zemsky & Oedel (1983) did not draw new geographic borders, but rather made certain extant borders more salient to the process of recruiting.

Geomarkets have been incorporated into the supply-side structure of college access in ways that are simultaneusly mundane and fundamental. We posit three ways. First, Geomarkets became a principle for how many – if – admissions offices organized their labor. In states where a college recruits heavily from, admissions officers are often assigned specific Geomarkets as their territory [CITE]. Geomarkets were created to mirror the territories of admissions officers and, in turn, admissions offices structured their territories around Geomarkets. Second, The Market Segment Model and Geomarkets became the basis for Geomarkets are the basis for the College Board Enrollment

Planning Service (EPS), founded in 1984 and still active today. EPS software recommends which Geomarkets a college should recruit from and which schools/communities they should prioritize within targeted Geomarkets. College Board (2010) says "Enrollment Planning Service (EPS®) the analysis tool that pinpoints the schools and geomarkets where your best prospects are most likely to be found." Noel-Levitz (1998) reports that, in 1995, 37% of 4-year public institutions and 49% of 4-year private institutions used EPS.

Third, Geomarkets were incorporated into the College Board "student list" product named Student Search Service. Student lists have been the primary source of lead generation in U.S. higher education since 1972, when College Board began selling "names" (Belkin, 2019; Jaquette, Salazar, & Martin, 2022). Ruffalo Noel-Levitz (2022) reported that 87% of private and 86% of public four-year institutions purchase student lists. Lists contain contact information for prospective students. The Student Search Service database consists of College Board test-takers. Colleges pay a fee for each prospect (e.g., $0.50 in 2021). Colleges control which prospect profiles they purchase by selecting search filters, such as high school graduation year, SAT score, AP score, state, etc. Geomarket filters enable colleges to include/exclude prospects from particular Geomarkets. An analysis of 830 student lists purchased by 14 public universities found that 16% of purchases filtered on Geomarket (Jaquette & Salazar, 2024).

Geomarkets have never been the subject of empirical research. This omission is surprising because the sociology of education is concerned with sorting (Domina, Penner, & Penner, 2017), particularly sorting into college. Traditionally, most scholarship – and certainly most scholarship in economics [HOXBY? CHETTY] – views inequality in college access as a function households or k-12 schools, which represent the demand-side of higher education. More recently, scholarship in the sociology of education takes seriously the idea that colleges are not passive recipients of applications, but rather they expend substantial resources soliciting demand from desirable applicants (Cottom, 2020; Holland, 2019; Stevens, 2007). However, most scholarship on recruiting analyzes the behavior of individual colleges (Salazar, 2022; e.g., Salazar, Jaquette, & Han, 2021), thereby creating the assumption that recruiting is a function of individual colleges. What these studies have missed is the broader enrollment management industry – third-party vendors, their products and consulting solutions – as a set of mechanisms that structure college access, funneling certain kinds of students

to certain kinds of institutions.

This manuscript analyzes one of those mechanisms, The Market Segment Model and College Board Geomarkets, as a case study of quantification. We develop arguments from the broader literature on quantification [e.g.,] (Espeland & Sauder, 2016; Espeland & Stephens, 2008; McArthur & Reeves, 2022), particularly the discussions of correlation and homophily from Chun (2021). Predictive analytics are based on correlation. When we use data on past correlations to make recommendations about the future, we amplify the effects of historic structural inequality. The Market Segment Model analyzes SAT score-sending data from 1980 and concludes that student demand for higher education is primarily a function of social class (Zemsky & Oedel, 1983). The Market Segment Model argues that homophily – actors that share characteristics are likely to form connections – is the organizing principle of student demand and competition between colleges. Zemsky & Oedel (1983, p. 72) state that "the hierarchical structure of collegiate competition largely reflects the stratified social and economic dimensions of the communities from which colleges draw their students." This snapshot of student demand in 1980, itself a consequence historic structural inequality, was programmed into the way admissions offices organize labor and programmed into the EPS and Student Service Service products that colleges utilize to identify and target prospective students. The result is a supply-side that reinforces structural inequalities observed on the demand-side.

Our analyses address the two research questions, which speak to how geomarkets are utilized within EPS and within the Student Search Service student list product. First, what is the socioeconomic and racial variation between geomarkets in metropolitan areas and how does this variation change over time? We address this question by spatially joining the geomarket shapefile to Census data about socioeconomic and racial characteristics. Second, how does the socioeconomic and racial composition of included versus included prospects vary when student list purchases filter on particular geomarkets? We address this question by analyzing actual student list purchases that utilize commonly used search filters (e.g., PSAT score, GPA) but do not filter on Geomarkets. We simulate which prospects in particular metropolitan areas would have been included/excluded had the student list purchase filtered on particular Geomarkets. We obtained these data by issuing public records requests to public universities.

In the following section we provide background information about enrollment management and

scholarship on recruiting. Second, we introduce core ideas and concepts from scholarship on quantification. Third, we apply these ideas to a close read of Zemsky & Oedel (1983) and motivate hypotheses. Four, we describe data and methods. Fifth, we present results. Finally, we discuss implications for scholarship and for policy.

2 Enrollment Management and Quantification

Enrollment Management

As a profession, enrollment management (EM) integrates techniques from marketing and economics in order to "influence the characteristics and the size of enrolled student bodies" (Hossler & Bean, 1990, p. xiv). As an administrative structure, the EM office typically controls the activities of admissions, financial aid, and recruiting (Kraatz, Ventresca, & Deng, 2010). Figure 1 depicts the "enrollment funnel," which modifies the traditional "marketing funnel" to depict broad stages in the process of recruiting students (EAB, 2019; Litten, Sullivan, & Brodigan, 1983). The funnel begins with a large pool of "prospects" (i.e., prospective students) that the university would like to enroll. "Leads" are prospects whose contact information has been obtained. "Inquiries" are prospects that contact the institution, consisting of those that respond to an initial soliciation (e.g., email) and those that reach out on their own (e.g., sending SAT scores). The purpose of the enrollment funnel is to inform recruiting interventions that target one or more stages. These interventions seek to increase the probability of "conversion" across stages (Campbell, 2017). At the top of the enrollment funnel, purchasing student lists is the primary means of converting prospects to leads (Jaquette et al., 2022). Purchased leads are served emails, brochures, and targeted social media advertisements designed to solicit inquiries and applications (Ruffalo Noel-Levitz, 2022).

Scholarship at the nexus of enrollment management and college access can be categorized by which part(s) of the enrollment funnel it speaks to. The majority of scholarship focuses on the admissions stage, analyzing which admissions criteria are utilized and/or which applicants are admitted (e.g., Hirschman, Berrey, & Rose-Greenland, 2016; Killgore, 2009; O. Y. A. Poon & Bastedo, 2022; Posselt, 2016; Taylor, Rosinger, & Ford, 2024). Economists often investigate financial aid leveraging, which seeks to convert admits to enrolled students [CITE].

A growing college access literature in sociology analyzes the earlier "recruiting" stages of identifying leads, soliciting inquiries, and soliciting applications. Salazar et al. (2021) conceptualize recruiting behavior as an indicator of college enrollment priorities. Ethnographies by Stevens (2007) and Khan (2011) identify connections between private school guidance counselors and college admissions officers as a mechanism for social reproduction. Quantitative case-studies of off-campus recruiting visits by public research universities and by selective private universities reveal a preference for visiting private schools and affluent, predominantly white public schools (Jaquette, Han, & Castañeda, 2024; Salazar, 2022; Salazar et al., 2021). From the student perspective, Holland (2019) finds that underrepresented students were drawn to colleges that made them feel wanted, often attending institutions with lower graduation rates and requiring larger loans than other college options. Cottom (2017) shows that for-profit colleges found a niche in Black and Latinx communities because traditional colleges ignored these communities. Consistent with scholarship on political economy (Cottom, 2017; Marion Fourcade & Healy, 2024; Stevens & Gebre-Medhin, 2016), this literature reveals a vertical hierarchy of postsecondary institutions matching to a vertical hierarchy of customer niches segmented by class and race, a process consistent with the notion of that higher education is mechanism of social reproduction (Domina et al., 2017; Stevens, Armstrong, & Arum, 2008).

By focusing on the behaviors of individual colleges, scholarship on college access implicitly states that recruiting – and enrollment management more broadly – is something done by individual colleges. This statement raises the question, why does recruiting behavior look so similar across colleges of a particular "type." Institutional theory defines the organizational field as "those organizations that, in the aggregate, constitute a recognized area of institutional life: key suppliers, resource and product consumers, regulatory agencies, and other organizations that produce similar services and products" (DiMaggio & Powell, 1983, p. 143). The broader enrollment management (EM) industry consists of university personnel (e.g., admissions counselors, VP for enrollment management), professional associations (e.g., National Association for College Admission Counseling), and third-party servicers that produce market research, software, and consulting services (e.g., College Board, ACT, EAB, Slate, PowerSchool). We argue college access is structured by third-party servicers and products that interact with direct-providers (colleges). Enrollment management is

often described as an opaque industry because obtaining concrete information about EM practices is difficult. This is why the title of Burd (2024) is *Lifting the Veil on Enrollment Management*. Although sociologists have hinted at the ways enrollment management contributes to inequality in colege access (e.g., Kraatz et al., 2010), scholarship has failed to make third-party servicers and products the object of empirical analysis.

Drawing from scholarship on organizational theory (Scott & Davis, 2007), enrollment management processes involve many "make or buy" decisions about whether to perform a given task in-house or outsource it to a third-party vendor (Jaquette et al., 2022). EM consulting firms provide advice and implementation in the areas of marketing, recruiting, pricing and financial aid, and student success. More recently, the EM consulting business model is based on software-as-service products (e.g., for example, EAB's Enroll 360 product) (Jaquette et al., 2022). As "creating a class" has becomes complicated and high-stakes (Stevens, 2007), many colleges hire EM consulting firms to develop and/or implement recruiting campaigns. The two largest enrollment consulting firms – Ruffalo Noel Levitz and EAB – claim to serve more than 3,000 colleges and universities collectively (EAB, n.d.; Ruffalo Noel Levitz, 2023).

The EM industry puts great stock in market research, in part because the EM profession emerged from marketing and market research (Hossler & Bean, 1990; Litten et al., 1983). Litten et al. (1983, p. 17) define market research as all "activities intended to increase understanding of a market and consumer behavior in that market." At the most basic level, in-house market research is a function of being intentional about record-keeping and using those records (Stevens, 2007).[1] In recruiting, market research informs decisions about which prospective students to target with recruiting interventions. How to acquire market research is another make-or-buy decision. The College Board played a pivotal role in transforming market research about enrollment from something done by individual universities to something done by third-party professionals. In 1983, College Board published *Applying Market Research in College Admissions* (Litten et al., 1983), which became

[1]Stevens (2007) describes the archives of annual reports of admissions activities from a selective liberal arts college. In the 1942 report, "Section 2.5 is titled 'Secondary School Quartile Standings," a measure of where matriculants fell in the rankings of their high school classes" (Stevens, 2007) while Section 3.11 describes the high schools visited. In the chapter entitled "Travel," Stevens (2007, p. 69) describes how The College used record-keeping to inform decisions about visits to local high schools in the 2000s: "The College keeps files on hundreds of schools across the country, and around the globe, with which it had contact …The files enable officers to quickly discern"how we've done here lately," …with the number, relative quality, and yield rate of applicants from a particular school."

the basis for their Admitted Student Questionnaire (ASQ) product, and published *The Structure of College Choice* (Zemsky & Oedel, 1983), which became the basis for the Enrollment Planning Service (EPS) product/division. Today, EPS remains the market research arm of College Board, while Encoura Eduventures is the market research arm of ACT. Market research often distills large amounts of data into simpler indicators. Therefore, the quantification literature provides a useful lens to understand market research.

Quantification

Espeland & Stephens (2008, p. 402) define quantification as "the production and communication of numbers" (p. 402). They introduce reacivity, discipline, and authority as three interrelated themes that describe the effects of quantification. Reactivity is the idea that salient quantitative measures cause people and organizations to change their behavior. Discipline is the idea that quantification causes actors to react in a particular way. Authority is the idea that quantification changes decision-making power, often weakening the discretion of local decision-makers.

Scholarship about U.S. News & World Report (USNWR) Law School rankings demonstrate the reactivity, discipline, and authority effects of quantification (Espeland & Sauder, 2007, 2016; Sauder, 2008; Sauder & Espeland, 2009). Law school rankings were developed as a means of informing prospective students about the relative quality of different programs. Speaking to *reactivity* effects, rankings had the intended effect of affecting where students apply and enroll [CITE]. However, rankings also affected hiring decisions of firms because clients evaluated firms based on the prestige of law schools attended by firm lawyers. Once law schools realized that "important groups of constituents — students, faculty, trustees, employers, other media — were using rankings to make decisions that had large consequences for schools …[then] schools felt pressured to take them seriously" (Espeland & Stephens, 2008, p. 415). Rankings *disciplined* the behavior of law schools. For example, applicants with characteristics valued by the rankings system (e.g., LSAT scores) became more important for decisions about admissions and merit aid (Espeland & Sauder, 2016). Rankings also weakened the *authority* of admissions directors and admissions officers to make independent decisions about which applicants to admit, ideal class size, and curricular offerinags (Espeland & Sauder, 2016).

The analysis of UK League Tables by McArthur & Reeves (2022) show how quantification can be a mechanism of social reproduction. In 1992, the UK government began publishing school "league tables," which ranked schools based on student performance on high-stakes national exams taken at age 16. League tables facilitate making evaluative comparisons between schools regardless of geographic proximity. They also discipline households and schools to conceive of school quality in terms of test scores, which are substantially a function of the class composition of schools. Using Census data measured at the local authority level (similar to a U.S. county), McArthur & Reeves (2022) find that localities with higher performing schools experienced growth in the share of managerial/professional households following the adoption of league tables and a decline in the share of working-class households. Using longitudinal survey data, managerial/professional households were more likely to move to localities with higher ranked schools following the introduction of school league tables. The introduction of league tables contributed to social reproduction because professional/managerial households were more aware of these consumer-facing metrics and had resources to respond by moving to more expensive neighbhorhoods, near higher performing schools.

Correlation. The discussions of correlation and homophily by Chun (2021) introduce ideas salient to the analysis the Market Segment Model and College Board Geomarkets. Correlation measures the extent to which two or more variables move together. Chun (2021, p. 50) writes that "correlation grounds big data's so-called revolutionary potential. As Wired editor Chris Anderson infamously declared …, big data proved that 'correlation supersedes causation, and science can advance even without coherent models, unified theories, or really any mechanistic explanation at all.' " Predictive analytics are based on correlation and are developed in two steps. First, apply statistical techniques to previous cases (training data) in order to identify factors positively and negatively associated with an outcome of interest. Second, apply these results (e.g., regression coefficients) to future cases in order to make predictions and to assign levels of risk to each case. These models predict outcomes based on correlations without requiring knowledge about underlying causal relationships. Chun (2021) provides the example of Kosinski, Stillwell, & Graepel (2013), who develop a method to predict sensitive personal attributes (e.g., gender, political party) based on Facebook Likes.

Due to data limitations, predictive analytics often utilize "proxy" variables (Chun, 2021; O'Neil, 2016), which are variables that are correlated to a variable of interest. For example, "e-scores"

utilize proxy variables to identify "people like you" and then predict your buying behavior based on the past buying behavior of people like you. O'Neil (2016, p. 146) states that "the modelers for e-scores have to make do with trying to answer the question 'How have people like you behaved in the past?' when ideally they would ask, 'How have you behaved in the past?' " We observe similar behavior in market research about college access, when enrollment managers use 'which colleges did students near you consider' as a proxy for, 'which colleges would you consider?'

Several studies show that using correlational models make predictions reproduces structural inequality (Burrell & Fourcade, 2021). The correlations observed during the training data stage are a snapshot of relationships between variables at a particular point of time. These correlations may be a function of enduring structural inequality, but underlying causes are not considered by applications of predictive models. Reviewing scholarship about algorithms, Burrell & Fourcade (2021, p. 224) state that "predicting the future on the basis of the past threatens to reify and reproduce existing inequalities." Disproportionately targeted/excluded populations are predicted to have a higher risk of an outcome, which amplifies subsequent targeting/exclusion. This phenomenon whereby has been termed the "ratchet effect" (Harcourt, 2015) and "pernicious feedback loops" (O'Neil, 2016).[2]

Homophily. Chun (2021) argues that homophily is central to models that use correlation to predict future behavior. Homophily means that actors who share common characteristics are likely to form connections with one another, or "birds of a feather flock together." Homophily is a core assumption for network science (McPherson, Smith-Lovin, & Cook, 2001), in which actors – in this manuscript, high school students – are linked to one another through direct and indirect network ties – submitting SAT scores to the same college. Because network science models often draws from rational choice theory, they assume that homophily is the result of voluntary action by individuals, thereby "eras[ing] historical contingencies, institutional discrimination, and economic realities" (Chun, 2021, p. 95) that underlie behavior consistent with homophily. Chun (2021) problematizes the idea that homophily is a naturally occurring phenomenon. In commercial social networks (e.g., Faceboo, X, TikTok), homophily is more than an assumption; homophily is programmed into the

[2]An often cited example is the LSI-R recidivism model which predicts a prisoner's chances of re-arrest and is used by 24 states (O'Neil, 2016). Because the algorithm uses zip code as an input, people who live in highly policed neighborhoods have a higher predicted probability of being arrested, which leads to more policing in those neighborhoods, which perpetuates racialized inequality in arrests. Note that predictive models such as the LSI-R model are not merely used for social science purposes. Rather, they reproduce structural inequality because they direct the allocation of future resources based on a snapshot of historical inequality.

algorithms that create connections between users.[3]

Within the market research profession, homophily is central to geodemography and the creation of market segments. Geodemography emerged in the 1970s as a branch of market research that estimates the behavior of consumers based on where they live (Burrows & Gane, 2006). Market segments are subgroups within a larger market that have similar consumer demand. Early geodemographic classifications of consumers (e.g., PRIZM by Claritas Corporation) were derived from publicly available Census data, which disaggregated data to the zip code level. The Claritas Corporation had a financial incentive to argue that people living near one another share similar consumer preferences because geographic localities could then be categorized into market segments that would be useful for direct mail marketing campaigns (McKelvey, 2022). Later, the development of individual credit scores (e.g., FICO score) enabled merchants to classify consumers into many, fine-grained groups (M. Poon, 2007). M. Fourcade & Healy (2013) introduce the concept "classification situations" to describe the expansion of actuarial techniques to categorize customers into many, ordinally ranked groups. Merchants and lenders began tying these classifications to tiered products that targets different consumer groups with different levels of benefits and costs (Marion Fourcade & Healy, 2024).[4] Classification situations engender markets where a vertical hierarchy of products are targeted to a vertical hierarchy of consumers.

Reviewing scholarship on quantification, Berman & Hirschman (2018) argue that quantification has effects to the extent that stakeholders care about the numbers. Law school rankings (e.g., Espeland & Sauder, 2016) and school league tables (e.g., McArthur & Reeves, 2022) seem to exemplify this sort of salience. Studies of quantification in the sociology of education tend to study consumer-facing metrics.

Widely known studies of quantification in education tend to study consumer-facing quantification. To our knowledge, prior research on quantification in education has not examined how third-party market research classifies consumers. This manuscript analyzes "market segment model" (Zemsky & Oedel, 1983), which categorized high school students into vertical market segments and simul-

[3]Thus, Chun (2021, p. 82) writes, "echo chambers are not unfortunate errors, but deliberate goals" because "homophily is used to create agitated clusters of individuals whose angry similarity and overwhelming attrication to their common object of hatred both repel them from one another and glue them together."

[4]For example, "payday loans" charge high interest rates to consumer groups that were previously denied credit altogether.

taneously created local "geo-markets" that were evaluated based on their composition of student market segments. The market segment model became the basis for the College Board *Enrollment Planning Service* (EPS), which advised colleges which geo-markets to target. Noel-Levitz (1998) reports that in 1995, 37% of 4-year public universities and 49% of 4-year private universities used EPS, while 41% of 4-year publics and 16% of 4-year privates used ACT's market analysis service product, which was similar to EPS. Geo-markets later became a filter in the College Board *Student Search Service* student list product, which is utilized by the vast majority of public and private universities. Scholarship on predictive analytics (Chun, 2021; O'Neil, 2016) suggests the mechanisms by which market research reproduces structural inequality. Based on a snapshot of existing social stratification, market research matches verticially categorized consumers to vertically categorized producers, thereby amplifying the effect of initial stratification on subsequent stratification. Unlike studies like McArthur & Reeves (2022) we cannot show the effect of quantification. However, this study provides inisight about the mechanism underlying the effect. By analyzing and simulating *Student Search Service* purchases that filter on geo-markets we can show *how* the geo-markets reproduce historical class-based and race-based inequality in college access.

3 REVIEW OF EEPA 2024 PROLLY GOES IN "THE CASE"

Jaquette & Salazar (2024) deconstruct the College Board *Student Search Service* product. Selection devices are procedures or routines for making categorical decisions based on input values (Hirschman & Bosk, 2020). Student list products are selection devices that enable colleges to choose which prospective students they target or ignore based on search filters that incorporate search filters (e.g., high school graduating class, state) which enable colleges to select prospective students. "Racialized inputs" are ostensibly race-neutral inputs that are systematically correlated with race because marginalized racial/ethnic groups have historically been excluded from the input (Norris, 2021). Jaquette & Salazar (2024) argue that several frequently utilized student list filters (zip code, AP test score, SAT score) are racialized inputs. Using a national sample of high school students, and also using data from actual student lists purchased by public universities, they show that racialized search filters have a strong negative relationship with the selection of Black and Latinx prospects.

Student list products offer many geographic filters. Geographic borders are perhaps the most com-

monly studied racialized input in scholarship about algorithmic bias (Benjamin, 2019; Harcourt, 2007; O'Neil, 2016), owing to extreme racial segregation in the U.S. In addition to offering geographic filters based on known geographic borders (e.g., zip code, county, CBSA, state), the College Board created new geographic borders that subsequently became filters in the *Student Search Service*. The geodemographic segment filters utilize cluster analysis to allocate each census tract and each high school into different categories based past college enrollment and other factors (College Board, 2011). Geodemographic search filters can be read as the mimicry of corporate market logic (Thornton, 2002) in that they apply the logic and methods of commercial geodemographic market segmentation products, such as PRIZM by the Claritas Corporation (McKelvey, 2022), to the case of college recruiting.

Geomarket search filters, the focus of this manuscript, slice states and metropolitan areas into smaller, local recruiting markets. For example, geomarket "CA08" refers to "Alameda Country excluding Oakland." A university might purchase prospect contact information by filtering on this geographic region in combination with additional filters, such as year of high school graduation and SAT test score. When we initiated this manuscript, we asked ourselves, "where did geomarket filters come from?" The answer surprised us. We had imagined ourselves studying the application of the "data science revolution" to college recruiting, but it turned out we were studying the 1970s and 1980s! The Market Segment Model and geomarkets can be read as the application of social science research methods to "capture and quantify the phenomenon behind the folklore" (Zemsky & Oedel, 1983, p. 11) of college admissions officers. This work, comissioned by College Board, was subsequently turned into a market research tool – The College Board Enrollment Planning Service – that helps colleges decide where to look for prospective students.

4 The Market Segment Model and College Board Geomarkets

As a member organization, several College Board products developed from joint collaborations with administrators or professors from member institutions. During the 1970s, under the leadership of Larry Litten, then director of institutional research, Carleton College pionered applying market research to student recruiting. In the late 1970s, College Board provided Carleton College with funding and data for a six-year project that analyzed college choice decisions by households in six

metropolitan areas. This project was the basis for the landmark book *Applying Market Research in College Admissions* (Litten et al., 1983), published by College Board, and was the basis for the College Board Admitted Student Questionnaire (ASQ), a revenue-generating product that provides colleges with information about admitted students – those who enrolled and who did not enroll. Litten would later become Associate Director of the Consortium of Financing Higher Education (COFHE), a consortium of 30 selective private universities founded in the mid-1970s.

In 1978, Robert Zemsky, a University of Pennsylvania professor, was asked by the President to figure out, " 'Who thinks about Penn?' " and " 'What other institutions do they think about when they think about us?" (Zemsky & Oedel, 1983, p. x). To answer these questions, Zemsky began working with the Market Research Committee of the Consortium on Financing Higher Education (COFHE). As the project project became more ambitious, the researchers reached out to College Board because "we needed a database that described most institutions and most students…Coincidentally, the Board was reviewing its own efforts to help colleges estimate their enrollment potential, efforts which had faltered largely because the smallest demographic unit used in tehse analyses was the state' (Zemsky & Oedel, 1983, p. x). In 1979, College Board began providing data and funding for what became the *Comprehensive Undergraduate Enrollment Planning Project (CUEPP)*.[5] Zemsky & Oedel (1983, p. 4) write that,

> For our analysis, we sought not a complex mathematical model, but a straightforward classification system that would track the pattern of SAT-score submissions to create a map of student choice. The Market Segment model that we developed was nothing more than a set of simple rules for disaggregating high school seniors into similar groups. The model worked because students, once so disaggregated, appeared to behave in remarkably consistent ways.

Creating the Market Segment Model. Considering the Espeland & Stephens (2008) [p. 402] definition of quantification as "the production and communication of numbers," the Market Segment Model is an effort to quantify and communicate the knowledge that admissions officers have about student demand. Zemsky & Oedel (1983, p. 4) state that "our initial task was to define enrollment markets in a manner consistent with admissions officers' intuitive understanding of student pools."

[5] say that Pennsylvania Department of Education was also a partner; see page x of Zemsky

They created "three types of boundaries" (Zemsky & Oedel, 1983, p. 11), region, state, and community. The three regions were New England, Middle States, and the South. Next, "we divided each state into as few as two and as many as thirty community-based enrollment markets or pools, for a total of 143 separate markets" [in New England, Middle States, and the South].

These enrollment markets, later called "geomarkets" by the College Board Enrollment Planning Service were intended to be consistent with the conception of a catchment market from the perspective of admissions counselors. We know little about how geomarkets were created. Zemsky & Oedel (1983) write that,

> In many cases, the market boundaries match formal political and educational divisions, reflecting natural channels of communication. Each major metropolitan area is composed of several markets, usually corresponding to the inner city, a first ring of suburbs, and an outer ring of suburbs. In more sparsely populated areas, communities are sometimes combined in order to make the analysis meaningful."

Having defined these geographic boundaries, high school students were categorized into one of four different *market segments* – local, in-state, regional, and national – based on SAT score-sending behavior. Each institution a student sends SAT scores to can be defined as "local" (institution is in the same local market that the student lives in), "in-state" (same state but different local market), "regional" (same region but different state), or "national." In turn, a "local" student submits more SAT scores to local institutions than they do to in-state, regional, or national institutions. An "in-state" student submits more SAT scores to in-state institutions than they do to local, regional, or national institutions, etc.

The two primary outputs of the market segment model are the (1) Market Segment Profile and (2) the Institutional Profile. The Market Segment Profile, which was produced separately for each of the 143 geo-markets, provides information about the number and characteristics of students in each market segment. Table 1 reproduces a partial, simplified version of the bottom panel of Zemsky & Oedel (1983, fig. 2.1) which represents the Market Segment Profile for "Connecticut Market 3: Fairfield County." Table 1 has separate columns for each market segment (local, in-state, regional, national) and rows show the number of test-takers and characteristics of test-takers. For example,

there were 550 "local" students in Fairfield county and these students submitted SAT scores to 2.8 postsecondary institutions on average. By contrast, there were 1,664 "regional" students who submitted test scores to 4.8 institutions on average. For local students, 11.2% had family income greater than $35,000 and 9% had both parents with a BA. For regional students, 41.9% had family income greater than $35,000 and 34.0% had both parents with a BA. Each Market Segment Profile also present information about the institutions that students from each segment sent scores to.[6]

INSERT Table 1 ABOUT HERE

The *Institutional Profile* describes students who send scores to a particular institution and which majors these students are interested in. For each institution, institutional profiles are created separately for students from a particular local market, for all students in a state, or all students in a region. Table 2 reproduces a partial, simplified version of Zemsky & Oedel (1983, fig. 2.3), the institutional profile of an anonymous institution for students from Fairfield County, CT. Table 2 shows that 58 in-state students submitted SAT scores to the institution. These 58 students represented 4.8% of the total 1,199 in-state students from Fairfield County. 69 regional students sent scores to the institution, representing 4.1% of all 1,664 regional test-takers. Of these 69 regional students, 35 expressed interest in majoring in the liberal arts. These 35 students represent 7.0% of all regional students from Fairfield County who expressed interest in the liberal arts.

INSERT Table 2 ABOUT HERE

Zemsky & Oedel (1983) argue that the Institutional Profile and the Market Segment Profile enable admissions officers to know where to look for students and which institutions are competing for those students (p. 25):

> The Institutional Profile and the Market Segment Profile quantify the admission officers' intuitive grasp of market structure. Structure here carries a dual meaning, connoting both the structure of student choice and the structure of institutional competition…This two-sided interpretation furnishes the essential framework for planning by individual colleges and universities…To draw effectively on its own natural constituency, a college not

[6]Table 3 recreates the top panel of Zemsky & Oedel (1983, fig. 2.1) for the Fairfield County, CT local market. For example, of the 550 local students, 277 (50.4%) sent scores to institution #1, which was a private master's granting institution. Of the 1,199 in-state students, 757 (63.1) sent scores to institution #1, a public doctoral granting institution, and 515 (43.0%) sent scores to institution #2, a public master's granting institution.

> only must contact the "right" kind of students — that is, students who are predisposed toward that type of institution – but also must persuade them of its special character. This means knowing the competition as well as the clientele.

Correlations. Chapter 3 of Zemsky & Oedel (1983) – "A Sense of Place: Students, Families, and Communities" – identifies the student characteristics associated with being in the local, in-state, regional, or national market segment and examines the extent to which these relationships hold across states and local markets. The analyses identify four variables – educational aspirations, parental education, scholastic aptitude, and family income – that predict score sending behavior, both individually and in combination. (Zemsky & Oedel, 1983, p. 33) state that these four variables "reflect the basic social patterns of the nation. It would have been surprising if these were not the four social variables that best explained the patterns of college choice."

Zemsky & Oedel (1983) summarize their correlational analyses using authoritative language. Zemsky & Oedel (1983) [pp. 34-35] asserts, "it is hard to overemphasize the importance of this statistical pattern. Social data seldom line up as we expect …The information derived from the Market Segment Model, however, is a remarkably ordered set of data, consistent in its relationships, that reflects the basic social and economic patterning associated with the structure of college choice." With respect to family income, Zemsky & Oedel (1983, p. 33) state that "these data allow us to say with considerable confidence that local and in-state students are not likely to come from families in which both parents have received college educations" and "the implication is simply that college-educated parents instill in their children more wide-ranging educational aspirations." Commenting on family income, Zemsky & Oedel (1983, p. 33) write that "we could predict that all local students would come from moderate-income or low-income families and be wrong only 5.5 percent of the time." Further analyses reveal that the SAT score is the most important predictor of score-sending behavior, followed by parental education, family income, and educational aspirations. Considering prior research showing that SAT scores are substantially a function of social origin (Sewell & Shah, 1967), the Market Segment Model implicitly and explicitly states that student demand for higher education is mostly a function of social origin. Zemsky & Oedel (1983) also find that the SAT score, parental education, and family income predict student score-sending behavior at the local geo-market level.

However, geomarkets differ in the relative abundance of students with particular socioeconomic characteristics and this has practical implications for recruiting. Zemsky & Oedel (1983) recommend that colleges target geo-markets with desirable compositions of socioeconomic characteristics and student market segment. Zemsky & Oedel (1983, p. 44) describes a hypothetical college that wants to target regional and national students in New England and is considering whether to expend limited recruiting efforts in the Boston geo-market – which was relatively low-income in 1980 – or in more affluent geo-markets nearby:

> Where would you concentrate your energies? Ideally, you would seek communities with a high proportion of students already predisposed toward institutions such as your own. The Market Segment Model would provide this information through segment percentages for the community in question. Further classification of students by social attributes allows you to identify a group for mailings or recruiting…If you were to recruit in Boston, only about two out of every ten students with fewer than two attributes would likely listen, while slightly less than half of the students with two or more attributes would be receptive…. Your efforts would surely be better directed toward three of the four communities in the bottom band, Manchester, Hartford, and Fairfield County. Simply by knowing a little bit about the students' backgrounds and academic records you could quickly focus your attention on those most likely to consider your kind of institution. Indeed, in Fairfield County alone you could reach more than 40 percent of your "primary target" population – that is, students with a greater than 75-percent probability of concentrating their college choices among institutions like your own."

EPS and College Board Geomarkets. In 1984, College Board created the Enrollment Planning Service (EPS) based on the Market Segment Model (College Board, 2012; Takamiya, 2005). Each institution purchasing EPS information services would obtain access to the Market Segment Report for each local market. They also received the Institutional Profile – their own and that of competitors – for each local market. Promotional material highlights the themes of "locate the students you want" (Board, 2003) and "focus your valuable time and resources on the right prospects" (College Board, 2005). College Board (2010) promotional material describes EPS as:

> the analysis tool that pinpoints the schools and geomarkets where your best prospects

> are most likely to be found. You can research your existing (or new) markets using selection criteria and locate your top prospects in various ways – by states, geomarkets, counties, Zip codes, high schools and international regions. EPS provides you with comprehensive reports on your markets, your position in those markets, and your copetition."

Whereas Zemsky & Oedel (1983, Appendices B1-B3) identified 143 geo-markets covering the New England, Middle States, and South region, EPS created geo-markets for the remaining U.S. states, with 304 geo-markets in total. College Board (2023) shows the College Board geo-markets circa 2023. Interestingly, the geo-markets for New England, Middle States, and the South remain nearly identical to those developed by Zemsky & Oedel (1983). Concrete information about how EPS created the remaining geomarkets is elusive. Documentation and promotional material suggests that geomarket borders were chosen based on a combination of formal geographic borders (e.g., counties) as well as proprietary College Board data designed to identify geographic areas with different college-going behaviors.[7]

Although how we lack clarity about how geomarkets were created, we expect substantial socioeconomic inequality between geomarkets in large metropolitan areas. Given the extent of class- and race-based residential segregation in the U.S., it would be surprising to not observe such inequality. Additionally, Zemsky & Oedel (1983) created geomarkets in service of the Market Segment Model. The Market Segment Model argues that socioeconomic status drives whether students belong to the local, in-state, regional, or national market segment. In turn, geomarkets are described by the relative numbers of local, in-state, regional, or national students, which is substantially a function of socioeconomic status. The language of Zemsky & Oedel (1983, pp. 11–12, quoted above) suggests that geomarket borders within large metropolitan areas may have been drawn in ways that separate affluent from less affluent communities. We present the following hypothesis:

H1. In large metropolitan areas that contain multiple geomarkets, we expect significant socioeconomic inequality (e.g., income, parental education) between geomarkets.

[7] Board (n.d.) states that "geomarkets are areas within a state that represent a further segmentation of a population. Students from California don't all share the same college-going behaviors. We have accounted for this variance by segmenting the 50 states into 304 geomarkets to provide further insight into student behaviors within particular areas of individual states."

We expect substantial racial inequality between geomarkets in large metropolitan areas for several reasons. Interestingly, the Market Segment Model is explicitly based on socioeconomic stratification, but Zemsky & Oedel (1983) do not mention race once. However, U.S. cities are characterized be extreme historic and contemporary residential racial segregation (Korver-Glenn, 2022; Rothstein, 2017). Structures built upon racialized structures are racialized structures. Chun (2021) argues that unless designers intentionally consider racial segregation, selection devices that categorize people based on geographic location are likely to reproduce historical race-based inequality in opportunity. Second, geomarket borders may have been drawn along class divides. There is a strong correlation between race and wealth (Kraus, Onyeador, Daumeyer, Rucker, & Richeson, 2019). Third, geomarket borders may have been drawn in a way that follows the countours of racial segregation in residential housing. Examples include: the "South and South Central Los Angeles" geomarket (CA21); the "City of Oakland" geomarket (CA07), which is surrounded by the "Alameda County excluding Oakland" geomarket (CA08); and the "Wayne County Detroit" geomarket (MI01), which is surrounded by the "Detroit's Northern Suburbs" (MI02) and "Ann Arbor" (MI03) geomarkets. Although these arguments are speculative, the extent of racial inequality between geomarkets can be assessed empirically. We present the following hypothesis:

H2. In large metropolitan areas that contain multiple geomarkets, we expect significant racial inequality (e.g., income, parental education) between geomarkets.

We argue that the Market Segment Model, geomarkets, and their commodification within EPS exemplify concerns about the application of correlational analysis. The data on 1980 SAT score-sending behavior analyzed by Zemsky & Oedel (1983) can be conceived as training data. These training data were used to define geomarkets (e.g., how many geomarkets in a metropolitan area is partially a function of the number of test-takers) and to identify student characteristics associated with the local, in-state, regional, and national market segments. These analyses found that student demand for different kinds of colleges was largely a function of social origin, and that student demand within a geo-market was largely a function of the class composition of the geo-market. However, Zemsky & Oedel (1983) did not interrogate the historical and contemporary structural inequalities that produced observed patterns of social stratification. Instead, the Market Segment Model encouraged colleges to use this snapshot of student demand as the basis for future decisions

about which communities and prospective students should be targeted by college recruiting campaigns. This process exeemplifies the "ratchet effect" (Harcourt, 2015) and "pernicious feedback loops" (O'Neil, 2016) whereby predicting the behavior of future individuals based on the behavior of past individuals "threatens to reify and reporduce existing inequalities" (Burrell & Fourcade, 2021, p. 224). This process also exemplifies concerns about proxy variables whereby selective colleges view privileged social class as a proxy for desirable students and this creates an incentive to focus recruiting efforts on communities that have these characteristics. Zemsky & Oedel (1983, p. 44) corroborates these concerns:

> On occasion, senior spokespersons for the profession worry that students outside the main market areas remain forgotten and hence, unchallenged. Inevitably, the increasing competition for students, the expense of travel and mailings, and internal political constraints compel institutions to concentrate their efforts where they will do the most good. The result is a natural reinforcing of the basic socioeconomic patterns that gave shape in the first place to the structure of college choice.

Homophily and Utilization. *The Company We Keep: Colleges and Their Competition* (Zemsky & Oedel, 1983, Chapter 4) shows that homophily is a core tenet of the Market Segment Model. The authors conduct a social network analysis that defines two institutions as being in competition with one another if at least 15% of students who sent SAT scores to one institution also sent scores to the other institution and vice-versa.[8] Zemsky & Oedel (1983, p. 42) sate, "we draw a fundamental conclusion about the structure of college choice: collegiate competition occurs principally between like institutions."[9] Subsequent analyses investigate the tuition price and socioeconomic composition of institutions in competition with one another. Private selective colleges and private flagship universities compete directly for students, charge the highest prices, and enroll students with the highest socioeconomic status. Zemsky & Oedel (1983, p. 72) describe these patterns as a natural

[8] We can think of students sending SAT scores to colleges as a "two-mode" social network in which students (mode 1) send SAT scores – the network tie – to colleges (mode 2). Next, the authors develop "Tinker Toy" diagrams that show which institutions are connected to one another. These diagrams are drawn separately for each student segment – local, in-state, regional, and national – and separately for each geomarket, such that the analyses convey which institutions compete with one another for which student segments in each local market.

[9] For example, describing the Figure 4.4 "Structure of Fairfield County Regional Market," (Zemsky & Oedel, 1983, p. 54) state that "competitive overlap, moreover, is often confined to institutions belonging to the same [Carnegie] type as well sector. For example, public flagships compete primarily with other public flagships; private standard colleges, with other private standard colleges; Catholic institutions, with other Catholic institutions."

process of homophily in which a vertical socioeconomic hierarchy of students is matched to a vertical hierarchy of universities:

> We now know why students so seldom speak of their own social or family backgrounds in explaining how they go about choosing a college. They have no need to. Students describe themselves socially simply by telling us the colleges and universities in which they are interested. The layering of collegiate competition is primarily a socioeconomic layering. The hierarchical structure of collegiate competition largely reflects the stratified social and economic dimensions of the communities from which colleges draw their students. Competition among colleges, as admissions officers have told us for so long, is in fact, a matter of keeping company with one's peers.

Although this perspective is broadly consistent with mid-20th Century scholarship on social mobility (Blau & Duncan, 1967; Sewell & Shah, 1967), the Market Segment Model was the basis for the EPS market research product. Later, geomarkets were incorporated into the *Student Search Service* student list product. Commodification of the Market Segment Model "engineers homophily" (Chun, 2021) by taking a snapshot of existing stratification and then recommending that colleges utilize this snapshot as the basis for decisions about where to concentrate recruiting efforts. Zemsky & Oedel (1983, p. 58) states that "correlations, do not simply predict actions; they also form them." In itself, the Market Segment Model is simply a stylized depiction [HIRSCHMAN 2016 STYLIZED FACTS] of the structure of college choice, one that does not consider class-based and race-based structures that produced these patterns. Once the College Board inscribed the Market Segment Model into the EPS and Student Search Service Products, these products are likely to amplify the effect of historic structural inequalities on future opportunity structure by encouraging colleges to pursue local markets – and student segments within these local markets – in ways that are consistent with the patterns observed by Zemsky & Oedel (1983).

Utilization of the Market Segment Model and geomarkets within the Enrollment Planning Service (EPS) raises concerns related to the quantification themes of reactivity, discipline, and authority introduced (Espeland & Stephens, 2008). Berman & Hirschman (2018) argue that quantification has effects to the extent that stakeholders care about the numbers. Although EPS is a business-facing rather than a consumer-facing product, it has been a highly salient one. Noel-Levitz (1998)

reports that in 1995, 37% of 4-year publics and 49% of 4-year privates used EPS, while 41% of 4-year publics and 16% of 4-year privates used ACT's market analysis service product. We suggest that EPS disciplines colleges to approach recruiting in a manner consistent with the Market Segment Model. Colleges are encouraged to, first, choose geomarkets with a high number of desirable prospects and, second, plan recruiting efforts within selected geomarkets. Under the principle of homophily, selective colleges should target geomarkets with large numbers of affluent, college educated households, while low-income communities are left to local four-year and community colleges. Consistent with this perspective, EPS software documentation from Oracle (n.d.) describes how geomarkets – here, called "EPS market codes" – can be utlized:

> EPS™ (Enrollment Planning Service) is a geographic and demographic data service offered annually by the College Board to Colleges and Universities. EPS provides information to subscribing institutions about competitors, feeder schools, and demographic strengths and weaknesses. EPS market codes are proprietary market codes owned by the College Board and are used to categorize external organizations and people into geographical areas, mostly in the United States. Some admissions offices use EPS market codes to focus their recruiting efforts in geographic areas in which they believe they will be the most successful.

EPS may also weaken the authority of local decision-makers. The Market Segment model sought to develop a concrete, data-driven framework that replicated the aggregate knowledge of local admissions officers (Zemsky & Oedel, 1983). Once this knowledge is quantified and commodified into a product stored on a CD-ROM, the local expertise of admissions officers becomes less valuable. The EPS product increases the ability of a college admissions leader – working with College Board staff or an enrollment management consultant – to plan recruiting efforts centrally. In turn, admissions officers are relegated to a foot-soldier implementation role rather than being sought out for their local expertise about student demand.

Finally, we suggest that utilization of geomarket filters within the Student Search Service product is likely to amplify class-based and race-based disparities in college opportunity. In contrast to standardized selection devices (e.g., the FICO score algorithm), student list products are discretionary selection devices in that colleges have discretion of which filters they elect to select prospects. Com-

pared to standardized selection devices, scholars tend to find that administrative discretion over selection devices causes structural inequality to increase (Castilla, 2008; Cotter, Medeiros, Pak, & Thorson, 2021; Norris, 2022). Even in the absence of explicit or implicit bias, discretionary selection devices can increase racial inequality when decision-makers have incomplete knowledge about how the inputs they choose are correlated with race. For example, research shows that Americans dramatically underestimate the magnitude of racial income inequality (Kraus et al., 2019). As such, discretionary selection devices are particularly sensitive to inputs that are correlated with race but are perceived to be race-neutral.

Geomarkets are opaque in that geomarket borders may be unclear to someone purchasing student lists and very few people know how these borders were created. O'Neil (2016) argues that opacity in algorithmic products is intentional and is a core criterion of "weapons of math destruction." Enrollment management professionals utilizing EPS and *Student Search Service* may interpret geomarkets as a race-neutral recruiting tool. When purchasing student lists, Zemsky & Oedel (1983, p. X) suggest that affluent colleges should consider targeting affluent geomarkets. Student list purchases do not show how the characteristics of targeted prospects compare to the characteristics of the surrounding community. From this perspective, racial inequality from the use of geomarkets in student list purchases may be the unintentional result of using a seemingly race-neutral product. Furthermore, purchases that specify multiple filters (e.g., test scores, grades, intended major) including geomarkets can yield unintended racial inequality because administrators have incomplete knowledge about how the intersection of these filters interact with local patterns of segregation.

5 Methods

Below, we use simulations and actual student list purchases that filtered on geomarkets. In purchases that filtered on test-score and/or GPA thresholds, we can simluate who would be included and excluded had certain geo-markets were been selected. In purchases that filter on geomarkets, we can get an initial sense of who is included in geomarkets targeted by regional state colleges versus research universities.

6 Discussion

In their analysis of quantifying school quality in England, McArthur & Reeves (2022, p. 517) observe that "one problem with school league tables …is that the measures of school quality often merely reflect the social origins of those who attend a particular school." Similarly, considering prior research showing that SAT scores are substantially a function of social origin (Sewell & Shah, 1967), the Market Segment Model argues that student demand for higher education is mostly a function of social origin.

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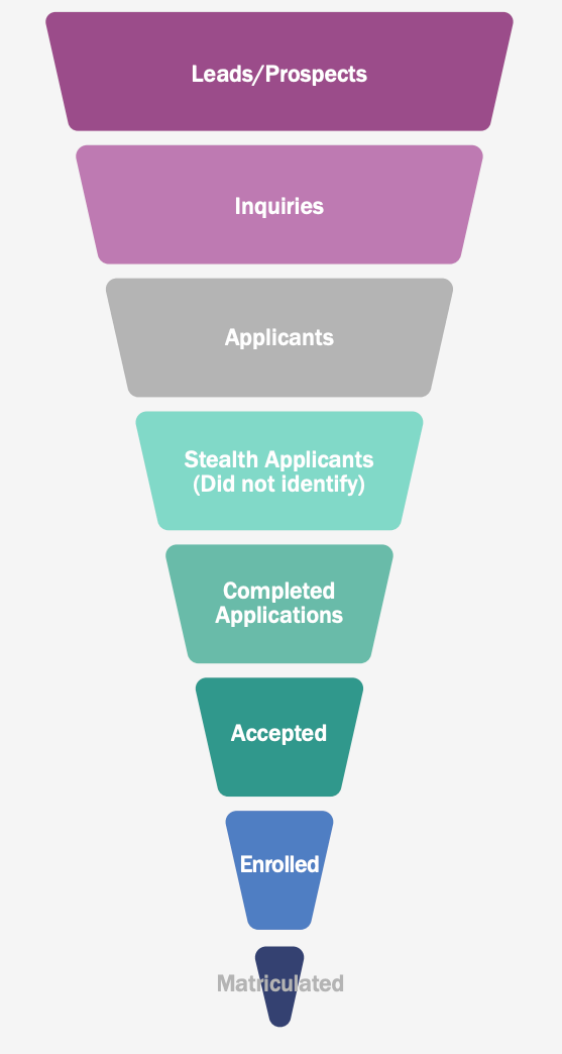

Figure 1: The Enrollment Funnel

Table 1: Simplified market segment profile, Connecticut Market 3: Fairfield County

Characteristic	Local	In-state	Regional	National
Total test takers	550.0	1199.0	1664.0	3766.0
Avg SAT (verbal + math)	770.0	850.0	970.0	980.0
Avg # scores sent per test taker	2.8	3.5	4.8	5.3
Percent in top 20% of HS class	27.8	26.1	44.7	45.7
Percent aspiring to more than BA	30.6	41.5	54.5	62.2
Percent family income more than $35,000	11.2	20.6	41.9	43.0
Percent both parents with BA	9.0	16.3	34.0	37.1

Table 2: Simplified sample institutional profile for anonymous institution, students from Connecticut Market 3: Fairfield County

	Local	In-state	Regional	National	Total
Total number of scores received	1.0	58.0	69.0	109.0	237.0
Pct of all test-takers in segment	0.2	4.8	4.1	2.9	3.3
lib_arts_num	0.0	25.0	35.0	61.0	121.0
lib_arts_share	0.0	8.4	7.0	5.3	5.9
engineering_num	0.0	2.0	5.0	3.0	10.0
engineering_share	0.0	3.0	5.8	0.8	1.8

Table 3: Top 5 institutions in terms of number of scores sent by segment, Connecticut Market 3: Fairfield County

	Local (N=550)			In-state (N=1,199)			Regional (N=1,664)			National (N=3,766)		
	Num	Pct	Type	Num	Pct	Type	Num	Pct	Type	Num	Pct	Type
1	277	50.4	priv ma	757	63.1	pub doct	610	36.7	pub doct	1226	32.6	pub doc
2	261	47.5	priv ma	515	43.0	pub ma	348	20.9	priv doct	371	9.9	priv doct
3	183	33.3	priv ma	438	36.5	pub ma	272	16.3	priv doct	327	8.7	priv res
4	103	18.7	pub doct	183	15.3	pub ma	248	14.9	pub doct	312	8.3	priv doct
5	100	18.2	pub ma	177	14.8	pub ma	197	11.8	pub doct	308	8.2	priv doct