Student Responsiveness to Earnings Data in the College Scorecard

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Abstract

Using the universe of SAT score sends to colleges and the exact date on which these scores are sent, we estimate how students respond to release of the U.S. Department of Education’s College Scorecard in September 2015. We find that data on annual cost and graduation rate, both of which were previously available, did not impact the volume of score sends received by colleges. By contrast, we estimate that each 10 percent increase in earnings results in a 2.4 percent increase in score sends. The impact is driven almost entirely by well-resourced high schools and students.

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1. Introduction

On September 12th 2015, the federal government released the new College Scorecard (henceforth referred to as the Scorecard). This initiative, crafted by the Obama administration, was a direct response to greater pushes for accountability among institutions of higher education. Over a two year period, partners from White House’s Council of Economic Advisers, the Domestic Policy Council, Office of Management and Budget, the U.S. Digital Service, the Department of Education, and the Department of the Treasury combined data sources and resources to develop the Scorecard. The publicly available data files created by these entities contain hundreds of pieces of data for thousands of postsecondary institutions; however, these data are trimmed and distilled into three main pieces of information that are relayed through infographics on a college’s Scorecard: “Average Annual Cost”, “Graduation Rate” and “Salary After Attending.”2 Prior to its release, information on annual cost and graduation rates were available through several well-known and well-traveled sources, including College Navigator, Big Future, and US News and World Report, and a preliminary version of the Scorecard, without college-specific median earnings.

Though the media and policy worlds were abuzz after the Scorecard release, it was unclear whether the Scorecard had the potential to influence student decisions. In other contexts, ranging from basic goods like breakfast cereal (Ippolito and Mathios, 1990) to much more complicated and essential services like health insurance plans (Scanlon et al., 2002), quality disclosure impacts consumers’ purchasing decisions.3 In the educational context, consumers demonstrate responsiveness to the quality disclosure of primary and secondary school data, as demonstrated

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2 An example infographic can be seen in Appendix Figure 1.
3 We use the word “quality” to be consistent with the economics literature on “quality disclosure.” We recognize that college quality cannot be captured by a few metrics; that some metrics may be driven entirely by selection and do not represent value-added of the college.
in school choice (e.g., Hasting and Weinstein, 2008) and housing prices (Figlio and Lucas, 2004), and consumers also respond to college quality data through rankings (e.g. Luca and Smith, 2013) and informational interventions (e.g. Hoxby and Turner, 2013).4

In this particular context- after a monumental disclosure of college quality by the federal government- there are several reasons to believe that students would respond to these data. First and foremost, the median earnings represent novel data that students might use to estimate their own earnings potential from attending different postsecondary institutions. There is ample evidence demonstrating that students generally lack the ability to estimate the earnings from different educational pathways (Betts, 1996; Arcidiacono, Hotz, and Kang, 2012; Wiswall and Zafar, 2015; Baker et al., 2016) and so the provision of the earnings data may afford them the opportunity to adjust their prior beliefs.5,6 Second, the Scorecard was created with an eye towards user-friendliness, and may be more salient and digestible to students than previously available information. Students tend to rely on heuristics and simplifying rules of thumb in the college application process (e.g. Smith and Luca, 2013; Pallais, 2015) and the Scorecard’s whittling down of countless elements of college data into just three metrics may simplify the decision process for students. Finally, consumers of higher education might put more faith in the Scorecard data because these data come directly from the federal government rather than an independent third party.7

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4 Research on quality disclosure in education often focuses on accountability or the supply side- how schools respond to the disclosure of information about the schools. Examples include Carnoy and Loeb (2002), Hanushek and Raymond (2004), Jacob (2005), Peterson and West (2003), Haney (2000), Cullen and Reback (2006), and Figlio and Getzler (2006).

5 Wiswall and Zafar (2015) use an informational experiment and show that students are willing to change their majors with access to more precise information on returns to each major.

6 Prior beliefs may include data on earnings by a select number of institutions. For example, Texas publicizes earnings for its public four-year campuses on SeekUT and California does so for its public two-year colleges on SalarySurfer.

7 This could also have the opposite effect. Dranove and Jin (2010) discuss the merits of disclosure from regulators versus third-party certifiers.
On the other hand, there are several reasons the Scorecard may not influence student decisions. First, the Scorecard might simply represent one more addition to the vast amount of information about college quality already available to students, therefore having minimal impact on decisions about where to apply. Second, the government had many choices about how to implement and present the Scorecard data, but each small decision has the potential to impact usage and responsiveness. For example, the decision of which metrics to include can impact consumer responsiveness (Scanlon, et al., 2002; Pope, 2009; Dafny and Dranove, 2008), such that including earnings 5 years or 20 years after enrollment may evoke different responses compared to the Scorecard’s data, which presents earnings 10 years after enrollment. Similarly, timing of disclosure has been shown to impact consumer responsiveness (Della Vigna and Pollet, 2009), and whether a September 12th release date, which coincided with the beginning of the school year, was timed properly to garner enough attention from the media or students is an open question. Finally, even if students have preferences for the metrics presented on the Scorecard, they may lack awareness of the Scorecard or not have enough time to access these data, which may be particularly true for traditionally underserved students (e.g. Haskins, Holzer and Lerman, 2009; Dettling, et al. 2015).

Whether students respond to the release of the Scorecard data is an empirical question that we seek to answer. To accomplish this, we harness data on the timing and volume of official SAT score sends (a measure of student interest in a college and a proxy for an application) to 1,600 four-year postsecondary institutions with complete Scorecard data. Our sample includes nearly 36 million score sends from all SAT takers in the 2010 through 2016 high school graduation cohorts.
Our identification relies on the sudden release of the Scorecard data on September 12th, 2015. Using this information shock, one could simply employ a differences-in-differences identification strategy to determine whether colleges with relatively favorable Scorecard metrics receive more Score Sends. Our estimation strategy goes one step further and exploits the exact date on which score sends are ordered by students to account for college-cohort specific trends. Specifically, for each cohort of students, we separate out score sends to each of these 1600 colleges into two distinct periods — those ordered by students before September 12th of the students’ senior years and those ordered on September 12th or later. Aggregating score sends at the college-cohort-period level (14 data points per college, from the two periods in each of the seven cohorts), we can estimate a model akin to a triple-difference approach and determine whether colleges with better quality measures in the Scorecard receive more score sends, using the pre-September 12th score sends to account for any college-cohort specific trends.

Our primary analyses yield two main findings. First, we find that the release of the Scorecard’s average annual cost and graduation rate — pieces of information that were previously available — did not influence the volume of SAT score sends. This is consistent with previous work on quality disclosure whereby consumers’ responses are partially determined by previously known information (Dafny and Dranove, 2008). Second, and by contrast, we find that a 10 percent increase in a college’s median earnings presented on the Scorecard led to a 2.4 percent increase in SAT score send volume. To put this estimate of choice elasticity with respect to earnings in context, the average “median earnings” across colleges is approximately $50,000 and the standard deviation is $9,000. For the average sampled college, a one standard deviation in median earnings translates into approximately 150 additional score sends (4.3 percent

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8 We cannot rule out that the information was not previously known and students simply do not have strong preferences for these metrics. There is ample evidence that students do not have full information when deciding on colleges (e.g. Dillon and Smith, 2013).
increase). To larger and more selective colleges, both of which receive many more score sends and tend to attract students most likely to pay attention to the Scorecard data, the impact of higher earnings can translate into many hundreds of score sends. These magnitudes are both meaningful to the colleges and are larger than estimated elasticities in related contexts.\footnote{Beffy et al. (2012) find a major choice elasticity with respect to earnings of around 0.10.}

Next, we investigate the characteristics of students and high schools that are driving the main findings. Such heterogeneity in responsiveness might result from different preferences for the Scorecard elements, differences in Scorecard awareness, and differences in prior beliefs on college quality. We find that, among private high school students, SAT score sends to colleges increased by nearly 4.1 percent for each 10 percent increase in a college’s median earnings. Across all public and charter high schools, responsiveness to the median earnings information is smaller in magnitude — 1.5 to 1.8 percent increases for a 10 percent increase in median earnings — and is not statistically significant at conventional levels. Average effects conceal the fact that students from more affluent public high schools (i.e. those with the lowest fraction of students receiving free/reduced price lunch) responded to the Scorecard by sending more SAT score sends to colleges with higher median earnings. These two findings are consistent with the literature documenting that under-resourced students are more likely to make sub-optimal college choices compared to academically comparable well-resourced students (e.g. Hoxby and Avery, 2012; Hoxby and Turner, 2015; Smith, Pender, and Howell, 2013). We also find that the response to Scorecard earnings data is much stronger for students with SAT scores of at least 1100 and for Asian and white students (but not black and Hispanic students). Finally, we show that responsiveness to the median earnings is strongest during the period coinciding with college application deadlines, when students send SAT scores to colleges to satisfy college application requirements.
This study stands at the intersection of two strands of research— that of quality disclosure and college choice. An overview of the quality disclosure literature, both theoretical and empirical work, is discussed extensively in Dranove and Jin (2010). The authors put forth the fundamental questions of quality disclosure, which includes accountability, whereas our paper is a testing ground for many of the theoretical issues on consumer responsiveness, such as impact of prior beliefs and heterogeneous impacts, with the additional virtue of existing as a critical policy issue.

The other literature, college choice, is too long and too varied to discuss in full but the most relevant work to our analyses is that which involves responsiveness to college quality and information. Long (2004) documents the growing importance of college quality on college choice as well as the changing student responsiveness to college pricing. Hoxby (2009) shows the increasing higher education stratification since the 1960s, in which higher-achieving students are increasingly gravitating to the most-selective and best-resourced colleges. In an analysis of 50 years of college choice, Kinzie et al. (2004) suggest that the democratization of information through various college guidebooks and college rankings played an influential role in shaping how students approach the college choice process in the 21st century. There are also numerous recent efforts to close the information gap between under-resourced and well-resourced students through a variety of information experiments (e.g., Hoxby and Turner, 2015). Additional research demonstrates the extent to which measures of college quality, specifically college rankings, influence student decision-making (Monks and Ehrenberg, 1999; Bowman and Bastedo, 2009; Smith and Luca; 2013; Alter and Reback, 2014). Our study adds to these papers by demonstrating how a government agency, not the market, can influence college choice through the provision of college quality metrics.
This rest of this paper proceeds as follows. Section 2 discusses the College Board and College Scorecard data, along with some descriptive statistics and the research methodology. Section 3 shows the main results, along with several robustness tests. Section 4 shows how the results differ by timing of score sends and high school and student characteristics. Section 5 concludes with some remarks on the potential benefits and costs of disclosing earnings data and more general policy on providing students with information.

2. **Data and Methodology**

2.1. **SAT and Score Sends**

We access administrative data on all SAT takers in the graduating high school cohorts of 2010-2016. For each of the approximately 1.7 million SAT takers in each cohort, we observe student SAT scores, which consist of a critical reading, math, and writing section that are each scored on a 200 to 800 point scale. College Board data also include the identity of the student’s high school, and whether the high school is classified as a public, private, or charter high school. For students attending public or charter high schools, we append data from the 2013-2014 Common Core of Data (CCD), which provides information on the racial/ethnic composition of the student body as well as the fraction of students eligible to receive free or reduced price lunch.

We also utilize rich data from the College Board on all colleges to which students sent their SAT scores (score sends). In addition to college identity, we know the exact date on which the student ordered the score to be sent. These two critical pieces of information on score sends allow us to exploit the timing of the Scorecard release to draw causal inferences about how the three prominent Scorecard elements shifted student demand for colleges. The score sends represent official documentation of a student’s SAT score, which most traditional four-year
colleges require as a part of the college application process. College entrance exam score sends are generally considered proxies for college applications (Card and Krueger, 2005; Pallais, 2015). Though not all score sends materialize into college applications, they are, at the very least, a good indicator of the colleges the student is considering (Smith, 2016). Under the College Board’s current score send policy, students receive four free score sends with each test registration, which must be used within 10 days of the exam date.\textsuperscript{10} Score sends are typically either sent when students register for exams, but also after the 10 day window, when students are completing college applications in the fall of their high school senior years. The college identity piece of the score sends allows us to determine how many score sends a college receives for a given cohort of students and the date of the request allows us to determine whether the score send was sent on or after the September 12\textsuperscript{th} Scorecard release date. A small number of students send SAT scores to a college multiple times, as students hope to update colleges on their latest and improved SAT scores. In our main analyses, we consider all score sends, and later show that considering only a student’s first or last score sends results in identical parameter estimates.

2.2. College Scorecard Data

The new College Scorecard is an online tool for students to compare and contrast colleges and was released to the public on September 12\textsuperscript{th}, 2015.\textsuperscript{11} As a part of this initiative, the U.S Department of Education released public-use data for approximately 7800 colleges, much of which was repackaged from existing data sources, like the Integrated Postsecondary Education Data System (IPEDS). However, for each college, the Scorecard features prominently, through

\textsuperscript{10} The four free score sends accompany each SAT registration and the cost of sending additional SAT scores has increased slightly over the time period of interest. Also, low-income students are eligible for four additional free score sends that can be used at any time during their high school careers. Students from the 2010-2016 cohorts were also subject to the current SAT score sending policy referred to as Score Choice. Under Score Choice, students have the option to send results from the SAT administration of their choosing.

\textsuperscript{11} An earlier version was online prior to September 12th but did not have earnings data and consequently had less fanfare.
easy-to-understand infographics, three pieces of information intended to provide students with a succinct snapshot of the college: average annual cost, six-year completion rates, and median earnings (see Appendix Figure 1). Inclusion into our final sample begins with the 2,174 four-year colleges that have all three of these data elements.

Among the three main Scorecard elements, the average annual cost, also referred to as net price, reflects the college’s total cost of attendance (including living expenses) net of grant aid from all sources for undergraduates receiving federal aid.\textsuperscript{12} For students attending public colleges, the average annual cost only reflects costs faced by in-state students. While the net price might be a relevant data point for the student eligible to receive federal Title IV aid, students not qualifying for such aid might be expected to pay considerably more than the advertised net price, particularly at colleges that do not offer merit-based aid. The six-year bachelor’s completion rate reflects the fraction of full-time, first-time students who started in the fall semester and earned bachelor’s degrees from their first institution. This metric is perhaps the best publicized of the three and available on numerous websites geared at informing students, including College Navigator and Big Future. In addition to a long track record of availability on IPEDS, this metric plays an influential role in highly trafficked \textit{US News and World Report} college rankings and is published alongside of the rank. The graduation rate does not account for the outcomes of students who transfer out of the institution or who transfer into the institution. Finally, the median earnings, which were previously unavailable at this scope and thus have the potential to represent the biggest information value-added, reflect earnings 10 years after the student first entered the postsecondary institution. Earnings data for students who did not complete degrees or who transferred to other institutions and then completed degrees are

\textsuperscript{12} Full documentation can be found online here: https://collegescorecard.ed.gov/assets/UsingFederalDataToMeasureAndImprovePerformance.pdf
included in the original institution’s data. Also, only students who received federal aid are included in the earnings statistics, so the salient data may not be representative of the typical entering student, particularly at colleges where small shares of students receive federal aid.

2.3. Variation in College Scorecard Data

How much variation is there in the Scorecard data and how does it relate to previously available information? In Figure 1, we show scatterplots of the relationships between each of the three Scorecard elements in the left-hand panels and relationships between each of the Scorecard elements and median SAT scores among enrolling students, for the subset of sampled colleges reporting average SAT scores on the 2013 IPEDS survey. Annual cost is distinctive from the other three dimensions shown in Figure 1 because it is not typically thought of as a measure of college quality. The strength of association between annual cost and the other three measures of college quality is fairly weak, with R-squared statistics in the vicinity of 0.10 to 0.20. Interestingly, the middle panels of Figure 1 reveal an upward sloping relationship between the x-axis college quality variables (SAT Composite and Median Earnings) and annual cost, which eventually transitions into a negative relationship among colleges with the highest median earnings and composite SAT scores. This downward slope is driven by the extremely generous financial aid packages provided to needy students at the nation’s most selective colleges. The relationship between the two “traditional” metrics of college quality- college completion rates and SAT scores (upper right-hand panel) - is the strongest shown in Figure 1. Median earnings-a new and previously unobserved measure of college quality, is only modestly related to the traditional measures.

There is substantial variation in median earnings, even conditional on other metrics commonly associated with college quality. For example, the lower right panel of Figure 1 shows
that, at each SAT increment, particularly above scores of 1000, there is a wide range of median earnings. Overall, these figures clearly relay that median earnings provide students with opportunities to revise their own impressions of college quality, ultimately influencing the student’s college selection/choice behavior.

2.4. Descriptive Statistics

We aggregate the student-level SAT score send data at the college-period-cohort level for all analyses. As a result, the typical college in our sample contains 14 observations, comprised of seven high school graduation cohorts of students (cohorts 2010-2016) and two “periods” for each of the seven cohorts. The first period of data for each cohort tallies all of the score sends before September 12th of the student’s senior year. The second period represents score sends on September 12th or later. September 12th is the date (in 2015) that the Scorecard data were released. We only include the 1,587 four-year colleges that receive score sends across the sample period. Colleges that do not receive score sends are primarily for-profit colleges and on occasion small non-selective non-profit colleges.

The descriptive statistics shown in Table 1 are intended to orient readers to the structure of our data. The average number of score sends in column 2 of Table 1 shows that the typical college in our sample receives between two and three times more score sends in the post-September 12th period than in the pre-period. The annual cost of the colleges represented by these score sends is nearly $20,000. Figure 1 reveals that an annual cost of $20,000 per year is

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13 In practice, we consider score sends through January 13th of the student’s senior year, roughly two weeks after many application deadlines have passed. At the time that these analyses were conducted, January 13, 2016 was the final date on which score send data were available.
14 A few colleges only receive score sends in some of the periods. We include them in our analyses but later test the sensitivity of the results with a balanced panel.
15 Appendix Table 1 shows the descriptive statistics at the student-level. We do not analyze the data at this level but do make use of student characteristics when we consider heterogeneous impacts.
16 The panel is unbalanced because a small number of colleges receive no SAT score sends in particular periods. We test the robustness of future results with a balanced panel.
reflective of the typical college in our sample. By contrast, both the median earnings and six-year bachelor’s completion rates accompanying the typical score send are considerably larger than those of the sampled college average. Colleges with higher bachelor’s completion rates and higher earnings tend to draw more score sends, and this was true even before the Scorecard was available for public consumption.

2.5. Methodology and Identification

Our main identification strategy is akin to a triple-difference estimation strategy. With an observation at the college-period-cohort level, we estimate equation (1):

$$\log(\text{ScoreSends}_{jpt}) = \beta_0 + \beta_1 \text{Cohort}_j + \beta_2 \text{PostPeriod}_p + \beta_3 \text{Cohort}_j \times \text{PostPeriod}_p + \beta_4 \log(\text{AnnualCost}_j) \times \text{Cohort}_j + \ldots$$

$$\beta_5 \log(\text{GradRate}_j) \times \text{Cohort}_j + \beta_6 \log(\text{MedianEarnings}_j) \times \text{Cohort}_j + \beta_7 \log(\text{AnnualCost}_j) \times \text{PostPeriod}_p + \ldots$$

$$\beta_{10} \log(\text{GradRate}_j) \times \text{PostPeriod}_p + \beta_{11} \log(\text{MedianEarnings}_j) \times \text{PostPeriod}_p + \ldots$$

$$\beta_{12} \log(\text{AnnualCost}_j) \times \text{Cohort2016} \times \text{PostPeriod}_p + \ldots$$

$$\beta_{13} \log(\text{GradRate}_j) \times \text{Cohort2016} \times \text{PostPeriod}_p + J + \epsilon_{jpt}$$

In equation (1), we regress the logarithm of ScoreSends$_{jpt}$ on a vector of fixed effects for colleges ($J$), a vector of fixed effects for Cohort, an indicator for whether the score send count represented the post September 12th period (PostPeriod$_p$), interactions between the vector Cohort, and the binary variable PostPeriod$_p$, and interactions between these variables and each of the three time-invariant college-specific Scorecard elements. The parameters associated with the triple interaction terms between Cohort2016, PostPeriod$_p$ and each of the three Scorecard elements, represented by $\beta_{10}$, $\beta_{11}$ and $\beta_{12}$, represent the causal response to the release of each
element of the Scorecard data.\textsuperscript{17} Formally, these three parameters indicate the extent to which the relationships between Scorecard elements and post-September 12\textsuperscript{th} score send growth differed for the 2016 (Scorecard exposed) cohort compared to prior cohorts but practically speaking, it is the causal impact of the Scorecard on student score sends. This method allows us to rule out the influence of college-cohort shocks that are correlated with the Scorecard data by accounting for pre-September 12\textsuperscript{th} score sends in each cohort. The log-log specification allows us to interpret the coefficients as elasticities with respect to each Scorecard data element. We also test the robustness of the models to the logarithmic specification.\textsuperscript{18} Finally, we report heteroskedastic robust standard errors but results are not sensitive to cluster-robust standard errors at the college level.

We attribute the results that follow regarding changes in students score send behavior to the release of the Scorecard data, but we also recognize that the release of the Scorecard did not happen in a vacuum and colleges with positive realizations of the metrics may exploit the good news, perhaps through advertising and outreach. This means that our results should be viewed as the net impact of the Scorecard release, which may include the effects attributable to colleges marketing their favorable Scorecard metrics to students. Also, we cannot determine whether the students are actually accessing the Scorecard data, rather than agents of the student (e.g. parents or school counselors), who in turn, guide the students.

3. Main Results

\textsuperscript{17} The more simplistic difference-in-difference strategy would look at aggregate counts of Score Sends to each college by cohort, where the 2016 cohort is treated (with varying realizations of Scorecard data). However, as Table 1 shows, between one-fourth and one-third of all Score Sends are before September 12\textsuperscript{th} in a given year, suggesting that aggregating at the cohort level will generate noisy estimates of the response to the release of the Scorecard data.\textsuperscript{18} We also try other non-linear models such as discontinuous responsiveness to exceeding an earnings threshold (e.g. $50,000) but do not see evidence that these fit the data better than the logarithmic specification.
3.1. Descriptive and Graphical Results

In Table 2 and Figure 2, we motivate our subsequent analyses by showing the total score sends in the pre- and post- September 12th periods for each cohort, after dividing sampled colleges into terciles based on the Scorecard’s median earnings.19 So, for example, Table 2 and the corresponding figure show that the 2010 high school cohort sent 107,433 score sends to colleges in the first tercile of median earnings prior to September 12th 2009. The second column shows that the same cohort sent 165,149 score sends to the same colleges on or after September 12th 2009. These patterns of the number of score sends in each cohort-period (by tercile) can be seen in Panel A of Figure 2. In columns 3, 6 and 9 (corresponding to each earning’s tercile), we show the sequence of score sends for each cohort as ratios of score sends in post-September 12th to pre-periods. These post- to pre-period ratios, within a cohort (by tercile), can be seen in Panel B of Figure 2.

Columns 11, 13 and 15 foretell the main findings of the paper using the pre/post period ratios for each median earnings tercile (columns 3, 6, and 9), which we then compare the aforementioned score send ratios across terciles (columns 10, 12 and 14). Finally, we calculate the annual change in the differential ratios by tercile (columns 11, 13, and 15). The year-over-year growth in these ratios between the tercile of colleges with the highest median earnings (Tercile 3) and the other two terciles is considerably larger for the 2016 cohort than for the other cohorts. For example, the ratio of the third tercile score sending sequence to the second tercile score sending sequence in column 12 increases by 7.3 percent between the 2015 and 2016 cohorts. Similarly, when comparing the third and first tercile ratios (in column 14), there is some oscillation over time and then a 9.7 percent increase in 2016. Since the 2016 cohort coincides

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19 The bottom tercile of sampled colleges have median earnings less than or equal to $36,700 and the top tercile has median earnings greater than or equal to $43,900.
with the release of the Scorecard, we conjecture that the large jumps in the relative number of score sends to high median earning colleges, compared to previous trends, is driven by the sudden introduction of college-specific median earnings data.

### 3.2. Regression Results

In Table 3, we show only the parameter estimates in equation (1) for the causal response to the Scorecard data (the triple-interaction terms) for the entire sample of students as well as for students attending regular public, charter and private high schools. Across the entire sample of students, a 10 percent increase in the college median’s earnings, as reported by the Scorecard, resulted in a 2.35 percent increase in score sends. Publication of the other two Scorecard elements, which were already available to students prior to the 2015 Scorecard release date, had little or no measurable impact on score sends.

Compared to students at public and charter high schools, students from private high schools were considerably more responsive to the new median earnings component of the Scorecard. Among students from these high schools, a 10 percent increase in median earnings resulted in 4.15 percent increase in SAT score sends. The triple interaction terms containing median earnings are not significantly different from zero among students from public and charter high schools.

### 3.3. Robustness and Placebo Tests

Through the magnitude and significance of the triple interaction terms, these analyses show that the relationship between the Scorecard-reported median earnings and score send volume during the post-September 12th period is stronger than what occurred among students in previous cohorts. One plausible threat to the validity of these claims is that there are annual changes in the relationship between median earnings and post-September 12th score send growth that are driven
by publicly available factors closely related to median earnings. Incorporating into our models interaction terms involving graduation rates and annual costs allays some of these concerns. We also conduct a series of tests to prove that the significance and magnitudes on the triple interaction terms in equation (1) are unique to the 2016 cohort.

In Table 4, we show the relationship between $PostPeriod$ and the three Scorecard metrics separately for each cohort, by regressing the $\log(\text{ScoreSends})$ on these three interaction terms, and an indicator for $PostPeriod$, continuing to control for the fixed effects of colleges. The positive relationships on the interaction terms between $\text{MedianEarnings}$ and $PostPeriod$ indicate that colleges with higher reported earnings on the September 12th, 2015 Scorecard tended to experience larger growth rates in score sends between the pre- and post-periods. For example, Column 1 shows that each 10 percent increase in median earnings correlates with 5.93 percent more score sends in the post-September 12th period. There is a clear jump in the interaction between $PostPeriod$ and $\log(\text{Median Earnings})$ between the 2015 cohort and the 2016 cohort, and this jump is even more dramatic among students who attend private high schools, implicating the Scorecard data as driving this paper’s results.

Table 4 motivates our formal placebo tests, which appear in Table 5. In the main specifications presented in this paper (Table 3), we have tested whether the 2016 cohort interaction terms between $PostPeriod$ and the Scorecard metrics differs from the interactions between these elements in earlier cohorts. Our placebo tests evaluate whether the triple interaction terms constructed for other cohorts are also statistically significant. Such placebo tests would detect trends in the relationships between median earnings and score send growth between the pre and post-September 12th periods and would also reveal whether annual fluctuations in this relationship are sufficiently large such that any triple interaction terms would
appear as statistically significant. We restrict our sample to the unaffected 2010 through 2015 cohorts and refit equation (1) six times, substituting out the triple interaction terms (that was interacted with the 2016 cohort dummy) with placebo interaction terms for each of the 2010 through 2015 cohort dummies. Such testing allows us to conclude whether the relationship between $PostPeriod$ and $Log(MedianEarnings)$ for each cohort differs from those existing in the other cohorts.

Table 5 shows the placebo triple interaction terms estimated from the 2010 through 2015 cohorts for all students and separately for private high school students. As in our main specification, the placebo interaction terms associated with graduation rates and annual cost are not significant at conventional levels. In contrast to our main specifications, the triple interaction terms associated median earnings are never significant at conventional levels. Combined with Table 4, these results show that time trends and spurious relationships between Scorecard metrics and score sends cannot explain the jump that occurs in the 2016 post-period.

We also perform several robustness and specification tests that confirm our main findings. Specifically, in Appendix Table 2 we fit models where the dependent variable, number of score sends, is not logarithmically transformed and evidence that the log-log model has desirable properties. In Column 1 of Appendix Table 3, we remove all colleges that don’t receive score sends in all of the 14 periods for the 2010-2016 cohorts and find consistent results. The final two columns of Appendix Table 3 show that results are insensitive to whether we use the earliest or latest score send from a student to a college.

4. **Heterogeneous Impacts**

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Subgroups that account for larger shares of score sends generate larger parameter estimates and this creates the illusion that students from these larger subgroups are more responsive to the score send data.
4.1. By Time Elapsed Since Scorecard Release

Access to the exact dates on which students sent SAT scores to colleges affords us the opportunity to split the post Scorecard period into intervals, which provides us insight on two related pieces of information. First, we can determine whether the Scorecard release induced an immediate response from students. On the one hand, the fanfare of the Scorecard release on September 12th, 2015 may correspond to a sharp increase in score sends to certain colleges. On the other hand, the information may take some time to diffuse to students. Second, even if students look at the Scorecard immediately upon release, college applications deadlines are generally around January 1st. Therefore, the scores sent in the months preceding these application deadlines may be reflexive responses to the prompt to send four free score sends at the time of SAT registration (Pallais, 2015; Smith, 2016; Hurwitz et al., 2016) and may not be as purposeful as the non-free score sends that that colleges receive near the application deadlines. Under these circumstances, responsiveness to the Scorecard’s metrics would be concentrated in later months.

To assess this empirical question, we re-fit our main specification (equation 1) but divide the post-period into 30 day intervals. For each of the regressions in Table 6, the post-period unit of observation only consists of the number of score sends during that 30 day period specified by the column headers. By splicing the post period into discrete smaller periods, we are able to pinpoint the timing of the student response which drove the overall effects shown in Table 3.

Table 6 shows that the Scorecard did not immediately shift score sending patterns. Rather, the main results in Table 3 are driven by student behavior in the months closer to college application deadlines. In the top panel, which uses all students, there is no statistical response to the release of earnings data other than after December 10th. In the lower panel, which considers only private school students, there is no statistical response right after the Scorecard is released.
but the October 12th-November 10th shows an approximately three percent increase in score sends to colleges with 10 percent higher median earnings. This impact persists somewhat for the next 30 days and then jumps even higher to a nearly five percent response, in the final period. While the final period is farthest removed from the September 12th release date, it also coincides with application deadlines for first-year admissions at many institutions. Related, the relatively high elasticities during the October 12th - November 10th period, particularly for students at private high schools, coincide with many college’s early decision/early action deadlines.

These results also suggest that the treatment on the treated impacts may be substantially larger than our intent-to-treat estimates. While Table 6 shows intent-to-treat estimates, the later periods use a subset of score sends that are more deliberate, and therefore the college destinations of these score sends are more likely to have been influenced by the Scorecard data, compared to the reflexive score sends accompanying SAT registrations.21

4.2. By Public High School Characteristics

In light of the differential responsiveness to the Scorecard, by private/public high school status, we estimate whether similar differential responsiveness is observed across public high schools that vary on measures typically associated with school resources and cultural capital that influence the college choice/selection process (see Einhorn, 2015). To accomplish this, we divide all score sends sent by public and charter high school students from the 2010 through 2016 cohorts into terciles based on high school-level free/reduced price lunch eligibility and underrepresented minority group (Black and Hispanic/Latino) membership.22, 23

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21 For the 2016 cohort, 61 percent of scores sent during the September 12- October 11 period were SAT registration score sends, while only 4 percent of score sends in the December 10- January 13 period fell into this category.
22 The middle tercile of free and reduced-price high schools include those where between 18 and 44 percent of students are eligible for free/reduced-price lunch. The middle tercile of URM high schools includes those where between 14 and 42 percent of students are black or Hispanic/Latino.
Table 7 reveals this differential responsiveness to the Scorecard elements across students from public/charter high schools that differ on student body racial/ethnic composition and free/reduced price lunch eligibility. The results in this table are consistent with those shown in Table 2, although not quite as stark. Unlike students from the wealthiest high schools and those from high schools with the low and medium shares of Black and Hispanic/Latino students, score sending among students from high underrepresented minority and high free/reduced price lunch eligibility high schools are not influenced by the release of Scorecard data.

4.3. By Student Academic Ability and Student Demographics

In Table 8, we show the estimates of the Scorecard’s impact by student SAT scores.24 For students with SAT scores below 1100, we find that the median earnings component of the Scorecard led to changes in score send volume that are not distinguishable from zero. By contrast, the parameter estimates on the triple interaction terms including median earnings for students with SAT scores between 1100 and 1390 are similar to the main results in that they are between 0.23 and 0.27 and even larger for students with the highest SAT scores-. We estimate that, as a result of the Scorecard’s release, an increase of 10 percent in a college’s median earnings led to a 3 to 4 percent increase in score sends received by those colleges from very high-scoring students.

In Table 9, we separately estimate equation (1) by student race/ethnicity, parental education and gender. Perhaps the starkest differences in responsiveness presented in this paper unfold when we disaggregate score sends by student race/ethnicity. Among Asian students, score sends increased by 5 percent for each 10 percent increase in a college’s median earnings in the post-

---

23 We omit private high schools from these analyses entirely because students at these schools generally are not eligible for free/reduced price lunch and comprehensive data on the racial/ethnic composition of students at these schools are not available.
24 We construct student SAT scores as the sum of the student’s maximum math and critical reading scores across all sittings.
September 12th period as a result of the Scorecard release. Among white students, the corresponding elasticity measure is about half as large at 2.4 percent, and elasticity estimates associated with the median earnings triple interaction terms for Hispanic and black students are approximately zero. These results are consistent with the public high school-level analyses in Table 3, which demonstrate that score sends from students attending high schools containing large shares of black and Hispanic students are uninfluenced by the Scorecard release. Disaggregating by the student-reported parental education, we find that only students whose parents had some postsecondary education responded to the median earnings Scorecard metric. Finally, we find that the score sending of females was more responsive to the earnings component of Scorecard data compared to that of males.

5. Conclusion

This paper demonstrates that the introduction of the College Scorecard pushed traditionally well-resourced students’ score sends towards colleges with higher reported median earnings, and that the other two prominently featured pieces of information (annual cost and graduation rate), which were previously available through a variety of sources, did not measurably influence student demand for colleges. Responding to earnings but not annual cost is consistent with Bleemer and Zafar’s (2015) information experiment to U.S. households, though, neither our work nor theirs can pin down the exact mechanism as to why one metric is more important to students than the others.

Although we estimate a clear influence of the earnings data, there remain at least two major missing pieces to the puzzle necessary to evaluate the total impact of quality disclosure in this context. First, it is unclear whether the differential responsiveness to the Scorecard that we consistently document will meaningfully impact which types of students attend which colleges.
This is particularly important given that the results shown in this paper are well-aligned with both the economics and higher education literature, which consistently reference the misinformation and lack of information that lower-income, underrepresented students carry with them into the college search/selection process (Avery, 2010; Avery, 2014; Hoxby and Turner, 2015). In each set of heterogeneity analyses that we conduct, the subgroups of students expected to enter the college search process with the most information and most cultural capital are exactly the students who responded most strongly to the Scorecard. It is unclear from these analyses whether the differential responsiveness to the Scorecard earnings data is due to gaps in awareness of these data between traditionally underrepresented students and overrepresented students or whether lower-income students are less able to adapt their college lists based on the information. Confusion about financial aid processes, particularly at the nation’s most competitive colleges (Avery et al. 2006), may unnecessarily prevent low-income students from adjusting their initial college list in response to Scorecard-like data. Overall, there exists some risk that differential awareness or utilization of these data may increase postsecondary stratification along racial/ethnic and socioeconomic lines.

Second, does the Scorecard information serve as an effective accountability tool? Though primarily marketed as a tool to help students make informed college choices, most policymakers and the media (Stratford, 2015) recognize that there is a clear accountability component to the Scorecard. The Scorecard calls attention to the metrics that matter, and institutions falling short on outcomes like graduation rates and median earnings, while charging students steep prices for enrolling, may face new pressures to improve upon these prominently featured metrics. In the K-12 space, research has documented real efforts and improvements by schools experiencing the threat of sanctions for not reaching certain benchmarks (e.g. Chiang, 2009; Rockoff and Turner,
2010). However, an unfortunate and well documented byproduct of accountability systems is that they create incentives to game the metrics or even cheat (Aviv, 2014), which only creates the illusion of improvement. Or perhaps, as Bar-Isaac et al. (2008) point out, if college quality is multidimensional and only a few of these dimensions are disclosed and evaluated, colleges may adapt in ways that allow them to improve on reported measures of college quality, perhaps at the expense of unreported measures of college quality.

What might this mean in practice? Carnevale, Cheah and Hanson (2015) show impressive differences in earnings based on choice of college major. Colleges eager to improve the perception of college quality, through improved earnings metrics, might reallocate resources and student enrollment from education or liberal arts programs into pre-professional courses of study like business or engineering.

Along with the potential for students and colleges to adapt to the Scorecard, the federal government can adjust the Scorecard as they see fit, which may also impact college decisions. For example, will they be updating the data every year? Will they incorporate more or better quality measures of earnings? Will they attempt to adjust the metrics for selection? Will they proactively push the information to underserved populations? These answers may determine the long-term use of the Scorecard and who ultimately relies on the information.

References


Figure 1: Relationship Between Scorecard Elements
Figure 2: Score Send Volume and Growth Over Time and College Earnings Terciles

Panel A: Number of Score Sends

Panel B: Score Send Growth, by Cohort
<table>
<thead>
<tr>
<th>Cohort</th>
<th>Through 9/11</th>
<th>After 9/11</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>1,570</td>
<td>1,562</td>
</tr>
<tr>
<td>2011</td>
<td>1,568</td>
<td>1,573</td>
</tr>
<tr>
<td>2012</td>
<td>1,569</td>
<td>1,569</td>
</tr>
<tr>
<td>2013</td>
<td>1,564</td>
<td>1,570</td>
</tr>
<tr>
<td>2014</td>
<td>1,572</td>
<td>1,568</td>
</tr>
<tr>
<td>2015</td>
<td>1,562</td>
<td>1,563</td>
</tr>
<tr>
<td>2016</td>
<td>1,566</td>
<td>1,560</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Avg. Number of Score Sends to College</th>
<th>Average Net Price</th>
<th>Average Median Earnings</th>
<th>6-Yr BA Grad Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Number of Score Sends to College</td>
<td>$19,233</td>
<td>$51,225</td>
<td>71%</td>
</tr>
<tr>
<td>Avg. Number of Score Sends to College</td>
<td>$19,194</td>
<td>$51,099</td>
<td>71%</td>
</tr>
<tr>
<td>Avg. Number of Score Sends to College</td>
<td>$19,130</td>
<td>$50,886</td>
<td>70%</td>
</tr>
<tr>
<td>Avg. Number of Score Sends to College</td>
<td>$19,106</td>
<td>$50,886</td>
<td>70%</td>
</tr>
<tr>
<td>Avg. Number of Score Sends to College</td>
<td>$18,893</td>
<td>$50,822</td>
<td>70%</td>
</tr>
<tr>
<td>Avg. Number of Score Sends to College</td>
<td>$18,701</td>
<td>$50,578</td>
<td>69%</td>
</tr>
</tbody>
</table>

Notes: The College Scorecard characteristics reflect what is visible to the student. The earnings data reflect 10 year median earnings among students who began at sampled colleges in 2001-2002. The six-year BA completion rate and estimated net price presented to students come from the IPEDS 2013 survey. Score sends come from the College Board administrative data of SAT takers.
### Table 2: Increase in Score Sends Over Time

| Cohort | Pre-Period Score Sends | Post-Period Score Sends | Post to Pre Ratio = \(\frac{2}{1}\) | Post-Period Score Sends | Post-Period Score Sends | Post to Pre Ratio = \(\frac{5}{4}\) | Post-Period Score Sends | Post-Period Score Sends | Post to Pre Ratio = \(\frac{8}{7}\) | Post to Pre Ratio = \(\frac{6}{3}\) | % Change Ratio = \(\frac{9}{6}\) | % Change Ratio = \(\frac{9}{3}\) |
|--------|------------------------|-------------------------|------------------|------------------------|-------------------------|------------------|------------------------|-------------------------|------------------|------------------|------------------|
| 2010   | 107,433                | 165,149                 | 1.54             | 358,117                | 590,982                 | 1.65             | 1,121,630             | 2,628,340              | 2.34             | 1.07             | --               | 1.42             | --               | 1.52             |
| 2011   | 95,403                 | 169,607                 | 1.78             | 336,569                | 616,926                 | 1.83             | 1,011,991             | 2,646,483              | 2.62             | 1.03             | -4.0%            | 1.43             | 0.5%             | 1.47             | -3.5%            |
| 2012   | 87,420                 | 176,076                 | 2.01             | 316,684                | 653,849                 | 2.06             | 901,491              | 2,747,971              | 3.05             | 1.03             | -0.6%            | 1.48             | 3.5%             | 1.51             | 2.9%             |
| 2013   | 86,531                 | 175,356                 | 2.03             | 313,980                | 692,754                 | 2.19             | 920,160              | 3,003,910              | 3.26             | 1.09             | 6.2%             | 1.42             | 0.2%             | 1.61             | 6.4%             |
| 2014   | 85,757                 | 177,817                 | 2.08             | 311,670                | 689,257                 | 2.21             | 910,657              | 3,034,277              | 3.33             | 1.06             | -2.2%            | 1.50             | 1.8%             | 1.60             | -0.5%            |
| 2015   | 81,735                 | 188,841                 | 2.31             | 301,484                | 727,175                 | 2.41             | 849,253              | 3,117,676              | 3.67             | 1.04             | -1.9%            | 1.52             | 1.0%             | 1.59             | -0.9%            |
| 2016   | 86,780                 | 186,945                 | 2.15             | 312,566                | 718,329                 | 2.30             | 837,260             | 3,143,696              | 3.75             | 1.07             | 2.2%             | 1.62             | 7.3%             | 1.74             | 9.7%             |

Notes: The College Scorecard earnings data reflect 10 year median earnings among students who began at sampled colleges in 2001-2002. Terciles are unweighted and the first tercile are colleges with median earnings less than $36,700, the second tercile is between $36,700 and $43,900, and the third tercile is greater than or equal to $43,900. Score sends come from the College Board administrative data of SAT takers.
<table>
<thead>
<tr>
<th></th>
<th>All Students</th>
<th>From Public High</th>
<th>From Private High School</th>
<th>From Charter High School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Period x 2016 Cohort x log(Median Earnings)</td>
<td>0.235**</td>
<td>0.157</td>
<td>0.415***</td>
<td>0.193</td>
</tr>
<tr>
<td></td>
<td>(0.108)</td>
<td>(0.112)</td>
<td>(0.107)</td>
<td>(0.147)</td>
</tr>
<tr>
<td>Post Period x 2016 Cohort x log(Graduation Rate)</td>
<td>0.065</td>
<td>0.123*</td>
<td>-0.004</td>
<td>0.041</td>
</tr>
<tr>
<td></td>
<td>(0.068)</td>
<td>(0.070)</td>
<td>(0.066)</td>
<td>(0.104)</td>
</tr>
<tr>
<td>Post Period x 2016 Cohort x log(Annual Cost)</td>
<td>-0.025</td>
<td>-0.028</td>
<td>-0.062</td>
<td>0.063</td>
</tr>
<tr>
<td></td>
<td>(0.057)</td>
<td>(0.060)</td>
<td>(0.058)</td>
<td>(0.081)</td>
</tr>
<tr>
<td>Observations</td>
<td>21,936</td>
<td>21,762</td>
<td>20,719</td>
<td>16,010</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.969</td>
<td>0.967</td>
<td>0.956</td>
<td>0.882</td>
</tr>
</tbody>
</table>

Notes: Robust standard errors are presented in parentheses and statistical significance is reported as follows: *** p<0.01, ** p<0.05, * p<0.1. All regressions include cohort and college fixed effects and a dummy variable for PostPeriod. The data come from all SAT takers in the graduating high school cohorts of 2010-2016. An observation is a college-cohort-period and the number of score sends for a college is aggregated across students in the cohort and period where period is either before or after September 12th of the students' senior year. Median earnings, graduation rates, and net price come from Scorecard and are repeated for all observations. We consider score sends through January 13th of the respective cohort.
Table 4: Score Sending in Pre (Before September 12th) and Post (After September 11th) Period, by Cohort
Outcome = Log (# of Score Sends)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Period x log(Median Earnings)</td>
<td>0.593***</td>
<td>0.585***</td>
<td>0.626***</td>
<td>0.737***</td>
<td>0.611***</td>
<td>0.649***</td>
<td>0.823***</td>
</tr>
<tr>
<td></td>
<td>(0.090)</td>
<td>(0.093)</td>
<td>(0.090)</td>
<td>(0.087)</td>
<td>(0.092)</td>
<td>(0.093)</td>
<td>(0.110)</td>
</tr>
<tr>
<td>Post Period x log(Graduation Rate)</td>
<td>0.167***</td>
<td>0.131**</td>
<td>0.169***</td>
<td>0.175***</td>
<td>0.257***</td>
<td>0.225***</td>
<td>0.279***</td>
</tr>
<tr>
<td></td>
<td>(0.057)</td>
<td>(0.059)</td>
<td>(0.054)</td>
<td>(0.056)</td>
<td>(0.057)</td>
<td>(0.056)</td>
<td>(0.071)</td>
</tr>
<tr>
<td>Post Period x log(Annual Cost)</td>
<td>0.195***</td>
<td>0.242***</td>
<td>0.241***</td>
<td>0.186***</td>
<td>0.181***</td>
<td>0.169***</td>
<td>0.173***</td>
</tr>
<tr>
<td></td>
<td>(0.053)</td>
<td>(0.054)</td>
<td>(0.051)</td>
<td>(0.050)</td>
<td>(0.052)</td>
<td>(0.053)</td>
<td>(0.060)</td>
</tr>
<tr>
<td>Observations</td>
<td>3,132</td>
<td>3,141</td>
<td>3,138</td>
<td>3,134</td>
<td>3,140</td>
<td>3,125</td>
<td>3,126</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.980</td>
<td>0.980</td>
<td>0.979</td>
<td>0.981</td>
<td>0.978</td>
<td>0.978</td>
<td>0.974</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Period x log(Median Earnings)</td>
<td>0.865***</td>
<td>0.727***</td>
<td>0.830***</td>
<td>0.819***</td>
<td>0.816***</td>
<td>0.903***</td>
<td>1.233***</td>
</tr>
<tr>
<td></td>
<td>(0.109)</td>
<td>(0.107)</td>
<td>(0.105)</td>
<td>(0.114)</td>
<td>(0.109)</td>
<td>(0.104)</td>
<td>(0.111)</td>
</tr>
<tr>
<td>Post Period x log(Graduation Rate)</td>
<td>0.302***</td>
<td>0.324***</td>
<td>0.308***</td>
<td>0.416***</td>
<td>0.364***</td>
<td>0.333***</td>
<td>0.299***</td>
</tr>
<tr>
<td></td>
<td>(0.078)</td>
<td>(0.068)</td>
<td>(0.072)</td>
<td>(0.083)</td>
<td>(0.066)</td>
<td>(0.065)</td>
<td>(0.071)</td>
</tr>
<tr>
<td>Post Period x log(Annual Cost)</td>
<td>0.337***</td>
<td>0.353***</td>
<td>0.346***</td>
<td>0.315***</td>
<td>0.332***</td>
<td>0.331***</td>
<td>0.286***</td>
</tr>
<tr>
<td></td>
<td>(0.065)</td>
<td>(0.063)</td>
<td>(0.058)</td>
<td>(0.064)</td>
<td>(0.064)</td>
<td>(0.067)</td>
<td>(0.061)</td>
</tr>
<tr>
<td>Observations</td>
<td>2,973</td>
<td>2,977</td>
<td>2,957</td>
<td>2,972</td>
<td>2,939</td>
<td>2,959</td>
<td>2,942</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.972</td>
<td>0.972</td>
<td>0.971</td>
<td>0.972</td>
<td>0.971</td>
<td>0.971</td>
<td>0.969</td>
</tr>
</tbody>
</table>

Notes: Robust standard errors are presented in parentheses and statistical significance is reported as follows: *** p<0.01, ** p<0.05, * p<0.1. All regressions include cohort and college fixed effects and a dummy variable for PostPeriod. The data come from all SAT takers in the graduating high school cohorts of 2010-2016. An observation is a college-cohort-period and the number of score sends for a college is aggregated across students in the cohort and period where period is either before or after September 12th of the students' senior year. Median earnings, graduation rates, and net price come from Scorecard and are repeated for all observations. We consider score sends through January 13th of the respective cohort.
Table 5: Placebo Tests, Outcome = Log (# of Score Sends)

<table>
<thead>
<tr>
<th>Cohort:</th>
<th>All Students</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2010</td>
<td>2011</td>
<td>2012</td>
<td>2013</td>
<td>2014</td>
</tr>
<tr>
<td>Post Period x 201XCohort x log(Median Earnings)</td>
<td>-0.053</td>
<td>-0.062</td>
<td>-0.018</td>
<td>0.118</td>
<td>-0.007</td>
<td>0.021</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.091)</td>
<td>(0.087)</td>
<td>(0.084)</td>
<td>(0.082)</td>
<td>(0.086)</td>
</tr>
<tr>
<td>Post Period x 201XCohort x log(Graduation Rate)</td>
<td>-0.026</td>
<td>-0.063</td>
<td>-0.024</td>
<td>-0.011</td>
<td>0.080</td>
<td>0.048</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.060)</td>
<td>(0.055)</td>
<td>(0.051)</td>
<td>(0.051)</td>
<td>(0.055)</td>
</tr>
<tr>
<td>Post Period x 201XCohort x log(Annual Cost)</td>
<td>-0.005</td>
<td>0.043</td>
<td>0.043</td>
<td>-0.014</td>
<td>-0.022</td>
<td>-0.046</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.051)</td>
<td>(0.047)</td>
<td>(0.046)</td>
<td>(0.046)</td>
<td>(0.047)</td>
</tr>
<tr>
<td>Observations</td>
<td>18,810</td>
<td>18,810</td>
<td>18,810</td>
<td>18,810</td>
<td>18,810</td>
<td>18,810</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.971</td>
<td>0.971</td>
<td>0.971</td>
<td>0.971</td>
<td>0.971</td>
<td>0.971</td>
</tr>
</tbody>
</table>

|                               | Private High School Students |          |          |          |          |          |
|                               |                            | 2010     | 2011     | 2012     | 2013     | 2014     | 2015     |
| Post Period x 201XCohort x log(Median Earnings) | 0.059         | -0.113   | -0.031   | -0.017   | 0.021    | 0.081    |          |
|                               |              | (0.104)  | (0.099)  | (0.099)  | (0.103)  | (0.100)  | (0.100)  |
| Post Period x 201XCohort x log(Graduation Rate) | -0.050       | -0.021   | -0.030   | 0.114    | -0.002   | -0.008   |          |
|                               |              | (0.071)  | (0.064)  | (0.068)  | (0.075)  | (0.063)  | (0.066)  |
| Post Period x 201XCohort x log(Annual Cost)   | 0.018        | 0.014    | 0.025    | -0.031   | -0.010   | -0.017   |          |
|                               |              | (0.060)  | (0.057)  | (0.053)  | (0.056)  | (0.057)  | (0.062)  |
| Observations                  | 17,777       | 17,777   | 17,777   | 17,777   | 17,777   | 17,777   | 17,777   |
| R-squared                     | 0.958        | 0.958    | 0.958    | 0.958    | 0.958    | 0.958    | 0.958    |

Notes: Robust standard errors are presented in parentheses and statistical significance is reported as follows: *** p<0.01, ** p<0.05, * p<0.1. All regressions include college fixed effects and a dummy variable for PostPeriod. The data come from all SAT takers in the graduating high school cohorts of 2010-2015. An observation is a college-cohort-period and the number of score sends for a college is aggregated across students in the cohort and period where period is either before or after September 12th of the students' senior year. Median earnings, graduation rates, and net price come from Scorecard and are repeated for all observations. We consider score sends through January 13th of the respective cohort. For each regression, we use a placebo treatment year, denoted by 201XCohort, and show estimates of the placebo impact (the triple interaction terms).
Table 6: Scorecard Impacts by Score Send Dates, Outcome = Log (# of Score Sends)

<table>
<thead>
<tr>
<th>Post Period Interval:</th>
<th>Sept. 12-</th>
<th>Oct. 12-</th>
<th>Nov. 11-</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Period x 2016Cohort x log(Median Earnings)</td>
<td>0.092</td>
<td>0.102</td>
<td>0.071</td>
<td>0.414***</td>
</tr>
<tr>
<td></td>
<td>(0.095)</td>
<td>(0.105)</td>
<td>(0.118)</td>
<td>(0.130)</td>
</tr>
<tr>
<td>Post Period x 2016Cohort x log(Graduation Rate)</td>
<td>0.099*</td>
<td>0.088</td>
<td>0.012</td>
<td>0.071</td>
</tr>
<tr>
<td></td>
<td>(0.059)</td>
<td>(0.065)</td>
<td>(0.079)</td>
<td>(0.086)</td>
</tr>
<tr>
<td>Post Period x 2016Cohort x log(Annual Cost)</td>
<td>-0.097*</td>
<td>0.008</td>
<td>-0.072</td>
<td>-0.007</td>
</tr>
<tr>
<td></td>
<td>(0.050)</td>
<td>(0.056)</td>
<td>(0.065)</td>
<td>(0.073)</td>
</tr>
<tr>
<td>Observations</td>
<td>21,650</td>
<td>21,736</td>
<td>21,626</td>
<td>21,605</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.973</td>
<td>0.967</td>
<td>0.956</td>
<td>0.947</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>All Students</th>
<th>Private High School Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Period x 2016Cohort x log(Median Earnings)</td>
<td>0.135</td>
<td>0.308***</td>
</tr>
<tr>
<td></td>
<td>(0.101)</td>
<td>(0.105)</td>
</tr>
<tr>
<td>Post Period x 2016Cohort x log(Graduation Rate)</td>
<td>0.030</td>
<td>-0.022</td>
</tr>
<tr>
<td></td>
<td>(0.066)</td>
<td>(0.068)</td>
</tr>
<tr>
<td>Post Period x 2016Cohort x log(Annual Cost)</td>
<td>0.024</td>
<td>0.087</td>
</tr>
<tr>
<td></td>
<td>(0.054)</td>
<td>(0.056)</td>
</tr>
<tr>
<td>Observations</td>
<td>19,533</td>
<td>19,892</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.954</td>
<td>0.951</td>
</tr>
</tbody>
</table>

Notes: Robust standard errors are presented in parentheses and statistical significance is reported as follows: *** p<0.01, ** p<0.05, * p<0.1. All regressions include cohort and college fixed effects and a dummy variable for PostPeriod. The data come from all SAT takers in the graduating high school cohorts of 2010-2016. An observation is a college-cohort-period and the number of score sends for a college is aggregated across students in the cohort and period where period is either before September 12th of the students' senior year or in the 30 day post-period time frame. Median earnings, graduation rates, and net price come from Scorecard and are repeated for all observations. We consider score sends through January 13th of the respective cohort.
Table 7: Results by Students from High Schools With Differing Fractions of Under-Represented Minority and Free and Reduced-Price Lunch
Outcome = Log (# of Score Sends)

<table>
<thead>
<tr>
<th></th>
<th>From High School with Low URM</th>
<th>From High School with Medium URM</th>
<th>From High School with High URM</th>
<th>From High School with Low FRL</th>
<th>From High School with Medium FRL</th>
<th>From High School with High FRL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Period x 2016 Cohort x log(Median Earnings)</td>
<td>0.214*</td>
<td>0.240**</td>
<td>0.008</td>
<td>0.211*</td>
<td>0.124</td>
<td>0.053</td>
</tr>
<tr>
<td></td>
<td>(0.114)</td>
<td>(0.118)</td>
<td>(0.123)</td>
<td>(0.114)</td>
<td>(0.119)</td>
<td>(0.120)</td>
</tr>
<tr>
<td>Post Period x 2016 Cohort x log(Graduation Rate)</td>
<td>0.049</td>
<td>0.066</td>
<td>0.140*</td>
<td>0.080</td>
<td>0.062</td>
<td>0.104</td>
</tr>
<tr>
<td></td>
<td>(0.074)</td>
<td>(0.070)</td>
<td>(0.074)</td>
<td>(0.075)</td>
<td>(0.072)</td>
<td>(0.074)</td>
</tr>
<tr>
<td>Post Period x 2016 Cohort x log(Annual Cost)</td>
<td>0.010</td>
<td>-0.002</td>
<td>0.024</td>
<td>-0.015</td>
<td>0.067</td>
<td>0.046</td>
</tr>
<tr>
<td></td>
<td>(0.063)</td>
<td>(0.064)</td>
<td>(0.064)</td>
<td>(0.065)</td>
<td>(0.062)</td>
<td>(0.063)</td>
</tr>
<tr>
<td>Observations</td>
<td>20,518</td>
<td>20,869</td>
<td>21,021</td>
<td>20,123</td>
<td>21,061</td>
<td>21,267</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.961</td>
<td>0.958</td>
<td>0.953</td>
<td>0.960</td>
<td>0.959</td>
<td>0.952</td>
</tr>
</tbody>
</table>

Notes: Robust standard errors are presented in parentheses and statistical significance is reported as follows: *** p<0.01, ** p<0.05, * p<0.1. All regressions include cohort and college fixed effects and a dummy variable for PostPeriod. The data come from all SAT takers in the graduating high school cohorts of 2010-2016. An observation is a college-cohort-period and the number of score sends for a college is aggregated across students in the cohort and period where period is either before or after September 12th of the students' senior year. Median earnings, graduation rates, and net price come from Scorecard and are repeated for all observations. We consider score sends through January 13th of the respective cohort. The middle tercile of under-represented minority students includes observations from high schools where between 13.98 percent and 42.22 percent of students are Black or Hispanic according to the 2013-2014 Common Core of Data (CCD). The middle tercile of free/reduced price lunch eligibility is also defined using data from the 2013-2014 CCD. This tercile is bounded by observations from high schools where eligibility for free/reduced-price lunch ranges from 18.07 percent to 44.24 percent.
Table 8: Results by Student SAT Scores, Outcome = Log (# of Score Sends)

<table>
<thead>
<tr>
<th></th>
<th>&lt;900</th>
<th>900-990</th>
<th>1000-1090</th>
<th>1100-1190</th>
<th>1200-1290</th>
<th>1300-1390</th>
<th>1400-1490</th>
<th>1500+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Period x 2016 Cohort x log(Median Earnings)</td>
<td>0.111</td>
<td>0.053</td>
<td>0.146</td>
<td>0.260**</td>
<td>0.273**</td>
<td>0.232*</td>
<td>0.370**</td>
<td>0.335*</td>
</tr>
<tr>
<td></td>
<td>(0.115)</td>
<td>(0.118)</td>
<td>(0.119)</td>
<td>(0.110)</td>
<td>(0.118)</td>
<td>(0.129)</td>
<td>(0.158)</td>
<td>(0.184)</td>
</tr>
<tr>
<td>Post Period x 2016 Cohort x log(Graduation Rate)</td>
<td>0.184**</td>
<td>0.102</td>
<td>0.065</td>
<td>0.051</td>
<td>-0.019</td>
<td>0.082</td>
<td>-0.095</td>
<td>0.167</td>
</tr>
<tr>
<td></td>
<td>(0.072)</td>
<td>(0.069)</td>
<td>(0.071)</td>
<td>(0.070)</td>
<td>(0.074)</td>
<td>(0.088)</td>
<td>(0.111)</td>
<td>(0.149)</td>
</tr>
<tr>
<td>Post Period x 2016 Cohort x log(Annual Cost)</td>
<td>-0.039</td>
<td>-0.047</td>
<td>-0.031</td>
<td>-0.078</td>
<td>-0.004</td>
<td>0.016</td>
<td>0.103</td>
<td>0.232**</td>
</tr>
<tr>
<td></td>
<td>(0.060)</td>
<td>(0.061)</td>
<td>(0.063)</td>
<td>(0.060)</td>
<td>(0.065)</td>
<td>(0.073)</td>
<td>(0.080)</td>
<td>(0.091)</td>
</tr>
<tr>
<td>Observations</td>
<td>21,327</td>
<td>21,082</td>
<td>20,986</td>
<td>20,522</td>
<td>19,735</td>
<td>18,259</td>
<td>15,618</td>
<td>11,038</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.942</td>
<td>0.948</td>
<td>0.954</td>
<td>0.957</td>
<td>0.956</td>
<td>0.952</td>
<td>0.947</td>
<td>0.942</td>
</tr>
</tbody>
</table>

Notes: Robust standard errors are presented in parentheses and statistical significance is reported as follows: *** p<0.01, ** p<0.05, * p<0.1. All regressions include cohort and college fixed effects and a dummy variable for PostPeriod. The data come from all SAT takers in the graduating high school cohorts of 2010-2016. An observation is a college-cohort-period and the number of score sends for a college is aggregated across students in the cohort and period where period is either before or after September 12th of the students' senior year. Median earnings, graduation rates, and net price come from Scorecard and are repeated for all observations. We consider score sends through January 13th of the respective cohort. Student SAT scores are constructed as the sum of the maximum critical reading and math scores across the student’s last five exam attempts.
Table 9: Results by Student Demographics, Outcome = Log (# of Score Sends)

<table>
<thead>
<tr>
<th>Student Race/Ethnicity</th>
<th>Student Gender</th>
<th>Parental Education</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Asian</td>
<td>Black</td>
</tr>
<tr>
<td>Post Period x 2016 Cohort x log(Median Earnings)</td>
<td>0.506***</td>
<td>0.068</td>
</tr>
<tr>
<td></td>
<td>(0.134)</td>
<td>(0.124)</td>
</tr>
<tr>
<td>Post Period x 2016 Cohort x log(Graduation Rate)</td>
<td>-0.001</td>
<td>0.065</td>
</tr>
<tr>
<td></td>
<td>(0.090)</td>
<td>(0.073)</td>
</tr>
<tr>
<td>Post Period x 2016 Cohort x log(Annual Cost)</td>
<td>-0.046</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>(0.073)</td>
<td>(0.062)</td>
</tr>
<tr>
<td>Observations</td>
<td>18,619</td>
<td>20,165</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.951</td>
<td>0.944</td>
</tr>
</tbody>
</table>

Notes: Robust standard errors are presented in parentheses and statistical significance is reported as follows: *** p<0.01, ** p<0.05, * p<0.1. All regressions include cohort and college fixed effects and a dummy variable for PostPeriod. The data come from all SAT takers in the graduating high school cohorts of 2010-2016. An observation is a college-cohort-period and the number of score sends for a college is aggregated across students in the cohort and period where period is either before or after September 12th of the students’ senior year. Median earnings, graduation rates, and net price come from Scorecard and are repeated for all observations. We consider score sends through January 13th of the respective cohort. Parental Education is defined as the maximum parental education earned across both parents.
Note: Appearance differs slightly from actual Scorecard due to redaction of college's name, city, and enrollment.
## Appendix Table 1: Student-Level Summary Statistics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>0.533</td>
<td>0.499</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Asian</td>
<td>0.128</td>
<td>0.334</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Black</td>
<td>0.104</td>
<td>0.305</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.147</td>
<td>0.354</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Male</td>
<td>0.447</td>
<td>0.497</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Female</td>
<td>0.552</td>
<td>0.497</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Parental Education - No Response</td>
<td>0.070</td>
<td>0.256</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Parental Education - Less Than HS Degree</td>
<td>0.047</td>
<td>0.212</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Parental Education - HS Degree</td>
<td>0.096</td>
<td>0.295</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Parental Education - Some College</td>
<td>0.199</td>
<td>0.399</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Parental Education - BA or Higher</td>
<td>0.586</td>
<td>0.492</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>From Public High School</td>
<td>0.782</td>
<td>0.413</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>From Private High School</td>
<td>0.164</td>
<td>0.370</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>From Charter High School</td>
<td>0.017</td>
<td>0.129</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>From Low-URM High School</td>
<td>0.251</td>
<td>0.434</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>From Medium-URM High School</td>
<td>0.261</td>
<td>0.439</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>From High-URM High School</td>
<td>0.270</td>
<td>0.444</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>From Low-FRL High School</td>
<td>0.230</td>
<td>0.421</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>From Medium-FRL High School</td>
<td>0.274</td>
<td>0.446</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>From High-FRL High School</td>
<td>0.278</td>
<td>0.448</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>SAT Score</td>
<td>1098.753</td>
<td>204.429</td>
<td>400.000</td>
<td>1600.000</td>
</tr>
<tr>
<td>Number of Score Sends</td>
<td>5.717</td>
<td>4.635</td>
<td>1.000</td>
<td>148.000</td>
</tr>
<tr>
<td>Number of Score Sends Before September 12th</td>
<td>1.512</td>
<td>2.803</td>
<td>0.000</td>
<td>109.000</td>
</tr>
<tr>
<td>Number of Score Sends On or After September 12th</td>
<td>4.206</td>
<td>4.296</td>
<td>0.000</td>
<td>129.000</td>
</tr>
<tr>
<td>Average Graduation Rate of Score Sends</td>
<td>0.676</td>
<td>0.147</td>
<td>0.022</td>
<td>0.972</td>
</tr>
<tr>
<td>Average Annual Cost of Score Sends</td>
<td>$ 19,228.307</td>
<td>$ 5,543.765</td>
<td>$ 1,776.000</td>
<td>$ 47,611.000</td>
</tr>
<tr>
<td>Average Median Earnings of Score Sends</td>
<td>$ 50,044.080</td>
<td>$ 9,044.681</td>
<td>$ 14,100.000</td>
<td>$ 116,400.000</td>
</tr>
</tbody>
</table>

Notes: The data come from 6,241,695 SAT takers in the graduating high school cohorts of 2010-2016. Data on racial composition of high schools and free/reduced price lunch eligibility apply only to public and charter schools. The middle tercile of under-represented minority students includes observations from high schools where between 13.98 percent and 42.22 percent of students are Black or Hispanic according to the 2013-2014 Common Core of Data (CCD). The middle tercile of free/reduced price lunch eligibility is also defined using data from the 2013-2014 CCD. This tercile is bounded by observations from high schools where eligibility for free/reduced-price lunch ranges from 18.07 percent to 44.24 percent.
## Appendix Table 2: Alternative Specifications, Outcome = # of Score Sends

<table>
<thead>
<tr>
<th></th>
<th>All Students</th>
<th>From Public High School</th>
<th>From Private High School</th>
<th>From Charter High School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Period x 2016 Cohort x log(Median Earnings)</td>
<td>1,260.635***</td>
<td>903.127***</td>
<td>292.503*</td>
<td>62.417***</td>
</tr>
<tr>
<td></td>
<td>(480.796)</td>
<td>(311.034)</td>
<td>(163.223)</td>
<td>(14.357)</td>
</tr>
<tr>
<td>Post Period x 2016 Cohort x log(Graduation Rate)</td>
<td>355.338*</td>
<td>243.009*</td>
<td>57.548</td>
<td>10.553</td>
</tr>
<tr>
<td></td>
<td>(213.470)</td>
<td>(142.422)</td>
<td>(68.840)</td>
<td>(8.335)</td>
</tr>
<tr>
<td>Post Period x 2016 Cohort x log(Annual Cost)</td>
<td>-289.155</td>
<td>-227.271</td>
<td>-27.877</td>
<td>-17.775**</td>
</tr>
<tr>
<td></td>
<td>(233.440)</td>
<td>(159.645)</td>
<td>(70.452)</td>
<td>(8.943)</td>
</tr>
<tr>
<td>Observations</td>
<td>21,936</td>
<td>21,762</td>
<td>20,719</td>
<td>16,010</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.838</td>
<td>0.857</td>
<td>0.771</td>
<td>0.797</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>All Students</th>
<th>From Public High School</th>
<th>From Private High School</th>
<th>From Charter High School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Period x 2016 Cohort x Median Earnings</td>
<td>0.024*</td>
<td>0.017***</td>
<td>0.005</td>
<td>0.001***</td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
<td>(0.008)</td>
<td>(0.004)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Post Period x 2016 Cohort x Graduation Rate</td>
<td>1,469.876**</td>
<td>1,057.583**</td>
<td>312.016</td>
<td>41.553**</td>
</tr>
<tr>
<td></td>
<td>(643.508)</td>
<td>(429.452)</td>
<td>(197.294)</td>
<td>(20.467)</td>
</tr>
<tr>
<td>Post Period x 2016 Cohort x Annual Cost</td>
<td>-0.023</td>
<td>-0.018*</td>
<td>-0.004</td>
<td>-0.001**</td>
</tr>
<tr>
<td></td>
<td>(0.015)</td>
<td>(0.010)</td>
<td>(0.005)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Observations</td>
<td>21,936</td>
<td>21,762</td>
<td>20,719</td>
<td>16,010</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.849</td>
<td>0.864</td>
<td>0.792</td>
<td>0.798</td>
</tr>
</tbody>
</table>

Notes: Robust standard errors are presented in parentheses and statistical significance is reported as follows: *** p<0.01, ** p<0.05, * p<0.1. All regressions include cohort and college fixed effects and a dummy variable for PostPeriod. The data come from all SAT takers in the graduating high school cohorts of 2010-2016. An observation is a college-cohort-period and the number of score sends for a college is aggregated across students in the cohort and period where period is either before or after September 12th of the students’ senior year. Median earnings, graduation rates, and net price come from Scorecard and are repeated for all observations. We consider score sends through January 13th of the respective cohort.
### Appendix Table 3: Robustness Tests, Outcome = Log (# of Score Sends)

<table>
<thead>
<tr>
<th></th>
<th>Balanced Panel</th>
<th>Using Earliest Score Send to Each College</th>
<th>Using Latest Score Send to Each College</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Period x 2016 Cohort x log(Median Earnings)</td>
<td>0.193* (0.108)</td>
<td>0.232** (0.109)</td>
<td>0.227** (0.110)</td>
</tr>
<tr>
<td>Post Period x 2016 Cohort x log(Graduation Rate)</td>
<td>0.103 (0.068)</td>
<td>0.073 (0.069)</td>
<td>0.044 (0.069)</td>
</tr>
<tr>
<td>Post Period x 2016 Cohort x log(Annual Cost)</td>
<td>-0.029 (0.058)</td>
<td>-0.024 (0.058)</td>
<td>-0.026 (0.058)</td>
</tr>
<tr>
<td>Observations</td>
<td>21,210</td>
<td>21,934</td>
<td>21,924</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.967</td>
<td>0.967</td>
<td>0.965</td>
</tr>
</tbody>
</table>

Notes: Robust standard errors are presented in parentheses and statistical significance is reported as follows: *** p<0.01, ** p<0.05, * p<0.1. All regressions include cohort and college fixed effects and a dummy variable for *PostPeriod*. The data come from all SAT takers in the graduating high school cohorts of 2010-2016. An observation is a college-cohort-period and the number of score sends for a college is aggregated across students in the cohort and period where period is either before or after September 12th of the students' senior year. Median earnings, graduation rates, and net price come from Scorecard and are repeated for all observations. We consider score sends through January 13th of the respective cohort.