College Is A Big Investment. Does Receiving College Scorecard Information Help Students Evaluate Which One Offers The Best "Bang For The Buck"?

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Abstract

College Is A Big Investment. Does Receiving College Scorecard Information Help Students Evaluate Which One Offers The Best "Bang For The Buck"?

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College Scorecard is a U.S. Department of Education website providing information on the average costs and returns, in terms of average earnings after leaving college, associated with all U.S. colleges receiving student aid under Title IV of the Higher Education Act. The Obama Administration launched the Scorecard to help students and their families identify the colleges offering them the "best bang for the buck", and also to encourage colleges to compete on price and quality. Limited evidence to date suggests that College Scorecard's impact, although in the right direction, is very small, in large part because students do not seek it out.

In a randomized control trial (N= 322), I find that providing well-presented summary cost, earnings and graduation rate information similar to that in College Scorecard directly to high school seniors leads them to rank colleges significantly more in line with the institutions' expected financial returns. Compared to a control group informed only of colleges' names, location, sector (public or private) and type (2- or 4-year), students receiving scorecard information perform better at ranking alternative four-year public and private colleges and also in evaluating the choice between starting directly at a four-year college versus pursuing the

community college two- to four-year transfer route, a common choice for low-income students in particular and one that decreases their chances of attaining a four-year degree.

Using a separate, experimental design involving a think-aloud protocol (N = 31), I directly investigated how scorecard information affects individual students' decision processes. I find that the framing of the information treatment itself acts as sufficient "advice" for students who use it to learn how to evaluate colleges' financial investment value. The majority of students shift from heuristic-decision making focused on sector-based cost perceptions to a weighted approach including estimations of future earnings and graduation probabilities. A large minority of students fail to improve their decision process, however, and continue to rank the colleges based on cost. These results suggest that improving the framing of the scorecard information treatment could thus increase its effect on students' ability to evaluate the returns to alternative college options. A particular challenge identified is how to effectively present information on the probability of successfully navigating the community college transfer pathway to a four-year degree. This probability is considerably lower than most students think it is.

Future research in the experimental information-updating econometrics literature should consider the impact of relaxing the assumption that students respond to information on the costs and returns of college options by updating the accuracy of their existing estimates. Not doing so could lead this literature to overemphasize the role of non-financial preferences and underestimate the potential impact of effectively designed information interventions revealing, not just the true costs and returns associated with colleges, but also how to use that information in decision-making.

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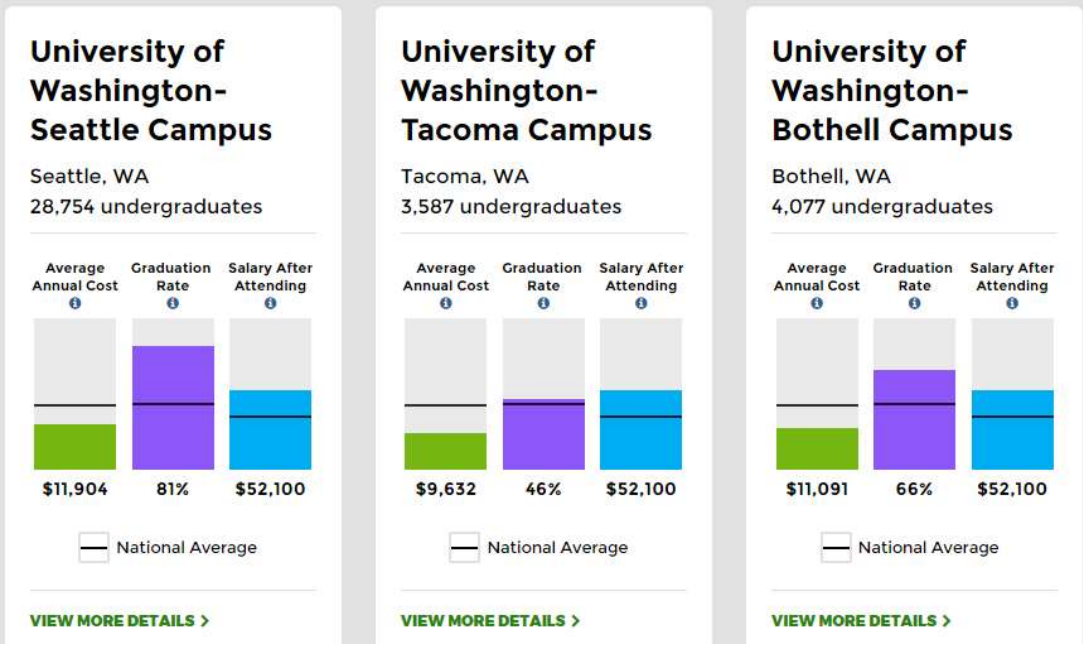
"… tomorrow, my administration will release a new "College Scorecard" that parents and students can use to compare schools based on a simple criterion -- where you can get the most bang for your educational buck." President Obama, State of the Union, 2013

1.1 WHAT IS COLLEGE SCORECARD?

College Scorecard is a website, launched by the Obama administration in February 2013, which provides a standardized page of information on every college that receives student aid under Title IV of the Higher Education Act. The over 7,000 U.S. public, private non-profit and for-profit post-secondary institutions covered by College Scorecard range from less than two-year certificate granting, largely for-profit, institutions, to public and private two-year colleges, and to four-year private and public baccalaureate degree-granting institutions.

Figure 1: College Scorecard Mobile Web Site Pages for University of Washington Campuses[1]



[1] Note that College Scorecard does not differentiate salary outcomes by campus.

As the quotation at the beginning of this section suggests, College Scorecard's main focus is on providing a standardized, reliable set of information on each college so that students can compare the 'bang for the buck' offered by alternative colleges. The Scorecard highlights three key pieces of data - average annual cost to the student, graduation rates and average salary 10 years after leaving (see example data for the University of Washington as of 2015 shown in Figure 1 above).

Average annual cost to students: This is the net price for first-time, full-time students who receive federal financial aid. Net price is the total cost of attendance, less average per-student federal, state, local, or institutional aid for students receiving federal aid. This information is drawn from the Integrated Post-Secondary Education Data System (IPEDS) maintained by the National Center for Education Statistics.[2]

Graduation rate: This is the cohort graduation rate for first-time, full-time students and is the official measure of institutional graduation rates mandated by the Higher Education Act. It measures the fraction of first-time, full-time students from a given entry cohort who complete their program of study within 100, 150, or 200 percent of the 'normal' completion time. For example, the 150 percent completion rate measures the fraction of the cohort that graduates within six years for students pursuing a four-year degree, or three years for students pursuing a two-year degree. College Scorecard reports six-year cohort graduation rates for all four-year (i.e. baccalaureate-granting) colleges and four-year graduation rates for all other colleges.[3]

Salary after attending: This is the median earnings of students who received federal financial aid 10 years after leaving college, regardless of whether the student successfully completed a degree or certificate. This data comes from earnings data from administrative income tax records maintained by the Department of the Treasury. Earnings are defined as the sum of wages and

[2] All data definitions are from U.S. Department of Education (2015) and Executive Office of the President (2015).
[3] Most of these other colleges are two-year-degree granting institutions, thus College Scorecard reports the percentage of their students who graduate within 200 percent of normal completion time while for four-year colleges it reports the percentage who graduate within 150 percent of normal completion time.

deferred compensation from all W-2 forms received for each individual, plus self-employment earnings from Schedule SE.[4]

Although these three pieces of information are highlighted, College Scorecard users can click through to get more information on costs, financial aid and student debt, graduation and retention, earnings after school, student body characteristics, and academic programs offered at each college. Table 1 below summarizes the data elements available. Elements in italics are those highlighted in the summary view of College Scorecard in Figure 1 above. Appendix 1 provides a full College Scorecard for the University of Washington.

[4] Sources for data definitions: Better Information for Better College Choice & Institutional Performance (U.S. Department of Education, 2015) and Using federal Data to Measure and Improve the performance of U.S. Institutions of Higher Education (Office of the President, 2015).

Table 1: College Scorecard Data Elements

Costs	Graduation and Retention	Earnings After School
• *Average annual net price for federal aid recipients, after all government and college grant aid*(1).* • Average annual net price by family income level(2) for aid recipients. • Link to the college's net price calculator.	• *First time, full time six-year graduation rate (four-year colleges) or four-year graduation rate (all other colleges). Compared to the national average.* • % of full time, first time undergraduates who return after their first year*.	• *Median earnings of former students who received financial aid, 10 years after leaving the college** • % of students who, 6 years after enrolling, earn more than an average high school graduate
Financial Aid and Debt	**Student Body Characteristics**	**Academic Programs**
• % of students who have repaid at least $1 of the principal of their federal loans within 3 years of leaving college* • % of students receiving Federal loans • Median federal debt of undergraduate borrowers who completed college • Median monthly loan payment for students who completed	• Number of undergraduates • Full time/part time share • Race/ethnicity proportions • Percentage of students receiving a Pell grant • SAT and ACT score range (25th to 75th percentile)	• Most popular programs • Available areas of study

* The national average is also provided.
(1) In-state net price is given for public colleges. Note that, although College Scorecard does not provide this information, net price allows for academic year living expenses as well as tuition and fees and therefore represents total estimated out of pocket expenses for an academic year.
(2) $0-$30,000, $30,001-$48,000, $48,001-$75,000, $75,001-$110,000, over $110,001

1.2 THE POLICY CONTEXT: BIG GOALS FOR INFORMATION TRANSPARENCY

1.2.1 The Obama Administration – A Partially Achieved Vision

President Obama's overarching policy goal for higher education was that, "by 2020, America will once again have the highest proportion of college graduates in the world" (Obama, 2009). This always seemed unlikely to be achievable, but in any case the administration's agenda for

moving towards that goal was squarely focused on increasing college "affordability, access and outcomes" (Obama, 2009). The Obama administration consistently emphasized the nexus between spiraling tuition costs, poor graduation rates, declining college access and increasing debt burdens, particularly for lower and middle class students (White House Higher Education website, no date; U.S. Department of Education n.d.; U.S. Department of Education, 2014).

Arguing that continued rapid growth in federal taxpayer subsidies for education was unsustainable, and frustrated by college ranking systems that are "constructed to drive colleges to care more, for example, about how many students they reject" than about how many they graduate (U.S. Department of Education, 2015, p.3), President Obama in 2013 put colleges on notice that the government would be creating its own rating system that would compare schools on factors such as how many of their students graduate, how much debt their students accumulate and how much money their students earn after graduating. Moreover, the President envisioned making the amount of federal student loans and grants schools receive dependent on their ratings (White House, 2013).

College Scorecard was to be just the first of these initiatives. But by the end of the Obama administration, it was the only one to have materialized. The President's other plans came under vigorous fire. Academic and think-tank commentators pointed out the inadequacy of available data and the difficulty of constructing an accurate, meaningful and yet relatively simple ratings system (Field, 2013; Akers and Chingos, 2013; Kaminer, 2013). College presidents argued that such a system could force schools to prioritize majors associated with high earnings such as engineering over liberal arts majors (Kaminer, 2013). Although a rather vague draft college ratings framework was released by the administration in December 2014, it received withering criticism (Stratford, 2014). Department of Education officials announced in June 2015 that they were moving away from a post-secondary ratings system (Fain, 2015), leaving College Scorecard as the main federal government source of information on colleges' value for money.

1.2.2 The Trump Administration Agenda – College Scorecard to the Fore

Under an administration focused on deregulating higher education and putting the onus of making smart college choices on students, College Scorecard's centrality as a policy tool is set to grow further. When commenting recently on the Trump administration's broader higher education agenda, Under Secretary for Education Diane Auer Jones commented that "it's [not] the role of the federal government to make the decision on behalf of the student" rather, consumers will "walk with their feet" when armed with the right information (Stratford, 2018). And the administration has identified College Scorecard as the main vehicle for increasing transparency.

In August 2018, the Department of Education announced plans to rescind Obama era regulations requiring institutions to demonstrate that all non-degree and career-preparation programs resulted in gainful employment, defined in terms of graduates' debt-to-earnings ratios. These regulations, introduced in 2014 in the wake of widespread accusations of malfeasance and predation by for-profit institutions, tied institutions' eligibility for federal aid to adequate debt/earnings outcomes for graduates. Instead, now the Department will simply require all institutions to provide, at a minimum, program-level information on median student debt and earnings. This program-level performance data will be made available in College Scorecard or another similar website (U.S. Department of Education, 2018). Although it's not clear exactly how higher education "programs" will be defined, this policy decision would, if implemented, dramatically expand the granularity of the information available in College Scorecard.

Thus, in late 2018, access via College Scorecard to information on the performance of higher education institutions has emerged as the main way in which the federal government plans to help students make life choices with enduring financial and other consequences, and also to encourage colleges to compete on price and quality.

Chapter 2. THE RELEVANT LITERATURE ON INFORMATION AND COLLEGE CHOICE

Can simply providing accurate information on key costs and benefits of colleges lead students to make better college choices? The Department of Education's own technical documentation for College Scorecard admits that providing information alone "puts the burden of synthesizing that information on potential students, who may have difficulty making these tradeoffs without proper support" (Executive Office of the President, 2015, p.75). As one journalist put it more colorfully, "the federal government has backed a dump truck to consumers' doors and left it to students and their parents to compare all those apples and oranges" (Turner, 2015).

Here I group the academic literature – and its implications for the impact of College Scorecard – into two broad schools of thought: one characterizing students as ill-informed human capital maximizers, and; one characterizing them as cognitively limited, heuristic decision makers. I then turn to three studies that have examined the impact of College Scorecard on student behavior and, finally, frame my own research in terms of the literature.

2.1 STUDENTS AS ILL-INFORMED BUT RATIONAL HUMAN CAPITAL MAXIMIZERS

Underpinning the economic literature on this topic is the assumption that, in evaluating their college options, students treat college as an investment and act as rational maximizers of their own human capital (Becker, 1964). Students are conceived of as comparing colleges based on their predicted life-time stream of costs, in the form of tuition, fees and associated debt payments, plus their foregone earnings while in college, and benefits, including the consumption value of attendance as well as post-college financial and non-financial returns (Avery and Hoxby, 2003). Students ultimately choose to attend the college they believe will yield them the highest utility, according to this framework.

This large literature provides insight on three questions directly relevant to the question of College Scorecard's likely effectiveness.

2.1.1 Do students know the true value of variables relevant to estimating the investment value of alternative colleges?

The subjective expectations literature in econometrics stems from Manski's question of whether it is reasonable to assume that students' own beliefs about variables, such as cost of attendance, correspond to those constructed based on best available data (Manski, 1993). This body of research provides motivation for College Scorecard by demonstrating that students generally do not have an accurate understanding of the true value of key variables, particularly cost of attendance.

Many students and parents cannot accurately estimate even the tuition or "sticker" price of college attendance. On average, they overestimate how much college costs, and underestimate how much financial aid they will qualify for (Government Accountability Office, 1990; Horn et al., 2003; Avery and Kane, 2004, Long, 2004b). As such, they assume they cannot afford to attend a selective college or university as these institutions are often more expensive in terms of "sticker" price than those that are less selective (Bowen, Chingos and McPherson, 2009; Scott-Clayton, 2012). Horn and colleagues (2003) report that only 24 percent of surveyed 11th and 12th grade students could accurately estimate sticker prices, while 28 percent grossly overestimated the cost of college attendance.

The literature on subjective expectations of the wage returns to colleges is smaller but growing, and fairly consistently finds that students also overestimate the returns to college for four-year colleges (Avery and Kane, 2004; Botelho and Pinto, 2004; Dominitz and Manski, 1996; Huntington-Klein, 2015; Hastings, Neilson, and Zimmerman, 2015) and for community college degrees (Baker, Bettinger, Jacob, and Marinescu, 2018).

Another consistent finding in the literature is that students from disadvantaged backgrounds tend to have less accurate beliefs than their more advantaged peers (Avery and Kane, 2004; Huntington-Klein, 2015 and 2016a; Hastings et. al. 2016; Bleemer and Zafar, 2018).

2.1.2 In practice, do students make choices like rational human capital investors?

Almost all econometric studies of college choice assume rather than demonstrate that students' choices reflect that they act as rational utility maximizers. One study, however, squarely addressed the question. Avery and Hoxby (2004) examined whether a group of high achieving students evaluating multiple college offers "over-reacted" to financial aid and consequently chose a college that would reduce their lifetime payoff from college attendance. They found that students generally responded to their college financial aid offers in ways consistent with the human capital model. Increased financial aid increased their probability of matriculating at a college, but, all else equal, they also preferred more selective colleges, ones whose average SAT score was at or above their own, and ones with higher instructional spending per student.

Overall, around 60 percent of students were not seduced by offers of financial aid into choosing a college that, due to its lower level of investment in their human capital as measured by instructional spending per student, would reduce the expected lifetime present value of college attendance.[5] This encourages one to think that, at least in a situation where they are faced with a limited, manageable choice set and specific information on the financial attributes of the alternative choices, students will endeavor to trade off the costs and benefits of each option and choose the option with the highest lifetime financial value.

2.1.3 What is the impact of providing accurate information on college costs and returns?

A group of experimental studies in the broad area of educational decision-making ask how students react to information interventions that correct their misperceptions on important variables. Several small-scale studies have addressed students' decisions about how much education to pursue and the choice of major by students already in college. Most relevant to assessing the likely impact of College Scorecard, however, is Hastings, Neilson and Zimmerman's large-scale study, discussed in detail below, studying the effect of an information

[5] That said, students were far from perfectly rational maximizers of their human capital. For instance, they over-reacted to named scholarships (as opposed to generic grants), to work/study and loans, and also tended to react more to the share of college cost covered by a grant than to the grant's dollar amount.

intervention on Chilean students' degree program choices (Hastings, Neilson and Zimmerman, 2015).

Years of Schooling. Four experimental studies investigated whether providing students with accurate information on the returns to education would lead students – who were hypothesized to underestimate those returns – to increase their investment in education. Two studies in developing countries (Jensen, 2010, in the Dominican Republic; and Nguyen, 2008, in Madagascar) found that students given this information completed more years of schooling. In Canada, Oreopoulos & Dunn (2013) found that students provided with information about the costs and benefits of post-secondary education increased their intention to pursue post-secondary education and were more likely to take steps towards it.

Most recently, Bleemer and Zafar (2018) found an effect – in this case, on college attendance expectations - from the provision of accurate information on the earnings of college graduates. The researchers embedded an information experiment about college earnings and costs in a representative sample survey of U.S. household heads (N=779). They found the usual inaccuracies in subjects' prior beliefs about college costs and graduates' earnings. The earnings information treatment had a significant and persistent impact on intended college attendance[6] with expectations of attendance increasing by about 0.2 of the standard deviation in the baseline likelihood.[7] The cost information treatment had no impact. Interestingly, the impact of earnings information did not vary with the size of the gap between subjects' initial beliefs and the correct information. Bleemer and Zafar interpret this as indicating that providing earnings information acted by increasing the salience of that variable, that is, inducing respondents to consider it, rather than via respondents updating their prior earnings beliefs.

College Major Choice. In the United States, examining college major choice, Wiswall and Zafar conducted an experimental information intervention with undergraduate students at New York University (Wiswall and Zafar, 2015a and 2015b). Students (N= 488) were first asked for their beliefs about labor force earnings for graduates in particular college majors and their

[6] For either the respondent's or a close friend's child.
[7] The treatment also decreased differences in planned college attendance by household income or parents' education by 20–30%.

expectations about their own earnings if they graduated with the same major. Students were then given publicly available information on the actual earnings of graduates in those majors and asked to report their earnings expectations again. Students did meaningfully revise their beliefs after receiving the new information, making large changes in the expected direction. Interestingly, subjects made much larger revisions to their expectations of future earnings when the information they received was good news. These beliefs persisted in a follow-up two years later.[8] Wiswall and Zafar (2015a) found that the effect on students' expected majors resulting from changes in earnings beliefs, although significant, was small relative to that resulting from students' personal tastes for particular majors.[9]

Studying students at two California community colleges, Baker, Bettinger, Jacob and Marinescu (2018) found that personal taste and self-assessed academic ability were more important than salary as determinants of major choice. However, using an experimental method they found larger impacts of expected earnings on major choice than did Wiswall and Zafar, finding that a 10 percent increase in salary, compared to students' self-reported prior expectations, was associated with a 14 to 18 percent increase in the probability of choosing a particular major, net of other variables.

Degree Program Choice in Chile. Hastings, Neilson and Zimmerman (2015) worked with the Chilean Ministry of Education to investigate whether providing students with information about the earnings and costs associated with different degree programs could help them make choices likely to result in higher financial returns.[10] Over 49,000 high school seniors about to make application decisions participated in their web-based experiment. All students were asked to report their top three preferred degree programs. Students in the treatment group were then taken to a page of additional information. This page provided them with a summary measure of the net

[8] Zafar (2011) also found a differential impact of information. In this study, which used panel data capturing students' expectations about their future performance before and after they got information on their abilities in the form of grades, learning about one's academic ability only led to an increase (decrease) in subjective expectations of future performance if the information was very positive (negative).

[9] This finding, given that their subjects were already in college and seem likely to have already formed strong preferences for particular fields of study, is perhaps not surprising.

[10] Chilean students apply to specific degree programs, that is combinations of an institution and major, rather than simply to an institution as is most typical in the United States. In other ways, however, higher education in Chile is quite similar to the U.S. system, with similar educational attainment rates, a significant role for state-based student loans, and a mix of public and private colleges serving students (Hastings et al, 2015).

value of each of their preferred degree programs. This net value measure, calculated by the authors for all degree programs in Chile, summarized earnings returns relative to non-attendance over a 15-year period, and also showed the earnings and costs components of the net value calculation, along with a brief explanation of terms and data sources.[11] On the same page, treated students also saw a box informing them if there were degree programs in the same broad field as their chosen degree program that were associated with similar entrance requirements but with higher net values and informed students how much net value gain they could expect if they made a switch. Finally, treated students were invited to search a database which allowed them to search for degree programs in their area of interest (and likely to be accessible to them based on their standardized test score results). The results of the search were displayed in tabular form showing the institution name, the major and the associated net value, earnings and cost measures.[12]

This information intervention did not affect whether students enrolled in college but had significant effects on the degree program in which they ultimately enrolled. Receiving the information intervention had a significant effect, raising predicted earnings by 1.4 percent of the control group mean, and by 3.2 percent for lower-SES students with low admissions scores. To understand the mechanisms underpinning these results, the authors estimated a discrete choice model of college enrollment, and concluded that, while students learn from the information intervention, they have strong preferences for non-financial aspects of degree programs, particularly for specific institutions, and that this limits the effect of the information intervention.

2.1.4 Implications for College Scorecard's Likely Effectiveness

Taken together, these studies, particularly that of Hastings and collaborators, give reason for guarded optimism that College Scorecard information will have some impact on students' ability accurately to evaluate colleges' financial investment value. They suggest the following logical chain. Students have imperfect information on the true value of the variables relevant to determining colleges' lifetime value. When they have that information, they do a fairly good job

[11] The fifteen-year time horizon was requested by Chile's Ministry of Education which preferred to align the calculation with the payback period for state-backed student loans, which are used by 36 percent of Chilean college students. The information was presented such that students could see that earnings less costs, both presented in present value terms, equaled net value.

[12] Students were not required to search but around 40 percent did.

of choosing the college with the biggest payoff. They also logically update their beliefs when given new information, although the effects are variable and not always large, possibly because they are moderated by students' non-financial preferences. Giving students accurate information on the relevant variables should improve their ability to choose colleges offering them the highest lifetime economic value, although it is difficult to predict by how much.[13] Also, there is some reason to believe that the effects will be larger for low-income students.

2.2 STUDENTS AS COGNITIVELY LIMITED, HEURISTIC DECISION-MAKERS

On the other hand, recent evidence from the "under-matching" literature gives pause for thought. This literature centers on the concern that, by attending a college where the academic qualifications of the average student are significantly less than their own, a large number of students may be reducing their likelihood of successfully graduating from college (since more selective colleges tend to have substantially higher graduation rates) and thus their payoff from college attendance. That students who under-match are disproportionately from low-income families increases this concern.

2.2.1 Students as Heuristic Decision-Makers

Many researchers on under-matching have moved to a view that students choosing colleges use rules of thumb rather than evaluating each college based on its attributes as the human capital model would suggest. This line of thinking is part of a broader emerging literature that examines students' and families' college-related decision-making through the lens of behavioral economics (see Castleman, Baum and Schwarz, 2015, for a summary).

Faced with an overwhelming amount of information on colleges from which to pick and choose, these researchers argue that students follow default rules of thumb when choosing to which colleges they should apply (Hoxby and Avery, 2012; Pallais, 2013; Avery and Turner, 2010). Avery and Turner went so far as to suggest that the "reach, match, safety" (RMS) rule of thumb

[13] While this is the obvious line of thinking, Bleemer and Zafar's 2018 study suggests an alternative possible chain of causation: providing information on decision-relevant variables induces some students, who would not otherwise have done so, to consider those variables in their decision-making.

often preached by college counselors is the best one for approximating a welfare-maximizing solution to the complex portfolio optimization problem of college choice (Avery and Turner, 2010).[14]

Hoxby and Avery found patterns consistent with such heuristic decision-making when examining the SAT and ACT score-sending behavior of very high achieving, low- and high-income students (Hoxby and Avery, 2012). While they found that high-income, high achievers followed score-sending patterns consistent with the RMS rule of thumb, only 8 per cent of low-income, high achievers followed similar patterns.[15] Instead, 53 percent of high-achieving low-income students favored colleges that are public, would allow them to live at home or are in-state, and disfavored higher sticker prices and colleges that were a match for them academically. This suggests that these students are following a rule of thumb aimed at minimizing the cost of college.[16]

These rules of thumb can be thought of as summarizing differences in social and cultural capital between higher and lower income students that have been pointed out by other researchers, mainly in the sociology literature. For instance, research has found that low-income students frequently conduct constrained college searches because they screen out many potential colleges on the basis of (mis)perceived lack of affordability (Roderick, Coca and Nagaoka, 2011; McDonough, 1997). Surveys and interviews conducted by the Consortium on Chicago Schools Research concluded that high achieving graduates of Chicago Public Schools know little about the colleges and universities at which they would be well-matched, and instead apply to those institutions most often attended by their peers, regardless of the academic match (Roderick,

[14] The RMS rule holds that students should apply to a portfolio of colleges consisting of ones that, based on their academic qualifications and the schools' acceptance rate, they are almost certain to get into ("safeties"), will probably get into ("matches"), and might get into ("reaches"). The RMS rule can could also be thought of as a "choose quality" heuristic, where college selectivity is a proxy for quality, which might alternatively be measured by variables such as graduation rates, instructional spending per student or post-college earnings, with all of which "quality" is correlated. Hoxby and Avery's econometric analysis found that, in addition to having a strong taste for reach and match schools, high-income, high achievers preferred schools with higher sticker prices, another proxy for quality (Hoxby & Avery, 2012).

[15] Score-sending behavior correlates closely to actual application patterns for selective colleges (Card and Krueger, 2005; Avery and Hoxby, 2004).

[16] The remaining 39 percent had idiosyncratic application patterns, e.g. applying to a community college and Harvard.

Nagaoka, Coca and Moeller, 2009). They may simply apply to institutions that sound familiar, are close to home, or at which they know a number of family members, friends, or classmates from high school. Also, despite the availability of tools such as College Scorecard and net price calculators on colleges' websites, only 29 percent of students consider their likely financial aid when thinking about college costs. Over half, 54 percent, look only at sticker price while 12 percent do not consider costs (College Board and Art and Science Group, 2013).[17]

Similarly, over twenty years ago, McDonough found that, at the affluent private high school she studied, students applied a two-part decision rule, screening colleges first on the basis of their academic and personal fit with the student and, only then, looking at cost. In contrast, the choices of students at the lower income public schools she studied were driven first and foremost by their perceptions of cost (McDonough, 1997).

2.2.2 Hoxby and Turner's Expanding College Opportunities Study

Hoxby and Turner's Expanding College Opportunities study (2013a) was based on the belief that high achieving, low-income students were under-matching because they were using the wrong rules of thumb or strategy to choose a college. Rather than testing a simple provision of information as did the studies reviewed above, this study tested a rich, personalized information intervention that was delivered directly to students at their home, at key points during the college search process, and carefully designed to maximize the likelihood that it would be attended to by students and regarded as trustworthy.[18] This intervention had a large impact on students' college choices, moving student application behavior, for instance, by amounts as large as half a standard deviation.

Hoxby and Turner tested three different information treatments and a combined treatment on 12,000 (2,400 per treatment or control group) students in their cohort of 2011-12 high achieving,

[17] Four percent did not respond to the survey question.
[18] Caroline Hoxby described the process of developing the materials as more like being in marketing than operating as an economist normally does.

low-income high school seniors.[19] The three individual treatments deployed corresponded to three different hypotheses about the reasons for differences between low- and high-income students' college application patterns. Hoxby and Turner also tested a combined treatment, the "Expanding College Opportunities" (ECO) treatment that combined all three individual treatments.

The "college strategies" treatment tested the hypothesis that low-income students lack the expert advice an experienced college counselor would provide. In particular, the students use the wrong rules of thumb to decide to which and to how many colleges to apply. This treatment included advice on: the rule of thumb, used by expert counselors, of applying to around eight or more colleges and to a mix of "reach", "match" and "safety" colleges; how to compare colleges based on curricula, instructional resources and outcomes such as graduation rates; deadlines and requirements such as completing the College Scholarship Service (CSS) profile, the FAFSA and application essays.

The "net price" treatment tested the hypothesis that students rule out more selective colleges because they have inaccurate cost perceptions. Students were provided with information on average net costs for low to middle income students, i.e. after federal, state and institutional grant aid, for a range of in- and out-of-state public and private colleges that were a match for their academic qualifications. Students also received information on instructional spending per student at each college[20] and an explanation of "how financial aid works, emphasiz(ing) how crucial it is to complete the FAFSA and CSS Profile on time, clarify(ing) how a student's Expected Family Contribution is computed, decipher(ing) a prototypical financial aid offer, and illustrat(ing) the trade-offs between loans, grants, and working while in college" (Hoxby and Turner 2013a, p. 10).

[19] Students were randomly selected from the national cohort of graduating students with (i) scores in the top decile of test takers of the SAT 1 or ACT, and (ii) family income in the bottom third of the income distribution for families with a twelfth grader (approximately $40,000).
[20] Econometricians frequently use this measure as a proxy for the expected financial benefits of attending a college.

The "application fees" treatment tested the hypothesis that students were deterred from applying to highly selective colleges by the application fees. This intervention provided each student with eight "no-paperwork" application fee waivers to 171 highly selective colleges.

Of the three sub-interventions, the "net price" treatment is closest to College Scorecard. Note that it is somewhat misleadingly named as it provides more than net price information. In fact, like College Scorecard, it provides information on variables that can be used to estimate the costs (net price of attendance) and benefits (instructional spending per student) of attending a particular college. The difference is that in College Scorecard graduation rates and average post-college salary serve as proxies for the likely financial benefits of attendance rather than instructional spending per student.[21]

Hoxby and Turner's results were impressive. The effects of treatment-on-the-treated were as follows.[22] In the case of the combined, ECO treatment, "if a student could at least recall having seen ECO materials, the ECO Intervention caused her to submit 48 percent more applications and to be 66 percent more likely to submit at least five applications. She was 42 percent more likely to apply to a very selective private university and 38 percent more likely to apply to a very selective liberal arts college. Among the colleges to which she applied, the most selective one had a higher Barron's ranking and enrolled students whose median SAT score was 86 points higher than that of controls. If she could recall seeing ECO materials, the ECO Intervention also caused her to apply to a college with a 17-percent higher four-year graduation rate, 55 percent higher instructional spending, and 52 percent higher student-related spending" (Hoxby and Turner, 2013a, p. 23).

With respect to admissions outcomes, a treated student, on average, "was admitted to 31 percent more colleges. The most selective college to which he was admitted had students whose median SAT score was 53 points higher. The most selective college that admitted him also had a 24 percent higher graduation rate, 34 percent higher instructional spending, and 34 percent higher

[21] Unfortunately, I was unable to secure copies of Hoxby and Turner's treatment materials in order to check how this information is presented.

[22] I report these rather than their intention-to-treat results – which are still impressive - as Hoxby and Turner argue, quite reasonably, that, if the intervention were scaled by a reputable organization such as the College Board, effect sizes would be close to the treatment-on-the treated levels.

student-related spending" (Hoxby and Turner, 2013a, p. 25). With respect to enrollment outcomes, "a student that experienced the ECO Intervention enrolled in a college whose graduation rate was 15.1 percent higher, whose instructional spending was 21.5 percent higher, and whose student-related spending was 26.1 percent higher" (Hoxby and Turner, 2013a, p. 26).

Most importantly for my research question, the net price intervention, which, like College Scorecard, provided students with information on both net price and on college quality, had a similar effect to the application strategies intervention on all application and admission metrics, including the quality of the colleges to which students applied and were admitted. *But, critically, the net price intervention had no significant impact on the quality of college of enrollment* (Hoxby and Turner, 2013a, Table 9, pg. 51).[23] It's not possible to say definitively why this should be so, but interestingly, students receiving this intervention were 1.5 times as likely as students receiving the combined ECO intervention to apply to a very selective liberal arts college. These colleges have high sticker prices but often highly subsidize low-income students. One possible explanation is therefore that students were motivated to apply to these colleges because of their surprisingly low net cost of attendance, but, in the absence of advice on how to compare alternative colleges, application did not translate into enrollment. It's also possible that the actual financial aid offer these students received was less than they expected based on the data for the "average" low-income student provided in the intervention materials.

In contrast, the application strategies intervention had effects on outcomes such as instructional spending per student, median SAT, and four-year graduation rate of students' college of enrollment that were close to, and in some cases larger than, the effect of the combined ECO intervention (Hoxby and Turner, 2013a, Table 9, pg. 51). Thus, in this study, providing advice on *how* to use information to evaluate colleges, but *not the information itself*, had a big impact on students' ultimate college attendance decisions.[24] The opposite approach – that taken by College Scorecard – of offering students information but not advice on how to use it, did not affect students' ultimate college decisions.

[23] Similarly, the fee waiver intervention was effective at inducing an increase in application volume but less effective at helping students find the colleges which were a good academic match for them.

[24] Presumably students told how to evaluate colleges but not given the information needed to do so sought out and found that information elsewhere.

2.2.3 Implications for College Scorecard

If students are using rules of thumb because they are overwhelmed with the amount of information available on colleges, then, to have an impact, College Scorecard would need to cut through the information maelstrom and garner students' attention. Moreover, even if it does so, it will not necessarily change students' decisions. For instance, if low-income students are using a cost minimization rule of thumb, then College Scorecard will only lead them to choose higher expected value colleges if:

(i) It reveals to those students that those colleges are also the least expensive. This could well be the case for private colleges that heavily subsidize low-income students; or

(ii) Receiving College Scorecard information leads students to change from a "minimize cost" rule to a decision rule that also considers indicators of the future benefits of college attendance such as graduation rates and expected future earnings.

Obviously, Hoxby and Turner garnered students' attention and changed their behavior. Their interventions had large effects, and on real world behavior. But it was a complex, nuanced intervention, carefully timed and presented. It's not possible to disentangle entirely which elements had the most impact.

College Scorecard is a very different information intervention. Most fundamentally, it is a website that students need to seek out, and it does not provide students with advice on how to choose a college. If advice on how to choose is essential to influencing student behavior, it seems unlikely to be successful. In addition, College Scorecard seeks to influence students of all academic abilities not just high achieving students, who Hoxby and Turner argue are more intellectually capable of evaluating the costs and benefits of alternative colleges.

At the very best, this line of thinking suggests that low-income students who somehow find and engage with College Scorecard will change their evaluations of colleges to the extent that they had overestimated the cost of attendance.[25] But it is not clear that this would enable these

[25] Another result from Hoxby and Turner's study is suggestive. The net price intervention had 1.5 times the effect of the combined ECO intervention on the probability that the student would apply to a very selective, private liberal arts college but had a much smaller effect ($\beta = 0.557$) than the ECO intervention on a student's probability of

students to differentiate between two colleges with the same net price but very different outcomes as indicated by graduation rates and average salary after graduation. Students strictly applying a cost-minimization rule of thumb would treat these really quite different colleges as equivalent.

2.3 STUDIES EVALUATING THE IMPACT OF COLLEGE SCORECARD

The Department of Education has not published any studies of the effectiveness of College Scorecard. Two studies – Huntington-Klein (2016b) and Hurwitz and Smith (2018) - did, however, exploit the relaunch of College Scorecard on September 12, 2015 to examine its impact on student college search and application behavior.[26] A third study, commissioned by the U.S. Treasury, used an experimental design to test the effect of a variant of College Scorecard in which students were provided with program-level information on student earnings - rather than the college-level information provided in College Scorecard – as well as the usual Scorecard information on average net price and graduation rates (Blagg, Chingos, Graves, Nicotera, 2017).

The results of these studies are not encouraging. Both Huntington-Klein (2016b) and Hurwitz and Smith (2018) utilized the sudden inclusion on September 12th, 2015 of earnings information in the College Scorecard. Up until that point, College Scorecard, which was introduced in 2013, included information only on average net price and average graduation rates. Both studies utilize difference-in-differences identification strategies with the goal of estimating the effect of the provision of earnings information upon student behavior.[27]

Huntington-Klein (2016b), using Google trends data on college searches, found that the inclusion of earnings information in College Scorecard did lead to increase in searches for colleges with relatively high graduation rates or earnings or low tuition. But, while statistically significant, the

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applying to a very selective private university. Very selective liberal arts colleges are those most likely to highly subsidize a high achieving, low-income student and thus the ones where information on the net price of attendance would be most likely be a large, pleasant surprise to a high achieving, low-income student.

[26] Both studies employ a difference-in-differences identification strategy.

[27] The relaunch of College Scorecard was accompanied by some media interest, but not by a campaign to promote it to students or to high school college counselors.

effects were very small. A $1,000 increase in median graduate earnings or decrease in tuition increased search popularity of a college by less than 1% of a standard deviation.

Hurwitz and Smith (2018), assessed the impact of the inclusion in College Scorecard, on September 15th, 2015, of information on the average mid-career salary of graduates associated with each college. Using a difference-in-differences identification strategy and data on students' SAT score sends to colleges before and after September 15th, 2015, the authors found that each 10% increase in reported earnings resulted in a 2.4% increase in SAT score sends to a college. The impact was, however, driven entirely by students from well-resourced high schools and concentrated among students whose parents had at least some college education, and by White and Asian students. The authors point out that "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" (Hurwitz and Smith, 2018, p. 29). Given their method, the researchers are unable to say whether less-advantaged students did not see the College Scorecard data or did see it but didn't change their behavior.

Finally, Blagg, Chingos, Graves and Nicotera (2017) found no evidence that students and schools were eager for program-level information on graduate earnings, or any impact of that information on students' colleges and majors immediately after high school. The researchers had a difficult time recruiting schools in Virginia to participate in an experiment in which students were provided with access to a website showing either College Scorecard-like information – program level earnings data, average net price and average graduation rate – for their in-state colleges or to a more basic website showing only colleges' location, sector (public/private) and level (four-year/two-year). Compared to the students with only access to the basic website, students in the treatment group did not enroll in colleges or majors associated with higher wages, higher graduation rates, or lower costs immediately after high school. The lack of any impact may well be due to low usage. Despite strong efforts at promotion, student usage of the websites was low and not significantly different between the treatment and control groups. It is also possible that students in both the treatment and control groups found the information that they wanted on the actual College Scorecard, which was relaunched at the beginning of the 2015/16 school year in which Blagg et al. conducted their study. Thus, while this study suggests that

students do not hanker for program-level earnings information, it could be that they did utilize the college-level information provided in College Scorecard.

2.4 WHERE TO FROM HERE?

The three studies discussed immediately above indicate that College Scorecard as it is currently structured is unlikely to be sought out by students in sufficient numbers and to have large enough effects on individual behavior to significantly affect students' college choices.

Could providing the information provided in College Scorecard directly to students increase its impact? On the one hand, studies in the information-updating literature suggest that it can. Hastings and collaborators' (2016) findings are particularly encouraging. Their study was not, however, performed in the U.S. context. It also provided students with a "one number" evaluation of the expected returns to alternative degree programs rather than, as College Scorecard does, providing them with the raw information – costs, average post-graduation salary, and average graduation rates – that could be used to make such a calculation. On the other hand, Hoxby and Turner's college choice information intervention, which was conducted in a U.S. context, raised doubts about whether simply providing scorecard information would shift students' college choices toward higher return options.

The question of whether directly providing students with Scorecard information will be effective is entangled with alternative conceptions in the literature of how students should be characterized as decision makers and how this in turn affects how they process scorecard information. If students are best characterized as heuristic decision-makers using simple rules of thumb to evaluate colleges, then providing them with scorecard information without educating them as to how to use it would not be expected to improve their college choices.[28] On the other hand, if students are in fact already weighing up variables affecting both the costs and benefits of their college options, as the literature grounded in the human capital model assumes, then providing

[28] Unless the information led them to update their beliefs about the variables already in use in their heuristic, most often cost.

them with scorecard information that enables them to better estimate the costs and benefits of their college options should improve the accuracy with which they do so.

In light of this, my research asks whether receiving scorecard information does shift U.S. students' evaluations of the financial investment value of college alternatives and also explores the question of how exactly students make those financial evaluations. In the next chapter, I frame these questions more specifically and present my research design.

Chapter 3. RESEARCH QUESTIONS AND DESIGN

My first research question asks whether a "best case" presentation of College Scorecard information, drawing on lessons from Hoxby and Turner (2013), Hastings et al. (2015), and decision-making literature more generally, improves U.S. high school seniors' ability to evaluate the financial investment value of alternative colleges. Can College Scorecard information be presented in a way that does have an effect on students' behavior? Hastings et al.'s findings suggest that it can, while Hoxby and Turner's findings raise doubts.

Secondly, I also wish to investigate the impact of College Scorecard information on the decision processes students use to evaluate colleges. Are students better characterized as rational human capital maximizers considering the impact of multiple variables on the lifetime financial value of attending alternative colleges? Or, are they heuristic decision-makers, using rules of thumb to simplify the decision process? Does their decision-making style change when they are given College Scorecard information on the colleges under consideration?

3.1 OVERALL RESEARCH DESIGN

To address my twin research questions, I decided upon a design that combines a between-subjects experiment - aimed at capturing the effect of College Scorecard information on the accuracy with which subjects evaluate the financial investment value of alternative colleges - with a follow-up combined quantitative/qualitative study aimed at investigating the decision processes that led them to those evaluations. The design draws on methods from the information processing approach to decision research. This literature is particularly appropriate for the research questions at hand which combine interest in the effect of well-presented College Scorecard information on students' judgments (the outcomes) with interest in the way in which students use the information to arrive at their judgments (the decision processes).

The information processing approach stems from Herbert Simon's insight that decision-making has cognitive costs and that attention is thus a scarce resource (Simon, 1978). As a result, people only selectively pay attention to information relevant to a decision, often choosing to apply

simple heuristics rather than engaging in a complicated evaluation of multiple attributes of a problem.[29] The focus of this approach is therefore on understanding the real processes people use to make decisions, how they choose to use information available to them, and whether those same processes lead to "good enough" outcomes (Simon, 1955; Payne and Bettman, 2004).[30] It is also interested in studying the factors, such as the complexity of the task or the information available, that lead them to select one decision strategy over another (Beach and Mitchell, 1978; Bettman, Luce and Payne, 1998).

Decision researchers within this framework combine an analysis of the accuracy of subjects' final judgments or choices with the results of evaluating subjects' verbal reports of their thoughts during the decision process (Ericsson and Simon, 1980; Svenson, 1996; Payne and Bettman, 2004). Thus, the methods associated with this literature are particularly appropriate to characterizing the decision processes of students evaluating the financial investment value of alternative colleges. Are they seeking to maximize their expected utility by considering multiple variables affecting predicted costs and benefits? Or are they using simpler heuristics? And does the strategy they choose change when they are given well-presented College Scorecard information?

I employed a between-subjects experiment to measure the accuracy of subjects' college rankings with and without College Scorecard information. The experiment consists of a survey in which subjects are asked to rank two short lists of colleges located within their state from best to worst financial investment. The control group received only "basic" information on the colleges (name, location, public vs. private sector) while the treatment group also received "Scorecard information" (net price to hypothetical focal student, average graduation rates, average graduate salaries). I measure subjects' ranking accuracy by comparing their rankings to a reference

[29] In the information-processing view, so long as the results of the decision are sufficiently accurate this "satisficing" strategy is not problematic. Bounded rationality in this view is not necessarily equivalent to irrationality. In contrast, the behavioral economics literature associated with Kahneman and Tversky focuses on cases where heuristic rules lead decision makers into errors. It tends to portray departures from utility maximization as irrational and as bad habits to be corrected. See Kling, Congdon and Mullainathan (2011, pg. 32ff) for a discussion of the differences between the two approaches.

[30] To make this judgment, outcomes are usually compared to those that would result from applying a more complicated maximizing decision rule involving multiple, weighted variables.

ranking of net economic value generated using a simple human capital model. The survey and reference ranking are described in detail in Section 4.

Secondly, I administered the same survey to a separate group of subjects who were asked to complete the two college ranking tasks while "thinking aloud" about their decision processes. To capture subjects' natural thought processes with minimum interference, I used a "think aloud" protocol. As the name suggests, the interviewer asks subjects to "think aloud" as they read and carry out the ranking tasks in the survey. "Think aloud" protocols have not, to my knowledge, been used in the college choice area. Such protocols are, however, a relatively common decision process-tracing technique in decision research (Payne & Bettman, 2004; Fischhoff, Bostrom, & Quadrel, 1993; Svenson, 1996). Unprompted or classic thinking aloud has little or no effect on behavior apart from prolonging tasks, however, prompted thinking aloud changes the level of cognitive effort engaged in by subjects and raises concerns about reactivity. That is, subjects may consciously or sub-consciously alter their reported thought process due to their consciousness of being observed (Hertzum, Hansen and Andersen, 2009; Ericsson and Simon, 1980). I discuss how I structured the protocol to minimize reactivity in Section 4.

I collected data for these two studies in December 2014 (ranking tasks) and December 2015 ("think aloud" ranking tasks). Two subject groups completed the ranking tasks: high school seniors at a lower-income public high school in Portland, Oregon, and; high school seniors at a higher income public high school also in Portland. Only seniors from the lower-income school completed the "think aloud" plus ranking tasks study.[31]

These data sets enable me to: (i) examine whether College Scorecard information improves the accuracy of any or all of these subject types; and (ii) investigate the decision processes used by low-income students and whether they differ by treatment versus control group. Thus, I can comment on the second research question of how we should characterize students' decision processes.

31 An important point of difference between my design and classic information-processing process-tracing designs is that different subjects, albeit from the same lower income school, completed the "think aloud" ranking tasks. I discuss this and other possible threats to validity in Section 6.

3.2 PRESENTING COLLEGE SCORECARD INFORMATION TO MAXIMIZE IMPACT

My goal was to present College Scorecard information in a way that, while simple and scalable, maximized the chance that students would pay attention to and engage with it, incorporating it into their decision making.

(i) The survey presents College Scorecard information not as it is in real-life, but in an easily accessible summary form.[32] Multiple studies have shown that reducing seemingly small barriers to information and making it easier to compare options have large impacts on subjects' choices (e.g. Kling, Mullainathan, Shafir, Vermeulen and Wrobel, 2011; Hastings and Weinstein, 2007).

(ii) Subjects are asked to rank, not for themselves, but for someone else. "Self-other" decision research suggests that in ranking for others we rank as our "best self." Specifically, we base the decision more on how we think we *should* behave than how we might *actually* behave at the point of decision, and we also seek out more information to inform the decision (Pronin, Olivola and Kennedy, 2008).

(iii) That "someone else" is a hypothetical low-income student facing a series of choice situations in which a low-income student's perceptions of value are, as indicated by the literature reviewed in Chapter 2, likely to be quite wrong and College Scorecard information thus more likely to lead to a significant change in their college evaluations.

(iv) Students are informed that this student cares only about the financial investment value of the college they attend. This framing dramatically simplifies the number of variables to be considered and thus the risk that, rather than systematically evaluate the options, students will adopt a simplifying strategy (Leonard, Thaler and Sunstein, 2008; Scott-Clayton, 2011). Also, it

[32] College Scorecard introduced a comparison function to its website in September 2015, however, it is structured differently to the tabular format I use. Users of CS are presented with first a table showing colleges' average net price information, then another table showing graduation rates, and finally another presenting average salaries. This serial comparison approach makes it hard to see colleges as a bundle of attributes.

frames the ranking task rather like a test, rather than as an expression of students' own preferences for individual colleges.

(v) Students are presented with a short list of colleges to evaluate, which also reduces cognitive load. Methodological research in the ranking literature indicates that shorter tasks elicit more accurate responses.[33]

(vi) The experimental context is in itself a treatment. Rather than relying on students to seek out College Scorecard information, as did Blagg, Chingos, Graves and Nicotera (2017) with very disappointing results, students are confronted directly with the ranking tasks.

3.2.1 Comparison with Other Information Treatments

As in Hoxby and Turner's (2015) information treatment, mine is delivered directly to students, even more directly than theirs in fact as students in my experimental setting must interact with the treatment. Although I do not explicitly provide guidance on how to evaluate colleges, the framing of the goal as selecting the college that is the best financial investment, and considering only financial costs and benefits, guides students considerably. For those students who receive scorecard information on net price, graduation rate and earnings, the fact that that information was provided to them indicates that it is likely to be relevant. The question is, do students need even more explicit advice?

As in Hastings et al.'s (2015) information treatment, students are confronted with both cost and earnings-related information. My treatment does not, however, provide students with a "single number" for the expected net value associated with attending a given college, rather it requires students to synthesize three numbers (cost, salary and graduation rate) to arrive at their own net value estimate. Also, my treatment is not personalized to students' own preferences and academic and other characteristics.

[33] Bradley and Daly (1994); but see Hess and Daly (2012) for a more optimistic assessment of fatigue effects.

3.2.2 The Choice Situations

I sought to identify choice situations where, based on the misperceptions in low-income students' thinking discussed in Chapter 2, low-income students' perceptions of the financial investment value of alternative colleges were most likely to be most wrong. From a policy perspective, so long as these are common choice situations, this approach also focuses the analysis on the most important policy targets for College Scorecard.[34]

Hoxby and Turner have already identified one situation - choosing between highly selective private four-year colleges and leading state public colleges - where low-income students are making choices that suggest they'd choose differently if they had College Scorecard information. As noted earlier, while elite private colleges often highly subsidize low-income students, such students are much more likely to apply to and attend public colleges that cost them more and deliver worse outcomes. That is, these students give up opportunities to attend colleges that would give them more and cost them less. While extremely puzzling, this is not a situation most low-income students commonly face. Generally, students will face a trade-off between price and quality (Avery and Hoxby, 2004). Very high achieving low-income students, because they are desirable target students for elite private colleges, face the anomalous situation of being offered more quality for a lower price.

I looked therefore for situations where low-income students deciding whether it is worth paying more to attend a college that offers more future benefits, measured in the case of College Scorecard by average graduation rates and the average salary of graduates, might be led by their focus on perceived cost to make choices that have a large negative impact on their lifetime payoff from attending college. I identified two additional high impact choice situations:

[34] Low-income students are the most important policy target for College Scorecard because they are likely to benefit the most from it. Not only do low-income students under-match at much higher rates than do students from higher income families (Bowen, et al., 2009; Roderick, et al., 2009, 2011; Smith, Pender and Howell, 2013; Dillon and Smith, 2017), they also suffer greater penalties for doing so. Several studies have found that minorities and lower SES students experience higher returns to college selectivity (Long, 2010; Alon and Tienda, 2005). Thus, these students have the largest potential to benefit from College Scorecard information that may lead them to select colleges that offer higher returns.

Choosing between a local commuter public college and a leading state public college. Low-income students may be attracted to local commuter four-year colleges[35] by the cost savings they appear to offer through lower tuition and reduced living costs if the student can live at home.[36] Yet those colleges are likely to have much lower average graduation rates and post-college average salaries than a state flagship or other leading public college (Dillon and Smith, 2017; Hughes, 2013). A student eligible to attend a leading public college who decides to attend a local commuter college instead could suffer a significant reduction in expected lifetime income.

Choosing between attending a public four-year college immediately after high school and attending a two-year community college and then transferring to a public four-year college to complete a four-year degree. Low-income students may also be attracted to the so-called two/four transfer route from community college to a public four-year college by the apparent attendant cost savings. It is, however, well-established in the literature that, controlling for academic ability, starting at a community college decreases the likelihood of a student whose goal is a four-year degree of ever attaining one by 14.5 to 31.5 percentage points (Goodman, Hurwitz, and Smith, 2015; Lockwood Reynolds, 2012; Long and Kurlaender, 2009).

3.2.3 Design Limitations

An important limitation of this small-scale experiment is that the ranking task survey does not measure College Scorecard's impact on actual college application and enrollment behavior but rather on students' perceptions of the financial investment value of each college for a high-achieving, low-income student. It is not clear whether students would make the same or similar assessment of the colleges' financial value for themselves. Also, given that many factors, including non-financial considerations such as college location and amenities, affect students' ultimate application and enrollment decisions, it's unlikely that many students' perceptions of financial value will fully determine their choices. These are non-trivial limitations and I will return to their implications when discussing the implications of this study.

[35] A commuter college is one where the majority of students commute to campus rather than living on-campus.
[36] Hoxby and Avery (2013, p. 38) found that for high achieving, low-income students, being able to live at home dramatically increased the probability that they would apply to a given college (odds ratio of 4.9), all other factors being held equal.

Chapter 4. DATA COLLECTION INSTRUMENTS, PROCESSES AND SAMPLE CHARACTERISTICS

This chapter describes the two data collection instruments used: the written survey instrument which captured students' rankings of AJ's and JJ's college choices (December 2014 and 2015 data collection rounds), and; the "think aloud" protocol which I used in December 2015 to prompt students to "think aloud" as they completed the survey instrument. It describes the December 2014 and 2015 sampling process and sample characteristics. Finally, it compares the observable characteristics of the December 2014 and 2015 samples of low-income students.

4.1 WRITTEN SURVEY INSTRUMENT DESIGN

As described further below, this survey instrument was used in both the December 2014 and December 2015 data collection rounds. To measure the impact of scorecard information on students' ability to assess the 'bang for the buck' of alternative colleges, I constructed a survey that asks subjects to rank two sets of colleges within their home state from best to worst financial investment. The colleges which students rank correspond to the three high impact choice situations discussed in Chapter 3.2.2 The survey is composed of three parts: a vignette; two ranking tasks; and some short demographic questions. Appendix 2 contains the full survey materials.

4.1.1 The Vignette

I ask subjects to rank the colleges from the viewpoint of two low-income students, AJ and JJ, who care only about the financial investment value of the college they attend. As well as having other attractive properties as discussed in Chapter 3, this presentation also enables me to avoid problems of heterogeneity in individual college preferences and to standardize the net price information presented to subjects using the characteristics of AJ and JJ.[37] This approach also increases power in a small sample size as I do not need to control for non-financial variables' effect on students' ranking of the colleges.

[37] Net price varies depending on the family income level of prospective students as students from lower income backgrounds receive more need-based aid.

The vignette informs subjects that they've been asked by two hypothetical low-income students – AJ and JJ - to rank the colleges each student is considering attending from "1" = best to "6" = worst financial investment. Subjects are also told that AJ and JJ "care only about the financial benefits and costs of attending college, not about things like location, what the students are like or the campus environment" and that "AJ and JJ are not related, but they both come from families earning under $25,000 per year and will therefore get a lot of financial aid for college.[38] They will be able to borrow any additional money needed for college at 0% interest and won't have to repay the loans until after leaving college. Loan repayments will then be limited to, at most, 10% of monthly income".[39] That is, they are not credit constrained.

To further simplify the ranking tasks, by removing any need to estimate admission probabilities, subjects are also informed that AJ and JJ have done very well in school and could get admitted to any of the colleges on their list.

4.1.2 The Ranking Tasks

AJ's and JJ's ranking tasks include only in-state colleges likely to be well known to the students so that the control group could be assumed to have some knowledge of all of them. In a pilot study, 56 out of 59 seniors recognized all these colleges.[40]

As in Hoxby and Turner (2013a), students are presented with a table summarizing information on the prices and outcomes at a set of colleges. The treatment group receives scorecard information (net price for a low-income student, average graduation rates and average mid-career salary) and the control group is told only the college's name, location and sector (public or private). The tables presented to the scorecard group are at Table 2 and 3 below. [41]

[38] Nothing in the survey implies that AJ or JJ are of a particular gender.
[39] I included these unrealistic assumptions in order to make it possible for students to ignore the cost of debt repayments when evaluating alternative colleges. My intention was to make it as easy as possible for students to evaluate colleges offering higher long-term benefits (higher graduation rates and higher post-college salaries) but also higher short-term costs.
[40] The pilot study, delivered to 59 seniors at the lower income high school in December 2013, asked students to check a box indicating whether they had heard of the college listed in the survey materials.
[41] The basic information group received similar tables but without the net price, average graduation rate and earnings data.

Hoxby and Turner's intervention presented students with information on their nearest colleges, their state's flagship public university, other in-state selective colleges, and a small number of out-of-state selective colleges. I took a similar approach but, in the interests of keeping the list short and increasing the probability that the colleges were already known to students, I listed only in-state colleges.[42]

AJ's college list consists of six four-year colleges: two private, highly selective, not for profit liberal arts colleges in Portland, Oregon (Reed College and Lewis and Clark); the two leading in-state public colleges (the University of Oregon and Oregon State University); the major local public "commuter" college (Portland State University); and a nearby private, less selective not for profit college (Linfield College). AJ's list corresponds to the first two high impact choice situations – highly selective private colleges versus leading state public colleges – and, choosing between a commuter public college versus a leading state public college.

Table 4.1: AJ's List of Four-Year Colleges, Summary Information Table for Scorecard Group

AJ's College List	City, State	Sector	Net Price Per Year	Graduation Rate	Average Salary(1)
Lewis & Clark College	Portland, OR	Private, 4-year	$20,000	75%	$77,000
Linfield College	McMinnville, OR	Private, 4-year	$16,000	68%	$71,500
Oregon State University	Corvallis, OR	Public, 4-year	$13,500	61%	$84,000
Portland State University	Portland, OR	Public, 4-year	$10,500	42%	$70,500
Reed College	Portland, OR	Private, 4-year	$4,000	82%	$99,500
University of Oregon	Eugene, OR	Public, 4-year	$14,000	67%	$75,000

(1) After working for 10-15 years. See text for data sources.

[42] Given that 81 percent of first-time college-going students attend college in-state, this does not greatly reduce the relevance of the materials (NCES, 2014).

JJ's college list consists of the three four-year public colleges in AJ's list (the University of Oregon, Oregon State University and Portland State University) and three two year/four-year college options combining transfer to those four-year colleges with initial attendance at Portland Community College. Portland Community College is the largest community college in Portland and markets itself as "the best place to begin a bachelor's degree" (Portland Community College, 2015). JJ's list corresponds to the third high impact choice situation - starting at a two-year community college and then transferring to a four-year public college (the 2/4 transfer route), versus starting at a four-year public college.

Table 4.2: JJ's List of Two/Four and Four-Year Public Options, Summary Information Table for Scorecard Group

College	City, State	Sector	Net Price Per Year	Graduation Rate	Average Salary[(1)]
Oregon State University	Corvallis, OR	Public, 4-year	$13,500	61%	$84,000
Portland State University	Portland, OR	Public, 4-year	$10,500	42%	$70,500
University of Oregon	Eugene, OR	Public, 4-year	$14,000	67%	$75,000
Portland Community College (PCC)	Portland, OR	Public, 2-year	$7,000	19% graduate; 15% transfer[(2)]	$50,500[(3)]

(1) After working for 10-15 years.
(2) A total of 34% of first time, full time PCC undergraduate students either graduate with a PCC degree or certificate (19%) or transfer to another college without graduating from PCC (15%). Some students who graduate or transfer continue their studies at a four-year college.
(3) This is the average salary earned by students who've been working for 10-15 years who graduated from PCC but did NOT go on to complete a four-year degree. Those who went on to graduate from a four-year college are assumed to earn the same average salary as other graduates of their four-year college.

As noted earlier, the "basic information" survey provides very limited information on each college - name, location, and sector. The "scorecard information" survey provides this "basic" information plus: the average net price of attendance for a low-income student, such as the

hypothetical AJ and JJ, from a family with income under $25,000 per year; average graduation rates and, in the case of two-year colleges, information on transfer rates; and average mid-career post-college earnings.

I do not always use College Scorecard data. The average net price data that College Scorecard provided at the time that I fielded the surveys averages the net price paid by students across all levels of family income and is often not very indicative of likely cost for a low-income student who will receive substantial financial aid. I therefore followed Hoxby and Turner's approach and used each college's net price calculator available at the time to calculate the estimated net price for a student from a family earning less than $25,000 per year (Hoxby & Turner, 2013a).[43] As College Scorecard did not at the time I fielded the 2014 survey provide average earnings data, I used average mid-career earnings data from PayScale.com.[44]

I did, however, use the average graduation rate and community college transfer rate data provided in College Scorecard.

Although I used it because it was the best data available at the time, the community college transfer rate data included in College Scorecard at the time was problematic.[45] Ideally, one would like to know the percentage of students who enroll in community college with the intention of transferring to a four-year college that do so. However, at the time of my data collection, College Scorecard presented both the community college graduation rate – the percentage of full-time, first-time students who graduate within three years – and the community college transfer rate – the percentage of full-time, first-time students who transfer to a different

[43] As of September 2015, College Scorecard now provides information on net price by family income level ($0-$30,000; $30,001-$48,000; $48,001-$75,000; $75,001-$110,000; $110,001+). Hershbein and Hollenbeck (2014) find that this data is still less accurate than net price calculator estimates.

[44] The PayScale.com data is imperfect but was the best available at the time. PayScale.com relies on graduates of the colleges in question to self-report their earnings. Consequently, sample sizes are often small and there is an unknown amount of self-selection bias. From September 2015, College Scorecard includes average earnings data constructed using tax records for students receiving federal student aid. Early analysis of the data suggests that it also suffers from biases and imperfections, albeit different ones to Payscale.com (Rothwell, 2015; Whitehurst and Chingos, 2015).

[45] In fact, it was dropped from College Scorecard in 2015. Eventually, it will be replaced by a new data element capturing the percentage of students receiving federal student aid at a community college who transfer to a four-year college and their various completion outcomes at that four-year college. That data element is currently available at College Scorecard's data and technical site but will not be released on the consumer-oriented site until concerns about the accuracy of the historical data have been resolved (U.S. Department of Education, 2015, p. 18).

two year college or to a four-year college before graduating from their community college program.[46] The best that could be done with that data was to advise students in the survey instrument that "a total of 34% of first time, full time PCC undergraduate students either graduate with a PCC degree or certificate (19%) or transfer to another college without graduating from PCC (15%). Some students who graduate or transfer continue their studies at a four-year college." Obviously, this information is far from ideal for anyone seeking to evaluate the likely benefits of pursuing the community college transfer route relative to starting directly at a four-year college.

4.1.3 Demographic questions

The survey also collected respondent demographic information such as race, ethnicity, parental education and subjects' own expectations for higher education.[47] Unfortunately, due to privacy restrictions under the Family Educational Rights and Privacy Act (FERPA), it was not possible to collect or access information on students' academic ability.

Ranking Tasks Vary in Difficulty

Decision research has found that, as the number of variables to be synthesized and the conflict amongst them – in terms of the direction and magnitude of each variable's impact on expected value - increases, accuracy of individuals' expected value calculations decreases (Payne and Bettman, 2004). The three high impact choice situations which AJ's and JJ's lists encapsulate vary in their difficulty level both in terms of the number of variables to be synthesized and the conflict between variables.

Choosing between an elite private college and a leading in-state public four-year college.

Looking back at AJ's list in Table 2, it's obvious that Reed College, an elite private liberal arts college, is the best financial investment value overall and definitely a better value than either of the two leading public four-year schools, Oregon State (OSU) and the University of Oregon (UoO). Reed College is the least expensive in terms of net price for a student like AJ or JJ (due to very generous financial aid rather than low tuition per se), has the highest graduation rate and

[46] This data is from the Integrated Post-Secondary Education Data System (IPEDS) maintained by the National Center for Education Statistics.

[47] But not gender.

the highest average post-college salary. No trading off of conflicting variables is required. This is an easy choice situation.[48] Importantly, a student could make the correct choice by simply applying a "minimize cost" rule of thumb.

Choosing between a commuter public college and a leading state public college. Also in AJ's list, comparing Portland State University (PSU), a local urban commuter college, to OSU and UoO is harder. Portland State is slightly cheaper but its average graduate salary is also slightly lower and its graduation rate is much lower. If its graduation rate is anything like a good indication of AJ's probability of graduating, it should clearly be ranked lower than either OSU or UoO, but that requires the evaluator to decide how to weight each of the conflicting variables. This is a harder choice situation.[49] A student employing a "minimize cost" rule of thumb would rank Portland State more highly than OSU or UoO.

Choosing between attending a public four-year college immediately after high school and attending a two-year community college and then transferring to a public four-year college to complete a four-year degree. Turning to JJ's list in Table 3, in addition to the attributes of the four-year college, student evaluators need to consider the probability of transferring from a community to a four-year college and also the net price of community college. Thus, they need first to interpret the ambiguous community college graduation and transfer rate data and then to decide how to incorporate it into a calculation trading off the cost, graduation rate and average salary associated with the four-year colleges. This is a much more difficult calculation challenge. A student employing a "minimize cost" rule of thumb would rank all options involving first attending community college higher than the four-year college only options.

4.2 "THINK ALOUD" PROTOCOL

As outlined in Section 3, in the December 2015 data collection round I used a think aloud interview protocol to elicit subjects' thoughts as they completed the college ranking survey tasks.

[48] On the other hand, evaluating Lewis and Clark, another highly selective private college, is more difficult as it combines the highest net price with a high graduation rate and average salary.

[49] In the discussion here, I make the simplifying assumption that in ranking colleges students should assume that AJ and JJ's probability of graduating from a college and their expected earnings after college are equal to that of the average student at that college. This is an oversimplification. Students could quite reasonably believe that AJ and JJ's outcomes would be different. This has important implications for my analysis which I discuss subsequently.

The full "think aloud" protocol is at Appendix 3. The interview followed the overall structure below. Importantly, in order to minimize any interference with subjects' reported thought processes, and in accordance with the guidelines for classic thinking aloud studies, I allowed subjects to complete the ranking tasks without any prompting beyond "keep talking" or "don't forget to tell me what you are thinking" before asking more structured questions. I also sequenced my questions to save the ones most likely to result in reactivity for last.[50]

Following the advice of Quadrel (1990), I also first gave subjects a chance to practice "thinking aloud" using a ranking task structured in the same way as the main task, but unrelated to college choice.

The think aloud interview was structured as follows:

(i) Practice task. To practice thinking aloud, I asked subjects to do so while ranking alternative methods of getting physically fit.

(ii) Brief explanation of interview process. I then asked subjects to think aloud as they read the survey and ranked colleges from best to worst.

(iii) Unprompted reporting of thought processes. In this part, subjects read the survey instructions and completed the ranking task elements of the survey. During this period, my only interventions were to ask students to "keep talking" or "remember to tell me what you are thinking".

(iv) Prompted reporting of thought processes. Once students had completed both ranking tasks, I asked them to stop. At that point, I asked a series of more probing questions, ordered to minimize reactivity.

a. What did you rank first (last) and why?
b. What additional information would you have liked to have?
c. What did the goal of "choosing the college that is the best financial investment" mean to you?

(v) Survey question on subjects' cost, graduation rate and salary expectations for one or more colleges. This was asked verbally.[51]

[50] My analysis, outlined in Section 6 below, will take account of potential differences in validity across the interview.

[51] I asked this question for two reasons. First, as a test of whether subjects receiving the College Scorecard information assumed that AJ and JJ would have the same graduation rate and salary outcomes as the average student

(vi) Demographic questions. I then asked students to complete the demographic data section of the paper survey.

4.3 SAMPLING PROCESS

Using the instruments described above, I collected data in two rounds, the first in December 2014 and the second in December 2015. In December 2014, 322 high school seniors at one higher and one lower income population school in Portland, Oregon[52] gave written responses to the survey. In December 2015, 31 high school seniors at the lower income high school gave written and "think aloud" responses to the survey in 1:1 interviews with me.[53] Thus, in the December 2014 data collection round, I collected only quantitative survey data, while in the December 2015 round I gathered both quantitative survey data and also qualitative data on students' thought processes.

4.3.1 December 2014 Data Collection Round, Written Survey - High School Seniors

All seniors in the two focal schools were invited to take the survey via an announcement in a Government class which almost all seniors take. All seniors sufficiently fluent in English to take the survey were eligible. Approximately 30 ESL students and one international exchange student at the lower income school were disqualified for lack of English fluency. Approximately 71 per cent of seniors at the lower income school participated and approximately 45 per cent of seniors at the higher income school participated. No students at the higher income school were disqualified. All participating seniors were compensated with a $10 gift card.

Students at the lower income school completed the survey in their Government class. To randomize students between treatment groups, I distributed surveys as students entered the room, alternating between the two versions of the survey. At the higher income school, students completed the survey in the hallway either at lunch or in a free period.[54] Here too I alternated

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at the colleges listed. Second, I wanted to see whether subjects' self-reported beliefs about these variables were consistent with their ranking decisions. Avery and Kane (2004) found little relationship between subjects' subjective expectations of the returns to college attendance and subjects' planned college attendance behavior.

[52] Income status of school as measured by students' eligibility for Free and Reduced Price Lunch.

[53] These seniors were juniors at the time of the December 2014 data collection round.

[54] I surveyed students at the lower income school first and teachers there preferred me to conduct the survey during class time. At the higher income school, teachers asked me to inform students about the survey immediately before

versions as I distributed surveys. Students at the lower income school took approximately 15 minutes to complete the survey with those receiving the "basic" information treatment finishing in around 10 minutes. Some students took as long as 30 minutes to complete the survey. At the higher income school, it was more difficult to time survey completion because students were not surveyed in an easily monitored classroom and started the survey at different times. Students seemed to complete a few minutes more quickly but not to a level where I was concerned that they were not engaging with the survey. And several students took over 30 minutes to complete the survey.

4.3.2 December 2015 Data Collection Round, "Think Aloud" Interviews – High School Seniors

Approximately one third of all seniors at the lower income school were invited to take the survey under the Think Aloud protocol via an announcement in their Government class. As in the December 2014 data collection round, all seniors sufficiently fluent in English to take the survey and on track to graduate and intending to attend college were eligible. More students, a total of 65, expressed interest than it was possible to interview. I randomly selected 35 students for interview using a random number generator. Students selected their preferred interview time from a list I gave them. I interviewed students individually in an office at the school and asked them to "think aloud" as they completed the survey. Of the 35 students selected for interview, 31 were interviewed, 2 missed their interview time and 2 dropped out due to schedule conflicts. To randomize students between treatment groups, I alternated surveys from one interview to the next. All participating seniors were compensated with a $30 gift card.

Interview times ranged from 20 to 35 minutes. Subjects seemed to find it easy to think aloud as they completed the survey. During the unprompted section of the interview I generally reminded subjects to "keep talking" only once or twice.

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lunch time, giving them an opportunity to take it straight after class ended. Unfortunately, due to the sequential nature of obtaining school and teacher consent to conduct the survey, it was not possible to standardize the location of survey delivery. As students remained in the classroom to take the survey (with a few choosing to sit outside in the hall), I have little concern that differences in the survey-taking environment affected validity.

4.4 SAMPLE CHARACTERISTICS

4.4.1 Sample Size and Demographics

Sample sizes and information on the very different demographic profiles of the two high schools are presented in tables 4 and 5 below.

Table 4.3: Sample Sizes

Data Collection Round	Treatment	Control	Total
Lower Income School			
December 2014	86	86	172
December 2015	16	15	31
Total	102	101	203
Higher Income School			
Higher income school	75	75	150

Table 4.4: Low and High-income School Characteristics

	Low-income School	High-income School
% of Students Eligible for Free and Reduced Price Lunch	66%	21%
English language learners	8.8%	2.0%
Talented and Gifted	6.3%	18.4%
Race & Ethnicity	34.3% White, 20.9% Hispanic, 17.4% African American, 17.1% Asian, 4.3% Native American or Pacific Islander, 6% Multiple Races	76.3% White, 7.3% Hispanic, 5% African American, 4.3% Asian, 1.2% Native American or Pacific Islander, 5.9% Multiple Races
% of Students Meeting or Exceeding grade-level standards (2011/12))	Reading 68% Math 51.5%	Reading > 95% Math 81.6%

Source: Portland Public Schools 2013 Enrollment Profiles

4.4.2 Low-income School (December 2014 and December 2015 data)

Examining the characteristics of the low-income school subjects by treatment group indicates that, in both data collection rounds, randomization did its work. The tables below show similar cell sizes between the treatment and control groups for students' race and ethnicity (Table 4.5), students' expected educational attainment (Table 4.6), and parental educational attainment (Table 4.7). Thus, I am not concerned that differences in observable characteristics between the treatment and control groups could be responsible for differences in their observed behavior.

Table 4.5: Race and Ethnicity, Low-income School, 2014 and 2015 Data

	December 2014		December 2015		Total N	
	Scorecard Info	Basic Info	Scorecard Info	Basic Info	2014	2015
White, Non-Hispanic	26	28	5	6	54	11
Hispanic	18	12	5	5	30	10
Non-White, Non-Hispanic	37	44	6	4	81	10
Missing	5	2	0	0	7	0
Total	86	86	16	15	172	31
Chi-squared test values	1.88 (*p*-value 0.39)		0.49 (*p*-value 0.78)		4.35 (p-value 0.11)	

Note: Chi-square tests calculated without "missing" category to ensure expected cell sizes > 5.

Table 4.6: Expected Educational Attainment, Low-income School, 2014 and 2015 Data

	December 2014		December 2015		Total N	
	Scorecard Info	Basic Info	Scorecard Info	Basic Info	2014	2015
High School or Less	7	4	0	0	11	0
Some College/2-Year Degree	19	19	2	0	38	2
4-year Degree or Higher	60	63	14	15	123	29
Total	86	86	16	15	172	31
Chi-squared test values	0.89 (*p*-value 0.64)		*p*-value 0.48 (Fisher's exact test)		182.18 (p-value < 0.001)	

Note: Fisher's exact test calculated for 2015 data as expected cell size <5 and total N is < 120.

Table 4.7: Parental Educational Attainment (Parent 1), Low-income School, 2014 and 2015

	December 2014		December 2015		Total N	
	Scorecard Info	Basic Info	Scorecard Info	Basic Info	2014	2015
High School or Less	46	45	9	8	91	17
Some College/2-Year Degree	15	13	5	5	28	10
4-year Degree or Higher	20	22	2	2	42	4
Missing	5	6	0	0	11	0
Total	86	86	16	15	172	31
Chi-squared test values	0.34 (*p*-value 0.95)		*p*-value > 0.99 (Fisher's exact test)		5.14 (p-value 0.08)	

Notes: Fisher's exact test calculated for 2015 test as expected cell size <5 and total N is < 120. Total N chi-square tests calculated without missing category as expected cell size < 5.

As I wish to use the December 2015 data to infer the decision processes followed by low-income students observed in December 2014, it's important that we are convinced that the characteristics of students sampled in 2015 do not differ significantly from those observed in 2014 and, therefore, can be interpreted as coming from the same population. Looking at the totals columns in the tables above, we see that, while the 2014 and 2015 samples do not differ significantly in terms of their racial and ethnic background, they do differ in both subjects' expected educational attainment and in the parental educational attainment of subjects' parents.

Students sampled in December 2015 have higher educational expectations than those sampled in 2014, with 94% (29) reporting that they expected to attain a four-year college degree or higher, compared to 72% (123) in the December 2014 sample.[55] This may be due to students' reluctance to report a low level of expected attainment in a face-to-face interview where the interviewer might be expected to review the subjects' answers, or perhaps to students not expecting to gain a college degree being unwilling to participate in an interview about college choices.

Students sampled in December 2015 also report a lower level of parental educational attainment than do those sampled in December 2014, with only 13% (4) reporting parental educational

[55] Educational aspirations in both 2014 and 20-15 are above national averages: 45 percent of high school seniors surveyed in the High School Longitudinal Study of 2009 (2013 Update) reported aspiring to a four-year degree, while 15 percent aspired to a sub-baccalaureate program.

attainment of a four-year degree or higher, compared to 30% (53) in the December 2014 sample. Overall, therefore, the December 2014 sample has a similar demographic background to the December 2015 sample, but has somewhat higher educational expectations, although these are in line with U.S. averages, and a somewhat lower level of parental educational attainment. I will consider possible implications of these differences when discussing my results.

4.4.3 Sample Characteristics: High-income School (December 2014 data only)

Turning to the high-income school, the tables below show good randomization across observable characteristics with no concerning differences across sub-groups.

Table 4.8: Race and Ethnicity, High-income School, 2014 Data

	Scorecard Info	Basic Info	Total N	Total N %
White, Non-Hispanic	58	53	111	74%
Hispanic	7	8	15	10%
Non-White, Non-Hispanic	10	14	24	16%
Missing	0	0	0	0%
Total	75	75	150	100%
Chi-squared test values	1.78 (*p*-value 0.62)			

Table 4.9: Expected Educational Attainment, High-income School, 2014 Data

	Scorecard Info	Basic Info	Total N	Total N %
High School or Less	4	2	6	4%
Some College/2-Year Degree	8	11	19	13%
4-year Degree or Higher	63	61	124	83%
Missing	0	1	1	1%
Total	75	75	150	100%
Chi-squared test values	2.08 (*p*-value 0.56)			

Note: Chi-square test calculated without missing category as expected cell size < 5.

Table 4.10: Parental Educational Attainment (Parent 1), High-income School, 2014 Data

	Scorecard Info	Basic Info	Total N	Total N %
High School or Less	13	10	23	15%
Some College/2-Year Degree	10	9	19	13%
4-year Degree or Higher	47	53	100	67%
Missing	5	3	8	5%
Total	75	75	150	100%
Chi-squared test values	1.56 (*p*-value 0.67)			

Note: Chi-square test calculated without missing category as expected cell size < 5.

Chapter 5. THE IMPACT OF SCORECARD INFORMATION ON RANKING ACCURACY

This chapter focuses on my first research question of whether providing students with College Scorecard information in the "best case" form outlined in Chapter 3 improves the accuracy with which students rank the financial investment value of the college choices facing AJ and JJ that were described in an earlier chapter.

Given the evidence reviewed in Chapter 2, it's reasonable to expect that students at the lower income school will, in the absence of College Scorecard information, rank colleges based on their perceptions of cost of attendance. It's less clear how students at the higher income school will behave. On the one hand, as noted in Chapter 2, higher income students are more likely to use rules of thumb that prioritize quality as measured by college selectivity or other proxies, but on the other hand the survey asks them to evaluate the colleges "as if" they are low-income students.[56]

> Hypothesis 1: Low-income students will rank private colleges below public colleges and "two/four" transfer pathways above ones that involve starting directly at a four-year college.
>
> Hypothesis 1a: High-income students will be more quality-driven in their college rankings and will rank colleges with higher graduation rates and post-graduation salaries more highly than do low-income students.

What impact will scorecard information have? Surely the way in which scorecard information was presented in the survey maximizes the likelihood that it will have an impact. Subjects were explicitly told that AJ and JJ are only interested in choosing the college that is the best financial investment for their future, and the scorecard information was presented in an easily digestible summary format.

[56] Indeed, as I am approximating students' family income status based on the demographic characteristics of the school they attend, some of the students who took the survey at the higher income school may be from low income families, and vice versa for students at the lower income school.

Hypothesis 2: Overall, students' evaluations of the financial investment value of the colleges will become more accurate when they are provided with summary, relevant College Scorecard information.

Nonetheless, due to the variation in difficulty of using College Scorecard information to evaluate AJ's and JJ's colleges – with Reed being the easiest college to evaluate and the options combining community college and four-year college the most difficult, I expect the effect of College Scorecard information to vary by college.

Hypothesis 3: The effect of scorecard information on students' accuracy (as defined below) will vary across the choice situations with scorecard information's effect on accuracy decreasing as the difficulty of using it, as measured by the number of variables that must be synthesized, increases.

My analysis in this chapter will use the 2014 survey data collected at both the low- and high-income schools. Before presenting any analysis of the response data, I first describe my approach to measuring students' accuracy in ranking the colleges' financial investment value. I then present descriptive statistics and statistical analyses of the responses, and conclude with a discussion of the results, their limitations and the questions they raise.

5.1 MEASURING STUDENTS' ACCURACY

To evaluate the accuracy of the college rankings generated by the "basic" and "scorecard" groups, I (i) use a simple human capital model to construct a reference or target ranking for both ranking tasks,[57] and (ii) compare subjects' actual rankings of the colleges to the reference ranking using multiple measures of ranking accuracy. Below I discuss the details of the ranking method, the attributes of the resulting reference rankings and the ranking accuracy variables I use.

[57] I do not call this an "ideal" ranking because it is only one of many possible rankings that could be constructed using reasonable assumptions.

5.1.1 Reference Ranking Method

My approach is somewhat similar to that taken by Avery and Hoxby (2004). In that study, the authors use a very simple human capital model to calculate a net present investment value for attendance at each college. They use the cost of attendance information from students' offer letters and, to estimate the post-college financial returns from attending a given college, assume that these are a function of the capital invested in the student by the college, as measured by instructional spending. They assume a 7 percent annual rate of return on human capital and a 40-year post-graduation working life. They do not report their discount rate.

I also use a simple human capital model, although not quite as simple a one as Avery and Hoxby's, to calculate a net present value of attendance for each college. I use the information provided to the treatment group, plus some additional necessary assumptions. Specifically, I estimate Equation 1 below.

Equation 1:
The expected lifetime financial value for a given individual of attending College X = (C)*(A) + (1-C)*(B).

Where,

(A) Is the present discounted value of attending College X if he or she successfully graduates.

(B) Is the present discounted value of attending College X if he or she drops out without completing a degree

(C) Is the probability of graduating if the student attends College X.[58]

An important difference between my approach and that of Avery and Hoxby is that I do not assume that, having matriculated at a college, the student will graduate from it. Given the wide range in college graduation rates, this is not a realistic assumption.[59] Equation 1 above reflects the fact that students need to consider not just the expected value of their future earnings (A) if they graduate from a given college, but also the probability (C) that they will not graduate and

[58] This simplifies the real decision somewhat. Since 38.5 percent of all students starting at a four-year college and 36.7 percent of all students starting at a community college transfer to another college at some at some point (Shapiro et al., 2018), the student really needs to consider many more possible paths to a degree.

[59] Huntington-Klein (2015) points out that the economic literature on the returns to education invariably and unrealistically assumes a 100% graduation rate. Avery and Hoxby (2004) for instance make this assumption.

the future earnings (B) that would be associated with that outcome. To keep things simple, I make the naïve assumption that AJ's and JJ's probability of graduating from a college is equal to the average graduation rate reported for that college.[60]

To estimate (A), the student must estimate Equation 2 below, which subtracts the present value of the cost of attending college j from the present value of the stream of income generated by attending it. To estimate (B), the student estimates a similar equation but must make some assumptions about when he or she will drop out of college. In Equation 3 below, I assume he or she drops out at the end of year two.

Equation 2: Present discounted value of attending College j if the student successfully graduates

$$\sum_{t=5}^{t=T} \frac{Post\ College\ Earnings_{ijt}}{(1+\delta^{t-1})} - \sum_{t=1}^{t=4} \frac{Net\ Price\ of\ Attendance_{jt}}{(1+\delta^{t-1})} - \sum_{t=5}^{t=T} \frac{Loan\ Repayments_{ijt}}{(1+\delta^{t-1})}$$

Equation 3: Present discounted value of attending College j if the student drops out at the end of year 2

$$\sum_{t=3}^{t=T} \frac{Post\ College\ Earnings_{ijt}}{(1+\delta^{t-1})} - \sum_{t=1}^{t=2} \frac{Net\ Price\ of\ Attendance_{jt}}{(1+\delta^{t-1})} - \sum_{t=3}^{t=T} \frac{Loan\ Repayments_{ijt}}{(1+\delta^{t-1})}$$

In both equations, *i* indexes the student, *j* indexes colleges, δ is the discount rate on values in future years, and t indexes years (t= 1 is the freshman year, t = 5 is the first post-baccalaureate year, t = 3 is the first post-dropout year) and T_i is the end of working life. Post-college earnings are the flow of income generated as a result of being a graduate of that college. Net price is defined as the amount the student or family must pay out of their own cash reserves to attend the college. It can be broken down into tuition and fees plus living expenses less grant aid and work study subsidies. Loan repayments are the cash flows resulting from borrowing to fund college costs.

To calculate these equations, I make the following assumptions.

[60] As noted in Section 4, students could quite reasonably believe that this is not the case. I discuss the implications of this issue for my analysis under "Limitations and Threats to Validity" at the end of this section.

1. *Post-College Earnings of Graduates*: Rather than estimating the post-college financial benefits from attending (and successfully graduating from) a particular college as a function of instructional spending as did Avery and Hoxby, I assume that post-college financial benefits are fully and accurately captured by the average salary information presented by College Scorecard. I also assume that, up to mid-career, graduates' salaries grow by 5 percent per annum and by 2 percent per annum thereafter.[61]
2. *Post-College Earnings of Drop-outs*: I assume that all those who fail to graduate drop out at the end of year 2 and achieve a mid-career salary of $30,000 per annum. This salary information, which is drawn from the American Community Survey,[62] was provided to subjects in the treatment group survey. I also assume that drop-outs' salary grows by 2 percent per annum throughout their career.
3. *Net Price of Attendance*: I assume that the net price information provided to the treatment group fully captures the cost of attending any given college for the hypothetical students, AJ and JJ.
4. *Loan Repayments*: I ignore these. The survey materials do not provide students with information that would enable them to estimate the amount of loans AJ and JJ would need to take out to attend each college. They do, however, tell them that AJ and JJ will be able to take out zero interest loans that do not need to be repaid until they leave college and that repayments will then be capped at, at most, 10 percent of their monthly earnings.[63] This makes increased borrowing a positive rather than a negative impact on any given college's net present value. My reference ranking therefore understates the attractiveness of colleges that are likely to require students to borrow more money.
5. *Discount rate:* 4 percent.[64]
6. *Working life*: For graduates, 30 years, and for drop outs, 32 years.[65]

[61] These growth rates were chosen to be conservative but unfortunately I did not find any useful literature in which to ground them.
[62] This figure is the average earnings of adults with "some college" but no degree between 18 and 64 in Oregon. U.S. Census Bureau, Summary File 2011-2013, American Community Survey (ACS).

[63] I make this unrealistic assumption in order to simplify the calculations students need to make to evaluate the colleges and also to minimize the potential for aversion to borrowing affecting students' evaluations.
[64] Christian, 2011.
[65] In retrospect, this seems a short working life as it would give a retirement age of around 55.

1. In addition, to enable me to rank the community college/four-year public options in JJ's list, I assumed that:*Community College Transfer Rates:* All 34 percent of students who graduate or transfer out of PCC successfully transfer to a four-year college. (A generous assumption since some are known to transfer to other two-year schools.)
2. *Graduation Rates of Community College Transfer Students:* Consistent with the literature, students who transfer to four-year colleges are assumed to graduate at the same rate as students who start at a four-year college (Melguizo, Kienzl and Alfonso, 2011; Dietrich and Lichtenberger, 2015; Monaghan and Attewell, 2015).
3. *Salary for Community College Drop-outs*: PCC graduates who do not go on to earn a four-year degree have a mid-career salary of $50,500.[66]

This combination of assumptions is likely to overstate the value of the community college pathway.

5.1.2 Reference Ranking Attributes

In examining the reference ranking of AJ's list (Table 5.1), three things stand out. Reed College is by a very large margin the best financial investment. Portland State University (PSU) is, by a smaller but still large margin, the worst investment (largely due to its low graduation rate). The four colleges in the middle of the list are separated by much smaller margins.

Table 5.1: Reference Ranking of AJ's List of Four-Year Colleges

College Rank	Net Price	Grad Rate	Avg Mid Career Salary	EV of attending
1. Reed	$4,000	82%	$99,500	$1,224,471
2. OSU	$13,500	61%	$84,000	$880,314
3. Lewis and Clark	$20,000	75%	$77,000	$875,416
4. UofO	$14,000	67%	$75,000	$832,542
5. Linfield	$16,000	68%	$71,500	$798,124
6. PSU	$10,500	42%	$70,500	$687,094

[66] PayScale.com data for mid-career PCC graduates. This may be skewed high due to more highly paid graduates of a college being more inclined to participate in PayScale.com.

Given data similar to the above, it's easy to see why Hoxby, Avery and Turner were puzzled that high achieving low-income students rarely applied to top-tier private colleges and preferred public four-year colleges. Reed College's expected value is $350,000 greater than the next best option, Oregon State University. Moreover, as Reed is the dominant option with the lowest net price, highest graduation rate and highest salary, students do not even need to use a weighted decision rule and make an expected value calculation to reach that conclusion.[67] Reed is obviously the best option. In contrast to Reed, ranking Lewis and Clark, the most expensive college listed in terms of net price, requires students to apply a weighted decision rule and to trade-off cost, graduation rates and salary.

Turning to JJ's list of four-year public college and two/four-year college options (Table 5.2), even making, as the reference ranking does, the generous assumption that all 34 percent of students who graduate or transfer from PCC go on to a four-year college, starting at a four-year college is a much better financial investment.[68]

Table 5.2: Reference Ranking of JJ's List of 2/4 and 4-Year College Options

College Rank	Net Price	Grad or Trf Rate	Avg Mid Career Salary	EV of attending
1. OSU	$13,500	61%	$84,000	$880,314
2. UofO	$14,000	67%	$75,000	$832,542
3. PSU	$10,500	42%	$70,500	$687,094
4.PCC/OSU	N. A., ranked using information on each four-year option above and the information below on PCC.			$655,686
5. PCC/UofO				$635,932
6. PCC/PSU				$600,203
PCC	$7,000	19% graduate; 15% transfer	$50,500	n.a.

This is clearest for Oregon State University where choosing to first attend PCC and then transferring to OSU rather than attending OSU throughout the college career lowers expected lifetime value by almost $225,000. But how many students will make this calculation? Not only do students need to trade-off net price, 4-year college graduation rate and future salary, they also need to add the additional variable of the community college graduation and transfer rates.

[67] As a reminder, the expected value column of the reference ranking table was not provided to students in the survey materials.

[68] The sensitivity analysis in Appendix 3 shows that this remains true even if we assume the smallest penalty for comparable community college entrants in regard to the probability of graduating with a four-year degree that is suggested by the literature (14.5 percentage points, Long and Kurlaender, 2009).

Decision research has found that as the number of variables to be synthesized increases and the conflict amongst them increases, accuracy of expected value calculations will decrease (Payne and Bettman, 2004). In addition, students need to decide how to interpret the ambiguous community college transfer and graduation rate data. All in all, this is a much more difficult calculation challenge than that presented by the choices on AJ's list.

5.1.3 Ranking Accuracy Variables

Overall Ranking Accuracy: To measure the match between students' rankings of the colleges and the reference ranking described above, I use Kendall's τ (tau). As all participating students rank both AJ's and JJ's list, this results in two observations per student – a tau for their accuracy in ranking AJ's list and one for their accuracy in ranking JJ's list.

Kendall's tau is a non-parametric measure of correlation between two ranked variables. It is similar to Spearman's ρ and Pearson's Product Moment Correlation Coefficient, or Pearson's r, in that it measures the relationship between two variables. Unlike those measures, it has a straightforward interpretation: it is the difference between the probability that the observed data are in the same order as the reference data versus the probability that the observed data are not in the same order. It ranges between -1 and 1 with negative numbers indicating that the rankings being compared are inversely correlated.

A limitation of Kendall's tau is that it assumes equally spaced ranks. Clearly, the ranks in the reference ranking are not evenly spaced. The expected value of attending Reed College (#1) is about $344,000 more than that of attending Oregon State University (#2), but the expected value of attending Oregon State is only about $5,000 more than that of attending Lewis and Clark (#3). Unfortunately, I have not found a measure that relaxes this assumption. As a consequence, it will be important to interpret Kendall's tau carefully. Kendall's tau will, however, be directionally correct within each ranking task, that is, if Kendall's tau is significantly higher for the treatment than for the control group it will be true to say that the provision of College Scorecard information significantly increased student ranking accuracy. But it will not be possible to compare Kendall's tau across ranking tasks. That is, if Kendall's tau is higher for the scorecard information group in AJ's task than in JJ's 2, I cannot conclude that students were

more accurate in ranking AJ's list than in ranking JJ's, or, concomitantly, use tau to measure the degree to which they were more accurate.

Indicator College Ranking Accuracy Measures: The colleges ranked first and last in the reference ranking – Reed and PSU in AJ's task and OSU and PCC/PSU in JJ's task – have useful characteristics for both measuring student accuracy and testing my hypotheses. I refer to these colleges as "indicator colleges" and use them in two ways. First, I calculate indicator college ranking accuracy for each indicator college as:

Individual indicator college accuracy = absolute (reference rank – observed rank)

This measure, which ranges from 0 to 5, is useful for testing my hypothesis that ranking accuracy will vary with the difficulty of the calculation.[69]

I also present an additional, simpler measure of overall ranking accuracy that reduces the emphasis Kendall's tau places on the accuracy with which students rank colleges in the middle of the reference ranking because, as we have seen, these colleges are separated by only small differences in expected values. The expected values of the indicator colleges are separated by wide margins - over $500,000 in the case of Reed and PSU and $280,000 in the case of OSU and PCC/PSU – compared to $82,000 and $196,000, respectively, for the second and fourth ranked colleges in AJ and JJ's lists. Rather than asking, as Kendall's tau does, whether students rank the colleges in the exact order of the reference ranking, we can ask simply whether they placed the first and last ranked colleges in the right half of the rankings. I therefore calculate a categorical variable – overall indicator college accuracy - for both AJ and JJ's task with levels indicating whether a student ranked both, none or one of the indicator colleges in the correct half of the rankings. Specifically, Reed in AJ's list and OSU in JJ's list are counted as ranked correctly if they are ranked in positions 1, 2 or 3. PSU in AJ's list and PCC/PSU in JJ's list are counted as being ranked correctly if they are in positions 4, 5 or 6.

[69] I cannot use this measure for the other colleges because it would have a narrower possible range.

5.1.4 Reference Ranking Sensitivity Analysis

A potential limitation of this study is that it compares subjects to a reference ranking constructed using assumptions that not all reasonable people would share. Students (or teachers) could be using a human capital model approach but making different assumptions about variables such as, for example, the appropriate discount rate on future earnings, the salary earned by drop-outs and individual graduation rates relative to institutional averages.[70] Variation in assumed graduation rates seems particularly important to test given that the vignette tells subjects that they are ranking the colleges on behalf of a high-achieving student. Students could reasonably – and correctly – decide that AJ's and JJ's probability of graduating from a less-selective school is significantly higher than that of the average student attending that school (e.g. Alon and Tienda, 2005; Dillon and Smith, 2015). To reduce possible concern about this threat to statistical conclusion validity, I present an analysis of the sensitivity of the reference ranking to variations in assumed discount rates, the salary earned by drop-outs and graduation rates in Appendix D which shows that ranking reversals require very large changes in these assumptions.

5.2 DESCRIPTIVE STATISTICS

5.2.1 Students' Ranking Patterns

This section presents data on students' ranking patterns for the two ranking tasks at the individual college level. It also examines whether students in the basic information group, seem to have ranked based on perceived cost, favoring public colleges in AJ's list and two/four college options in JJ's list.

5.2.1.1 AJ's Task

Did individual college rankings shift towards the reference ranking?

[70] It's worth noting that it's not always obvious how a student should adjust the averages they are given so as to be applicable to AJ and JJ. On the one hand, a student whose observed level of academic qualification exceeds that of the average student at their college of attendance is more likely to graduate than the average student at that college. On the other hand, low-income students are less likely to graduate than the average student at a college (Choy, 2002; Adelman, 2006; Pender, Hurwitz, Smith and Howell, 2012; Dillon and Smith, 2013).

Table 5.4 below summarizes students' rankings71 and also shows the ideal or reference rank for each college. For all colleges, the median ranking for the scorecard group is closer to the reference ranking – or at least no further from it – than is the case for the basic group. Most notably, Reed College moves from a median rank of 5 – close to the worst investment – for the basic information group to a median rank of 1 – the best investment – for the scorecard group. PSU's ranking is also quite different between groups, shifting from a median rank of 2 – close to the best investment – to a median rank of 4 - in the lower half of the list - for the scorecard group. On this basic indicator then, the scorecard information did "improve" students' rankings of the college choices.

Table 5.4: Descriptive Statistics by Treatment Group, AJ's List of 4-Year Colleges

College	Ref. Rank	Scorecard Information Group			Basic Information Group		
		Median	Mode	Mean (*S.D.*)	Median	Mode	Mean (*S.D.*)
Reed	1	1	1	1.820 *(1.647)*	5	3	4.248 *(1.785)*
OSU	2	3	2	3.006 *(1.217)*	3	2	2.807 *(1.238)*
Lewis & Clark	3	4	6	4.199 *(1.642)*	4	3	3.857 *(1.612)*
UoO	4	4	4	3.422 *(1.047)*	3	2	2.950 *(1.422)*
Linfield	5	5	5	4.484 *(1.342)*	5	1	4.453 *(1.275)*
PSU	6	4	6	4.043 *(1.712)*	2	3	2.671 *(1.877)*

Chart 5.1 shows the distribution of students' rankings for each college in AJ's list. One thing that stands out immediately is that, contrary to expectations, there are very few large differences between the ranking distributions based on high school of attendance. Students from both the low- and high-income high schools ranked the colleges very similarly, with two exceptions. High-income school students were less likely than low-income school students to rank PSU first (37 v 49 percent, respectively) and more likely to rank it third (21 v 8 percent). These differences disappear for the scorecard information groups with students in this group at both schools ranking PSU in almost exactly the same way. It might be that high-income school students perceive PSU as a lower quality school and ranked it accordingly. Nonetheless, they still ranked it in the top 3 69 percent of the time (compared to 72 percent for the low-income school). The other difference in ranking behavior between students from the two high schools is in how the scorecard group from each ranks Reed College. Students in the scorecard group at

[71] For both the low- and high-income school respondents.

the high-income school ranked Reed first only 67 percent of the time compared to 84 percent for scorecard group students at the low-income school. This is rather surprising given that Reed is by a large margin the cheapest college on a net price basis and has the highest graduation rate and average salary for graduates.[72]

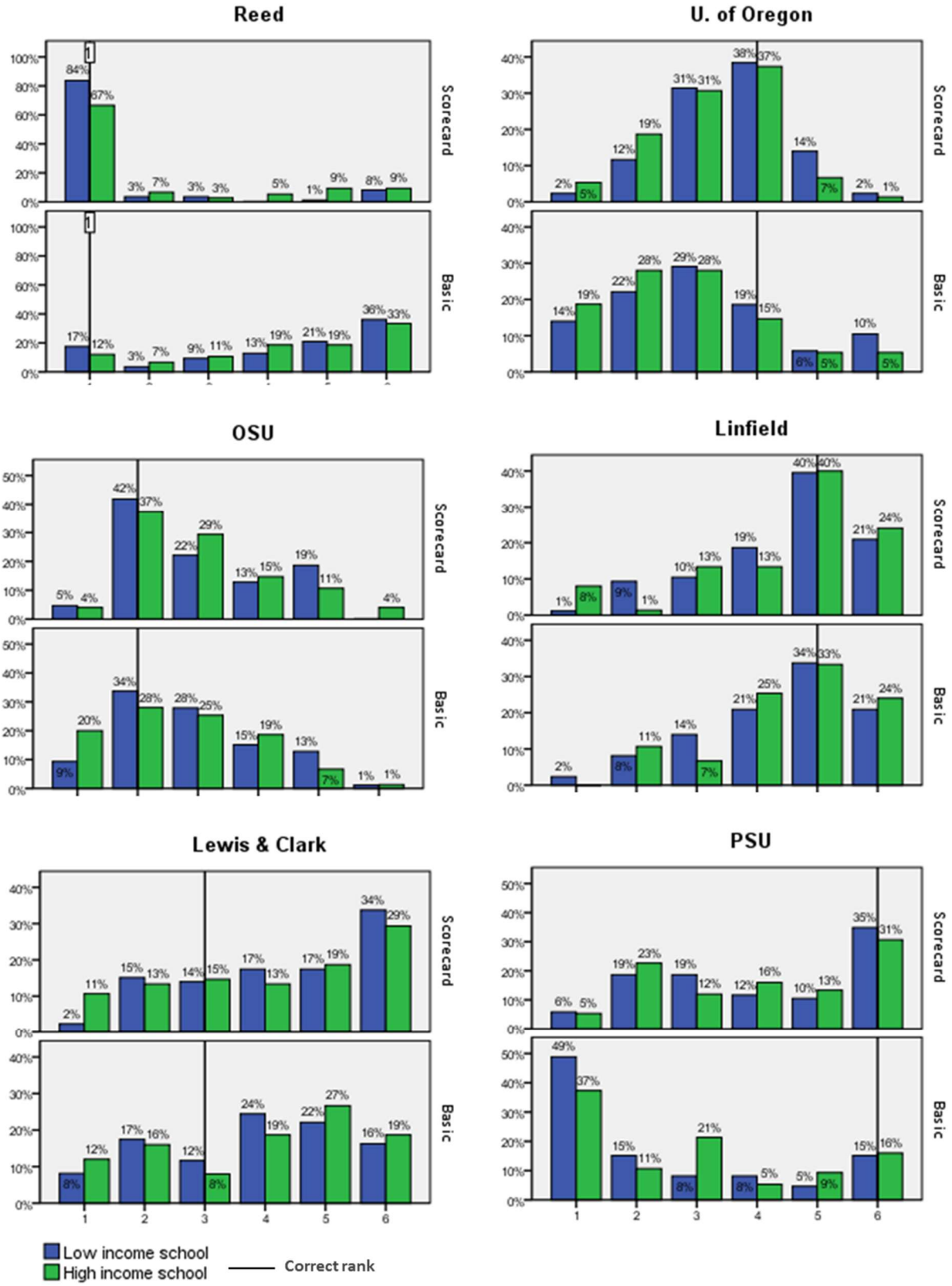
Turning to differences in ranking distributions between the scorecard and basic groups, Reed and PSU again stand out. As we've already seen, students' ranking of Reed dramatically reverses between the basic and scorecard groups. In the basic information group, 70 percent (low-income high school) and 71 percent (high-income high school) of students ranked Reed in the bottom 3. This more than reverses for the scorecard group with 90 percent (low-income high school) and 77 percent (high-income high school) ranking Reed in the top 3 and with rankings strongly clustered on the correct ranking of 1.

We observe a less dramatic but similar pattern for PSU. In both high schools, as discussed above, over two thirds of students in the basic group rank PSU in the top 3, with a strong spike on ranking it first. But, for the scorecard group, the rankings spike shifts to the last position, although with fewer students correctly ranking PSU last than ranked it first in the basic information group, and 57 percent (low-income school) and 60 percent (high-income school) ranking PSU in the bottom 3.

Other changes are less dramatic but still consistent with the expected improved ranking accuracy for the scorecard group. For OSU and Linfield, the basic information group's ranking distribution was already centered on the correct ranking and the scorecard information group's distribution simply strengthens that pattern. For the University of Oregon, students' ranking distribution remains skewed higher than the reference ranking, but shows a movement toward the correct ranking for the scorecard group.

[72] As these differences are both for indicator colleges, I am able to test for statistical significance in analysis reported later in this chapter.

Chart 5.1: Ranking Patterns by High School, AJ's List of 4-Year Colleges



Does the basic information group favor public colleges? Based on the literature, I expected low-income high school students receiving only basic information on AJ's colleges to use a perceived cost-based rule of thumb of "favor public colleges" and thought that those attending the high-income high school might be more likely to favor private colleges that they perceived as higher quality. Table 5.3 below shows that nearly half of students in the basic information group did in fact rank all three public colleges in AJ's list in their top 3. Continuing an already established theme, there are no large differences between the ranking behavior of students at the low- and high-income high schools. If many students at the low-income school were indeed using a "favor public" rule, then it seems likely that students at the high-income school were also doing so.

Table 5.3: Sectoral Composition of Top 3 Ranked Colleges, AJ's List

Sectoral Composition of Top 3 Ranked Colleges	Scorecard Info		Basic Info	
	#	%	#	%
Overall				
All Public	6	4%	75	47%
Mixed Public/Private	138	86%	77	48%
All Private	17	11%	9	6%
Total	161	100%	161	100%
Chi-squared test value	78.55 (p-value < 0.0001)			
Low Income High School				
All Public	1	1%	37	43%
Mixed Public/Private	76	88%	44	51%
All Private	9	10%	5	6%
Total	86	100%	86	100%
Chi-squared test value	43.78 (p-value < 0.0001)			
High Income High School				
All Public	5	7%	38	51%
Mixed Public/Private	62	83%	33	44%
All Private	8	11%	4	5%
Total	75	100%	75	100%
Chi-squared test value	35.51 (p-value < 0.0001)			

5.2.1.2 JJ's Task

Did individual college rankings shift towards the reference ranking with Scorecard Information? Table 5.6 below summarizes students' rankings[73] and also shows the ideal or reference rank for each college on JJ's list. As for AJ's task, for all colleges, the median ranking for the scorecard group is closer to the reference ranking – or at least no further from it – than is the case for the basic group, but the shifts are smaller than they were in AJ's case. The largest change is in PCC/PSU's ranking where the modal ranks shifts from 1 in the basic to 6 (the correct ranking) in the scorecard group. The often large variations in the scorecard group between the median and mode are best explored via Chart 5.2 below which students' ranking patterns in more detail and also by high school.

Table 5.6: Task 1, JJ's List of 4-Year Colleges, Descriptive Statistics by Treatment Group

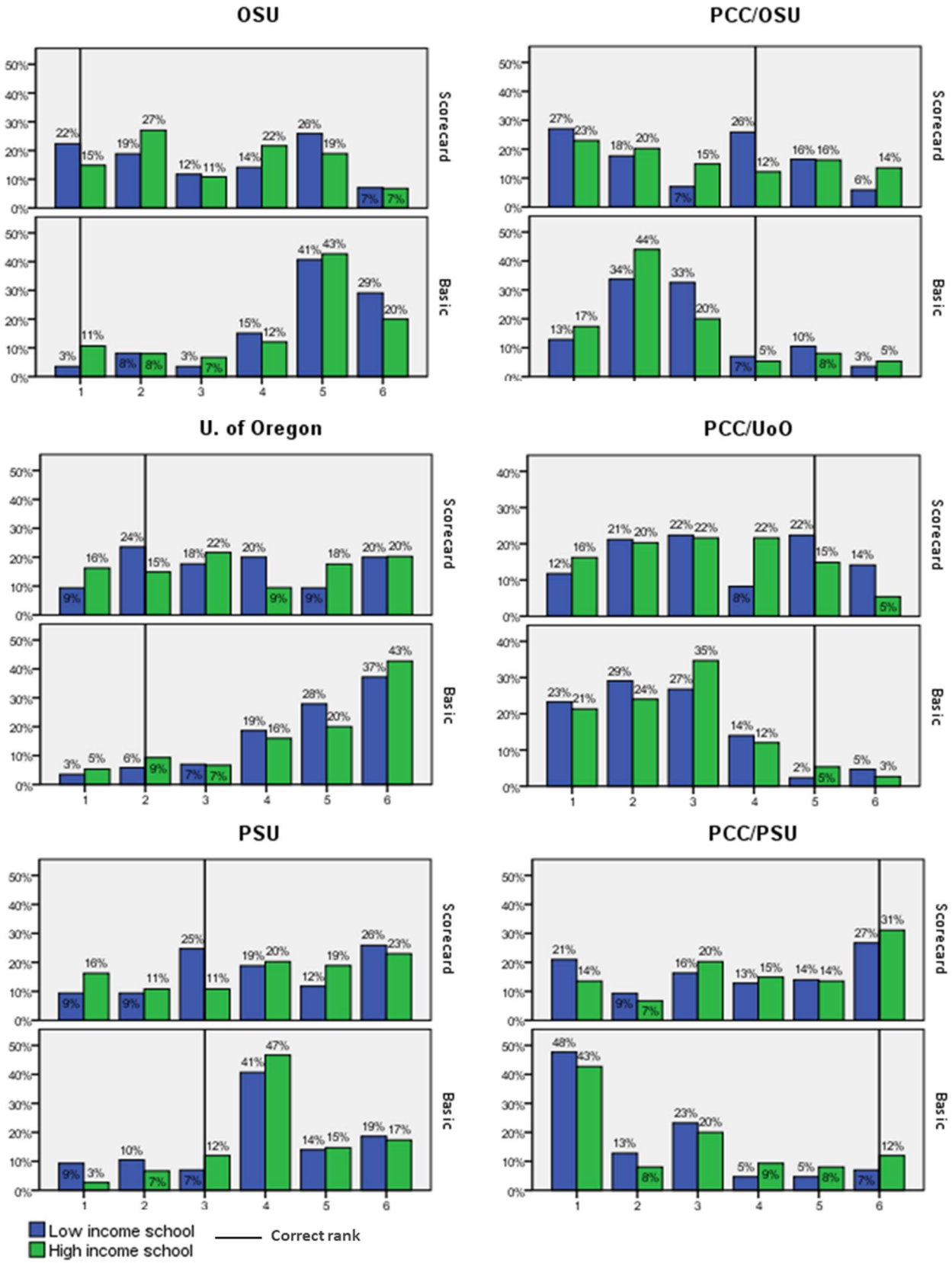
College	Ref. Rank	Scorecard Information Group			Basic Information Group		
		Median	Mode	Mean (*S.D.*)	Median	Mode	Mean (*S.D.*)
OSU	1	3	2 & 5	3.23 *(1.63)*	5	5	4.50 *(1.47)*
UoO	2	3	6	3.57 *(1.70)*	5	6	4.69 *(1.46)*
PSU	3	4	6	3.88 *(1.69)*	4	4	4.05 *(1.37)*
PCC/OSU	4	3	1	3.11 *(1.70)*	2	2	2.70 *(1.31)*
PCC/UoO	5	3	3	3.34 *(1.57)*	3	3	2.60 *(1.28)*
PCC/PSU	6	4	6	3.84 *(1.83)*	2	1	2.46 *(1.67)*

Chart 5.2 shows that, in contrast to the ranking patterns for AJ, students do not move from one clear pattern for the basic group to a different pattern for the scorecard group. Rather, the ranking distribution seems to move from a clear pattern of ranking community college transfer options highly and pure four-year options low in the case of the basic information group to no pattern in the scorecard group. PSU is a case in point. In the basic information group, over 40 percent of students ranked it fourth. This proportion halves to around 20 percent for the scorecard group, but that reduction seems to have been spread fairly evenly across the remaining ranking possibilities. The same is true for the other college options in JJ's list. In comparison to the basic information group, the scorecard group's ranking distribution is much flatter. It is tempting to infer that students given scorecard information became less certain of the right ranking rather than more certain. Perhaps the only exception to this is for PCC/PSU which

[73] For both the low- and high-income high school respondents.

should be ranked last. We do see something of a reversal between the basic information group, nearly half of whom rank this option first, and the scorecard group, where the percentage ranking it last dramatically increases from 7 to 27 percent in the case of the low-income high school, and from 12 to 31 percent in the case of the high-income high school.

Chart 5.2: Ranking Patterns by High School, JJ's List



Does the basic information group favor the community college to four-year pathway? Based on the literature, I expected that students in the basic information group, particularly those from the low-income high school, would favor options involving two years at community college as they would perceive those as lower cost. Looking at Table 5.5 below, it is clear that students in the basic information group at both schools did in fact favor this option with around two-thirds ranking all three community college/four-year options in their top 3. If students in the scorecard group recognize that the low transfer rate means that all options involving community college should be in the bottom half of the ranking, then we'd expect the share of students whose top 3 is comprised of four-year colleges to increase, and we do in fact observe that pattern although the shift is not as dramatic as that observed for Reed and PSU in AJ's list.

Table 5.5: Sectoral Composition of Top 3 Ranked Colleges, JJ's List

Sectoral Composition of Top 3 Ranked Colleges	Scorecard Info		Basic Info	
	#	%	#	%
Overall				
All 2/4 Combinations	55	34%	105	65%
Mixed 2/4 and 4-Year	58	36%	40	25%
All 4-year Colleges	48	30%	16	10%
Total	161	100%	161	100%
Chi-squared test value	34.93 (p-value < 0.0001)			
Low Income School				
All 2/4 Combinations	31	36%	57	66%
Mixed 2/4 and 4-Year	26	30%	23	27%
All 4-year Colleges	29	34%	6	7%
Total	86	100%	86	100%
Chi-squared test value	22.98 (p-value < 0.0001)			
High Income School				
All 2/4 Combinations	24	32%	48	64%
Mixed 2/4 and 4-Year	32	43%	17	23%
All 4-year Colleges	19	25%	10	13%
Total	75	100%	75	100%
Chi-squared test value	15.38 (p-value < 0.0001)			

5.2.2 Changes in Ranking Accuracy, Summary Measures

This section presents the summary measures of students' ranking patterns, Kendall's tau, and overall and individual indicator college ranking accuracy.

Kendall's tau. Table 5.7 below reports Kendall's tau statistics for both ranking tasks. For both AJ's and JJ's tasks, the basic information group's rankings were negatively associated with the reference ranking, weakly in the case of AJ's list, but strongly in the case of JJ's; and the scorecard groups' rankings were positively associated with the reference ranking, strongly in the case of AJ's list and weakly in the case of JJ's list. This suggests that scorecard information did, in both cases, improve students' ranking accuracy.[74] Within each treatment group, differences by school were small suggesting that, contrary to my hypothesis, students' ranking behavior did not vary by school.[75]

Table 5.7: Overall Ranking Accuracy by Treatment Group, Kendall's Tau

School		AJ's List		JJ's List	
		Scorecard Info	Basic Info	Scorecard Info	Basic Info
Low Income	M	0.375	-0.105	0.076	-0.467
	S.D.	*(-0.433)*	*(-0.389)*	*(-0.609)*	*(-0.461)*
High Income	M	0.305	-0.049	0.076	-0.349
	S.D.	*(-0.406)*	*(-0.374)*	*(-0.538)*	*(-0.559)*
Total	M	0.342	-0.079	0.076	-0.412
	S.D.	*(-0.421)*	*(-0.382)*	*(-0.575)*	*(-0.511)*

Overall Indicator College Accuracy. Table 5.8 below reports how accurately students ranked the indicator colleges – those that should be ranked first and last in AJ and JJ's list. Students ranking patterns for both tasks were significantly different in ways consistent with my hypotheses. Consistent with a ranking based on perceived cost and using a rule of thumb that "public colleges are cheaper", in AJ's task 62% of students rank the local public college PSU in the top half of the rankings and the private college Reed in the bottom half of the rankings. In JJ's task, an even larger proportion of the basic group – 75% - rank the worst two/four college

[74] I test this formally in an ANOVA analysis later in this chapter.
[75] I also test this in the ANOVA analysis.

option of PCC/PSU in the top half of the rankings and the top four-year college option, OSU, in the bottom half.

Consistent with scorecard information affecting their evaluation of the colleges, in AJ's task, 53% of the scorecard group correctly rank Reed in the top half of the rankings and PSU in the bottom half. Similarly, nearly half of the scorecard group ranks both colleges correctly in JJ's task. Interestingly, however, a large sub-group (30 percent) of students in AJ's task rank Reed correctly but PSU incorrectly, and a large number in JJ's task continue to rank both indicator colleges incorrectly. This is consistent with my hypothesis that PSU in AJ's list and OSU and PCC/PSU in JJ's list will be more difficult to rank than Reed as students are required to explicitly trade-off multiple conflicting variables.

Table 5.8: Overall Ranking Accuracy by Treatment Group, Indicator Colleges

Indicator College Ranking Pattern	Scorecard Info		Basic Info	
	#	%	#	%
AJ's Task				
Both Correct*	86	53%	34	21%
Both Incorrect	18	11%	100	62%
Reed Right, PSU Wrong	49	30%	14	9%
Reed Wrong, PSU Right	8	5%	13	8%
Grand Total	161	100%	161	100%
Chi-squared test values	100.15 (p-value < 0.0001)			
JJ's Task				
Both Correct**	78	48%	28	17%
Both Incorrect	65	40%	121	75%
OSU Right, PCC/PSU Wrong	6	4%	4	2%
OSU Wrong, PCC/PSU Right	12	7%	8	5%
Grand Total	161	100%	161	100%
Chi-squared test values	41.65 (p-value < 0.0001)			

* Reed ranked 1, 2 or 3; PSU ranked 4, 5 or 6
** OSU ranked 1, 2 or 3; PCC/PSU ranked 4, 5 or 6

Individual indicator college accuracy. Table 5.9 below reports absolute ranking accuracy for each of the four indicator colleges in AJ's and JJ's college lists. I expected that students receiving only basic information, and thus ranking the colleges based on their preconceptions

about the cost of each option, would be "wrong" about each of the indicator colleges, and to more or less the same degree. As Table 5.9 shows, this was indeed the case. Students ranking with only basic information are similarly wrong about each indicator college's correct ranking, with similar mean accuracy and dispersion.

This changes for the scorecard information group. As expected, students are very accurate in their ranking of Reed College, with the median and modal accuracy being 0, i.e. perfect accuracy. I also hypothesized that students would not only be less accurate in ranking PSU in AJ's list and OSU and PCC/PSU in JJ's list, but also that they would be more accurate in ranking PSU than OSU or PCC/PSU.[76] While students in the scorecard group are, as already noted above, less accurate in ranking these three colleges, there is little sign that they are much more accurate in ranking PSU. While Table 5.9 below shows that students were, on average, somewhat more accurate in ranking PSU than OSU and PCC/PSU, the differences are not great.[77]

As with overall accuracy as measured by Kendall's tau, the differences in ranking accuracy by school are small.

[76] This hypothesis flowed from that fact that ranking PSU involves trading off lower cost versus lower graduation rates and average salaries, but accurately ranking OSU and PCC/PSU required students to, in addition, consider the ambiguous information presented on transfer rates from community to four-year college.
[77] I test for statistically significant differences by treatment group and by school in a MANOVA later in this chapter.

Table 5.9: Absolute Ranking Accuracy for Indicator Colleges

College (Ranking Task)	Scorecard			Basic		
	Mean *(Std. Dev.)*	Median	Mode	Mean *(Std. Dev.)*	Median	Mode
Overall						
Reed (AJ)	0.820 *(1.647)*	0	0	3.248 *(1.785)*	4	5
PSU (AJ)	1.957 *(1.712)*	2	0	3.329 *(1.877)*	4	5
OSU (JJ)	2.233 *(1.627)*	2	1	3.497 *(1.471)*	4	4
PCC/PSU (JJ)	2.156 *(1.834)*	2	0	3.540 *(1.673)*	4	5
N	161			161		
Low Income School						
Reed (AJ)	0.56 *(1.45)*	0	0	3.24 *(1.85)*	4	5
PSU (AJ)	1.93 *(1.73)*	2	0	3.50 *(1.88)*	4	5
OSU (JJ)	2.24 *(1.69)*	2	4	3.69 *(1.34)*	4	4
PCC/PSU (JJ)	2.30 *(1.89)*	2	0	3.73 *(1.54)*	4	5
N	86			86		
High Income School						
Reed (AJ)	1.12 *(1.81)*	0	0	3.25 *(1.72)*	4	5
PSU (AJ)	1.99 *(1.70)*	2	0	3.13 *(1.87)*	3	5
OSU (JJ)	2.23 *(1.56)*	2	1	3.28 *(1.59)*	4	4
PCC/PSU (JJ)	1.99 *(1.76)*	2	0	3.32 *(1.80)*	4	5
N	75			75		

5.3 ANOVA ANALYSIS: DID OVERALL ACCURACY IMPROVE?

To investigate the statistical significance of the impact of scorecard information on overall ranking accuracy as measured by Kendall's tau, I conducted a mixed ANOVA with tau as a dependent variable, between groups factors of group (basic/scorecard information) and high school of origin (lower/higher income) and a within groups factor of task (AJ's list/JJ's list). There were n=320 subjects in the analysis.[78] The results reported in Table 5.10 below show a significant main effect of treatment group, F (1, 316) = 128.876, $p < 0.0005$, partial $\omega^2 = 0.29$ and task, F (1, 14.020) = 67.371, $p < 0.0005$, partial $\omega^2 = 0.17$. The effect sizes are large by Cohen's (1988) standards. There was, however, no significant main effect of respondent's high school. No interaction effects were significant.

[78] Two subjects were dropped as they did not answer the JJ ranking task.

These results confirm my expectations based on the descriptive statistics alone. In sum, the type of information subjects received – basic or scorecard - had a significant impact on ranking accuracy, but the school they attended did not, nor did it moderate the effect of information.[79]

As noted in section 5.1.3, the limitations of tau as a measure where rankings are not equally spaced mean that one should not overemphasize the differences in mean tau between AJ's and JJ's task and should refrain from interpreting the variables of "task" and the interaction between task (AJ or JJ's) and group (basic or scorecard) in the mixed ANOVA reported in section 5.3. A better measure of the differential impact of scorecard information between AJ's and JJ's task is the indicator college analysis presented in the next section.

Table 5.10: ANOVA results, Effect of Treatment Group, School and Task on Ranking Accuracy as measured by Kendall's Tau

Source	df	Mean Square	F	Sig.*
Tests of Between-Subjects Effects				
Intercept	1	.195	.779	.378
Group	1	32.236	128.876	.000
School	1	.110	.438	.509
Group*School	1	.591	2.362	.125
Error	316	.250		
Tests of Within-Subjects Effects				
Task	1	14.020	67.371	.000
Task*Group	1	.179	.862	.354
Task*School	1	.169	.814	.368
Task * grp * sch	1	.000	.002	.963
Error(Task)	316	.208		

* Computed using alpha = .05

[79] As noted in section 5.1.3, due to the limitations of Kendall's tau as a measure when ranks are not equally spaced, we need to be careful in interpreting the variable of task and the associated interaction variable. I return to this point in the discussion at the end of this chapter.

5.4 MANOVA ANALYSIS: DIFFERENTIAL EFFECT OF SCORECARD INFORMATION ON RANKING ACCURACY

In this section, I formally test my hypothesis that scorecard information would have a differential effect on ranking accuracy with the impact decreasing as the number of variables students need to evaluate increases. To do this, I conducted a MANOVA to test for differences in the indicator college ranking accuracy between the basic and scorecard information groups and then tested for mean differences in accuracy by college within each treatment group using paired sample t-tests.[80] The four dependent variables in the MANOVA were the absolute accuracy with which students ranked the two indicator colleges in AJ's list – Reed and PSU – and the two in JJ's list – OSU and PCC/PSU.

A multivariate analysis of variance (MANOVA) showed a significant effect for the factor of group (scorecard or basic information), with Pillais' Trace = 0.379, $F(4, 313) = 47.711$, $p < .001$.[81][82] The multivariate effect size, η^2, was estimated at 0.379. I conducted a series of univariate ANOVAs as follow-up to the MANOVA.[83] All were significant and are reported in Table 5.11 below.

[80] I adopted the multivariate approach to repeated measures as the college-level ranking accuracy variables are correlated and the ANOVA sphericity assumption is violated.

[81] Assumption checking revealed that data was approximately normally distributed, as assessed by QQ plots of the studentized residuals. There were no multivariate outliers as assessed by Mahalanobis' distance ($p < .001$) . Pearson's correlations were in range $.295 < r < .751$, $p < .0005$). Box's M test was not significant ($p = .015$), indicating homogeneity of variance-covariance matrices.

[82] I also included school (low-income/high-income high school) as a factor but the results were not significant for either the factor or its interaction with treatment group.

[83] Prior to conducting follow-up ANOVAs, I tested the homogeneity of variance assumption for all ranking accuracy variables using a series of Levene's F tests. Three out of four Levene's F tests were statistically significant ($p < .05$), indicating that the homogeneity of variance assumption was violated. However, as examination of the standard deviations revealed that none of the largest standard deviations were more than four times the size of the corresponding smallest, the ANOVA will be robust to this violation (Box, 1953).

Table 5.11: Univariate ANOVA test for differences in absolute accuracy by treatment group

College	F	df	Error df	Sig.	Partial Eta Squared
Reed	155.743	1	316	< .0005	.330
PSU (AJ)	44.622	1	316	< .0005	.124
OSU (JJ)	51.903	1	316	< .0005	.141
PCC/PSU (JJ)	50.940	1	316	< .0005	.139

I used paired-samples t-tests to determine whether, *within* both the scorecard and basic information groups, there was a statistically significant mean difference between the accuracy with which students ranked Reed, PSU, OSU and PCC/PSU.[84] I tested the following hypotheses for each group:

Students are most accurate in their ranking of Reed College, that is,

$$H_1: \mu_{Reed} < \frac{\mu_{PSU,AJ} + \mu_{OSU,JJ} + \mu_{PC\ \ PSU,JJ}}{3}$$

Students rank Portland State University (AJ's list) more accurately than either Oregon State University or Portland Community College/Portland State University in JJ's list.

$$H_1 = \mu_{PSU,AJ} < \frac{\mu_{OSU,JJ} + \mu_{PC\ \ PSU,JJ}}{2}$$

Within the basic information group, there were no significant mean differences in the accuracy with which students ranked the colleges. Students were no more accurate in their ranking of Reed (M = 3.248, SD = 1.785) than they were, on average, in ranking PSU in AJ's list and OSU and PCC/PSU in JJ's list (M = 3.456, SD = 1.389). Students were also no more accurate in ranking PSU in AJ's list (M = 3.330, SD = 1.877) than they were, on average, in ranking OSU and PCC/PSU in JJ's list (M = 3.519, SD = 1.465). This is consistent with my hypothesis that, without scorecard information, students will be equally inaccurate in their evaluation of these colleges.

[84] QQ plots of the differences between the paired values were approximately normal. Several outliers were detected that were more than 1.5 box-lengths from the edge of the box in a boxplot. Inspection of their values did not reveal them to be extreme and they were kept in the analysis.

Within the scorecard information group, students were, consistent with my hypothesis that Reed is the easiest college to rank correctly using scorecard information, more accurate in their ranking of Reed ($M = 0.820$, $SD = 1.647$) than they were, on average, in ranking PSU in AJ's list and OSU and PCC/PSU in JJ's list ($M = 2.115$, $SD = 1.306$), a statistically significant mean improvement of 0.844, 99% CI [-1.589,-1.000], $t(160) = -8.694$, $p < .0005$, $d = -0.685$. However, I did not find any support for my hypothesis that students would find it easier to use scorecard information to correctly rank PSU in AJ's list than they would be to use it to correctly rank OSU and PCC/PSU in JJ's list. Students were no more accurate in ranking PSU in AJ's list ($M = 1.956$, $SD = 1.717$) than they were, on average, in ranking OSU and PCC/PSU in JJ's list ($M = 2.203$, $SD = 1.596$).

5.5 DISCUSSION

The results reported above, with some exceptions, generally support the hypotheses I set out at the beginning of this chapter. Most importantly, they give strong, causal support to the hypothesis that scorecard information would improve students' ranking accuracy. But they also yield unexpected findings, particularly with respect to the differential impact of scorecard information on ranking accuracy for indicator colleges, and revealed variations in students' ranking patterns within the scorecard and basic groups and between ranking tasks.

5.5.1 Evaluation of Support for Hypotheses

I found support for my expectation, based on the literature, that (presumed) low-income students ranking based on their perceptions of college costs would rank private colleges below public colleges and "two/four" transfer pathways above ones that involve starting directly at a four-year college (Hypothesis 1).[85] That said, a sub-group of students ranked the colleges in ways that are inconsistent with those expectations. In fact, for AJ's list, over half of lower-income high school students in the basic group either filled their top 3 ranks with a mix of public and private colleges

[85] "Presumed" low-income students, because, as discussed in Chapter 4, I did not actually have family income data for the students surveyed at the lower-income school, but inferred they were lower-income based on the school's high share of students receiving free and reduced price lunch and the parental educational attainment levels reported by students' surveyed.

(51 percent) or with all private colleges (6 percent).[86] For JJ's list, more students ranked as hypothesized (66 percent) but still a large minority filled their top 3 ranks with a mix of 2/4 and 4-year colleges (27 percent), or with all 4-year colleges (7 percent). In addition, the evidence presented is correlative only. While the observed ranking patterns are consistent with a large proportion of low-income students ranking based on cost-perceptions, we can't rule out the possibility that students did consider the impact of college attendance on lifetime financial benefits but did not think that these varied greatly across colleges.

Importantly, I found strong evidence in support of my central hypothesis that students' evaluations of the financial investment value of the colleges would become more accurate when they are provided with summary, relevant College Scorecard information (Hypothesis 2). Moreover, the experimental design allows causal statements. We can conclude that providing students with scorecard information on the colleges to be ranked led them to rank them significantly more accurately. The results reported above provide causal evidence that students provided with scorecard information are better able to rank colleges by their financial investment value or "bang for the buck".

Students' overall accuracy as measured by tau was significantly greater for the scorecard group for both ranking tasks and the effect size was, as reported above, large for both AJ and JJ's lists. Looked at in terms of the simpler ranking accuracy measure – overall indicator college ranking accuracy - the number of students who ranked both indicator colleges at least in the correct half of the rankings more than doubled in both AJ's and JJ's tasks, rising from 21% to 53% in AJ's task and from 17% to 48% in JJ's, and a chi-square test strongly supported the hypothesis that the distribution of rankings was significantly different between the basic and scorecard groups.[87] Clearly, providing students with scorecard information can make a large difference in the accuracy with which they evaluate their relative financial investment value. The question

[86] Perhaps some of this variation in ranking behavior reflects individual knowledge about particular colleges. For instance, Lewis and Clark College, located in Portland, has a large Masters in Teaching program and students may have met high school teachers who studied there. Some may also have encountered Reed (also in Portland) and Linfield (not far away) via high school visits and other outreach programs.

[87] To be precise, it rejected the null hypothesis that the distributions were the same with $p < 0.0001$.

remains of course whether we can generalize from these results to other students ranking other colleges in different contexts.[88]

Interestingly, my hypothesis (Hypothesis 1a) that students at the higher-income high school would rank differently than students at the lower-income school and would favor colleges with higher graduation rates and post-graduation salaries did not bear out. Based on the literature about the impact of social and cultural context on students' college choices reviewed in Chapter 3, I expected students in the basic group at the higher-income school to favor colleges with better graduation and salary outcomes for themselves, and for this to carry over to how they ranked them for a highly qualified low-income student. And yet there were no significant ranking differences between the basic information groups at the two high schools. It may be that putting themselves into AJ's and JJ's shoes led students at the higher-income school to adopt a more cost-driven approach than they would have if they ranked for themselves, but without further information it is impossible to say. In addition, it's important to remember that I do not directly measure subjects' family income level and instead use school of attendance as a proxy. It may be that the family income levels of the sample of students at the higher-income school did not differ all that much from those of students who opted to participate at the lower income school. All in all, it is an unexpected and intriguing but inconclusive result.[89]

My final hypothesis probed the question of which variables would moderate the impact of scorecard information on students' ranking accuracy. I hypothesized that the impact of scorecard information would vary inversely with the difficulty of using it to evaluate the colleges. Specifically, I proposed that within AJ's list, students would find Reed easiest to rank because it is the dominant option on all attributes given, i.e., net price, average graduation rate, and salary, whereas they would find PSU harder to rank accurately as doing so requires them to make trade-offs amongst all three variables. While this proved to be true, my hypothesis that, because they would need to take the ambiguous and incomplete community college transfer information into

[88] I address these and other questions of internal and external validity in Chapter 6.

[89] The lack of any significant differences between how students at the higher-income high school who received scorecard information ranked the colleges and how students at the lower-income school did so is also somewhat surprising. One would have expected, given the literature suggesting that lower-income students are more risk-averse and therefore have higher discount rates, to see differences in how higher- versus lower-income students ranked high cost, high payoff colleges. Again, I emphasize that I did not measure respondents' own income at the two high schools with different SES profiles.

account, students would be even less accurate in ranking the two indicator colleges in JJ's list than they were in ranking PSU, did not prove out. This finding is not consistent with my hypothesis that ranking accuracy will decrease as the number of variables to be synthesized and the ambiguity of the information increases. Or, to look at it another way, the hypothesis might be true, but adding the community college transfer rate data may not significantly increase the perceived difficulty of using the scorecard information.

This is quite a plausible interpretation. Depending on how they approached the task, students did not in fact have to interpret four pieces of information to rank OSU and PCC/PSU in JJ's list correctly. Students had already ranked OSU, PSU and UofO while ranking the colleges in AJ's list. They then moved on to rank JJ's list. As students were told that JJ and AJ shared identical academic qualifications and goals for college with the one difference being the colleges they were considering attending, there would be no need to change the rank order of the three four-year colleges JJ was considering. The one decision students needed to make was whether to rank options starting at community college in the top or bottom half of the rankings. And doing this required them to consider only one additional piece of information – the community college transfer and graduation rate. If this was the case – and the fact that 92 percent of students ranked OSU, UofO and PSU in the same order in both AJ and JJ's tasks suggests that it was – then the implication is that students were equally as good at weighing up the implications of PSU's net price, average graduation rate and salary attributes as they were at evaluating the impact of the community college transfer rate data on the choice between starting at a community college or directly at a 4-year college.

5.5.2 Unpacking The Black Box of Causation

Although the results presented in this chapter answer in the affirmative my first research question of whether a "best case" presentation of scorecard information could improve students' ability to evaluate the financial investment value of alternative colleges, they leave open the important question of the mechanism by which this occurs. The "think aloud" survey was designed to answer this question by exposing students' decision processes and how they differed with the information provided. I turn to those results and the question of causal mechanisms in the next chapter.

Chapter 6. STUDENTS' DECISION PROCESSES

The results reported in the previous chapter showed that students did a significantly better job evaluating the expected financial investment value of AJ's and JJ's college options when they were provided with scorecard information. But what was the causal mechanism? As discussed in Chapter 2, how students use the information, not just whether it improves their accuracy, is important for efforts to improve the impact of initiatives such as College Scorecard.

In Chapter 2, I outlined two broad schools of thought in the literature. On the one hand, the mainstream economics and econometric literature associated with Becker's human capital model of educational investment has assumed that students are best characterized as human capital maximizers who consider the impact of multiple cost and benefit variables on the lifetime value of attending alternative colleges. In this conception, students receiving scorecard information will use it to update their, often inaccurate, subjective expectations of the values of key variables such as the cost of college and post-graduation salaries. Scorecard information is thus expected to operate through an information updating mechanism within a human capital maximizing decision framework to increase the accuracy of students' evaluations of the expected financial investment value of alternative colleges.

Against this, another line of research, associated with behavioral economics and sociological approaches, argues that students are better characterized as heuristic decision-makers, using rules of thumb, such as favoring public colleges or evaluating colleges on cost alone, to simplify the decision process. In this conception, unless receiving scorecard information leads students to change their decision framework to include both cost and benefit variables, an intervention like College Scorecard is unlikely to improve the *overall* accuracy of students' college financial investment value evaluations. Scorecard information could, nonetheless, improve students' evaluations of *some* colleges' financial investment value even without changing their decision framework. For instance, students evaluating colleges based on cost alone might be surprised to learn that Reed College is so inexpensive on a net cost basis for low-income students. Scorecard information would lead these students to evaluate Reed more positively, but only for cost reasons, not because it also has a very high graduation rate and average post-graduation salary.

These same students would, however, continue (incorrectly) to regard PSU positively, even though despite being relatively inexpensive it has a low graduation rate and average post-graduation salary.

Students' ranking behavior alone in the 2014 exercise does not reveal the mechanism which caused students receiving scorecard information to rank AJ's and JJ's colleges more accurately than those receiving only basic information. To illustrate this, consider the indicator college ranking patterns in Table 6.1 below, which repeats Table 5.8 from the previous chapter.[90]

Table 6.1: Overall Ranking Accuracy by Treatment Group, Indicator Colleges

Indicator College Ranking Pattern	Scorecard Info		Basic Info	
	#	%	#	%
AJ's Task				
Both Correct*	86	53%	34	21%
Both Incorrect	18	11%	100	62%
Reed Right, PSU Wrong	49	30%	14	9%
Reed Wrong, PSU Right	8	5%	13	8%
Grand Total	161	100%	161	100%
Chi-squared test values	100.15 (p-value < 0.0001)			
JJ's Task				
Both Correct**	78	48%	28	17%
Both Incorrect	65	40%	121	75%
OSU Right, PCC/PSU Wrong	6	4%	4	2%
OSU Wrong, PCC/PSU Right	12	7%	8	5%
Grand Total	161	100%	161	100%
Chi-squared test values	41.65 (p-value < 0.0001)			

* Reed ranked 1, 2 or 3; PSU ranked 4, 5 or 6
** OSU ranked 1, 2 or 3; PCC/PSU ranked 4, 5 or 6

[90] As a reminder, the indicator colleges are those ranked first and last in the reference ranking – Reed and PSU in AJ's task and OSU and PCC/PSU in JJ's task.

In AJ's task, 53 percent of students receiving scorecard information ranked both indicator colleges correctly, putting Reed in the top and PSU in the bottom half of their rankings. This is consistent with these students using a weighted evaluation of the scorecard cost, salary and graduation rate information for each college. But it is also consistent with ranking the colleges simply on salary, or on graduation rate. And what of the large minority, some 30 percent, of scorecard group students who correctly ranked Reed in the top half of the rankings, but incorrectly ranked PSU in the top half? This could be because they ranked the colleges on cost alone, ignoring PSU's relatively low graduation and average salary performance. But it could also be because these students, quite reasonably, believed that a high performing student like AJ would have a much higher than average chance of graduating from PSU and would also earn a higher than average salary after doing so.

A similar logic applies to JJ's college options. Did the 40 percent of students in the scorecard group who ranked OSU in the bottom half and PCC/PSU in the top half of the rankings do so because they ranked the colleges based on cost alone, ignoring the low probability of transferring from PCC to a four-year college? Or, did they consider that information but believe that a high performing student such as JJ was much more likely than the average PCC student to transfer successfully?[91]

In summary, we can explore the broader question of how best to characterize students' decision processes through the lens of their indicator college ranking patterns. Are the indicator college ranking patterns revealed in Table 6.1 above the result of human capital maximizing students taking a nuanced approach to evaluating new information? Or are they the result of students ranking the colleges using simple heuristics and paying attention only to scorecard information

[91] Of course, one can also make similar arguments about the basic information group's behavior. Perhaps the 62 percent of basic group students who ranked Reed in the bottom and PSU in the top half of the rankings believed that Reed would be more expensive than PSU and that AJ's probability of graduating and future salary would not be affected by the college he/she attended. In JJ's case, perhaps the 75 percent of students who ranked PCC/PSU in the top and OSU in the bottom half of the rankings also believed that cost was the only relevant factor because they believed JJ's probability of transferring to a four-year college to be very high. This would be a complex and nuanced thought process but is nonetheless possible.

relevant to the rule of thumb that they are using? In this chapter, I use the 31 2015 interviews in which students "thought aloud" as they ranked AJ and JJ's colleges to investigate this question.

6.1 PRIMARY ANALYTICAL STRATEGY

The 31 think aloud survey subjects were randomly selected from a total of 65 seniors at the low-income high school surveyed in 2014, with 16 students randomly assigned to give insight into the scorecard group's decision processes and 15 assigned to the basic information group.[92] Table 6.2 below segments think aloud subjects indicator college ranking patterns.

Table 6.2: Think Aloud Interview Categorization by Indicator College Ranking Pattern

	Scorecard Info		Basic Info	
Indicator College Ranking Pattern	#	%	#	%
AJ's Task				
Both Correct*	9	56%	3	20%
Both Incorrect	1	6%	9	60%
Reed Right, PSU Wrong	6	38%	1	7%
Reed Wrong, PSU Right	0	0%	2	13%
Grand Total	16	100%	15	100%
JJ's Task				
Both Correct**	5	31%	2	13%
Both Incorrect	9	56%	11	73%
OSU Right, PCC/PSU Wrong	1	6%	1	7%
OSU Wrong, PCC/PSU Right	1	6%	1	7%
Grand Total	16	100%	15	100%

* Reed ranked 1, 2 or 3; PSU ranked 4, 5 or 6
** OSU ranked 1, 2 or 3; PCC/PSU ranked 4, 5 or 6

The first step in my primary analytical strategy was to use the "think aloud" interview data to characterize students' decision rules for AJ's and JJ's tasks in a way that captured the essence of their decision processes.

[92] See Section 6.5 for a comparison of demographic and ranking pattern similarities between the think aloud subjects interviewed in 2015 and the subjects surveyed in 2014.

To do so, I, together with a second coder, focused on what students said, unprompted, as they ranked the colleges.[93] As the reader will recall from the research design and sample description in Chapter 3, the premise of the "think aloud" survey, which is well validated by the literature on such surveys, is that, if subjects are allowed to speak freely during a decision process, their voiced thoughts will accurately reflect their internal decision processes.[94] In brief, using a multi-step, structured coding process, students' unprompted thought processes were coded and each student's decision process categorized based on the dominant rules and factors, for example, cost of attendance, college reputation and so on, that they talked about as they made their ranking decisions.[95] In order to maximize the ability of others to replicate my findings, coding followed a standard step-by-step process based on the methods developed by Fonteyn, Kuipers and Grobe (1993). The coding and analysis process are described in more detail in Appendix E.

After coding of students' decision rules was completed, I then mapped each student's decision rule to their indicator college ranking pattern and examined the results to see if there was any association between ranking patterns and students' ranking rules.[96]

6.2 DECISION PROCESSES IN AJ'S TASK: EVALUATING FOUR-YEAR COLLEGES

To give the reader a "bigger picture" flavor of the think aloud interviews, I begin by presenting a narrative account of the themes that emerged before turning to the structured analysis of students' decision rules.

[93] Although I did ask students some follow-up questions about their reasons for ranking as they did and what information they used or would have liked to be able to use, I drew on these prompted comments, which must be regarded as less reliable than students' unprompted thoughts, only when necessary to clarify an ambiguous comment made in the unprompted interview section. The prompted comments therefore inform the analysis presented here but are not reported separately.

[94] Students certainly did not seem to have trouble with the process. They readily moved into the survey proper once they had completed the warm-up task of ranking a series of physical exercise program options for a student who wants to get fit, seeming to treat it as class exercise or even a test.

[95] As Appendix E explains, the data was in fact double-coded using a careful protocol to maximize reliability.

[96] To reduce the risk of confirmation bias, I did not analyze students' indicator college ranking patterns until after the decision rule coding was complete.

6.2.1 Themes in the Basic Information Group

The students who received only basic information on AJ's college options almost all started ranking the colleges straight away - "so I'm gonna [*sic*] go with PSU as his first best investment"[97] - rather than articulating how they planned to approach the task. The two who did state an approach related it to a rule of thumb relating college costs to college sector. One of these students, for example, commented that, "I'd probably put private colleges last because they are really expensive."[98]

Many students, seven in total of the 15 in this group, made overarching statements in favor of public colleges and repeated them more than once as they ranked. Their comments mostly turned on straightforward cost-based rules of thumb such as "public tuition is best" or "private colleges require more money".[99] Only one student made any evaluation of public college quality and two students talked about private schools' reputations as an indicator of their high cost rather than of a future earnings payoff.[100] One of these students commented, as he ranked Reed College last, "I'm guessing Reed is really expensive because it is private…Reed College would be Oregon's Harvard, that's how I picture Reed."[101]

Four students, however, expressed a rule of thumb favoring private colleges. Three of these students were clearly thinking about the potential impact on AJ's future financial outcomes with one commenting that, "investment-wise they could offer better resources for what he wants to do…when people in jobs or companies see that you are from a private college…you'd probably get paid more," and the other two commenting, "they're private for a reason," and "it's a really good education".[102] Another student had heard that private colleges offered a lot of scholarships and might therefore be cheaper for low-income students.[103]

[97] Student 1321.
[98] Student 1318.
[99] Students 1308 and 1321, respectively.
[100] Students 1314 and 1330.
[101] Student 1330.
[102] Students 1312, 1322 and 1326.
[103] Student 1316.

Net price (cost) was the most frequently mentioned of the scorecard variables, although this group of students was not provided with that information. All but two of the students repeatedly cited the cost of attendance at each college as a consideration as they ranked, saying things like, "it costs the least amount of money", or "the tuition for a year though is also pretty high".[104] Only two students mentioned the impact of college choice on AJ's future salary – the student mentioned previously who believed attending a private college would have a positive impact on AJ's earnings, and a student who commented on how a particular college had, "a lot of fields you can major in that can make you a lot of money."[105] No student in this basic information group referred to graduation rates in any way.

Instead, students mentioned many non-scorecard factors - a total of 22 different factors - with the median student mentioning seven. After college sector, the most common factors mentioned were the programs and majors offered by a college, its reputation or prestige, its location, particularly whether AJ could live at home or not, whether or not the student had heard about the college from others, student loans/debt, aid and grants from the college[106], the college's acceptance rate, AJ's and JJ's family's income level, if the student knew someone who had attended the college, the size of the college, and the resources and opportunities available there (see Table E.3, Appendix E).

Many of these factors could reasonably be used by students to estimate the future benefits attending a particular college might yield, but it was far from clear that this is what students were trying to do. For instance, one student commented of Reed, "they accept the top students, so…I mean he's really smart, but if he's trying to get to a school that's affordable, that he can afford, that's probably not an option."[107] The brevity of students' comments on each of these factors was striking, and they leapt from one to another as they talked about each college rather than, for instance, speaking of each college's reputation in turn.

[104] Students 1325 and 1310, respectively.
[105] Student 1312.
[106] These students did not seem to realize that net price gives them information on out-of-pocket costs and therefore, indirectly, information on loans/debt and grant-based financial aid. The net price definition provided at the beginning of the survey did, however, explain how net price was calculated.
[107] Student 1314.

In sum, the overall impression I formed was that, for most students in the basic information group, the only thing that they were sure of for each college was its sector, and that was the key factor on which their ranking turned. For most, that meant favoring public colleges due to their lower cost. For a small group, however, it meant favoring private colleges, which they believed would offer AJ more benefits in the long run. After applying these basic rules of thumb, students seemed to layer on many other factors, drawing on whatever they knew or had heard about the colleges, as they sought to rank them more granularly.

6.2.2 Themes in the Scorecard Information Group

In contrast, students in this group tended to be more deliberate in their approach to ranking the colleges. Students seemed to begin by considering how to process the scorecard information, with seven out of the 16 students starting by stating how they were going to use the information to rank AJ's college options. Three of the seven articulated approaches based on salary and net price: "so he wants the best financial benefits and the lowest cost I can get. So low cost, but average salaries [are important]" - and one focused on salary alone: "They're thinking about only a financial benefit in the future….average salary".[108] One student instead focused on cost and graduation rate: "they're looking at just how much it costs per year and the graduate [*sic*] rate."[109] And two students focused on cost alone: "...AJ is looking for, is just focusing on how cheap the school is".[110] No student mentioned all three scorecard factors, although logically all three are relevant, when setting out their approach to ranking the colleges.

Scorecard group students were also much less likely than those receiving just basic information to make overarching statements that could be used as rules of thumb to rank the colleges, suggesting that rules of thumb substitute when good information is not available. No students expressed a "favor public" rule of thumb. The broad generalizations about the implications of a college's sector that were so prevalent in the basic information group's comments are almost completely absent. Two students did mention that private colleges often give good scholarships to low-income students, with one adding that graduates of private colleges often earn more and

[108] Cost - student 1331 (quoted), 1309, 1317. Salary – student 1320.
[109] Student 1304.
[110] Student 1302 (quoted) and 1329.

have more opportunities.[111] Both students made these comments in reaction to seeing Reed's low net price and high average salary and seemed to be assessing the consistency of this specific information about Reed with their prior information on private colleges in general, rather than expressing a general belief about private colleges that they would use as a rule of thumb to rank the colleges. Having thus tested for the plausibility of the scorecard information, these students seemed likely to rely on it rather than on generalizations based on college sector. This is a very different approach to that taken by students in the basic information group.

Consistent with this focus on the scorecard factors with which they were provided, students in this group mentioned far fewer non-scorecard factors, mentioning half as many different factors as the basic group,[112] with the median student naming only one and six students mentioning none at all. Only five factors were mentioned by more than one student in this group - college sector, student loans and debt, AJ's family income level, aid provided by the college, and financial aid generally – all of which were mentioned by two or three different students (Table E.4, Appendix E).

6.2.3 Structured Analysis of Students' Decision Rules and Ranking Patterns

The structured analysis of each student's decision process revealed that the themes identified in the descriptive analysis above underpin distinct decision rules, and these rules are associated with their indicator college ranking patterns.

6.2.3.1 The Basic Information Group

As Table 6.3 below shows, the structured categorization of students' decision rules confirmed that a majority (two-thirds) of students in the basic information group ranked the colleges based on cost, with most using a "favor public" rule of thumb. A minority (4 of the 15) focusing on benefits and using a "favor private rule".[113]

[111] Students 1315 and 1317.
[112] 11 compared to 22 factors mentioned overall.
[113] The method and detailed results for which are set out in Appendix E.

Table 6.3: AJ's List, Basic Information Group Decision Rules

Indicator College Ranking Pattern	Decision Rule Considers		
	Cost Only	Benefits	Idiosyncratic
Both Correct*	1	2	
Both Incorrect	8		1
Reed Right, PSU Wrong**	1		
Reed Wrong, PSU Right		2	
Total	10	4	1
% of Total (N = 15)	67%	27%	7%

* Reed Top 3 and PSU Bottom 3 ** Reed Top 3 and PSU Top 3

Cost-based rule. Most students in the basic group - 10 out of the 15 - used a decision rule that considered cost only. This led eight of the 10 to, incorrectly, but in line with the behavior I expected students with only basic information to follow, rank Reed in the bottom 3 and PSU in the top 3. All but one of these eight students applied a two-part decision rule: (i) "favor public" – rank public colleges relatively high and private colleges relatively low; (ii) within that, rank colleges based on estimated cost.[114][115] The student whose decision process is summarized in Table 6.4 below used this "favor public" rule of thumb, and then colleges' location to rank them by cost, favoring colleges located in Portland, which would allow AJ to save by living at home.

Table 6.4: "Favor Public" - Student 1321's Decision Process

Colleges In Rank Order (1-6)	Quote
PSU	"it's a public college in Portland when private colleges require more money".
University of Oregon	"it's Eugene, so the cost of things are gonna be lower"
OSU	"because it has a lot of more prestigious, I guess, programs"
Lewis & Clark	"For the private colleges, I don't know much about these colleges, but they're all private, which costs more money. I'll put 4 as Lewis & Clark because it's in Portland"
Reed	"because it's in Portland, but I never hear about it; living in a city and going to college is going to be a little bit cheaper than a smaller town,

[114] Students 1303, 1308, 1314, 1318, 1321, 1328 and 1330 used a two-part rule. Student 1310 mentioned only cost considerations but did not mention college sector.

[115] The two students who used a cost-based rule but ranked in unexpected ways had atypical perceptions of the cost of private colleges. Student 1306 believed all private colleges were inexpensive for low income students and filled the top 3 rankings with them, pushing PSU to the bottom. Student 1325 specifically thought that Reed was inexpensive but Lewis & Clark was expensive and ranked accordingly.

	except in the case of Eugene because it's all city too"
Linfield	"because it's out of Portland"

Most of these students also made comments that were coded as possibly indicating that the student was using a proxy for college quality. However, once the remarks were examined in context, it became clear that students cited these factors only for one or two colleges, rather than consistently for all colleges, and did not use them primarily to estimate the benefits of attending a particular college. For instance, one student says of Reed, "I just know it's a really big-name school, therefore I'm assuming it's a lot of money you have to pay to go there."[116] This was coded as mentioning the factor of "reputation", but clearly this student was using this factor to estimate cost of attendance.

That said, students using a cost-based rule to rank AJ's colleges did sometimes use benefit-related factors to differentiate colleges that they thought cost about the same. For instance, one said, "the University of Oregon and OSU are probably about the same [cost] level as Portland State, but I feel like Portland has a lot more stuff around it to do, so you'd be more well-rounded."[117] Some also mention benefit-related factors almost as an afterthought, seeming to want to say more to justify a decision that was already made on their first-mentioned factor which was cost-related. For example, "I would probably rank Portland State number one because I know that they're one of the cheaper universities, but they like also would be graduating from college, so it'll still look good afterward for getting a job".[118] This was coded as "post-college job opportunities" but is the only time the student mentions this factor and, in context, it is clear that the intent was not to compare the future financial benefits of attending one college over another.

Benefit-oriented Rule. In contrast to this well-defined majority decision rule and ranking pattern based largely on cost, a minority of four students adopted a benefit-oriented approach, citing a "favor private" rule of thumb, and ranked private colleges - Reed, Lewis and Clark or both - in

[116] Student 1314
[117] Student 1318
[118] Student 1303

their top 3 and PSU in their bottom 3.[119] These students focused exclusively on outcome-related factors such as colleges' sector and reputation as an indicator of quality. They were united by their future orientation and "pro-private" beliefs, treating cost, if they referred to it at all, as a potential indicator of college quality. The student whose decision process is traced in Table 6.5 below is a good representative of this group, ranking private colleges among the top 3, and then ranking within sectors based on their personal exposure to the college via alumni and friends and personal visits.

While these four students were consistent in their focus on college quality, there was – apart from the belief that private colleges are higher quality – some variation in how they sought to evaluate it. The student in Table 6.5 below uses personal knowledge of a college and its alumni to differentiate private colleges, but other students also referred to program strength, reputation and curriculum. Also, while these students strongly favored private colleges, they also factored in what they knew about the quality of the public colleges in AJ's list, sometimes ranking OSU or UoO in the top 3.

Table 6.5: "Favor Private" - Student 1326's Decision Process

Colleges In Rank Order (1-6)	Quote
Lewis & Clark	a private college would be better just because they're private for a reason. My boss went to Lewis & Clark and he said he loved it and it was awesome.
Reed	I've looked into Reed a little bit last year and they seem cool, and they're private
Linfield	probably the last private one, Linfield. I don't know much about Linfield.
OSU	I was thinking about going to OSU but my GPA wasn't high enough
PSU	I know a lot about PSU and they just seem pretty chill
University of Oregon	No reason

Idiosyncratic Approach: One student clearly struggled to find a consistent rationale for ranking the colleges.[120] This student tacked from one rationale to another and it was impossible to discern any cohesive approach.

[119] Students 1322 and 1326 ranked Reed in their top 3, while students 1301 and 1312 ranked Lewis & Clark (but not Reed) in their top 3.
[120] Student 1316.

6.2.3.2 The Scorecard Information Group

Even more so than for the basic information group, scorecard group students' rankings of the indicator colleges, Reed and PSU, were associated with distinct decision rules – either cost-only or inclusive of an assessment of future benefits - that align logically with their ranking patterns.

The nine students (56% of this group) in Table 6.6 below who correctly ranked Reed in the top 3 and PSU in the bottom 3 all in some way considered the impact of the college they chose on the future benefits – as measured by salary and/or graduation rate – likely to be realized by AJ. In contrast, the six students who ranked both Reed and PSU in the top 3, focused almost entirely on the costs of attending each of the colleges, considering benefits barely if at all and never systematically.[121]

Table 6.6: AJ's List, Scorecard Information Group Decision Rules

Indicator College Ranking Pattern	Decision Rule Considers		
	Cost Only	Benefits	Idiosyncratic
Both Correct*		9	
Both Incorrect			1
Reed Right, PSU Wrong**	6		
Reed Wrong, PSU Right			
Total	6	9	1
% of Total (N = 16)	38%	56%	6%

* Reed Top 3 and PSU Bottom 3 ** Reed Top 3 and PSU Top 3

Benefit-oriented rule. Most of the nine students who considered the impact on AJ's realization of future benefits as they evaluated each college used a weighted decision rule that traded off the cost of attending a given college against future benefits. But the weighted rule students applied varied considerably with two students considering all three scorecard variables (net price, graduation rate and average salary),[122] three considering only net price and salary,[123] and two

[121] Student 1317 was very idiosyncratic in their decision process and was not categorized.
[122] Students 1323 and 1320.
[123] Students 1331, 1315 and 1309.

considering net price and graduation rate.[124] A final two students did not consider cost at all, focusing only on colleges' graduation rate and average salary.[125] For the most part, these students systematically and consistently evaluated the variables used in their decision rule. The student whose decision process is traced in Table 6.7 is an exemplar of this, consistently weighing the trade-offs among net price, graduation rate and average salary.

Table 6.7: Weighted Rule (Net Price, Graduation Rate & Salary): Student 1323

Colleges in Rank Order (1-6)	Quote
Reed	It's a private college so you know they're for profit, but net price per year in their case is $4,000. Graduation rate is pretty good looking
OSU	[OSU's] graduation rate is slightly less than Univ. of Oregon, but the net price is also less and the average salary is way higher
University of Oregon	
Lewis & Clark	Lewis & Clark's net price is $4,000 more [than Linfield's], but graduation rate is 7% higher and average salary is 6,000 higher, so they could easily get that back.
Linfield	
PSU	It doesn't have a good graduation rate and the average salary, even then it's lacking compared to other schools with less tuition rates

Similarly, the student below systematically considered graduation rates and average salary.

Table 6.8: Weighted Rule (Graduation Rate & Salary), Student 1319

Colleges in Rank Order	Quote
Reed	Obviously. 82% graduate and are making almost 100 grand
Lewis & Clark	Even though OSU is making more than Lewis & Clark, it's like not by much and the graduation rate is pretty far apart
OSU	
University of Oregon	People from Linfield graduate more, but make less…not much more than PSU
Linfield	
PSU	Because only 42% finish and they're only making $70,000 a year

Cost-based rule. In contrast, the six students who ranked both Reed and PSU in the top 3 focused on the single variable of cost and ranked AJ's entire list in perfect or almost perfect cost order.[126] Often they said little as they ranked the colleges beyond comments such as, "the right price is the right price", "Portland State [is second] because it's the second cheapest", and, "the lower cost

[124] Students 1304 and 1324.
[125] Students 1327 and 1319.
[126] Two students have one reversal.

the better".[127] Three of these students do, however, mention benefit-related factors – seemingly in passing - when ranking Reed, the lowest cost college, first.[128] But they then abandon considerations other than cost. These students also ranked the colleges quickly rather than pausing to consider their decisions. Two ranked PSU second, explicitly dismissing its low graduation rate as something either not of concern to AJ – "he's more worried about financial issues and not really graduation rate" – or, as the student whose decision process is traced in Table 6.9 below suggests - not relevant to him.[129] Another ranks OSU second, above PSU, as it's, "one of the lower prices, but he'd make a lot more money", but then ranks the remaining colleges in cost order.[130]

Table 6.9: Cost-oriented Decision Rule, Student 1305

Colleges in Rank Order (1-6)	Quote
Reed	it's cheaper and the graduation success rates is higher
PSU	it's second, like least expensive…if he's really determined to go to college, he shouldn't fall under the low graduation rate.
OSU	same reasons as PSU and it's cheaper than U of O by $500
University of Oregon	
Linfield	because it's cheaper than Lewis & Clark
Lewis & Clark	because it's most expensive

6.2.4 Scorecard Information Changed Students' Decision Processes

Table 6.10 below summarizes the decision rules for the basic and scorecard information groups and shows that giving students college scorecard information slightly more than doubled, from 27 to 56 percent, the number of students considering future benefit-oriented factors, salary, graduation rate or both, when evaluating colleges. Clearly, some students – 27 percent of the basic group - were always going to consider benefit-related factors, whether they got scorecard information or not. But, in contrast to the scorecard group students who used a weighted rule that considered both costs and benefits, these basic information group students all used a rule of thumb based entirely on benefits, and did not consider cost at all.

[127] Student 1313, 1302 and 1329, respectively.
[128] Student 1307.
[129] Students 1307 and 1305, respectively.
[130] Student 1311.

Table 6.10 AJ's List Basic and Scorecard Group Decision Rules and Ranking Patterns

Ranking Pattern	Scorecard Group			Basic Group		
	Cost-Oriented	Benefit-Oriented	Idiosyn-cratic	Cost-Oriented	Benefit-Oriented	Idiosyn-cratic
Both Correct*		9		1	2	
Both Incorrect			1	8		1
Reed Right, PSU Wrong	6			1		
Reed Wrong, PSU Right					2	
Total	6	9	1	10	4	1
% of Total**	38%	56%	6%	67%	27%	7%
Fisher's exact test (two-tailed) for difference in the distribution of decision rules by group: $p = 0.202$, $p = 0.140$ if the idiosyncratic group is dropped.						

* Reed Top 3, PSU Bottom 3 ** N= 16 (scorecard group), N = 15 (basic group)

Table 6.10 also shows that the reason that scorecard information was less likely to lead students to rank PSU accurately than it was to lead them to rank Reed accurately was that a group of students nonetheless ranked PSU highly due to its low cost. All students in the scorecard and basic information groups who adopted a cost-oriented rule used a simple rule of thumb to evaluate the colleges, ranking them from lowest to highest cost based either on their perceptions (the basic group) or on the average cost information provided (scorecard group). That is, students in both groups used the same decision rule but information updating occurred.

All in all, the analysis of students' decision rules suggests that, in AJ's task, students' college ranking accuracy was higher in the scorecard group because having scorecard information increased the number of students who went beyond considering cost alone to also consider the impact of the future financial benefits AJ would likely accrue. That is, scorecard information increased students' ranking accuracy, because it led some of them to adopt a weighted decision rule considering both costs and benefits, not simply to update the value of variables that they were already considering.

That said, the difference in the distribution of decision rules between the basic information and the scorecard groups was not statistically significant in this sample using a two-tailed Fisher's exact test, which necessarily reduces our confidence in these results. Also, we cannot fully rule out the possibility that students using a cost-based rule, although they did not report considering

benefit-related variables, in fact believed that there was little or no variation in outcomes between the colleges.

It is also possible that basic information group students adopted a simple decision rule because they lacked better information. Similarly, despite not appearing to give careful consideration to the graduation and salary information, students in the scorecard group who used a cost-based rule may have believed, given AJ's proven academic ability, that his/her probability of graduating and expected post-graduation salary did not vary materially across the colleges. I explore these two possibilities below using additional information from the interviews.

6.2.5 Was heuristic decision-making in the basic group a pragmatic response to lack of information?

To probe this question, I asked students, after they had finished both ranking tasks, what additional information they would have liked to help them rank the colleges. My premise was that, if students were in fact acting pragmatically by using a rule of thumb, they would ask for information that would have allowed them to evaluate the colleges more accurately.

Of the 10 students in the basic information group who ranked AJ's colleges using a cost-based rule, only three requested information on a benefit-oriented variable. Each of the three requested a different variable, with one asking for graduation rates, another post-graduation employment rates, and another for post-graduation salary levels.[131] And yet when these same 10 students were asked how they interpreted AJ's and JJ's goal of maximizing the financial benefits of college attendance, all but one explicitly said that this goal involved balancing the costs of college attendance against their future earnings. As one student said,

> *"…certain schools might be better now if you don't have enough money, but in the long run…if you can get a better degree somewhere or you can get a more well-known degree somewhere, then you can probably get a better job in the future and get more money"*[132]

[131] The other seven students asked only for cost-related information – either cost of attendance or college financial aid. Interestingly, the four students who ranked the colleges with a benefit-oriented rule did not ask for cost information, only for benefit-oriented information – graduation rates and salaries.
[132] Student 1318.

As we saw earlier in this chapter, the myriad of factors, such as program offerings, college prestige and reputation, that these students mentioned in ranking AJ's colleges strongly suggest that they knew that other factors were relevant to the ranking decision. Taking all this together, the obvious conclusion is that students who received only basic information knew that they needed to go beyond cost considerations in ranking AJ's college options – they wanted to be human capital maximizers - but had little idea of how to go about doing so in a systematic fashion. As Dillon and Smith recently remarked, the "consistent finding that many students, parents, and high school guidance counselors have little or no idea about how to choose a college… is a sad feature of this literature" (Dillon and Smith, 2018, p. 4).

6.2.6 Were students sophisticated interpreters of scorecard information?

Why did some scorecard group students not use the average graduation and post-graduation salary information they received? One possible explanation is that students who did not behave as I expected were sophisticated users of the scorecard information who discounted the variation in salary and graduation rates across colleges because AJ was described as highly qualified academically. Certainly, some discounting would be entirely reasonable as students' own academic ability moderates – but does not eliminate - the impact of college quality on their college and post-college outcomes (e.g. Long, 2010; Dillon and Smith, 2018). An alternative explanation is that students were in some way cognitively limited in their ability to use the information, or even simply tired or disengaged from the exercise.

In AJ's task, the six students receiving scorecard information who nonetheless ranked AJ's colleges using a cost-based rule did not usually even mention salary or graduation rates. Assuming they fully voiced their decision processes, this means they did not consider those factors. But additional corroboration would be welcome. To this end, I asked students in the scorecard group for their estimates of AJ's probability of graduating from Portland State University and their prediction of the average salary AJ could expect to earn 10-12 years after graduation.[133] My expectation was that scorecard group students who ranked PSU in the top half

[133] This is the timeframe specified in the scorecard information with which they were presented. Students still had this information in front of them as they answered this question.

of the rankings would give higher estimates of AJ's graduation rate probability and expected future salary than students who ranked PSU in the bottom half of the rankings.

This proved not to be the case. As Table 6.12 below shows, regardless of how they ranked PSU, both groups of students thought, on average, that AJ had only a slightly higher chance of graduating than the average graduation rate provided in the scorecard data and could expect a post-graduation salary that was only slightly less than the average post-graduation salary given in the scorecard.

Table 6.12 Subjective Expectations of AJ's Outcomes from Attending PSU

Subjective Expectations of AJ's:	Students' Ranking of PSU:		Scorecard Data
	Ranked 1-3	Ranked 4-6	
Probability of graduating	56%	53%	42%
Post-graduation salary	$69,000	$69,000	$70,500
Total N (Students)	6	9	

Particularly as students answered this question late in the interview, there is always a possibility that they were tired or for some other reason did not convey their true beliefs, but nonetheless this evidence adds to the impression garnered from students' comments as they ranked that those who ranked PSU highly despite being provided with information on its (low) average graduation rate and post-graduation salary were not making a sophisticated evaluation of that information and choosing to discount it. Rather, they were likely ranking PSU based on its low price.

Unfortunately, however, it's not possible to further disentangle the factors moderating the impact of scorecard information on these students' thinking and decision-making. The possibilities range from their not having noticed the information at all, noticed it but not considered it relevant to the ranking decision - although this seems unlikely as most students said that AJ's and JJ's goal required them to balance cost and future salary - to having simply been too tired or uninterested in the exercise or unsure about how to "do the math" to do so.

6.2.7 Discussion

The preponderance of the evidence presented above supports the conclusion that, students in the basic information group, while aspiring to some degree to be human capital maximizers, in fact acted as heuristic decision makers, using a simple, single variable decision rule. Moreover, they took this approach, not simply because they lacked the specific information on each college necessary to assess the expected benefits associated with each, but because they were unable to articulate what information that might be. Without guidance, they were unable to say what information they would have liked to have to better inform their decision.

How then did scorecard information lead to improved ranking accuracy? At the beginning of this chapter I hypothesized that. for heuristic decision makers, scorecard information would only have an impact if it led students to apply a different decision rule or if updating the value of the variable in the heuristic-in-use led them to more accurately rank the colleges. Both these mechanisms were in play in AJ's case.

For a majority of students, it seems that scorecard information itself enabled them to translate their aspirations to be human capital maximizers into a practical decision rule. These students ranked both Reed and PSU correctly. For a minority of students, however, simply receiving scorecard information did not lead to this outcome. It does not seem that this was due to sophisticated thinking about AJ's likely outcomes from attending PSU. It could be that simply receiving scorecard information did not given them enough "guidance" on how to evaluate the colleges, or that they balked at the calculation challenge of evaluating the net effect of PSU's low cost versus its low graduation rate and post-graduation salary. And, there is always the possibility that they were disengaged and seeking a quick way to complete the exercise.

6.3 DECISION PROCESSES IN JJ'S TASK: EVALUATING THE COMMUNITY COLLEGE PATHWAY

If receiving scorecard information crystallized students' understanding of how to evaluate AJ's college choices and gave them the information necessary to do so, did it have the same effect in JJ's task? In JJ's task, the only new information students received in the scorecard group was

related to the transfer and graduation rate for Portland Community College (PCC). We saw in Chapter 5 that there were no significant differences in the order in which students ranked the four-year colleges in AJ's and JJ's tasks. This is also true for students in the 2015 think aloud study. The primary question to address here, therefore, is how students in the scorecard group, who received community college transfer and graduation rate information, thought about the community college pathway for JJ, compared to those in the basic group who did not get that information.

Most obviously, their behavior might be similar to that in AJ's task. Then we'd expect the following behavior. In the basic information group, we'd expect:

- Most students to use a simple cost heuristic to rank the community college pathways first, and a smaller, benefit-focused minority group to rank them last.
- Students to talk about different ways in which taking the community college pathway would affect JJ's ultimate outcomes, but not be able to articulate what information they'd want in order to assess that.

In the scorecard group, we'd expect:

- One group of students to "get" that they should incorporate community college transfer and graduation rates into their assessment and rank community college pathways at the bottom of the ranking.
- Another group will continue to rank based on cost only, raising the question of whether they believed that JJ, being highly qualified academically, was likely to transfer successfully in spite of what the data say about transfer chances overall.

Below, I investigate these possibilities by presenting a similar descriptive and more structured analysis of students' thinking about the community college pathway for both groups and its relationship to their indicator college ranking patterns.

6.3.1 Themes in the Basic Information Group

Students in the basic information group overwhelmingly expressed positive attitudes about the idea of JJ starting his 4-year degree at a community college. All students unhesitatingly and unequivocally expressed a view on the subject, and 13 out of 15 were supportive of the idea.

Eight of the 13 students favoring starting at a community college focused exclusively on cost, speaking purely in terms of the cost advantages of starting at community college, commenting for instance that, “I would say [start] at PCC…because of the financial benefits," and, “going to [a 4-year] without going to PCC first would be more expensive so I would probably rank those on the bottom, investment-wise."[134] The other five students favoring the community college pathway, although still focused primarily on cost, also implied that this path would not compromise JJ’s academic outcomes. As one student said, "You're getting your pre-reqs out of the way and for a cheaper price than going all four years at a big college."[135] Two students went even further, suggesting that JJ would be more likely to be successful at a 4-year college if he started at community college because they thought that community colleges would offer smaller class sizes. This student’s comments encapsulate that point of view.

> *"It's a great plan to start at PCC...it’s kind of easier. You start out with the basic classes that you need to get through, and PCC has smaller classes, so yeah, I think it’s better to start off at a community college and then go off to a 4-year"*[136]

Both of the students who disfavored the community college pathway also favored private colleges in AJ’s task, and for similar reasons. [137] One student in particular displayed a subtle and nuanced understanding of the trade-offs between costs and investing in future financial benefits as they ranked both AJ’s and JJ’s colleges, and, in JJ’s case, was concerned about the risk that JJ might never transfer to a 4-year college or might end up on a less financially rewarding career path.

> *"The people that I've seen go straight to university usually end up getting a higher paying job and they get it done so they can start making that living……attending a community college first ...might sway what he wants to do and you know, just life happens sort of."*

These themes in students’ decision rules are similar but in some ways contrast with the views these students expressed when ranking AJ’s public and private four-year colleges. On the one hand, the majority espoused a similar cost-focused rule of thumb based on college type, but on the other this rule of thumb often also encapsulated a point of view of the likely impact of

[134] Students 1328 and 1310, respectively. The other students expressing cost-related pro-community college beliefs were 1301, 1306, 1314, 1316 and 1321.
[135] Student 1330.
[136] Student 1312.
[137] Student 1322 (quoted) and student 1326.

starting at community college on JJ's ultimate degree outcome. Also, while two of the four students who favored private colleges in AJ's task also favored starting at a four-year college in JJ's, two did not, instead favoring starting at community college. In one case this was for purely cost reasons and in the other with the qualification that the cost savings would not, the student believed, come at the cost of poorer outcomes.[138]

6.3.2 Themes in the Scorecard Information Group

Almost as many students in the scorecard group (11/16) favored JJ starting at community college as did students in the basic information group. Five of these students did so for the same reasons as students in the basic information group, focusing either exclusively on cost savings - "I think that's the cheapest way to get a 4-year college degree" – or expressing the view that the community college pathway involved cost savings with no negative impact on outcomes - "…it's cheap, take care of pre-reqs, and then finish your degree at a 4-year school."[139]

But the other six students noticed the low community college transfer and graduation rate in the scorecard data and in some way endeavored to reconcile it with their pro-community college views. In the interview these students often visibly paused to think with several starting out to say something and then backtracking or asking for clarification and then re-reading the survey. Ultimately though, the information did not change their pro-community college points of view. Four students made comments along the lines that the low rate would not or might not apply to JJ because he'd work hard.

> *"Starting at PCC is the lowest [cost] but the down part would be graduation rate because it's pretty low. But ... if he actually wants to continue with college and stuff, he'll actually work hard and he can graduate and then transfer." [140]*

One student pondered the issue at great length and was obviously struggling with the information provided.

> *"How come they don't tell you the percentage of students that graduate from PCC that transfer to a 4-year college? That makes things harder. [Long silence…] Some students*

[138] Students 1301 and 1312, respectively.
[139] Quotes are from students 1329 and 1315, respectively.
[140] Student 1304.

go on to 4-year college?...I think 2 years at community college is a good idea; it saves a lot".[141]

Ultimately, as the quote above shows, this student stayed with their initial presumptions. The issue did, however, continue to trouble this student who was the only one to specifically request clearer transfer rate information when asked later in the interview what additional information would have helped them rank the colleges.

As expressed during their ranking process, these six students' comments on the community college graduation/transfer rate data presented more as a series of ad hoc justifications for downplaying the impact of the information than as the product of reflective consideration of the fact that JJ is highly qualified academically and may therefore not be subject to PCC's low transfer rate. Students' comments did not always even make logical sense. For instance, one student said that JJ was "looking for a transfer graduation rate".[142]

Of the minority of four students who disfavored community college,[143] three were concerned about the impact of the community college graduation/transfer rate.[144] As the quote below shows, these three students unequivocally interpreted the low community college graduation and transfer rates as seriously undermining JJ's chances of ever achieving a 4-year degree.

"I...recommend not going to a community college because...he eventually wants to go to a 4-year anyway, and it's cheap but the likeliness [sic] of him graduating or transferring to another college is so low."[145]

Thus, while a slight majority – nine out of 16 students - noticed and responded in some way to the community college graduation/transfer rate data, only three found the - admittedly

[141] Student 1323.
[142] Student 1307 did not expand further on this ambiguous comment made in the unprompted section of the interview and thus reflecting the subject's stream of consciousness rather than a considered response to a question.
[143] And disregarding a final student whose comments on the community college graduation/transfer rate and on the community college pathway in general were brief and too disjointed to allow interpretation (student 1327).
[144] Students 1309, 1319, and 1320 were concerned. Student 1305 was confused about the length of time to degree completion, thinking it would require a minimum of six years, and disfavored community college for that reason.
[145] Student 1309.

ambiguous and incomplete - information sufficiently compelling to lead them to assess the community college pathway negatively[146]

6.3.3 Students' Community College Views and Indicator College Ranking Patterns

For AJ's task, whether or not a student considered the impact on AJ's outcomes while ranking the colleges was associated neatly with their ranking patterns: students who were outcome-oriented, whether in the basic information or scorecard group, ranked the indicator colleges correctly; those who considered only costs ranked them incorrectly. Receiving scorecard information shifted both students' decision rules and their ranking patterns, leading to an increase in ranking accuracy.

In JJ's task, however, outcome-orientation is not closely associated with ranking accuracy. As discussed above, nearly half of students in the basic information group used a rule of thumb that incorporated a point of view on the importance of outcomes, but, as most of them thought that starting at community college would not affect or would favorably affect JJ's outcomes, this did not lead them to rank the indicator colleges correctly. As shown in Table 6.11 below, the 13 students in the basic information group and the 11 students in the scorecard group who favored community college for the most part ranked both indicator colleges predictably and incorrectly, ranking PCC/PSU in the top 3 and OSU in the bottom 3. The two pro-community college students in each group who ranked one indicator college correctly did so for reasons unrelated to their attitude to JJ's starting at community college.[147] The one student in the scorecard group who ranked both indicator colleges correctly despite favoring the community college pathway, disfavored PSU strongly based on its low salary and thus ranked both options involving PSU in the bottom 3.

[146] Surprisingly, only five of the nine students who commented on transfer rates also considered outcome-related variables in AJ's task. Four ranked AJ's colleges on a purely cost basis, not commenting on either graduation rates or salary outcomes.

[147] The two students in each group who ranked one indicator college correctly did so not because they disfavored the community college pathway in any way, but for other reasons. For instance, one scorecard group student disfavored PSU so strongly due to its low post-graduate salary that they ranked both PSU options in the bottom 3. Another student in the basic group, rather than ranking all the community college options in the top 3, alternated community college and relevant four-year options, e.g. PSS/OSU then OSU, which led to OSU being ranked in the top 3.

Table 6.11 JJ's List Basic and Scorecard Group Ranking Patterns

Indicator College Ranking Pattern	Scorecard Group			Basic Information Group		
	Favor 2/4	Disfavor 2/4	Total	Favor 2/4	Disfavor 2/4	Total
Both Correct*	1	4	5		2	2
Both Incorrect	9		9	11		11
OSU Right, PCC/PSU Wrong**	1		1	1		1
OSU Wrong, PCC/PSU Right	1		1	1		1
Total N	11	4	16	13	3	15

*OSU top 3 and PCC/PSU bottom 3 **OSU top 3 and PCC/PSU top 3

Moreover, of the four students in the scorecard group who ranked both indicator colleges correctly because they disfavored the community college pathway, only three did so as a result of the transfer rate information. The other student thought (incorrectly) that the two years of community college would be additional to the four years at a public college and ranked the options based on total cost. So, in reality, although the aggregate data show an increase in the share of students who rank both colleges accurately in the scorecard group, once one peels apart the causation, the true impact of transfer rate information was to increase the number of students ranking both indicator colleges correctly only from two in the basic information group to three in the scorecard group.

For this sample of students, receiving information on the community college transfer rate had little if any impact on the accuracy of their evaluation of the community college pathway.[148]

[148] As the reader will recall from Chapter 5 and from Table 6.1 at the beginning of this chapter, scorecard information did have an impact on students ranking accuracy in JJ's task. In 2014, the percentage of students correctly ranking the two indicator colleges correctly rose from 17 percent in the basic information group to 48 percent in the scorecard group. In the 2015 think aloud study, 13 percent of students in the basic group ranked both colleges correctly but the proportion increased only to 31 percent in the scorecard group. In contrast, the distribution of indicator college rankings for AJ's task is almost identical in 2014 and 2015. I discuss the possible reasons for and implications of these differences at the end of this chapter.

6.3.4 Discussion

To recap, in the basic information group I expected that most students would use a simple cost heuristic to rank the community college pathways first, and a smaller, benefit-focused minority group to rank them last. I expected students to talk about different ways in which taking the community college pathway would affect JJ's ultimate outcomes, but not be able to articulate what information they'd want in order to assess that. What we saw was slightly different.

We did see the benefit-oriented minority, but the majority behavior was more complex than a simple cost-based rule would imply. Many students in the basic group who favored community college often included a statement about outcomes along the lines of community college being a low-cost preparation for four-year college. Starting at community college was seen by many as a cheap way to get the first two years of college done, and maybe also even set oneself up for success at four-year college. Should this be characterized as a weighted human capital style approach? Or is it a rule of thumb that implies underlying judgments – to which the students may not pay conscious attention - about multiple factors?

When asked what information would have been helpful to them as they evaluated the community college pathway, only two students in the basic group asked about the transfer process and none about transfer rates specifically, with most asking only about costs. Moreover, 12 out of the 15 reported that they felt more confident in the accuracy of their ranking of JJ's college options than they did in their ranking of AJ's colleges.

The above seems to be more characteristic of a rule-based decision rather than a human capital model approach, and points to the deeply embedded nature of beliefs about the community college pathway. One could, in a sense, characterize students in the basic information group as acting as if they believed that the transfer rate was 100 per cent but this seems to miss the point that this assumption was so embedded in a holistic "pro-community college" belief that it did not occur to students to seek to verify it by asking for information on how often students successfully went on from community to four-year colleges.[149] And yet, given that most students stated that

[149] Obviously, one wouldn't expect them to use the technical term "transfer rate".

JJ's goal was to assess the financial costs and future benefits of each college, it seems that students aspired to be human capital maximizers. But, in JJ's case, perhaps because of the deeply held nature of their beliefs about the wisdom of starting at community college, they had even less inclination either to seek to verify their prior beliefs or knowledge of what information to request.

Turning to the scorecard group, we had expected to see one group of students who "got" that they should incorporate community college transfer and graduation rates into their assessment and rank community college pathways at the bottom of the ranking, and another group that continued to rank based on cost only, raising the question of whether they believed that JJ, being highly qualified academically, was sure to transfer successfully. We did see a minority group that ranked on cost alone, not even mentioning anything like transfer rates. As in AJ's case, whether because they were tired or because they thought it was not relevant as JJ was sure to transfer successfully, transfer rates simply did not enter their voiced decision process.

For the majority of students who did notice the transfer rate information, its impact seems to have been moderated by both its ambiguity and incompleteness, and also by its conflict with their prior beliefs about the attractiveness of the community college pathway. As noted in earlier discussion, students' comments about transfer rates as they ranked suggested more of an inclination to disregard or downplay the information than a sophisticated evaluation of it.[150] The one student who tried repeatedly to understand it eventually gave up. Students' reactions could be due to the inadequacy for the task of the information provided, could reflect the deep-seated nature of students' beliefs about the superiority of the community college route, or could be a combination of both factors. After all, as discussed in Chapter 3, the information on transfer rates that students received was difficult to interpret, ambiguous and incomplete, whereas the graduation rate and salary information presented for AJ's colleges was straightforward and unambiguous. Moreover, as discussed above and consistent with deeply held beliefs about the superiority of the community college route, students were more confident in the accuracy of their preconceptions in JJ's case than in AJ's. They were not hungry for additional information and

[150] Unfortunately, however, I did not have time in the interviews to ask students for their predictions of JJ's probability of transferring from community to four-year college and cannot rule out that explanation.

may therefore have been more likely to discount the conflicting and confusing transfer rate information.

6.4 OVERALL CONCLUSIONS

If by "human capital maximizers" we mean that students have in mind a structured method for evaluating colleges that allows them to systematically weigh the costs and benefits of each, then there is little evidence here for that. Students did not manifest as natural econometricians. In their approach to AJ's and JJ's tasks, students seem best characterized as aspirational human capital maximizers, who, while wanting to weigh costs against future benefits, have only limited understanding of how to do so in a structured way.[151] As a result, when they lack information and guidance on how to structure their decision process, they fall back on rules of thumb – whether based on beliefs about costs alone or benefits alone (in AJ's case) or combining an assessment of both (as often occurred in JJ's case).

A positive conclusion from AJ's task, in particular, however, is that, for many students simply providing them with well-structured and presented information relevant to their decision enables them to crystallize and apply a cost/benefit decision rule. On the other hand, not all students responded to the intervention and it is not clear whether that is due to disengagement with the exercise, shortcomings in the way in which the information was presented, or in students' ability to make complex calculations.

Students response to the transfer rate information provided in JJ's task showed, however, that, ambiguous and incomplete information will often not shift students' beliefs, particularly when these are deeply held, as in the case of belief in the superiority of the community college pathway.

[151] This does not exclude the possibility that they take benefit-related factors into account in a more unstructured, ad hoc way when making decisions in real life.

6.5 GENERALIZABILITY OF RESULTS

To what extent can we generalize from these conclusions to: (i) the larger 2014 sample of students at the lower-income high school; (ii) students more generally, for instance, at the higher income school surveyed in 2014, beyond these schools, and outside the experimental context?

All students at the lower-income school. At the outset of this chapter I suggested that we consider the 31 subjects interviewed in the think aloud study as a random sample of all subjects surveyed in the previous year at the low-income high school and thus offering us insight into those students' decision processes. There are, however, several possible threats to the validity of this assumption.

As we saw in Chapter 4, students in the 2015 think aloud sample do not differ significantly in terms of their racial and ethnic background from the low-income school students surveyed in 2014. In addition, with one exception, students' overall accuracy and indicator college ranking patterns are remarkably similar between the think aloud (2015) and 2014 samples (Appendix F). This reduces concerns about possible selection bias. On the other hand, however, students in the think aloud study report significantly higher educational expectations for themselves and lower levels of parental educational attainment. In addition, students in the think aloud study who received scorecard information were less accurate in ranking JJ's indicator colleges. Although their indicator college ranking patterns were not significantly different, whereas students in 2014 were, contrary to my expectations, equally accurate in ranking PSU in AJ's list as they were in ranking OSU and PCC/PSU in JJ's list, students in the think-aloud study were significantly less accurate in ranking JJ's indicator colleges (Appendix F).

One possible explanation for the lower levels of reported parental education in 2015 is that, although they were from the same high school, the students in the think-aloud sample were from lower-income families than those in the 2014 sample. Participating in the think-aloud study required more effort on students' part as interviews were scheduled outside of classroom time

during study hall or at lunch, while in 2014 students from this school participated in the survey in their government class.[152]

It is difficult to know if students in the think-aloud study genuinely had a higher level of expected educational attainment. On the one hand, they may have exaggerated their aspirations to save face in an in-person interview, while students in 2014 whose responses were written had no reason to do so. On the other hand, students who did not expect to go to college may well have hesitated to participate in an in-person interview about colleges despite that fact that the survey invitation made it clear they were eligible. While it's not possible to be conclusive, it seems reasonable to treat the think-aloud sample as skewing lower in income and having higher (and more unrealistic) educational aspirations than the overall sample.

If students' ranking patterns were identical between the think-aloud and 2014 samples, one might conclude that these differences in sample characteristics were not associated with differences in behavior and that it is therefore reasonable to conclude that the decision processes identified in the think aloud sample generalize to the lower income school overall. But think aloud students' lower accuracy in using scorecard information to rank JJ's indicator colleges gives pause for thought. This could be due to simple sample variation in a small N experiment (Gerring, 2006). Another possibility, however, is that the difference in the study setting – an in-person interview rather than a written survey – depressed students' receptiveness to the scorecard information. The literature on think-aloud studies cautions that thinking aloud requires more effort of subjects and that one should be careful about interview length (e.g. Barkaoui, 2010). By the time students commenced JJ's task, they had been talking aloud for 15 minutes on average. This is greater than the average time students took to complete the entire written survey in 2014. Students in the think-aloud scorecard group may have been less effective in processing the information due to task fatigue while students in the basic information group, who simply ranked on their preconceptions, were not affected. This explanation fits the observation that the basic group –

[152] As an aside, note that although participation in the think aloud study was more financially rewarding with students being compensated $30, compared to $10 in 2014, the sampling process adopted means that this is unlikely to have led to a higher proportion of lower income students participating in 2015 than in 2014. All 65 students in three senior government classes signed assent/consent forms indicating their wish to participate. Subjects for the think aloud study were then randomly selected from these 65 students. Of the 35 (out of 65) students who were then randomly selected to complete the think aloud survey, 31 participated with two being lost to scheduling problems and two no shows.

for whom the information processing burden was lower - ranked in almost exactly the same way in the think-aloud and 2014 survey samples while the scorecard think-aloud group was less accurate.

Another possibility is that the introduction of free community college in Oregon – the "Oregon Promise" – in July 2015 affected students' decision processes. When students first took the survey in December 2014, the Oregon Promise was only a potentiality being studied by Oregon's Higher Education Coordinating Commission, but by December 2015 it was in effect.[153] At the time, the Counseling Department at the lower income high school advised me that they were aware that applications for the scholarship were now open, and were promoting the scholarship in college counselling meetings with individual students. Counselors had not, however, begun promoting the Oregon Promise more generally and planned to do so later in the school year, with for example, marketing posters throughout the school and school-wide college events. Ultimately, nearly one-third of all Oregon high school graduates applied for the Oregon Promise in 2016 (Hodara et al., 2017). There is also some evidence that the introduction of the Oregon Promise grant influenced more students to start at community college with the plan of transferring to a four-year college (Hodara et al., 2017).

How would awareness of the Oregon Promise have affected students' ranking of JJ's college options? One might reasonably expect it to skew the ranking patterns of both the scorecard and basic information groups to favor community college more heavily, and yet only the scorecard group's ranking behavior varies from that observed in 2014. Against this, the reasons given by the small number of students in the basic information group who did not favor the community college pathway were related either to negative perceptions of likely outcomes or, in one case, the mistaken belief that students starting at community college were required, at a minimum, to complete a total of six years of college. As neither of these reasons would be affected by free community college, we cannot rule out the possibility that the introduction of the Oregon Promise reduced the impact of the scorecard information.

[153] The relevant legislation was passed in July 2015 and applications opened on November 1, 2015.

If the introduction of Oregon Promise or simple task fatigue reduced the impact of scorecard information on ranking accuracy in the think-aloud study, decision processes as observed in the think aloud study may nevertheless still be a good indication of the decision processes of the broader 2014 survey group.

Students at the higher income high school and beyond the experimental context. I expected that students' ranking behavior would vary by their family income level, with students from higher income backgrounds being more likely to rank private schools highly in the absence of scorecard information. As discussed in Chapter 5, this hypothesis was not confirmed as students' ranking patterns did not differ between the lower and higher-income high schools surveyed. As I noted in that chapter, however, two considerations confound that finding: participating students may not have varied greatly in family income as I did not capture that particular information, and; students at both schools were asked to rank the colleges not on their own behalf but on behalf of AJ and JJ, two hypothetical low-income students. I hesitate therefore to generalize too strongly from the think-aloud results to students at the higher income school.

Beyond the experimental context, as well as considering variation in student behavior due to variation in their individual characteristics such as family income level, one needs to consider the possible impact on students' decision process of the "best case" presentation of scorecard information adopted in this study. As discussed at length in Chapter 3, I deliberately and carefully structured the presentation of the scorecard information to increase the probability that it would be attended to and used. I carefully controlled the characteristics of the information provided to students, how it was presented visually, and the instructions on how to evaluate it, including the preferences that should inform that evaluation. Changing any one of these elements could affect the impact of scorecard information on students' decision processes. This consideration, and the impossibility of identifying the separate impact of each element of my "best case" presentation, necessarily affects the practical policy implications of my research, which I turn to, along with the implications for the academic literature discussed in Chapter 2, in the next and final chapter.

Chapter 7. WHAT HAVE WE LEARNED?

This research was motivated by the dissonance between the considerable policy aspirations for College Scorecard and the lack of evidence that it is, or will be, effective in its current form. Building on policies from the Obama administration, the Trump administration is moving to greatly expand College Scorecard by adding program level data, and emphasizes that "it's [not] the role of the federal government to make the decision on behalf of the student" rather, consumers will "walk with their feet" when armed with the right information (Stratford, 2018). But, as we saw in Chapter 2, there is so far little evidence that students would seek out College Scorecard in sufficient numbers and that its impact would be large enough to achieve the Administration's goals for it (Huntington-Klein, 2016b, Hurwitz Smith, 2017, Blagg, Chingos, Graves, and Nicotera, 2017).

Reviewing the literature, it became apparent that the best hope for the information provided in College Scorecard to have an impact on students' college decision-making would be if it were provided directly to them as an information intervention. However, it was not clear that simply providing students with information would be sufficient, and the question was entangled with alternative conceptions in the literature of how students should be characterized as decision makers. If students are best characterized as heuristic decision-makers using simple rules of thumb to evaluate colleges then, as Hoxby and Turner found in their large-scale study of alternative interventions to encourage high-achieving low-income students to apply to colleges that will provide them with higher returns, providing students with information without educating them as to how to use it would not improve their college choices.[154] On the other hand, if students are in fact already weighing up variables affecting both the costs and benefits of their college options, as the literature grounded in the human capital model assumes, then providing them with scorecard information that enables them to better estimate the costs and benefits of their college options should improve the accuracy with which they do so.

[154] Unless the information led them to update their beliefs about the variables already in use in their heuristic, most often cost.

The most relevant study in this literature, which examined the effect of providing high school seniors in Chile with accurate cost and estimated earnings information for their top three preferred degree programs and for similar but higher pay-off alternatives, found significant effects on students' enrollment behavior, particularly for lower-SES students considering college options with relatively low pay-offs. This research was encouraging but took place in a non-U.S. context. Also, the researchers found that students' responsiveness to information on financial returns was limited by their non-financial preferences for specific institutions. While they found that the policy intervention resulted in net benefits and was worthwhile undertaking – in fact the Chilean government has since implemented it – the importance of students' non-financial preferences limited the scope for improving the interventions' effectiveness (Hastings et al., 2015).

My research therefore asked whether U.S. high school seniors would be able to use a scorecard information intervention to more accurately evaluate colleges' financial investment value and how they would incorporate it into their decision processes in choosing colleges. In particular, I was interested to know if they acted as information updaters or whether the information intervention led them to shift from using heuristic decision rules based on cost perceptions, to acting as human capital maximizers considering both the costs and returns associated with each college in their choice set.

In a nutshell, the research I have presented in the previous chapters provides causal evidence that high school seniors can use scorecard information effectively, and yet my findings do not support the conception of students as rational but ill-informed human capital maximizers who use scorecard information to update their prior beliefs about the costs and returns associated with individual colleges. Rather I find evidence that, in practice, students while aspiring to be human capital maximizers, acted in practice as heuristic decision-makers and that, for a majority of students, the information intervention itself framed the decision and educated them on how to use it, leading some of them to change their decision process. Thus, the way in which information does (and does not) change students' decisions suggests that educating them on how to use it, including by changing how it is presented, could increase the effectiveness of the intervention.

Below, I consider these findings, their limitations, and the implications for future research in terms of three broad themes.

First, while my findings provide strong evidence of the potential for a scorecard information intervention to change U.S. college students' college choices in ways that improve, for many, their financial returns to higher education, they are limited by the fact that I do not capture the impact on students' application and enrollment behavior. I discuss this issue and also present some simple comparisons to the effect sizes observed in Chile by Hastings and collaborators.

Second, my finding that students shift from heuristic to weighted decision making in response to being provided with well-presented scorecard information on costs, graduation rates and average post-graduation salary has implications for the academic literature grounded in the conception of students as information-updating human capital maximizers. For instance, this literature may overemphasize the role of non-financial preferences and underestimate the moderating effect of the form in which information is presented and its corresponding effectiveness in framing and modifying individuals' decision processes.

Third, while I find that the majority of students respond to scorecard information by including some estimate of the estimated benefits associated with each college option, not all of them respond and there is considerable variation in how students who respond incorporate the information into their decision processes. This opens up issues for future research on information framing and, in the case of the community college pathway, which specific data is needed.

Finally, I conclude with some broader thoughts on College Scorecard and the opportunity for information interventions based on the trove of information it contains already.

7.1 The Impact of a Scorecard Information Intervention on Student Enrollment Decisions

While a contribution of this research is its finding that students can and do change their evaluation of colleges' financial investment value in response to receiving scorecard information, its major limitation is that I do not attempt to capture effects on students' own college application and enrollment decisions.[155] In fact, my study does not even ask students to evaluate the colleges from their own perspective but rather as if they were high-achieving, low-income students with zero interest in the non-financial attributes of the colleges. It does not attempt to customize the information provided to individuals' actual choice sets as conditioned by their academic achievement level, costs as conditioned by their family income level, and individual non-financial preferences. This leaves well short of an answer the question of whether a real-world version of this intervention would lead to changes in students' college preferences and decisions.

As the reader will recall from Chapter 2, Hastings and collaborators found that a similar information intervention in Chile led to significant changes in students' college choices, particularly for lower-SES students. In their experiment, receiving the information intervention raised students' net value from higher education by 1.7 percent of the control group mean with larger gains of 3.4 percent of the control group mean for low-SES students.[156]

The median student in their study was shown an alternative to their reported preferred degree program that, if they were to switch to it, would result in an increase in predicted earnings of 33 percent (p. 13, Hastings et al., 2015).[157] Making some rough and ready comparisons to the information with which students were confronted in my study is useful. For instance, switching from PSU to the University of Oregon - a choice more attainable for the average student than the highly selective Reed College – is associated with in a 23 percent increase in average predicted

[155] This is a limitation shared by all the other information-updating studies discussed in Chapter 2 except for Hastings et al. (2015).
[156] Net value was calculated over a 15-year time horizon as the projected earnings gains from attending college (that is, over entering the labor market with only a high school degree) less the incremental costs. This treatment effect adjusts for the potential for drop-out and also for observable student characteristics (Table 3, p. 49, Hastings et al., 2015).
[157] Predicted earnings were calculated over the same 15-year time frame.

earnings. Switching from PCC/PSU to starting directly at PSU is associated with a 25 percent increase, and switching from PCC/PSU to starting directly at the University of Oregon with a 54 percent increase. While far from apples to apples comparisons, that these magnitudes are in a similar zone to those presented to students in Chile gives some comfort that responses of a similar magnitude to those found in Chile could be observed here.

If these effect sizes were achieved in the U.S. they would be much larger than those currently estimated for College Scorecard as it stands, which have so far been not only small but disproportionately reaped by students from higher-income sub-groups (Huntington-Klein, 2016b; Hurwitz and Smith, 2017; Blagg, Chingos, Graves, Nicotera, 2017).

7.2 Implications for Econometric Models of College Choice

In Chapter 3, I reviewed a series of studies, including Hastings et al. (2015), that assume that students can best be characterized as ill-informed but rational human capital maximizers. These studies assume that students incorporate their, often inaccurate, estimates of the financial and non-financial costs and benefits associated with college-related decisions and make decisions that they believe will maximize their utility. In these models, providing students with more accurate information on financial costs and benefits "changes college choice by reducing uncertainty about earnings outcomes, but … its impact is limited by … student preferences for non-pecuniary degree attributes".

My research finds that, prior to receiving scorecard information, students are better characterized as aspirational human capital maximizers who, in practice, are heuristic decision-makers using, mostly cost-based, rules of thumb to evaluate college decisions. Rather than "reducing uncertainty" in existing perceptions of expected earnings outcomes, the information intervention leads the majority of students to add those variables to their decision process, adopting a weighted cost/benefit rule more aligned with that assumed by standard econometric models. My findings therefore challenge college choice models that assume that students incorporate estimates of future returns when making decisions.

They do, however, align with Bleemer and Zafar's findings, discussed in Chapter 2.1.3, from their information intervention experiment, in which they provided information on college costs and returns to participants in a representative survey of U.S. household heads with an average age of 51. Contrary to what one would expect if information updating were occurring, the authors found that the impact of earnings information on planned college attendance did not vary with the size of the gap between subjects' initial beliefs and the correct information provided to them. The authors concluded that being confronted with earnings information increased its salience, leading respondents to take it into account in their decision, not simply to update their prior earnings beliefs (Bleemer and Zafar, 2018).

What are the implications of this view of decision-making for the literature based on mainstream economic models of college choice?

If students are not incorporating their expectations about the returns to college into their decisions, then even models such as Huntington-Klein's (2015) which model the college decision using students' self-reported college cost, earnings and employment expectations will result in biased estimates of student preferences. This could, for instance, explain the very loose connection between students' expected value from college attendance based on their reported expectations of the costs and the earnings returns remarked on by Avery and Kane (2004) in their study of a college counseling program for low-income high school seniors.

Importantly, if information interventions affect students' decisions by changing their decision processes to include considerations affecting the returns to each college, then models assuming information updating within an unchanging decision process as the sole mechanism are likely to over-emphasize the role of non-financial factors in moderating the students' response to financial information.

Hastings and collaborator's research is a case in point. The authors estimate a discrete choice model of college enrollment in which the provision of cost and earnings information for individual institutions affects choice by increasing the precision of students' beliefs about those variables, and which model also included non-pecuniary factors of major, field of study,

institution, and geographic location. Their model does not allow for the possibility that students' responsiveness to the information intervention may vary, not because of their non-pecuniary preferences, but for the same reasons that led six out of sixteen students who received scorecard information on colleges' salary and graduation outcomes in my think-aloud study to nonetheless consider only cost when ranking AJ's colleges. That is, information may fail to change students' decision processes at all. I also found considerable variation in how students used scorecard information: some students used both the salary and graduation rate information provided in their decision-making, others used only one of those variables. To put it more generally, students' decisions may reflect both the influence of both true preferences and decision-making errors (Laibson et al., 2008).

Hastings and collaborators find that, while their treatment raises the weight students place on earnings by 32 percent, students' very strong preferences for particular institutions and majors limits the role of earnings in their choices. In fact, "the earnings elasticity of enrollment at students' stated first choice degrees would rise by 73% if institution-specific preferences were eliminated" (Hastings et al., 2015, p.3). It would be dramatically overstating the case to suggest that students do not have strong non-financial preferences for particular institutions and majors and that, for instance, communicating the returns information more effectively would raise earnings enrollment elasticity by 73 percent. Nonetheless, my findings, and Bleemer and Zafar's (2018), suggest that the provision of college financial information acts as a treatment in itself that, imperfectly, corrects students' decision-making errors so that improving the effectiveness of that treatment could increase students' response to it. Just how much of an impact is possible is a question for future research.

7.3 Increasing the Impact of College Scorecard as an Information Intervention

While my research supports the sociological and behavioral economics literature's characterization of students as being, in practice if not aspiration, heuristic decision-makers using rules of thumb to simplify their decision process as summarized in Chapter 2, it suggests that this literature may have underestimated the desire of students to find ways to make decisions that take variation in the financial returns to college into account, and also underestimated their

ability to respond as desired without any more specific advice than the provision of well-presented information on average salaries and graduation rates.

Students ranking AJ's set of four-year private and public colleges in my study were reaching, in their scattershot mention of multiple different variables, such as reputation, prestige, programs offered and many more, for ways to differentiate colleges based on their expected returns. For the majority of students, simply providing them with average salary and graduation rate information was enough to stimulate them to factor in variations in returns. This finding does not sit well with Hoxby and Turner's finding that only students provided with advice on how to evaluate colleges use it in a way that leads them to enroll in colleges with higher expected returns (Hoxby and Turner, 2013).

As discussed in Chapter 2, Hoxby and Turner did test an intervention that provided students with both net price and returns information on a set of colleges but found that it only increased application behavior, not enrollment. Why did they not see any effect on enrollment behavior? The most obvious hypothesis is that "details matter" and have large effects on the final impact of policies (Duflo, 2017).

Hoxby and Turner's intervention presented students with a measure that econometricians recognize as a predictor of student outcomes, namely instructional spending per students, but which students may not intuitively interpret in the same way. Students' struggles with the transfer rate information in JJ's case showed that students tended to dismiss ambiguous, hard to interpret information. They may have done the same with the instructional spending information Hoxby and Turner provided. An additional possibility is that they did not even notice it. While I was unable to obtain the intervention materials, the intervention was focused on providing students with net price information. The information on instructional spending per student may have been presented in a less prominent way.[158]

[158] As an aside, I note that my findings do fit with the possible explanation I suggested in Chapter 2 for why students who received Hoxby and Turner's net price intervention were more likely to apply to higher return colleges but not significantly more likely to matriculate at them. Like the minority of students in my study who ignored the salary and graduation rate information but processed the cost information, leading them to rank Reed first, students in Hoxby and Turner's study may have been led to apply more often to the elite private colleges that heavily subsidize low income students but, not having processed the returns information, regarded them as no better than other

In contrast, in two studies where a scorecard-like information intervention did have a significant effect, my own and Hastings and collaborators' study of a scorecard-like information intervention with high school seniors in Chile[159], students were presented with information they may have found easier to interpret. Hastings and collaborators presented students with one number - the net present value associated with alternative college choices – and included a short explanatory note in everyday language on how this was calculated. In my study, students were presented with salary and graduation rate outcomes, both of which are everyday concepts, and in a simple table which gave these variables equal prominence to net cost.

The impact of information presentation on students' responsiveness to it is an obvious avenue for further research. Given that College Scorecard has emerged as such a major plank in federal policy, more research on the most effective way to present it to students is highly desirable.

We know that two treatments – Hastings (2015) and mine - that enabled students to identify higher value colleges shared several features. First, narrow messaging – they focused only on the financial implications of alternative college options. Second, both highlighted variation in returns across colleges: my research did so by presenting students with a choice set deliberately chosen to contain colleges whose cost/returns profiles were likely to surprise students; Hastings and collaborators showed students an estimate of the increase in net value associated with switching from their first choice to an alternative college option. Third, students were presented with a short list of college options that were compared on a single page.

My research also identifies two areas for further research on what Duflo (2017) calls the "plumbing" details of designing effective information policy interventions to enable students to evaluate the likely financial impact of their college choices.

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colleges costing the same and which they may have been more familiar with and therefore preferred for non-financial reasons.

[159] Discussed at length in Chapter 2.

First, how can we increase both the responsiveness of students to the returns information and also lead them to use it accurately? Why did a significant minority of students in my study not respond to, or even comment on, the returns-related information in the scorecard intervention? For those who did include the earnings-related information in their decision process, the degree of variation in how they did so was striking. Some students considered both average salaries and graduation rates, some only one of these. Such limited use of the information could lead to valuation errors. Would it be better to present students instead with net value information as do Hastings and collaborators?

Second, how can we best present information on the community college pathway? A large and growing number of students, particularly lower-income students, start at community college with the aspiration of attaining a four-year degree. These students, like the ones in the think-aloud study who expressed such positive perceptions of the community college pathway, are unlikely to be aware of the evidence that taking this route lowers comparable students' likelihood of obtaining a four-year degree by somewhere in the range of 14.5 to 31.5 percentage points (Goodman, Hurwitz, Smith, 2015; Lockwood Reynolds, 2012; Long and Kurlaender, 2009). A scorecard information intervention that helped students qualified to start at a four-year college see the potential benefits of doing so could significantly improve their degree outcomes.[160]

The quantitative survey results discussed in Chapter 5 showed that even providing students with ambiguous and confusing information on the effect of the community college pathway on degree-attainment led a significant number to recommend starting directly at a four-year college. But the think-aloud study showed, unsurprisingly, that students struggled to interpret the transfer rate information and that this decreased their responsiveness to the information intervention. What would have helped them?

The right data would be a good place to start, but exactly what that would be is not a straightforward question. When I formulated the scorecard information intervention, College Scorecard provided both the community college graduation rate – the percentage of full-time,

[160] This research agenda does not fit well with the current enthusiasm, in a constrained budget environment, for "free" community college policies and other initiatives aimed at increasing community college attendance, but it is potentially relevant to many students and worthy of pursuit.

first-time students who graduate within three years – and the community college transfer rate – the percentage of full-time, first-time students who transfer to a different two-year college or to a four-year college before graduating from their community college program. Obviously, this is not exactly what is needed because…. As one student said, "Why don't they just tell you the percentage of students who transfer to four-year college?"

In general, U.S. Department of Education data systematically measuring the effectiveness of individual community colleges in enabling baccalaureate degree-seeking students to transfer to four-year colleges are sorely lacking (Jenkins, 2016). Currently, College Scorecard does not present students with any information on transfer rates as the data I used was deemed unreliable due to variations in reporting by institutions. The Department of Education is developing a series of measures of transfer rate performance, but these are not yet available to the public.[161]

The point that my research makes is that whatever data is developed should meet the needs, not just of academic researchers and institutions, but also of students endeavoring to make informed decisions about where to start their four-year degree. For students qualified to start at a four-year college, a simple yet useful transfer metric might be one measuring the percentage of first-time, full-time students who were academically qualified to attend a four-year college but started at a two-year one that successfully transfer to any four-year college within three years (150% of normative completion time) of commencing at a given community college. Controlling for academic qualification in this way would make the data more applicable to JJ's situation, rather than presenting transfer rates artificially lowered by the inclusion in the denominator of students for whom starting at a four-year college was never an option.[162]

Even if the simple metric I suggest above were available, a student like JJ would then need to layer on consideration of the likely graduation rate of students successfully transferring to a four-

[161] These nascent transfer and completion metrics – which are available by download only and not easily accessed - are calculated using data on federal aid-receiving students from the National Student Loan Data System (NSLDS). The Department has made these metrics available in a preliminary way so that researchers and institutions can use them to "gauge and benchmark their [institution's] performance relative to other institutions and to help generate better understanding" of their validity (Department of Education, 2018).

[162] . In practical terms, it would be possible to construct this metric using data from the National Student Loan Data System (NSLDS) and the National Student Clearinghouse (NSC). Because the proposed metric would need to draw on NSC information on students' academic qualifications, it would require significant commitment to construct it.

year college.[163] I saw no evidence in the think aloud study that students presented with a two-year college transfer rate and a four-year college graduation rate were able to combine these two numbers to estimate an overall completion rate. It may well be better to present students like JJ with an end-to-end completion rate for a particular community college to four-year path. Or, the information could be summarized even more, as per Hastings and collaborators' (2016) approach, and presented to students in terms of the impact of the community college pathway on estimated net value from college attendance.

7.4 Final Thoughts on College Scorecard

The pithy assessment that the "the federal government has backed a dump truck to consumers' doors and left it to students and their parents to compare all those apples and oranges" (Turner, 2015) may become even more accurate as plans to expand College Scorecard to include salary outcomes at the program level and information on graduate programs come to fruition (U.S. Department of Education, 2018). Increasing College Scorecard's impact by directly providing cost and earnings information to students is an obvious opportunity to increase its effectiveness that merits policy attention. Moreover, as my research shows, students rely on the structure of the information intervention to "teach" them how to evaluate their college options. This opens up rich opportunities for collaboration between researchers and the Department of Education in designing and testing possible scorecard interventions in order to maximize their effectiveness.

[163] As noted in Chapter 4, community college transfer students complete at about the same rate as "native" freshmen (Melguizo, Kienzl and Alfonso, 2011; Dietrich and Lichtenberger, 2015; Monaghan and Attewell, 2015).

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Appendix A. COLLEGE SCORECARD EXAMPLE

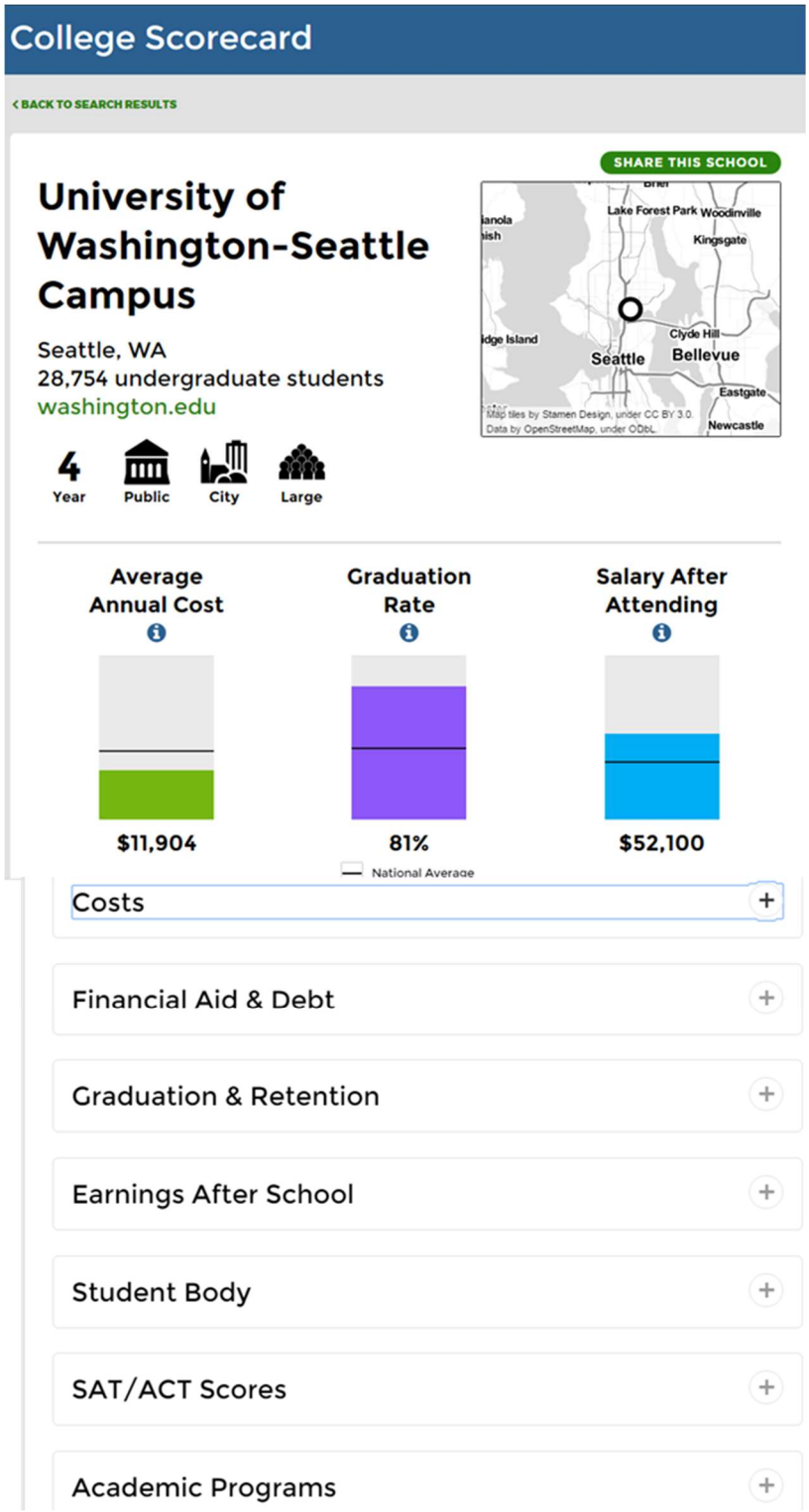


Figure A.1: College Scorecard Summary Page for the University of Washington, Seattle

Figure A.2: Expansion of "Cost" Heading

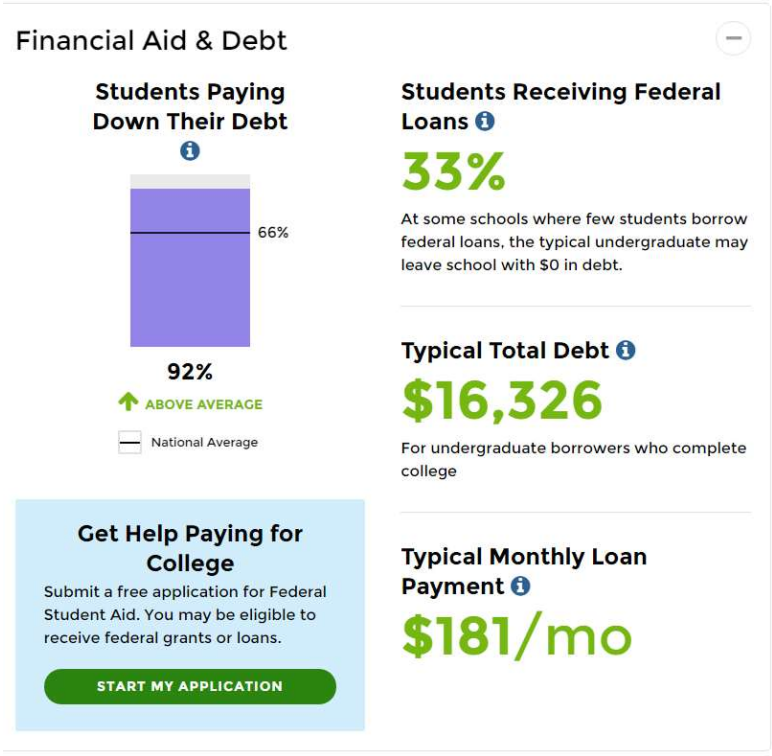


Figure A.3: Expansion of "Financial Aid and Deb" Heading

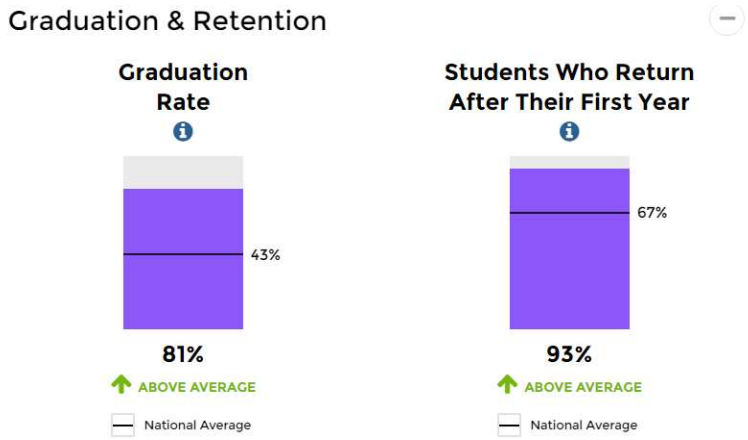


Figure A.4: Expansion of "Graduation and Retention" Heading

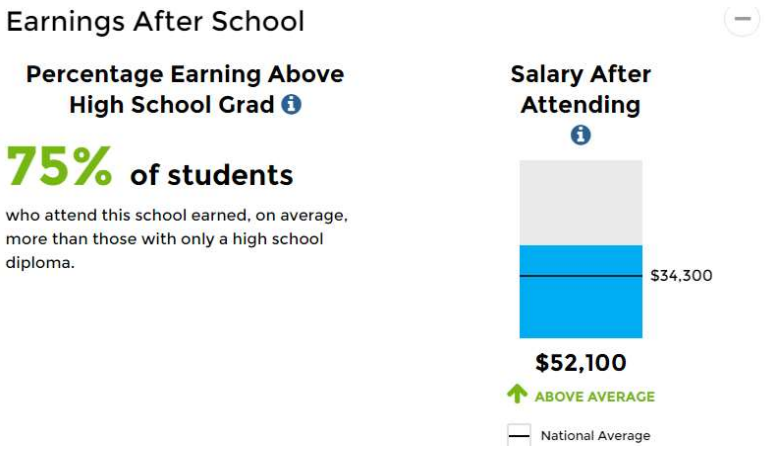


Figure A.5: Expansion of "Earnings After School" Heading

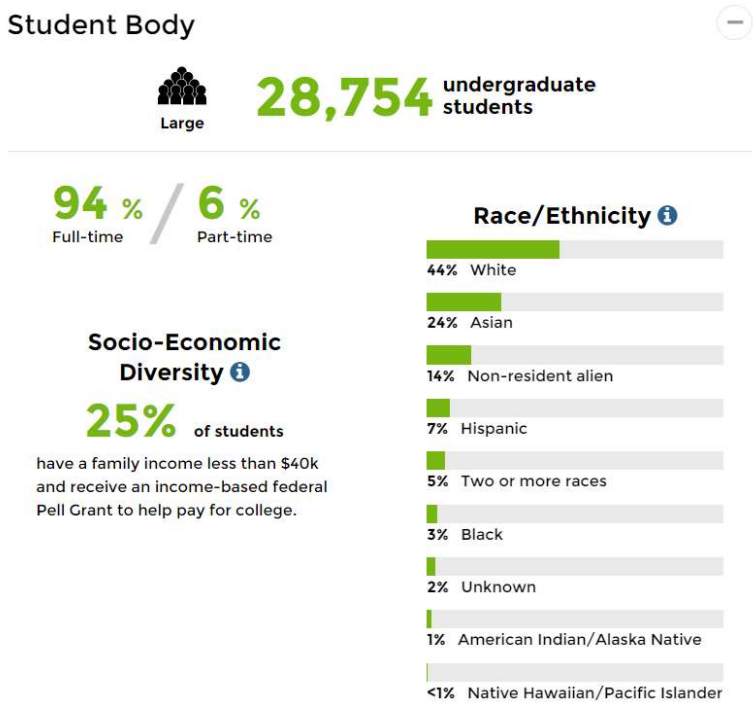


Figure A.6: Expansion of "Student Body" Heading

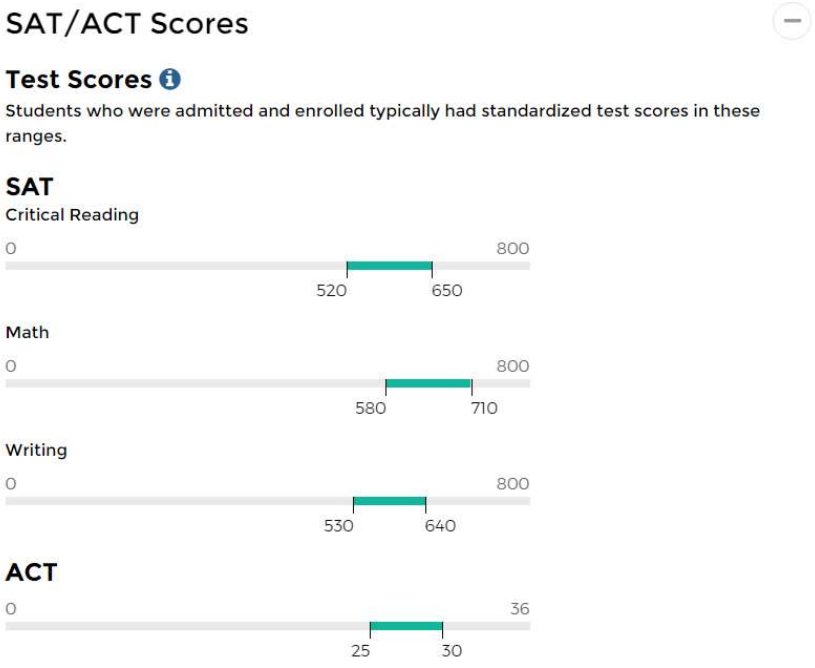


Figure A.7: Expansion of "SAT/ACT Scores" Heading

Figure A.8: Expansion of "Academic Programs" Heading[164]

[164] All information downloaded from www.collegescorecard.gov in December 2015.

Appendix B. SURVEY MATERIALS

FOR: COLLEGE SCORECARD INFORMATION GROUP

INSTRUCTIONS

We are interested in understanding how people evaluate different colleges. In this survey, we are going to ask you to rank some colleges from "best" to "worst" investment.

IMPORTANT! In each question you need to rank ALL the colleges listed. Please do NOT give two or more colleges the same ranking. There should be no "ties".

IMPORTANT! You are going to evaluate the colleges for two students, AJ and JJ, who have asked for your advice. You don't know much about them, but they have told you two important things.

1. Both AJ and JJ have a clear goal – each of them wants to choose the college that is the best possible investment in their financial future. AJ and JJ have told you that they care ONLY about the financial benefits and costs of attending college, NOT about things like location, what the students are like or the campus environment.
2. AJ and JJ are not related, but they both come from families earning under $25,000 per year and will therefore get a lot of financial aid for college. They will be able to borrow any additional money needed for college at 0% interest and won't have to repay the loans until after leaving college. Loan repayments will then be limited to, at most, 10 % of monthly income.

IMPORTANT! We are going to give you the following information for the colleges AJ and JJ are interested in.

1. **AVERAGE NET PRICE FOR A LOW-INCOME STUDENT**: Net price includes college tuition costs AND living expenses. A college's net price is the bottom line cost that the student needs to cover each year with loans, work or scholarships. It goes up as a

student's family income goes up. The net price information we will give you is for students like AJ and JJ whose families earn under $25,000 per year.

2. **GRADUATION RATE**: This is the percentage of students who complete their program and graduate from a college.[165] Only full-time undergraduate students attending college for the first time are included when calculating this rate.
3. **COMMUNITY COLLEGE TRANSFER RATE**: This is the percentage of community college students who transfer to a different college before graduating from their community college program[1]. Only full-time undergraduate students attending college for the first time are included when calculating this rate.
4. **AVERAGE ANNUAL SALARY:** The average annual salary of graduates of this college who have been working for 10-15 years.

If this is not clear, please raise your hand. If it is, please start the survey. Raise your hand if something is not clear as you are doing the survey.

[165] Students who graduate within 6 years (for four-year colleges) and 3 years (for two-year colleges) are counted as graduating.

1. AJ's College List

AJ has done very well in high school and could get in to any of the colleges on the list below. AJ wants to know how you'd rank these colleges. Don't forget that:

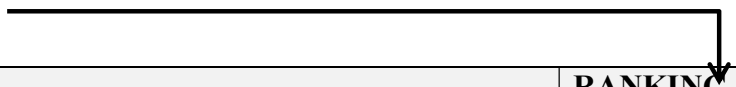
1. AJ has a clear goal –choose the college that is the best possible investment in his/her financial future. AJ cares ONLY about the financial benefits and costs of attending college, NOT about things like location, what the students are like or the campus environment.
2. AJ comes from a family earning under $25,000 per year and will therefore get a lot of financial aid for college. AJ will be able to borrow any additional money needed for college at 0% interest and won't have to repay the loans until after leaving college. Loan repayments will then be limited to, at most, 10% of monthly income.

Please rank the colleges in AJ's list from "best" to "worst" investment, where "1" = "best". Use the information in the following table and then record your answer in the next table. Rank all colleges and do not give a college the same ranking as another college (i.e. no tied rankings).

AJ's College List	City, State	Sector	Net Price Per Year	Graduation Rate	Average Salary(1)
Lewis & Clark College	Portland, OR	Private, 4-year	$20,000	75%	$77,000
Linfield College	McMinnville, OR	Private, 4-year	$16,000	68%	$71,500
Oregon State University	Corvallis, OR	Public, 4-year	$13,500	61%	$84,000
Portland State University	Portland, OR	Public, 4-year	$10,500	42%	$70,500
Reed College	Portland, OR	Private, 4-year	$4,000	82%	$99,500
University of Oregon	Eugene, OR	Public, 4-year	$14,000	67%	$75,000

(1) After working for 10-15 years.

Note: Students who do some college but do not graduate earn $30,000 per year on average.

Record your answer here 

AJ's COLLEGE LIST	RANKING (1 = "BEST INVESTMENT")
Lewis & Clark College	
Linfield College	
Oregon State University	
Portland State University	
Reed College	
University of Oregon	

2. JJ's College List

JJ is also a strong student and wants to get a four year Bachelor's degree. JJ could get into any of the four-year colleges listed below. JJ is also considering starting a Bachelor's degree at Portland Community College (a two year college) and then completing the degree at a four-year college. JJ would like you to rank the college options below. Don't forget that:

1. JJ has a clear goal –choose the option that is the best possible investment in his/her financial future. JJ cares ONLY about the financial benefits and costs of attending college, NOT about things like location, what the students are like or the campus environment.
2. JJ comes from a family earning under $25,000 per year and will therefore get a lot of financial aid for college. JJ will be able to borrow any additional money needed for college at 0% interest and won't have to repay the loans until after leaving college. Loan repayments will then be limited to, at most, 10 % of monthly income.

Please rank the colleges in JJ's list from "best" to "worst" investment, where "1" = "best". Use the information in the following table and then record your answer in the next table. Rank <u>all</u> colleges and <u>do not</u> give a college the same ranking as another college (i.e. no tied rankings).

College	City, State	Sector	Net Price Per Year	Graduation Rate	Average Salary[1]
Oregon State University	Corvallis, OR	Public, 4-year	$13,500	61%	$84,000
Portland State University	Portland, OR	Public, 4-year	$10,500	42%	$70,500
University of Oregon	Eugene, OR	Public, 4-year	$14,000	67%	$75,000
Portland Community College (PCC)	Portland, OR	Public, 2-year	$7,000	19% graduate; 15% transfer[2]	$50,500[3]

(1) After working for 10-15 years.

(2) A total of 34% of first time, full time PCC undergraduate students either graduate with a PCC degree or certificate (19%) or transfer to another college without graduating from PCC (15%). <u>Some</u> students who graduate or transfer continue their studies at a four-year college.

(3)This is the average salary earned by students who've been working for 10-15 years who graduated from PCC but did NOT go on to complete a four-year degree. Those who went on to graduate from a four-year college earn the same average salary as other graduates of their four-year college.

Note: Students who do some college but do not graduate from either a community college or a four-year college earn $30,000 per year on average.

Record your answer here 

JJ's COLLEGE LIST	**RANKING (1 = "BEST INVESTMENT")**
University of Oregon	
Oregon State University	
Portland State University	
Portland Community College, then the University of Oregon	
Portland Community College, then Oregon State University	
Portland Community College, then Portland State University	

Other Questions

3. Please go back to your answers for AJ. Just to confirm, which college do you believe would be the BEST possible investment in his/her financial future? Select only ONE college from the list below.

□ Lewis & Clark College
□ Linfield College
□ Oregon State University
□ Portland State University
□ Reed College
□ University of Oregon

4. How confident are you that you ranked AJ's list of four-year colleges correctly from best to worst?

□ Very confident. I'll stand by it!

□ Confident .

□ Neutral.

□ Not very confident.

□ Not at all confident. I had no idea!

5. Please go back to your answers for JJ. Just to confirm, which option below do you believe would be the BEST possible investment in his/her financial future? Select only ONE option from the list below.

□ University of Oregon
□ Oregon State University
□ Portland State University
□ Portland Community College, then the University of Oregon
□ Portland Community College, then Oregon State University
□ Portland Community College, then Portland State University

6. How confident are you that you ranked JJ's options correctly from best to worst?

□ Very confident. I'll stand by it!

□ Confident .

□ Neutral.

□ Not very confident.

□ Not at all confident. I had no idea!

7. What factors did you consider in ranking the colleges and how important were they? If you didn't think about a factor choose "did not consider this". Be honest! It is ok if you didn't consider something.

	Very Important	**Important**	**Moderately Important**	**Of Little Importance**	**Unimportant**	**Did not consider this**
Net price	□	□	□	□	□	□
Average salary after graduation	□	□	□	□	□	□
Graduation rates	□	□	□	□	□	□
% of community college students who go on to a 4-year college	□	□	□	□	□	□
Other (please list)						

8. Did you make any written calculations?

□ Yes

□ No

9. Where do you think you will get to in school? Choose the <u>most likely</u> outcome.

□ Less than a high school degree

□ High school degree

□ Some college

□ Associate's degree or technical degree (2-year college degree)

□ Bachelor's degree (4-year college degree)

□ Master's degree, PhD, MD (Doctor), or JD (Lawyer)

10. What is the highest level of schooling completed by your parents or guardians?

	Parent/Guardian 1	**Parent/Guardian 2**
Less than high school completed	□	□
High school completed	□	□
Some college/vocational school	□	□
2-year college completed	□	□
4-year college completed	□	□
Graduate school (Masters, Ph.D, J.D. M.D. etc)	□	□
Don't know	□	□

11. Where did your parents complete their highest level of schooling?

Parent/guardian 1 □ United States □ Other country

Parent/guardian 2 □ United States □ Other country

12. With what race below do you most identify? (Check all that apply.)

□ Black □ White,

□ Asian □ Hawaiian or Pacific Islander

□ Native American □ Multi-racial

13. Do you identify as Hispanic? □ Yes □ No

THANK YOU FOR YOUR TIME TODAY!

Please turn in your survey to the survey administrator and collect your compensation.

For: Basic Information Group

INSTRUCTIONS

We are interested in understanding how people evaluate different colleges. In this survey, we are going to ask you to rank some colleges from "best" to "worst" investment.

IMPORTANT! In each question you need to rank ALL the colleges listed. Please do NOT give two or more colleges the same ranking. There should be no "ties".

IMPORTANT! You are going to evaluate the colleges for two students, AJ and JJ, who have asked for your advice. You don't know much about them, but they have told you two important things.

3. Both AJ and JJ have a clear goal – each of them wants to choose the college that is the best possible investment in their financial future. AJ and JJ have told you that they care ONLY about the financial benefits and costs of attending college, NOT about things like location, what the students are like or the campus environment.
4. AJ and JJ are not related, but they both come from families earning under $25,000 per year and will therefore get a lot of financial aid for college. They will be able to borrow any additional money needed for college at 0% interest and won't have to repay the loans until after leaving college. Loan repayments will then be limited to, at most, 10 % of monthly income.

If this is not clear, please raise your hand. If it is, please start the survey. Raise your hand if something is not clear as you are doing the survey.

AJ's College List

AJ has done very well in high school and could get in to any of the colleges on the list below. AJ wants to know how you'd rank these colleges. Don't forget that:

3. AJ has a clear goal –choose the college that is the best possible investment in his/her financial future. AJ cares ONLY about the financial benefits and costs of attending college, NOT about things like location, what the students are like or the campus environment.
4. AJ comes from a family earning under $25,000 per year and will therefore get a lot of financial aid for college. AJ will be able to borrow any additional money needed for college at 0% interest and won't have to repay the loans until after leaving college. Loan repayments will then be limited to, at most, 10 % of monthly income.

Please rank the colleges below from "best" to "worst" investment, where "1" = "best". Use the information below and any information you already know about these colleges. Rank all colleges and do not give a college the same ranking as another college (i.e. no tied rankings).

College	City, State	Sector	Rank ("1" = best investment)
Lewis & Clark College	Portland, OR	Private, 4-year	
Linfield College	McMinnville, OR	Private, 4-year	
Oregon State University	Corvallis, OR	Public, 4-year	
Portland State University	Portland, OR	Public, 4-year	
Reed College	Portland, OR	Private, 4-year	
University of Oregon	Eugene, OR	Public, 4-year	

JJ's College List

JJ is also a strong student and wants to get a four year Bachelor's degree. JJ could get into any of the four-year colleges listed below. JJ is also considering starting a Bachelor's degree at Portland Community College (a two year college) and then completing the degree at a four-year college. JJ would like you to rank the college options below. Don't forget that:

3. JJ has a clear goal –choose the option that is the best possible investment in his/her financial future. JJ cares ONLY about the financial benefits and costs of attending college, NOT about things like location, what the students are like or the campus environment.
4. JJ comes from a family earning under $25,000 per year and will therefore get a lot of financial aid for college. JJ will be able to borrow any additional money needed for college at 0% interest and won't have to repay the loans until after leaving college. Loan repayments will then be limited to, at most, 10 % of monthly income.

Please rank the colleges below from "best" to "worst" investment, where "1" = "best". Use the information below and any information you already know about these colleges. Rank <u>all</u> colleges and <u>do not</u> give a college the same ranking as another college (i.e. no tied rankings).

JJ'S COLLEGE LIST	**RANKING (1 = "BEST INVESTMENT")**
University of Oregon (Eugene, OR, public 4-year college)	
Oregon State University (Corvallis, OR, public 4-year college)	
Portland State University (Portland, OR, public 4-year college)	
Portland Community College (Portland, OR, public 2-year), *then* the University of Oregon (Eugene, OR, public 4-year college)	
Portland Community College (Portland, OR, public 2-year), *then* Oregon State University (Corvallis, OR, public 4-year college)	
Portland Community College (Portland, OR, public 2-year), *then* Portland State University (Portland, OR, public 4-year college)	

Other Questions

3. Please go back to your answers for AJ. Just to confirm, which college do you believe would be the BEST possible investment in his/her financial future? Select only ONE college from the list below.

□ Lewis & Clark College

□ Linfield College

□ Oregon State University

□ Portland State University

□ Reed College

□ University of Oregon

4. How confident are you that you ranked AJ's list of four-year colleges correctly from best to worst?

□ Very confident. I'll stand by it!

□ Confident .

□ Neutral.

□ Not very confident.

□ Not at all confident. I had no idea!

5. Please go back to your answers for JJ. Just to confirm, which option below do you believe would be the BEST possible investment in his/her financial future? Select only ONE option from the list below.

□ University of Oregon

□ Oregon State University

□ Portland State University

□ Portland Community College, then the University of Oregon

□ Portland Community College, then Oregon State University

□ Portland Community College, then Portland State University

6. How confident are you that you ranked JJ's options correctly from best to worst?

□ Very confident. I'll stand by it!

□ Confident .

□ Neutral.

□ Not very confident.

□ Not at all confident. I had no idea!

7. What factors did you consider in ranking the colleges and how important were they? If you didn't think about a factor choose "did not consider this". Be honest! It is ok if you didn't consider something.

	Very Important	**Important**	**Moderately Important**	**Of Little Importance**	**Unimportant**	**Did not consider this**
Cost of attendance (tuition, fees and books + living expenses)	□	□	□	□	□	□
Average salary after graduation	□	□	□	□	□	□
Graduation rates (% of students who graduate with a degree)	□	□	□	□	□	□
% of community college students who go on to a 4-year college	□	□	□	□	□	□

Other (please list)

8. Where do you think you will get to in school? Where do you think you will get to in school? Choose the <u>most likely</u> outcome.

□ Less than a high school degree

□ High school degree

□ Some college

□ Associate's degree or technical degree (2-year college degree)

□ Bachelor's degree (4-year college degree)

□ Master's degree, PhD, MD (Doctor), or JD (Lawyer)

9. What is the highest level of schooling completed by your parents or guardians?

	Parent/Guardian 1	**Parent/Guardian 2**
Less than high school completed	□	□
High school completed	□	□
Some college/vocational school	□	□
2-year College completed	□	□
4-year College completed	□	□
Graduate school (Masters, Ph.D, J.D. M.D. etc)	□	□
Don't know	□	□

10. Where did your parents complete their highest level of schooling?

Parent/guardian 1 □ United States □ Other country

Parent/guardian 2 □ United States □ Other country

11. With what race below do you most identify? (Check all that apply.)

□ Black □ White,

□ Asian □ Hawaiian or Pacific Islander

□ Native American □ Multi-racial

12. Do you identify as Hispanic? □ Yes □ No

THANK YOU FOR YOUR TIME TODAY!

Please turn in your survey to the survey administrator and collect your compensation.

Appendix C. THINK ALOUD PROTOCOL, DECEMBER 2015

My colleagues and I at the University of Washington are interested in finding out how people think about the financial costs and benefits of attending different colleges. To help us do that, I'm going to ask you to complete a survey. You'll be asked to rank some colleges from "best" to "worst" financial investment for a prospective student. You'll be giving advice to two students – AJ and JJ – that you'll learn a little bit more about.

We're mainly interested in what you think about as you decide how to rank the colleges. So, I'd like you to talk out loud as you think about the ranking task. It is very important that I know all the things you think about. You don't need to worry about giving the "right" answer - there isn't one! - or whether what you say makes sense. I just want to know whatever you are thinking as you think it.

"Thinking out loud" is not always easy. Therefore, I'd like you to practice thinking out loud. Try this one. (Hand over piece of paper with the following scenario.)

Someone at school that you don't know well wants your advice on the best way to get physically fit. They are thinking of these options. Their goal is to get fit as fast as possible. How would you rank these options from "best" to "worst"? Make sure you rank ALL the options. No tied rankings!

Exercise Option	Location	Number of Days	Time per Day	Ranking
Running	School track	2 x per week	30 mins	
Walking	From home to school	5 x per week	20 mins per day	
Gym class	Montavilla Community Center	3 x per week	45 mins	
Swimming	Montavilla Community Center	1 x per week	60 mins	

Talk out loud as you think, OK?

Prompts: What's going on in your head? Tell me about it. Is that all you were thinking about? Anything else? Is there any other information you'd like to have to help you rank these options?

OK. That was good. I think you get the general idea. Now, I would like you to do the same kind of "out loud" thinking as you read and respond to this task. (Hand over survey.) Just talk aloud as you read the instructions and start completing the survey.

Prompts: Keep talking. What are you thinking?

Probes. These are to be asked only after the subject has finished ranking colleges and completed "Other Questions" up to and including Question 8.

- College Scorecard group: Is there any other information you'd have liked to have to help you rank these options? How did you interpret the information in the table? What about (graduation rate, net price, etc., community college transfer rate – whatever they don't comment on unprompted). What do you think is the probability that AJ will graduate from Portland State University? What about Reed College? What do you think is the probability that JJ will graduate from Portland State University, for example? What is the probability that JJ will transfer to Portland State University if he or she starts at Portland Community College? What is the probability in that case that he or she will graduate from Portland State University?
- Basic Information group: Is there any other information you'd have liked to have to help you rank these options? What do you think is the probability that AJ will graduate from Portland State University? What about Reed College? What do you think is the probability that JJ will graduate from Portland State University? What is the probability that JJ will transfer to Portland State University if he or she starts at Portland Community College? What is the probability in that case that he or she will graduate from Portland State University?

Other Questions

Prompt the subject to complete demographic Questions 9 – 13. Remind the subject that their name will not be associated with the responses they give and also that they do not need to answer any questions they feel uncomfortable about.

Wrap-up

Thanks so much for your time today! It was very helpful to hear your thought process. As I said, there are no right or wrong answers. We're interested in the different approaches people take. Remember, if you have any questions about the study you can contact me using the information on the form I gave you at the beginning of the interview. Or you can ask me now of course.

Appendix D. REFERENCE RANKING SENSITIVITY ANALYSIS

I tested the sensitivity of the reference ranking to variations in assumed discount rates, the salary earned by drop-outs and graduation rates. Variation in assumed graduation rates seems particularly important to test given that the vignette tells subjects that they are ranking the colleges on behalf of a high-achieving student. Students could reasonably – and correctly – decide that AJ's and JJ's probability of graduating from a less-selective school is significantly higher than that of the average student attending that school.

As Table D.1 below shows, increasing drop-outs' salary from $30,000 to $50,000 did not change the order of the ranking although it compressed the difference in expected lifetime value between the top and bottom-ranked colleges from over $500,000 to just under $400,000. Changing the discount rate does not change ranking order until a discount rate of 20 percent is applied, but it dramatically compresses the difference in value between the top and bottom ranked colleges. Finally, increasing the probability of graduating to 75 percent and 85 percent for all colleges has little effect on ranking order (pushing PSU from last to 5th place), but again compresses the difference in value between the top and bottom ranked colleges.

Table D.1: Reference Ranking of AJ's List - Sensitivity Analysis

College	Base Model	Sensitivity Analysis					
		Drop Out	Discount Rate			AJ and JJ's Probability of Graduating	
		Salary $50K	10%	15%	20%	75% for all colleges	82% for all colleges
1. Reed	$ 1,224,471	$1,286,350	$ 471,968	$ 252,898	$ 151,042	$ 1,163,319	$1,224,471
2. OSU	$ 880,314	$1,014,386	$ 331,244	$ 171,321	$ 97,093	$ 969,848	$1,014,615
3. Lewis and Clark	$ 875,416	$ 961,360	$ 313,864	$ 152,305	**$ 78,548**	$ 875,416	$912,514
4. UofO	$ 832,542	$ 945,988	$ 309,763	$ 157,982	**$ 87,826**	$ 873,531	$909,397
5. Linfield	$ 798,124	$ 908,133	$ 293,027	$ 146,746	**$ 79,379**	$ 830,308	$862,491
6. PSU	$ 687,094	$ 886,484	$ 267,601	$ 143,635	**$ 85,100**	**$ 837,350**	**$869,223**

Turning to JJ's list, differing assumptions about the likelihood of transferring from a community to a four-year college are critical. The reference ranking assumed that only 34 percent of PCC students seeking to transfer to a four-year college were able to do so. This is a large graduation rate penalty compared to beginning at a four-year institution. What if students were somehow extremely well-informed and knew that, conservatively, and controlling for observed academic ability, starting at a two-year college decreased an individuals' chances of ever graduating with a

four-year degree by about 15 percent (Long and Kurlaender, 2009). Table D.2 below shows that this does not dramatically change the ranking order with the only effect being that PSU drops to 5th place.

Table D.2: Reference Ranking of JJ's List - Sensitivity Analysis

College	Base Model	Rank	15% Graduation Rate Penalty	Rank
OSU	$ 880,314	1	$ 880,314	1
UofO	$ 832,542	2	$ 832,542	2
PSU	$ 687,094	3	$ 687,094	5
PCC/OSU	$ 655,686	4	$ 808,797	3
PCC/UofO	$ 635,932	5	$ 767,049	4
PCC/PSU	$ 600,203	6	$ 651,409	6

Appendix E. QUALITATIVE CODING METHOD FOR 2015 THINK-ALOUD STUDY

As outlined in chapter 3, each interview consisted of two sections.

1. *Unprompted reporting of thought processes*. In this part, students read the survey instructions and completed the ranking task elements of the survey.[166] During this period, my only interventions were to ask students to "keep talking" or "remember to tell me what you are thinking". This approach is the most reliable source on information on students' decision processes (Ericsson and Simon, 1980 and 1984; Henry, LeBreck and Holzemer, 1999). Subjects seemed to find it easy to think aloud as they completed the survey. During the unprompted section of the interview I generally reminded subjects to "keep talking" only once or twice.
2. *Prompted reporting of thought processes*. Once students had completed both ranking tasks, I asked them to stop. At that point, I asked two more probing questions, ordered to minimize reactivity.
    a) What additional information would you have liked to have?
    b) What did the goal of "choosing the college that is the best financial investment" mean to you?
    c) For Portland State University, what do you think is the cost of attendance (net price), average graduation rate and average salary earned by graduates after 10-12 years of work. Due to time constraints, not all students were asked this question.

Each section of the interview was coded separately using the AtlasTi 7.5.10 package.

Students' unprompted thought processes as they ranked were coded in two rounds by the author and by a recent law school graduate. The first round coded for the factors and variables mentioned by students as they ranked the colleges. Coding began based on a list of codes generated by the author from the human capital model, e.g. costs, graduation rates, salary. Then, codes were added by both coders as they were identified, with the two coders conferring to check

[166] The survey materials were exactly the same as those completed by the larger sample of students in December 2014.

mutual understanding of constructs. The second round coded for beliefs or rules of thumb mentioned by students as they ranked, focusing on beliefs about the cost, quality and value (cost and quality considered together) of public, private and community colleges, and for overarching statements by students about how they were approaching the ranking task, i.e. what ranking rules or strategies they intended to apply.

Using the factors/variables coding list generated by coding of students' reported unprompted thought processes, students' response to question 2a, "What additional information would you have liked to have"? was coded. Question 2b, "What did AJ and JJ's goal mean to you?", was coded using a coding framework generated by the author from a sample of the interviews and then validated by the second coder. Once both coders had finished coding, inter-coder disagreements were identified and, as they were small in number, resolved via discussion between coders. Almost all inter-coder conflicts were due, not to disagreements about which concept was represented by the data, but to the second coder coding the same concept more times in the same interview than did the author.[167]

IDENTIFYING STUDENTS' DECISION RULES: AJ'S TASK

In order to categorize each student's decision rule(s), I relied primarily on the coded unprompted thought processes data.[168] Rather than using a single analysis, I triangulated amongst multiple analyses to generate a hypothesized decision rule for each student and then used script analysis of each student's reported thought processes as they ranked to either confirm or change the hypothesized rule (Fonteyn, Kuipers and Grobe, 1993).

First, based on the factors/variables mentioned, rules of thumb, and articulated approach to the ranking tasks, I generated implied ranking decision rules for each student. Since each analysis generated a possible decision rule for the student, this resulted in three possible decision rules per student. Often the rules implied by each analysis were the same, but not always.

[167] Students' responses to question 2c, and of course to the ranking tasks, were quantitative and easily recorded.
[168] I later use students' prompted reporting of their thought processes and reported expectations for key variables in order to add depth to the story told by the unprompted data.

Second, I examined students' implied decision rules by ranking pattern, i.e., based on how they ranked the indicator colleges. Where there was disagreement between implied rules for a student, or incongruity between the implied rules and the ranking pattern observed, I reviewed closely the transcript of the student's comments as they ranked each college, seeking to identify the essence of their reason for ranking each college as they did and thus to identify the decision rule in use. Ultimately, the script analysis was so revealing and helpful in confirming that the decision rule I had assigned to students was correct that I decided to do it for all students.

Below I present summary results for the individual implied rule analyses, and also students' segmentation by ranking pattern and the final decision rule which they were assigned.

AJ's Task: Selected Qualitative Analyses

Table E.1: Implied Rule Analysis Results, Basic and Scorecard Group

Basic Information Group		
ID	Decision Rule	Quote
1330	Single variable (cost); Favor public	"I'm gonna keep the private colleges separate because I don't know much about their prices. I just know they're private".
1318	Weighted (cost, future benefits); Favor public	I'd probably put private colleges last because they are really expensive, not really that much better from what I can tell from public colleges
Scorecard Information Group		
1302	Single variable (cost)	"...AJ is looking for, is just focusing on how cheap the school is".
1304	Weighted (cost, future benefits)	"How they're looking at is like they're looking at just how much it costs per year and the graduate rate."
1309	Weighted (cost, future benefits)	"He is focused on financial [costs] and also looking towards...the future, wanting to make more money"
1317	Weighted (cost, future benefits). Favor private.	"...he could benefit from private colleges because sometimes they give out scholarships...if he really wants to earn more money, he should go for a private college".
1320	Single variable (future benefits)	"They're thinking about only a financial benefit in the future….average salary".
1329	Single variable (cost)	"So only financially for AJ, I guess lower cost the better".
1331	Weighted (cost, future benefits)	"So he wants the best financial benefits and the lowest cost I can get. So low cost, but average salaries".

Table E.2: Rules of Thumb Results, Scorecard and Basic Group

Basic Information Group		
ID	Rule of Thumb	Quotes
1330	Favor public	I'm guessing Reed is really expensive because it's private…I'm gonna keep the private colleges separate because I don't know much about their prices. [As ranks Reed last] Reed College would be like Oregon's Harvard, that's how I picture Reed.
1303	Favor public	Private schools tend to be more expensive, so I mean in the end you might be paying more back for loans.
1314	Favor public	Reed College is another private college…I know it's a really big name school, so I'm assuming it's a lot of money you have to pay to go there.
1318	Favor public	I'd probably put private colleges last because they are really expensive.
1321	Favor public	private colleges require more money…it's a public college, a better investment.
1328	Favor public	It's public, so it would cost less money.
1308	Favor public	I think Portland State is first because it's public and public tuition is best.
1322	Favor private	Private colleges are more expensive…but investment-wise they could offer better resources …I'd probably choose one of these private ones as the top one…when people in jobs or companies see that you're from a private college…these see it as a higher rank...so you'd probably get paid more.
1326	Favor private	I think a private college would be better … they're private for a reason.
1312	Favor private	It's a private four-year college, it's a really good education.
1316	Favor private	I heard if you go to a private college, there's a lot of scholarships. It's more expensive, but they offer a lot of scholarships too.
1306	Favor both	I'm putting Reed as number 1 because…private colleges are able to give more money for [low-income] students….[PSU] is a good investment…it's public, and if they live at home, they don't have to pay the room and board.
Scorecard Information Group		
1315	Favor private	If they do well in high school and apply for a private college, and are from a low-income family, there's more chances for them to give you money.
1317	Favor private	…he could benefit from private colleges because sometimes they give out scholarships…if he really wants to earn more money, he should go for a private college because he'll probably end up making more money and have more opportunities…Reed College has the highest graduation rate, but it's a private college, not public...he can get more help in a public than a private college.

Table E.3: Factors and Variables Cited While Ranking, Basic Group

ID	Scorecard Factors	Other Cost-Related Factors	Other Benefit-Related Factors
1301	Cost, salary		Quality/reputation, programs offered, acceptance rate, AJ's grades, curriculum/teaching quality, student body characteristics
1322	Cost, salary	Sector, loans/debt, AJ's family income, can live at home	Quality/reputation, programs offered, post-college job opportunities, college resource/opportunities, college size
1325	Cost	Loans/debt, AJ's family income, can live at home	Quality/reputation, programs offered, acceptance rate, college resources/opportunities, college size
1321	Cost	Sector	Quality/reputation, programs offered, acceptance rate, college resources/opportunities, college size
1314	Cost	Sector, college financial aid, AJ's family income, can live at home	Quality/reputation, acceptance rate, AJ's grades
1330	Cost	Sector	Quality/reputation
1316	Cost	Sector, college financial aid, financial aid generally	Programs offered, curriculum/teaching quality
1308	Cost	Sector, college financial aid	Programs offered
1303	Cost	Sector, loans/debt	Post-college job opportunities
1318	Cost	Sector	College resources/opportunities
1328	Cost	Sector	College resources/opportunities
1306	Cost	Sector, loans/debt, college financial aid, AJ's family income, can live at home, financial aid generally, help with aid process	
1310	Cost		
1312		Sector	Quality/reputation, programs offered, acceptance rate, college size, curriculum/teaching quality, student body characteristics
1326		Sector	

Table E.4: Factors and Variables Cited While Ranking,

Scorecard Group

ID	Scorecard Factors	Other Cost-Related Factors	Other Benefit-Related Factors
1320	Cost, salary, graduation rate	Sector	
1323	Cost, salary, graduation rate	Sector	
1307	Cost, salary, graduation rate		
1309	Cost, salary, graduation rate		
1311	Cost, salary, graduation rate	Loans/debt	
1317	Cost, salary, graduation rate	Sector, loans/debt, college financial aid, AJ's family income	Quality/reputation, post-college job opportunities, non-financial support for students
1331	Cost, salary		
1315	Cost, salary	Sector, college financial aid, AJ's family income, can live at home	AJ's grades
1324	Cost, graduation rate		
1304	Cost, graduation rate	Financial aid generally	
1305	Cost, graduation rate		AJ's determination to finish college
1327	Salary, graduation rate		
1319	Salary, graduation rate		AJ's grades
1302	Cost		
1329	Cost		
1313	Cost	Loans/debt, financial aid generally	

Table E.5: Students' Ranking Patterns and Final Decision Rule Categorization, Basic Group

ID	Factor Analysis		Articulated Rule	Rule of Thumb	Final Rule
	Scorecard Factors	All Factors			
Both Indicator Colleges Correct					
1306	Cost	Cost		Favor both	Cost only
1322	Costs & Benefits	Costs & Benefits		Favor private	Benefit-oriented
1326	Indeterminate	Cost		Favor private	Benefit-oriented
Both Indicator Colleges Incorrect					
1303	Cost	Costs & Benefits		Favor public	Cost only
1308	Cost	Costs & Benefits		Favor public	Cost only
1310	Cost	Cost			Cost only
1314	Cost	Costs & Benefits		Favor public	Cost only
1316	Cost	Costs & Benefits		Favor private	Idiosyncratic
1318	Cost	Costs & Benefits	Costs & Benefits	Favor public	Cost only
1321	Cost	Costs & Benefits		Favor public	Cost only
1328	Cost	Costs & Benefits		Favor public	Cost only
1330	Cost	Costs & Benefits		Favor public	Cost only
First Correct, Last Incorrect					
1325	Costs & Benefits	Costs & Benefits			Cost only
Last Correct, First Incorrect					
1301	Costs & Benefits	Costs & Benefits			Benefit-oriented
1312	Indeterminate	Costs & Benefits			Benefit-oriented

Table E.6: Students' Ranking Patterns and Final Decision Rule Categorization, Scorecard Group

ID	Factor Analysis (All Factors)	Articulated Rule	Rule of Thumb	Final Rule
Both Indicator Colleges Correct				
1309	Costs & Benefits	Costs & Benefits		Benefit-oriented
1320	Costs & Benefits	Benefits		Benefit-oriented
1323	Costs & Benefits			Benefit-oriented
1327	Costs & Benefits			Benefit-oriented
1319	Costs & Benefits			Benefit-oriented
1315	Costs & Benefits		Favor private	Benefit-oriented
1331	Costs & Benefits	Costs & Benefits		Benefit-oriented
1304	Costs & Benefits	Costs & Benefits		Benefit-oriented
1324	Costs & Benefits			Benefit-oriented
Both Indicator Colleges Incorrect				
1317	Costs & Benefits	Costs & Benefits	Favor both	Idiosyncratic
First Correct, Last Incorrect				
1307	Costs & Benefits			Cost only
1311	Costs & Benefits			Cost only
1305	Costs & Benefits			Cost only
1302	Cost	Cost		Cost only
1313	Cost			Cost only
1329	Cost	Cost		Cost only

Table E.7: Students' Attitudes to the Community College Pathway, Basic Group

ID	Quote
Favor 2/4 Options	
….because they cost less	
1301	"JJ's considering going to a community college…I can see that being a financial reason. I'm gonna put PCC to the other colleges first."
1303	"PCC is cheap and or could be free at this point is what I've heard, so starting there would make it easy for him."
1310	"Going to [a 4-year] without going to PCC first would be more expensive so I would probably rank those on the bottom, investment-wise."
1314	"PCC would be smart for two years since he is lacking money."
1321	"PCC is easy to get into, easy to pay for.
1316	"If he cares about money and the benefits, costs, financial benefits and costs, I think his no. 1 choice would be PCC [first] because that's a cheaper way. Because they're doing the Oregon Promise."
1328	"I would say [start] at PCC…because of the financial benefits."
1306	"I'm putting PCC first... because there is now a federal scholarship that can be applied through the Oregon Promise where they can get free community college for two years."
….and they offer the same or better education as a 4-year college	
1312	"It's a great plan to start at PCC. You start out with the basic classes that you need to get through first."
1308	"4-year university classes are very big…[community college] is a stepping stone into college."
1318	"I'd definitely put the ones going to a community college and then a 4-year college first…they're cheaper and get the same degree."
1325	"PCC…would be free under the Oregon Promise…he's just getting his core classes done at community college."
1330	"You're getting your pre-reqs out of the way and for a cheaper price than going all four years at a big college."
Favor 4-Year Options	
1322	"The people that I've seen go straight to university usually end up getting a higher paying job and the get it done so they can start making that living."
1326	"I was considering…community college…for two years, but I get decent grades and I don't think there's a point to it."

Table E.7: Students' Attitudes to the Community College Pathway, Scorecard Group

ID	Quote
Favor 2/4 Options	
….because they cost less	
1302	"Portland Community College…first because he cares only about the financial cost".
1329	"Portland Community College...I think that's the cheapest way to get a 4-year degree."
1331	"…anything that goes to the community college and then to the university is better… It's just a good way to save up money, and then be able to go to a bigger school and not have to worry about loans as much".
...and they offer the same or better education as a 4-year college	
1315	"I think that it would be very smart to go to community college first - it's cheap, take care of pre-reqs, and then finish your degree at a 4-year school."
1324	"PCC first because it's just gonna cost him $7,000 and because it's a public 2-year, so that would get him started and ready for his 4-year college."
...and the transfer rate information does not offset the advantages	
1304	"Starting PCC is the lowest [cost] but the down part would be graduation rate because it's pretty low. But ... if he actually wants to continue with college and stuff, he'll actually work hard and he can graduate and then transfer."
1317	"He cares only about the benefits and cost, so he would save money going to PCC for two years…the graduation rate, PCC is only 19% and then transfers is 15%, but he would just have to stay on top of his classes."
1323	"How come they don't tell you the percentage of students that graduate from PCC that transfer to a 4 year college? That makes things harder. [Long silence…] Some students go on to 4 year college?...I think community college is a good idea; it saves a lot".
1311	"PCC doesn't have a high graduation rate or transfer rate, but everyone I talk to says that it's smarter to go to a community college first, as it's a lot cheaper...I feel JJ's a committed person who wants to graduate, so it'd just be cheaper for him to go there."
1313	"I would honestly always put PCC first…transfer percentage is kind of low…you still have a chance and the price isn't that high."
1307	"He's worried about financial issues - PCC first because it's the lowest amount of money….and is the only one that has a transfer graduation rate, which he's looking for."
Favor 4-Year Colleges	
1309	"I,..recommend not going to a community college because...he eventually wants to go to a 4-year, and the likeliness of him graduating or transferring is so low."
1319	"The issue is how much money [he earns] so I don't even really like the PCC choice just because it says only 15% of transfer students...graduate--oh, like 34% of the time…pay for a nicer [4-year] school…because you're gonna make more in the end."
1320	"If you're gonna go to a community college and transfer to a 4-year, I think it would be best to save up …and go straight to the 4-year. Graduation rate is really important."
1305	"So starting at PCC and then completing at a 4-year… six years, that's expensive".
Unclear Point of View	
1327	"For PCC, it's 19% if he graduated, but if he'd transfer to another college, like Portland Bible College, if he transferred over to PCC, he'd have a 50%, that's not really high".

Appendix F. COMPARISON OF RANKING PATTERNS, 2014 AND 2015 LOW INCOME HIGH SCHOOL

OVERALL RANKING ACCURACY

There are no significant differences in students' overall ranking accuracy between the December 2014 and 2015 samples at the low income high school, either as measured by Kendall's tau (Table E.1 below), or as measured by the accuracy with which students ranked the indicator colleges in AJ's and JJ's tasks (Table E.2 below).

Table E.1. Ranking Accuracy, Kendall's Tau

Low Income School		AJ's List		JJ's List	
		Scorecard Info	Basic Info	Scorecard Info	Basic Info
2014 (N=172)*	M	0.375	-0.105	0.076	-0.467
	S.D.	*(-0.433)*	*(-0.389)*	*(-0.609)*	*(-0.461)*
2015 (N=31)**	M	0.425	-0.076	-0.033	-0.413
	S.D.	*0.401*	*0.304*	*0.550*	*0.496*
t-value (probability)		-0.431 (0.667)	-0.282 (0.778)	0.669 (.505)	-0.408 (.684)

* Split evenly between the scorecard and basic information groups
** N=16 scorecard information group, N=15 basic information group

Table E.2. Indicator College Absolute Ranking Accuracy

Indicator College (Ranking Task)	Scorecard Information Group			Basic Information Group		
	Mean (Std. Dev.)		*t*-value (Probability)	Mean (Std. Dev.)		*t*-value (Probability)
	2014	2015		2014	2015	
Reed (AJ)	0.558	0.500	0.151 (0.881)	3.244	3.400	-0.298 (0.766)
PSU (AJ)	1.930	1.813	0.246 (0.806)	3.500	3.667	-0.323 (0.747)
OSU (JJ)	2.235	2.625	-0.84 (0.403)	3.686	3.400	0.766 (0.445)
PCC/PSU (JJ)	2.302	2.688	-0.75 (0.455)	3.733	3.867	-0.307 (0.759)
N	86	16		86	16	

Note: Absolute ranking accuracy ranges from 0 (perfect accuracy) to 5.

Comparing indicator college ranking accuracy within each sample, however, reveals significant differences. In 2014, contrary to my hypothesis, students were not significantly less accurate in ranking OSU and PCC/PSU in JJ's list than they were in ranking PSU in AJ's list. As reported

in Chapter 5 (at 5.4), a paired samples t-test showed that students were no more accurate in ranking PSU in AJ's list (M = 1.956, SD = 1.717) than they were, on average, in ranking OSU and PCC/PSU in JJ's list (M = 2.203, SD = 1.596). Applying the same test to the 2015 data showed that those students were significantly less accurate in ranking OSU and PCC/PSU with a mean decrease in accuracy of -1.295, $t(15) = -3.34$, $p < .0005$.

INDICATOR COLLEGE RANKING ACCURACY

Students' indicator college ranking patterns for AJ's task and for the basic group in JJ's task are remarkably similar (Table E.3 below). However, a smaller proportion of students in the 2015 scorecard group rank both indicator colleges correctly in 2015 than did so in 2014 (31 percent in 2015 v 48 percent in 2014), and, concomitantly, a larger proportion ranks both colleges incorrectly (56 percent versus 42 percent).

Table 6.X: Overall Indicator College Ranking Accuracy

Indicator College Ranking Pattern	Scorecard Information				Basic Information			
	2014		2015		2014		2015	
	#	%	#	%	#	%	#	%
AJ's Task								
Both Correct	48	56%	9	56%	17	20%	3	20%
Both Incorrect	7	8%	1	6%	53	62%	9	60%
1st Right, Last Wrong	30	35%	6	38%	9	10%	1	7%
1st Wrong, Last right	1	1%		0%	7	8%	2	13%
Grand Total	86	100%	16	100%	86	100%	15	100%
Fisher's exact test	$p > 0.999$				$p = 0.872$			
JJ's Task								
Both Correct	41	48%	5	31%	10	12%	2	13%
Both Incorrect	36	42%	9	56%	69	80%	11	73%
1st Right, Last Wrong	4	5%	1	6%	3	3%	1	7%
1st Wrong, Last right	5	6%	1	6%	4	5%	1	7%
Grand Total	86	100%	16	100%	86	100%	15	100%
Fisher's exact test	$p = 0.558$				$p > 0.586$			

While these differences in the distribution of rankings do not rise to the level of significance using Fisher's exact test, they are concerning, especially because they reduce the number of students whose think aloud responses give insight into the decision processes of students who

ranked the indicator colleges correctly. Only five students ranked both of JJ's indicator colleges correctly in 2015, but 7 would have done so if, as occurred in 2014,48 percent of students in the 2015 scorecard group had ranked both colleges correctly.