Understanding the Value of a UC Degree

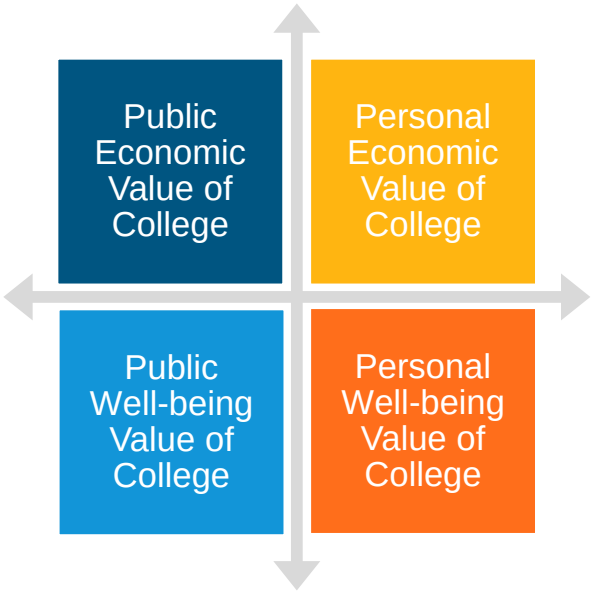
As public concerns grow around college costs, student debt and degree completion rates, colleges and universities are under increasing pressure to demonstrate the value of higher education. Value is often measured in economic terms, such as earnings post-graduation; however, this presents a narrow picture. Non-economic outcomes, such as learning and civic impact, are often missing from the discussion.

Leveraging University of California (UC) data, state and national data sources, the UC Office of the President's Institutional Research and Academic Planning (IRAP) department is developing a series of topic briefs which incorporate indicators (both economic and non-economic) and indirect measures of student learning to more comprehensively demonstrate a college degree's impact on students and the broader public. These topic briefs may also be transformed into dashboards, infographics and other communications.

To guide the development of indicators, IRAP is using an adjusted framework adapted by the Post Collegiate Outcomes (PCO) Initiative, a collaboration of the American Association of Community Colleges (AACC), the American Association of State Colleges and Universities (AASCU), and the Association of Public and Land-grant Universities (APLU). The framework (see Figure 1) proposes four areas to use to communicate the impact of a college degree.

UC has data to represent outcomes in each of these quadrants, but is continuing to secure data (see Appendix C). The following sections introduce each of the quadrants and provide example data of points. If UC data is not yet available, examples will reference national data.

Figure 1. Adjusted Post Collegiate Outcomes Framework



College graduates relative to high school graduates:

- contribute $6900 more in tax revenue per year
- contribute $278K more to consumer spending, over a lifetime.
- are half as likely to be unemployed.
- are twice as likely to vote and almost three times as likely to volunteer
- are less likely to smoke, more likely to eat fruits and vegetables, use seat belts and preventative health care.

UC alumni:

- from five of UC campuses raised over $47 billion in venture capital funding and created about 2270 companies.
- who are first-generation surpass their parents income within 7 years of graduation
- are one in three CA state-elected officials

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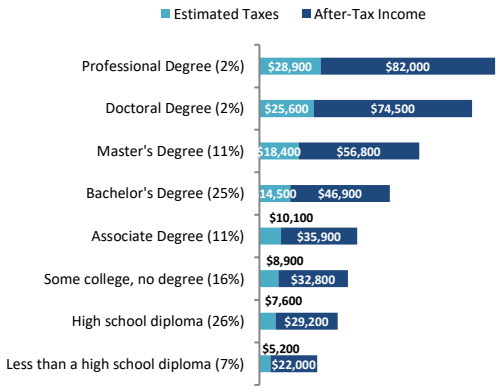
Public/Economic

The public/economic quadrant (top left) represents outcomes related to the public good, primarily in financial terms. Some examples might be tax revenues generated by degree recipients, consumer spending, and fulfillment of state workforce needs.

College degree recipients contribute to the economy through tax revenue and spending. Nationally, bachelor's degree recipients contribute an estimated $6,900 on average more in taxes per year than high school graduates. Moreover, doctoral degree recipients contribute $9,100 more than Bachelor's degree recipients (see Figure 2).

The Brookings Institute estimates that on average bachelor's degree recipients contribute $278,000 more than high school graduates

Figure 2. Median earnings and tax payments of full-time year round workers aged 25 and older, by education level 2015



Source: College Board, Education Pays 2016

to local economies through direct spending over the course of their lifetimes (Rothwell, 2015). Furthermore, Trostel (2015) estimates lifetime contributions of bachelor's degree recipients through income, property and sales taxes at about $328,500; contributions increase to $443,900 for advanced degree earners and dip to $136,600 for those with a high school diploma.

In addition to spending, college graduates also serve workforce needs. The Public Policy Institute of California projects that 38% of California's 2030 workforce will need a bachelor's degree or higher (Johnson, Mejia & Bohn, 2015).

In 2016, UC awarded 28% of all bachelor's degrees and 39% of all STEM degrees in California.[1]

UC alumni start companies that can generate jobs. In 2018, Pitchbook ranked five UC campuses (Berkeley, UCLA, San Diego, Santa Barbara, and Davis) in the top 50 for producing venture-capital backed entrepreneurs. Since 2006, alumni from these five campuses created about 2270 companies and have raised over $47 billion in capital.

Personal/Economic

The personal/economic quadrant (top right) encompasses outcomes related to the personal (or individual) financial good. Some examples

[1] Source: Integrated Postsecondary Education Data System(IPEDS), excludes for-profit institutions.

are employment outcomes and individual earnings.

College graduates fare better in employability than non-graduates. In 2017, the unemployment rate for bachelor's degree recipients or higher was 2.5% compared to 5.3% for high school graduates aged 25 to 34 years old (Bureau of Labor Statistics, U.S. Department of Labor, 2017).

In addition to employment, earnings are often cited as an outcome. Every additional year of higher education increases American workers' average wages by around 8 percent (Card 1999). Recent evidence suggests wide variation in employment outcomes by college major: the wage gap between high- and low-return majors in the US is almost as large as the gap between college attendance and non-attendance (Altonji, Blom, and Meghir 2012), and switching into higher-return majors like engineering substantially increases marginal students' future wages (Kirkeboen, Leuven, and Mogstad 2016).

On average, employed 40-year-olds with a college degree earn about 80 percent higher annual wages than those without a college degree, though this gap is broadly underestimated by the American public, especially among lower-income and non-college-educated adults (Bleemer and Zafar 2017).

UC undergraduates typically earn about $40K at two years after graduation, $56K at five years after graduation and $78K at ten years after graduation (UC Information Center). There is considerable variation in UC alumni earnings by major; for example at two years after graduation social science majors earn about $37K compared to computer science and engineering alumni who typically earn about $68K.

Income is one measure, but income relative to parent income is another metric to consider as colleges can act as a vehicle for social and economic mobility. UC First generation students, surpass their parents' income within seven years of graduating UC. Furthermore, five UC campuses ranked by the Equality for Opportunity Project in the top 50 colleges with highest economic mobility and access rate for low income students: Irvine (#12), Riverside (#19), Los Angeles (#24), Berkeley (#39) and San Diego (#41). For almost all UC campuses more than 50% of alumni whose parents come from the bottom income quintile move to the top income quintile in adulthood.

While information on earnings and economic mobility is essential for prospective students and families, it is also important to acknowledge the benefits of college education on public and personal well-being.

Public/Well-being

"We would lose a tremendous amount of society if each individual sets as his or her life goal maximizing lifetime income"

- College Board, Education Pays 2016

The **Public/Well-being** quadrant (bottom left) represents outcomes related to the public good, defined primarily in non-financial terms. Some examples might be civic engagement, such as

voting or volunteering; appreciation of diversity; teaching; working as a social worker or other helping profession or increased moral development. These elements lead to greater quality of life and well-being for the public. Volunteer work can facilitate improvements in the welfare of others. Of those 25 years or older, 16% of high school graduates volunteered in 2015, compared to 39% of those with a bachelor's degree of higher (Ma, Pender & Welch, 2016). More volunteers can also help offset public cost of labor. Trostel (2015) estimates that high school graduates contribute on average $840 in labor costs through volunteering. That contribution increases to $1,665 per year for bachelor's degree recipients and $2,682 per year for graduate degree holders.

While the public benefits from volunteer work, volunteers stand to gain greater awareness of societal issues, which may provide greater clarity in addressing them.

College graduates are also more likely to shape public policy by voting. According to Ma, Pender & Welch (2016), "The national voting rate of 25-to 44-year-olds with at least a bachelor's degree (45%) was more than twice as high as the voting rate of high school graduates (20%) in the same age group."

College graduates are 2.5 times more likely to contact public officials than high school graduates (Trostel, 2015). UC alumni also serve as public officials, one out of three California state-elected officials is a UC graduate (UC State and Government Relations). For example, Governor Jerry Brown, Senator Kamala Harris, and Chief Justice Tani Cantil-Sakauye all graduated from a UC.

There is evidence that formal curricular experience, such as service work and service-learning have a positive influence on student civic values and engagement. Particular forms of co-curricular engagement such as student government, student organizations and leadership also help fostered civic values and behaviors (Pascarella, 2016)

The current sociopolitical climate reveals concerns about the impact of heterogeneous populations on the public good. College is one space offering an opportunity for exposure to the benefits of a diverse citizenry. At UC, 92% of seniors reported being able to appreciate global and cultural diversity (UCUES, 2014) and 86% of seniors reported being able to understand international perspectives (economic, political, social, cultural). More research is needed to assess if this change occurred at UC or if students who attend UC are more likely to feel this way, already.

Student attitudes and values can be affected by college attendance. Institutional mission plays an important role in fostering student attitudes and values. However, the impact of the institutional mission is mediated by students' curricular and co-curricular activities, characteristics and behaviors of peer groups and faculty teaching styles. All of these factors can have an impact on students' social-political attitudes (Pascarella, 2016).

Evidence suggests that contact with members of different racial groups during college is related to positive intellectual development.

These effects are most strongly pronounced for White and wealthier students, who tend to benefit more from interracial interactions and diversity courses compared to students of color and less wealthy students.

Attitudes and values can be one factor that influences the type of work one does. Alumni working in helping professions might not be paid high salaries, but their work is meaningful to them and benefits society. UC alumni contribute by working in areas such as education, mental health and healthcare. At least one quarter of mid-career[2] UC undergraduate alumni employed in California work in these sectors, 17 percent work in education (9 percent in K-12 education[3] and 8 percent in higher education), 10 percent work in healthcare and 2 percent work in social assistance (UC Information Center).

Furthermore, UCLA and Berkeley rank 1st and 5th for number of alumni joining Teach for America (Teachforamerica.org), whereas, UCLA, Santa Barbara and Davis ranked in the top 20 schools for alumni volunteering in the Peace Corps. Over 30,000 UC-trained doctors and nurses are caring for Californians; while medical professionals typically have higher salaries others working in the helping professions, they too support public well-being. UC- trained social workers and marriage and family counselors work in 32 of California's 58 counties[4].

Finally, moral development has been linked to college-going, with increasing exposure to college leading to greater gains in moral development. Many studies reviewed showed that moral growth can and does occur during college, mostly due to exposure to certain experiences with moral or social justice emphases, or both. (Pascarella, 2016) However, measuring the direct effect of college alone on one's moral development is challenging because a myriad of contextual factors seem to influence the effect, such as institution size, location, academic ranking, and internal policies.

Personal/Well-being

The **Personal/Well-being** quadrant (bottom right) includes outcomes that demonstrate personal (or individual) value not defined in financial terms, such as interpersonal relationships, career satisfaction, learning, skill development, self-concept and health outcomes. While, personal income is related to well-being, studies show that once a "subsistence level" of income is met, income no longer correlates with well-being (Camfield & Skevington, 2008).

Well-being is associated with "pursuing intrinsic goals, like close relationships, personal growth and bettering the community" (Ryan and Deci, 2000 in Camfield & Skevington, 2008). There are some metrics available to try to understand the relationship between educational attainment and these aspects of well-being.

[2] Mid-career is defined as 10 years after graduation, Source: CA Employment Development Department

[3] Data are currently being acquired from the California Department of Education on the number of UC alumni who teach in California public schools.

[4] California Department of Consumer Affairs

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According to the 2016 General Social Survey, when asked if coworkers took a personal interest in them, 90% of those with a bachelor's degree or higher reported that this was true, versus 86% of high school graduates and 76% of those with less than a high school diploma. However, both college degree holders and high school graduates share similar levels of job satisfaction: 92% of those with a college degree or higher are very satisfied or somewhat satisfied with their jobs, versus 87% of high school graduates.

College engages students with a population that differs from their K-12 peers. Thus students may undergo psychosocial change: a change in self-concept through interactions with others and feedback that either confirms or disconfirms self-concepts. Psychosocial change represents one aspect of personal growth. Several aspects of psychosocial change in college have been studied, such as academic self-concept, leadership skills, interpersonal skills, self-efficacy, autonomy & independence, psychological well-being and locus of self-control(extent to which you believe you have control over outcomes) and identity development (racial & ethnic, gender, sexual orientation and religious and spirituality)

Studies show a positive impact of college on academic self-concept. Seniors report increases in critical thinking, analytic skills, and writing skills. Conversely, college negatively impacts self-concepts related to math ability, particularly for women (Pascarella, 2016).

In the absence of direct measures of learning, the UCUES[5] offers indirect measures of student learning at UC that is perceived gains in skill development. For example, 73% of UC seniors reported an increase in their analytic and critical thinking skills from when they started at UC (UCUES, 2016), 64% reported an increase in their written communication and 65% reported an increase in their oral communication skills. UC alumni perceived gains in academic skills, lend some evidence that UC students are prepared for the next level of education. 36% of all UC alumni go on to complete a graduate degree, and almost 70% of undergraduate students that reported wanting to purse a graduate degree, go on to complete one.

Generally, research shows that leadership and interpersonal skills increase during college, but that interpersonal skill development is also based on maturation. There is some evidence that students rely less on external authorities, have an enhanced internal locus of control, and exhibit increased autonomy.

There is limited evidence that college helps develop racial & ethnic identity or gender identity. However, some studies have found evidence of gay, lesbian, & bisexual identity development in college, with enhanced likelihood for development at women's colleges and decreased likelihood at Christian colleges.

Aside from skills and identity development, some evidence relates educational attainment to a lifestyle which could lead to better health. For example, one in five of high school graduates smoke daily, compared to one in

[5] UC Undergraduate Experience Survey

twenty bachelor degree recipients (Trostel, 2015). Culter and Lleras-Muney, (2010) found a strong positive relationship between educational attainment and eating fruits and vegetables, seat belt use, and preventative medical care. Furthermore, the life expectancy of a degree earner (bachelors or higher) is seven years longer than those who never attend college (Trostel, 2015)

The data in each of these quadrants are a starting point to consider the value of a college degree; however, there are many more aspects not yet captured.

Higher Education Professionals ' Reflections

In 2016, IRAP shared the adjusted PCO quadrants and data points in presentations at three higher education conferences (Association of American Colleges & Universities, California Association for Institutional Research, and Association for Institutional Research). Presentation attendees were invited to help IRAP expand its thinking on how the value of a degree is being represented and other data sources to consider.

Attendees were asked to reflect on their own personal experiences and answer the following question: "What was a moment when you noticed your college education was valuable? Please describe."

143 responses from higher education professionals (deans, faculty, CEOs, chief academic officers, directors of institutional research, analysts, etc.) were collected and qualitatively analyzed. Table 1 shows the themes that emerged from responses.

Conference attendees mentioned employability and financial stability were enhanced by a college degree. However other areas of enhancement we also noted, such as applying education to real world situations, cultural competence, having an expanded world view, improving communication skills, focusing interests, and increasing self-confidence. While the responses are from a sample that may only be generalizable to higher education professionals who attend conferences, the responses do give examples that are worth exploring for a more general population.

Table 1. Themes from conference attendee responses

Theme	Percentage of Responses
Employability/Job Choices	27%
Applied Education/Practical Skills	27%
Cultural Comp. & Openness to Diversity	17%
Preparation for Graduate School	17%
Critical Thinking	16%
Communication Skills	13%
Informed Conscious & Social Awareness	13%
Self-Confidence	13%
An Expanded World View	10%
Focused Interests	9%
Collaboration	6%
Networking	6%
Leadership Skills	6%
Financial Stability & Social Mobility	4%
Negative Attributes/Costs of College	1%

Note: The percentages in parentheses correspond to the percentage of responses expressing the theme and do not add to 100%. Each response could have multiple themes embedded in it. See **Appendix A** for examples of responses from each theme.

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Both academic research on how college affects students and the personal experiences of conference attendees lend evidence that the value of a college degree extends to many areas of life and society far beyond financial impact. This evidence impels UC to consider whether these benefits happen for UC alumni.

Establishing Causal Relationships

Indicators that show UC and/or college graduates have higher wages, greater psychosocial change, more developed morals, attitudes and beliefs or healthier lifestyles might not necessarily demonstrate the value of a degree. It is important to explore if these outcomes would have occurred even without UC or college attendance.

Many benefits of a college education depend on not just attending college, but actually completing a degree. In that sense, there is the value of the degree itself, apart from the experience of college. Thus, a college degree can act as a "sheep-skin" effect or gatekeeper to these benefits. Furthermore, some outcomes that occur for alumni may be a result of higher earnings and not directly attributable to increased education.

To understand if UC plays a role in these outcomes, causal relationships between the UC experience and alumni outcomes must be explored. Regression discontinuity, propensity score matching and coarsened exact matching (see Appendix B for description) are statistical techniques to explore causal relationships between educational experiences and outcomes. Where possible, these statistical techniques will be applied to determine if there is evidence of a causal effect of college on the outcomes represented in each of the quadrants.

Variations in Outcomes by Subgroups

While research might show benefits of attending college overall, there are differences by racial, gender, socioeconomic or political subgroups. The subsequent series of topic briefs will also consider differences in outcomes by subgroups, where possible.

Future Topics

IRAP is securing data sources that represent alumni outcomes in each of the value of degree quadrants. In the coming year, as data is analyzed, topic briefs devoted to each quadrant will be distributed to UC leadership and infographics, e-briefs and dashboards related to each topic area will be shared.

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Appendix A: Responses from conference attendees by theme

Employability/Job Choices

"[I was] employed in job requiring college degree w/in 1 month of graduating (which was during a recession)."

"I was able to apply for government jobs, outside of my discipline, just with a baccalaureate degree"

Applied Education/ Practical Skills

"Shopping in drug stores, understanding drug labels, from taking Chemistry courses"

"Using skills and knowledge obtained from my degree to work collaboratively across departments"

Cultural Competence & Openness to Diversity

"Interacting with a diverse community group; taking African-American studies classing in college was directly helpful, particularly since my high school was nearly all white"

"Just a general sense that I see the more openly and less fearfully than some who haven't traveled as much. [Participating in] Study abroad, and living with persons from multiple cultures and backgrounds"

Preparation for Graduate School

"In grad school, I realized that I had stronger research background (experience & knowledge) than others in my cohort"

"A signature work project at BA level prepared me for rigors of graduate school"

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Critical Thinking

"Being on College debate team gave me experience in analytic arguments critical thinking that I use in my job today."

"Application of creative problem solving skills to a situation I wasn't trained for"

Critical Thinking (cont.)

"Every time I get sucked into political/social discussion on Facebook, research skills, constructing an argument, responding to and deconstructing responses"

Communication Skills

"When I was able to talk educational policy with a dinner guest and defend my contrary view in a respectful and civil way"

"Developed logic skills in order to be able to win arguments with my husband"

"When I got my first job at a university. I was picked over other candidates not because of experience, but because of my personal nature & good communication skills"

Informed Consciousness & Social Awareness

"Learning to recognize bias/persp[ectives] even in books/scholarship"

" Encountering diversity through residence life especially, but in class too; learned to appreciate and welcome different experience and not take my own as normative"

"During my first trip home (November of freshman year). Returning to poor Appalachia country, saw it different than ever before "noticed" poverty in a new way."

"A deeper understanding of my rights as a citizen"

Self-Confidence

"Being able to advocate for myself"

"Being able to travel by myself successfully without help (parents)"

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"Be able to tackle problems more on my own"

An Expanded World View

"The moment that I opened the college catalogue…so many choices"

"International Internship helped me see many difference countries, broaden world view, see needs in a way I hadn't seen previously"

An Expanded World View (cont.)

"Coming to a realization about the complexities of social & economic issues (rarely straightforward)"

Focused Interests

"Being able to study a field to an extent possible in higher education"

"As a result of taking a couple of quantitative courses I realized I had both the internet and the ability to pursue a quantitative analysis career"

"In law school: that law school was a poor fit with my goals to 'make a difference in the world' "

Collaboration

"Having to work in groups and teams helped me break out of my comfort zone"

"Using skills and knowledge obtained from my degree to work collaboratively across departments"

"Working in teams, applying models to real world problems, understanding [organization]"

Networking

"When I moved to a new city and had an alumni network to connect to, going to a college with an alumni network"

"[At the] NSBE [National Society of Black Engineers convention] being called to the front of a long line to speak with a recruiter, when I was just passing by. All because he happened to read my school name on the name tag"

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Leadership Skills

“Being president of a campus group; every leadership position since then reminds me of the skills & confidence. “

“Leadership, Communication Skills”

“Research work, leadership and collaboration”

Financial Stability & Social Mobility

*“*Being self-reliant, college is unstructured compared to high school, learned to prioritize time and resources; got the skills degree --> $$$"

*“*1st college grad in family - Helped future generations of family go to college and get a degree. Able to help other 1st generation college students understand the college admissions process”

“Being the first in my family to earn a college degree”

Negative Attributes/Costs of College

“The narrowness of the academic experience closed a lot of other arenas for me.
But I wrote a paper every week and that helped when I wrote journalistically”

“Very narrow academic college experiences followed by a very narrow academic professional life. So my entire professional success is traceable to my entire college experience “

Appendix B: Explanation of statistical techniques for evaluating causal effects

Isolating the impact of attending college on student outcomes can be complicated, for example when answering a question like: "Does going to college increase expected future wages?" It is not sufficient to simply, compare the wages of college-goers and non-college-goers, because this comparison ignores there could be other key differences between the two groups, such as individual characteristics like academic achievement or social networks that may influence a decision to attend or complete college. There is a possibility that these characteristics might also be the same characteristics that garner higher wages, thus higher wages are not directly attributable to college-going. In order to understand the effects of college-going on outcomes like wages, causal inference techniques must be employed to reduce the "selection bias" that may be present in characteristics of those who go to college to isolate causal effects.

Randomized control trials

Randomized control trials (RCTs) are true experiments in which subjects are randomly placed in to different conditions, usually one condition serves as a control and another condition exposes subjects to a treatment (Note: More than two conditions can be used). Rather than subjects choosing or self-selecting into conditions, such as choosing to enroll in college, subjects are randomly selected and randomly placed into these conditions. Therefore, a randomized control trial might randomly assign high school graduates of various academic achievement levels and social networks to either enroll in college or not enroll in college. To determine if there is an effect of college-going, wages for each group would be compared after completing college. While this experiment would substantially reduce selection bias, it would not be a reasonable or ethical experiment to conduct, however there are other quasi-experimental approaches to consider.

Regression Discontinuity

The regression discontinuity design belongs to the category of "quasi-experimental" studies, it shares many of the statistical advantages of RCTs without requiring researchers to implement randomization themselves. It is a statistical methodology that compares outcomes of two groups, by addressing some of the student characteristics that may affect the outcome. Imagine that the only university in a town has an admissions formula where they admit all applicants with an SAT score higher than 1500 and

reject everyone else. Now consider two nearly-identical applicants who apply *only* to this particular university: one with an SAT score of 1490, the other with 1500. The first applicant, would be rejected, while despite their essentially-similar levels of achievement, the second applicant would be admitted to the university. If there were hundreds of applicants in each bucket—hundreds of 1490s who were all rejected, and hundreds of 1500s who were accepted—then the "discontinuity" in the admissions formula could be seen as a minimal difference in academic achievement. Therefore the group of students scoring “1490” can be likened to a control group who do not receive the “treatment” of college, whereas the “1500” receive the “treatment” by going to college. If the latter group had significantly higher earnings than the former, it couldn't be because of the differences in achievement scores described above—after all, the two groups are essentially identical in those respects—but must be due to the effect of interest: that the latter group attended college than rather than the former. Regression discontinuity relies on an as-if-random distinction between 'treated' and 'control' groups based on SAT score (see Zimmerman, 2015)

Coarsened Exact Matching/Propensity Score Matching

Coarsened Exact Matching (CEM) is a statistical method in which two populations (treatment and control) are matched on characteristics in order to determine the existence of a treatment effect. Unlike regression discontinuity, CEM requires that the treatment and control groups be matched on all baseline characteristics (King and Nielsen, 2016). In CEM each characteristic is coarsened into meaningful groups (e.g., high, medium and low socioeconomic status and low, medium, high SAT scores). Next, subjects are partitioned into strata based on their membership in these categories. These strata are linked to the original data that determines if they were in a treatment (attended college) or control condition (did not attend college). Once this process is completed, one can test treatment effects (Blackwell and et. al, 2010) on outcomes (e.g. wages).

Propensity score matching is similar in its approach to coarsened exact matching, but instead of directly matching subjects on characteristics (such as socioeconomic status or SAT score), the characteristics are used to estimate a probability that the subject would be in a treatment group (e.g. attend college). Subjects are then matched on the probability they would be in the treatment group (attending college) and outcomes (wages) between matched treatment (college goers) and control (non-college goers) students are compared.