Does Beauty Matter in Undergraduate Education?*

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Abstract:

Physically attractive individuals achieve greater success in terms of earnings and status than those who are less attractive. However, whether this “beauty premium” arises primarily because of differences in ability or confidence, bias, or sorting remains unknown. We use a rich dataset from a women’s college to evaluate each of these three mechanisms at the college level. We find that students judged to be more attractive perform significantly worse on standardized tests but, conditional on test scores, are not evaluated more favorably at the point of admission, suggesting that more attractive people do not possess greater abilities at the beginning of college. Controlling for test scores, more attractive students receive only marginally better grades in some specifications, and the magnitudes of the differences are very small. Finally, there is substantial beauty-based sorting into areas of study and occupations.

Keywords: beauty premium, education, discrimination.

JEL Codes: J16, I21, I23

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1. Introduction

In most settings, discrimination based on characteristics such as gender, age, race, and national origin is illegal. Appearance-based discrimination, while not currently unlawful, has been the subject of several lawsuits in recent years.[1] In parallel, the academic literature has documented a positive correlation between earnings and perceived attractiveness for both men and women (Hamermesh and Biddle, 1994; Biddle and Hamermesh, 1998).[2] However, much about the mechanism behind this "beauty premium" remains unknown, including the role of self-confidence, the extent to which beauty is a signal of innate or acquired ability, the degree of bias in favor of more attractive people, and the extent to which career sorting plays a role.

In this paper, we use a unique and rich dataset to test for these mechanisms at the college level. Our principal goals are (1) to test whether attractive students appear more capable or confident when they begin college, as measured by their standardized test scores and admission ratings; (2) to test whether they have higher GPAs conditional on their characteristics at the point of admission, which would suggest bias or unmeasured ability; and (3) to estimate the extent of beauty-based sorting into areas of study and occupations. To achieve these objectives, we estimate the relationships between attractiveness, standardized test scores, course grades, admissions ratings, and major/career choices. We then gauge the implications of these results for beauty-based differences in ability or confidence, for bias in favor of more attractive people, and for whether the beauty premium in the labor market can be explained by sorting.

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[1] See for example Yanowitz v. L'Oreal USA, Inc. (2005) and Brice v. Resch and Krueger Int'l, Inc. (Corbett, 2011).

[2] The importance of beauty has been studied in contexts other than the labor market. See, for example, Ravina (2009) for the beauty premium in credit markets, Andreoni and Petrie (2008) for the beauty premium in public goods games, Wilson and Eckel (2006) for the beauty premium in trust games and Berggren et al. (2010) for the beauty premium in electoral outcomes.

We find that, once we control for standardized test scores, more attractive women do not receive different admissions ratings, showing that more attractive individuals do not appear to be more capable at the beginning of college, conditional on being admitted. This finding also suggests that they do not differ from less attractive women in our sample along a very wide range of characteristics, at least on net.

More attractive individuals in our sample have significantly lower standardized test scores, all else equal. Specifically, a one standard deviation (s.d.) increase in attractiveness is associated with scoring 0.10 s.d. lower on the math SAT section, 0.14 s.d. lower on the verbal SAT section, and 0.45 s.d. lower on the SAT writing section. To our knowledge, our study is the first to find that attractiveness is *negatively* correlated with ability, as measured by these tests. There are a number of possible explanations for this result. First, more attractive individuals may be less intelligent. However, existing evidence suggests that this is not the case (Kanazawa 2011; Scholz and Sicinski 2014), although there may be heterogeneity across the distribution of ability. Second, more attractive individuals may put less effort into test preparation because of better outside options. Finally, this result is also consistent with previous literature that finds a positive correlation between self-confidence and self-perceived attractiveness (Franzoi and Shields 1984; Wade and Cooper 1999; Wade 2000), as well as literature that demonstrates a positive correlation between confidence and attractiveness as judged by third-party raters (e.g., Mobius and Rosenblat 2006; Langlois et al. 2000).[3] If, all else equal, more attractive high school seniors are more likely to apply to a selective college, and the admission process has some randomness

[3] Studies have also found a significant positive correlation between subjects' ratings of own self-perceived attractiveness and those they received from third-party raters (Pittenger and Basket 1984). However, *self-ratings* of physical attractiveness appear to be positively correlated with a wider range of attributes than actual physical attractiveness (Feingold 1992).

to it, then the negative correlation between attractiveness and SAT scores could arise among the admitted students even if it is not present in the broader population.

When we look at college grades, we find that, conditional on their SAT scores and admission rating, more attractive women have a marginally higher GPA. However, the estimates are not robust and the magnitude of the implied beauty premium is small. There is no significant heterogeneity across areas of study, instructor gender, or class size, suggesting that bias is unlikely to be driving these estimates. Our conclusion is that if there is a beauty advantage in college courses, it is very small and not driven by bias.

We then estimate the degree of sorting into different majors and find that there is substantial beauty-based selection into study areas. Specifically, more attractive women are considerably less likely to major in the sciences and much more likely to major in economics. We find no corresponding selection into humanities, other social sciences, or another group of majors that we label "area studies." Overall, we conclude that beauty-based differences at the undergraduate level occur largely along the dimension of selection into study areas rather than ability or bias in favor of more attractive students.

Finally, we estimate the extent of beauty-based selection into various occupational categories. Consistent with our results on academic major selection, we find that more attractive women are much more likely to become consultants and managers and much less likely to become scientists and technical workers (including paralegals, technical writers, technicians, and computer programmers). Previous work has shown that earnings vary substantially by major and occupation. Unfortunately, we do not observe the wages for the women in our sample. However, a back-of-the-envelope exercise suggests that at least half of the beauty premium in the labor market is explained by major/occupational choice and that managerial professions exhibit a larger return to beauty than scientific professions.[4]

We contribute to two streams of literature. The first assesses the relationship between attractiveness and ability; it has thus far produced mixed findings. Using assortative mating arguments and empirical patterns, Kanazawa and Kovar (2004) provide indirect evidence suggesting why beauty and intelligence should be positively correlated in humans. Kanazawa (2011) shows empirically that there is a positive association between IQ test results and physical attractiveness in British and American children of both sexes. Several studies have also found that body symmetry is positively correlated with cognitive performance (Prokosch et al. 2005, Bates 2007).[5] von Bose (2012) shows that more attractive teenagers receive higher high school GPAs than less attractive ones. However, in a sample of American men, Scholz and Sicinski (2014) find no relationship between attractiveness and IQ or high school class rank. In a sample of high-ability law students, Biddle and Hamermesh (1998) find that there are no observable skill differences (including LSAT scores) between more and less attractive individuals. In a laboratory experiment, Mobius and Rosenblat (2006) show that more attractive subjects do not perform better in a maze-solving task. In another experimental setting, Deryugina and Shurchkov (2013) use labor-market-relevant tasks to test for both the existence of a beauty premium and performance differentials between less and more attractive subjects. They also find that there is no significant performance differential by attractiveness related to any of the tasks. To our knowledge, our study is the first to consider the relationship between attractiveness and SAT

[4] For more on the relationship between earnings and academic major choice, see Daymont and Andrisani (1984), Berger (1988), James et al. (1989), Grogger and Eide (1995), Loury and Garman (1995), Loury (1997), Blundell (2000), Bratti and Mancini (2003), Arcidiacono (2004), Kelly et al. (2010), Arcidiacono et al.(2011), Andrews et al. (2012), and Wiswal and Zafar (2012).
[5] Body symmetry has been shown to be strongly correlated with attractiveness (see e.g., Rhodes et al. 1999, Rhodes 2006).

scores as well as between attractiveness and college grades, although our sample is admittedly more selected than the samples used in some of the abovementioned studies.

We also contribute to the broader body of literature on the beauty premium.[6] With the exceptions of Scholz and Sicinski (2014) and von Bose (2012), neither the origins nor the persistence of the beauty premium has been studied. Moreover, with the exception of Fletcher (2009), the extent to which the beauty premium may be driven by differences in ability has not been explicitly estimated. We observe individuals who are very likely to become high earners at three critical pre-labor market stages: college admissions, college studies, and college completion. The detailed nature of our data allows us to test for the existence of beauty-based differences at each stage and thus shed light on the origins of the beauty premium.

The rest of the paper is organized as follows. Section 2 describes our sample and data. Section 3 outlines the empirical strategy. Sections 4 and 5 presents and discusses the findings, respectively. Section 6 concludes.

2. Data and Descriptive Statistics

Our dataset consists of 794 alumnae who graduated from an anonymous women's college between the years 2002 and 2011.[7] To measure attractiveness, we use pictures taken when the alumnae were first-year students. A key advantage of our data is that the pictures are not chosen by the student: all are photographed for their student ID cards by campus officials. The pictures were subsequently rated by current male and female students from a college in another state.

[6] See Hamermesh and Biddle (1994), Biddle and Hamermesh (1998), Fletcher (2009), Ravina (2009), Mocan and Tekin (2010), Berggren et al. (2010), Berri et al. (2011), Scholz and Sicinski (2014), von Bose (2012).

[7] This study was conducted with IRB approval. Individuals had to consent to have their photographs included in the study. About 5,000 alumnae were contacted for consent. The informed consent form and description of the project sent to the alumnae are available upon request.

Each picture was rated by at least 25 male and 25 female raters. We demean the ratings to remove rater fixed effects and average them to obtain the mean attractiveness rating of each alumna. Due to the large number of alumnae, not every picture was rated by the same set of raters. For additional details about the rating procedure, see Appendix A.

The attractiveness rating is then matched to the alumna's academic record, which includes her major, SAT scores, course-level grades, race, non-merit-based financial aid awards, international status, and scores from a quantitative reasoning (QR) test that all first-year students are required to take. Like the SAT, the QR test is scored blindly, without observing the test-taker's appearance. We also have detailed characteristics for each course taken by the student, including department, course level (introductory, intermediate, or advanced), total enrollment, and the gender of the instructor.

Finally, we observe each student's admission rating, as assigned by three or more application reviewers. The college uses a "holistic" approach to assign admission ratings, considering each student's academic record (including high school GPA, SAT and other standardized test scores, Advanced Placement courses and test results), extracurricular activities, recommendation letters, two essays and, in some cases, artwork or music. The college does not have a set weight for each of these components, but the student's academic record is undoubtedly very important.

The committee that reviews the applications is made up of admissions officers, faculty members, current students, and the Director or Dean of admissions. The applications are divided into subgroups based on the applicant's geographic region. Each committee member is assigned to read all the applications from a particular group of states or countries (e.g., Midwest, New

York State, Europe). Thus, although we do not observe the identity of the reviewer, we can proxy for it with the applicant's home state or country. With few exceptions, application reviewers do not observe the student's appearance.[8] At the request of the college, we use a non-disclosed linear transformation to disguise the true rating scale.

After the admission ratings are assigned, the committee for each region meets to pool individual ratings, discuss each applicant, and decide whether to admit her or not. The admission rating is a guideline; a particular rating does not preclude or guarantee admission. The committee also considers the applicant's specific credentials (which are also used in determining the rating) as well as other student characteristics, including race, legacy status, international status, socioeconomic background, and which state or country the student is from. Admission is need-blind for domestic students, but not for international students. The committee discussions are undoubtedly important for the admission decision, as we observe a wide distribution of admission ratings in our sample (see Figure A1 in the Online Appendix).

Starting in the fall semester of 2004, the college implemented an anti-grade-inflation policy that capped the average grade in introductory and intermediate courses with ten or more students to a B+.[9] This policy change disproportionately affected humanities courses. If there is beauty-based selection into humanities courses, this policy change may affect our estimates. To control for the potential impacts of the anti-grade inflation policy, we identify departments that had average grades exceeding a B+ and label beginning and intermediate courses with more than

[8] A few international applicants have TOEFL scores that are accompanied by a picture. In some cases, applicants are interviewed by a member of the admissions staff or by an alumna. However, the application reviewers themselves only have access to the interviewer's comments, which do not contain information about the applicant's appearance. The channel through which appearance can affect admissions rating in this case is very similar to that of recommendation letters, which all applicants have.

[9] The full impact of the anti-grade-inflation policy has been analyzed by Butcher, McEwan, and Weerapana (2013).

ten students in those departments as "treated." We then control for the treated indicator and its interaction with a "post-fall-semester-2004" indicator in all course-level regressions.

We classify the courses and majors offered at the college into six categories: humanities, sciences, social sciences, area studies, economics, and other. To do this, we use a publication provided by the college, which classifies courses and majors into "Humanities," "Social Sciences," "Science and Mathematics," and "Interdepartmental Programs." Because the "Interdepartmental Programs" category contains a significant share of the majors, we reclassify some of them into one of the first three categories. In addition, we classify majors such as "South Asia Studies" and "German Studies," which are listed as interdepartmental into a new "Area Studies" category. We place economics in its own category because the college does not have a separate business major. Thus, the students who elect to study economics may be different from students choosing other social sciences as their major. The courses and majors that do not fit into any of the above categories are classified as "Other." See Appendix B for the exact classification.

Finally, data on occupations come from alumnae surveys and are available for slightly over half of the alumnae in our sample. We categorize occupations into ten broad categories: consultant/manager, administrator, art/advertising, teacher, technical, scientist, lawyer, doctor, other medical, and non-profit/government. In a few cases, the categories overlap: someone who is working in an administrative position in a non-profit would be placed in both categories, for example. There are a few alumnae reporting occupations that cannot be classified into one or more of these categories, because the stated occupation is either vague or very unique. Although we cannot list the specific occupations due to confidentiality concerns, we provide a general list of occupations in each category in Appendix B.

Our data are not without limitations. Unfortunately, we do not observe parental income, a potentially important control. However, we do observe the amount of need-based and non-need-based loans and grants that a student receives, which we use as a proxy for parental income. We also do not observe post-college earnings. Thus, we cannot test whether more attractive students in our sample also end up earning a higher salary.

Table 1 presents summary statistics for the key variables in the data, broken down by whether individuals are below or above the median attractiveness rating of -0.03. The attractiveness rating itself ranges from -2.7 to 2.4 and has a mean of 0 by construction. The admission ratings range from 0 to 10, with higher ratings corresponding to a higher chance of admission. The average GPA in the sample is fairly high, ranging from 3.23 in economics to 3.52 in area studies. On average, 94% of the students pass the quantitative reasoning test, which is scored out of 18 points. The average grant amount is about $50,000. Need-based and other loans are substantially smaller, averaging around $1,600 and $700, respectively.

There are a few significant differences between those who are above and those who are below the median attractiveness rating. More attractive students are more likely to be Hispanic/Latina and have about $400 more in non-need-based loans. They score significantly lower on the math, verbal, and writing sections of the SAT as well as on the QR test. In addition, more attractive students have lower admission ratings, on average. Finally, there are no significant differences between the two groups in terms of GPA, need-based loans and grants, or other racial categories. We later perform a formal regression analysis to test whether the differences in test scores and admission ratings hold once controls for student characteristics are included.

One potential concern is that the sample of women who consented to participate in our study may not be representative of the student body. To test for this, we compare the mean test scores, admission ratings, and year of enrollment for the entire population of alumnae who graduated between 2002 and 2011 with those of the consenting group. The results are shown in Table 2. Overall, the consenting students have significantly higher test scores and admission ratings. They also enrolled in the college about half a year later than the general population of students, on average. Because of the necessity to obtain informed consent, we cannot do anything to correct for this or test whether there is beauty-based selection into our sample. However, as long as there is no selection on the *relationship* between attractiveness and other outcomes, such as test scores and GPA, our analysis is valid despite the baseline differences. While we view such selection as highly unlikely, we recognize that the validity of our analysis relies on the assumption that it did not occur.

We have also looked at the racial composition of our sample versus the college's alumnae population from the same years. Compared to the sample of alumnae, we have statistically more white students (62% versus 52%), fewer black students (3.4% versus 5.4%), and fewer Asian students in our sample (21% versus 26%). However, the proportions of Latina/Hispanic and "other" races are similar.

It is also useful to compare the demographics in our sample to college students as a whole. In 2000, about 71% of students enrolled in 4-year colleges were white, 10.6% were black, 6.6% were Hispanic, and 6.2% were Asian. By 2005, the share of whites fell slightly, to 68%

while the percent of black and Hispanic students rose to 11.9% and 8.2%, respectively (US Department of Education, 2014). Thus, compared to the broader college student population, our sample contains fewer white, black, and Hispanic students and more Asian students.

The college from which we obtain data is fairly selective, as evidenced by the high average SAT scores of admitted students (see Table 2). To further see how our results might generalize to other college students, we consider the relative selectivity of our college, using the interquartile ranges of math and verbal SAT scores of admitted freshmen from 342 top colleges and universities. These are collected by PowerScore from statistics published by the colleges.[10] We take the average of each range and add a random number uniformly distributed between -5 and 5 to each average to prevent our college from being identified exactly.

The data show that our college is in the selective range, but not at the very top based on standardized test scores (see Figure A2 in the Online Appendix). About 30 colleges are more selective when it comes to the verbal SAT score, including all of the Ivy League colleges except Cornell, Tufts University, Vanderbilt University, Georgetown University, Rice University, and Amherst College. About 50 colleges are more selective when it comes to the math SAT scores, including the University of Illinois at Urbana-Champaign, the University of California at Berkeley, the University of Southern California, and Carleton College. Overall, the selectivity of the college based on standardized test scores is somewhere near the middle of the top 100 colleges and universities in the country.

A related concern may be that the students in our sample are all of extremely high academic ability, leaving little room for other factors to influence their grades. However, because

[10] Available from http://www.powerscore.com/sat/help/average_test_scores.cfm.

the college weights non-academic factors in its admission decision, the distribution of SAT scores (and, likely, academic ability) in our sample is fairly wide. Many of the students score between 650 and 750 on the math or verbal SAT, which corresponds to the 85^{th} - 90^{th} percentile among test takers. However, almost a quarter of our sample has math SAT scores below 650 and about 15% have verbal SAT scores below 650 (see Figure A3 in the Online Appendix). More importantly, we observe substantial dispersion of GPAs in our sample (see Figure A4 in the Online Appendix). Almost half of the students have a GPA of 3.5 or below and less than 4% have a GPA that is higher than 3.9. Thus, the distribution is not so compressed that there is no room for beauty to play a role in determining grades. However, we do recognize that the individuals in our sample are at the top of the ability distribution compared to the broader population. Thus, our study complements some earlier work such as Fletcher (2009), who focuses on individuals with high school diplomas only.

A final concern is that, because our sample comes from a women's college, it may not be representative of colleges as a whole. The absence of males from our analysis may affect our ability to generalize the results to co-educational environments by shutting down some channels through which beauty may affect performance. For example, if more attractive female students receive a disproportionate amount of help from male classmates relative to their less attractive female counterparts, there may be a beauty advantage in a co-educational setting that would not exist in a single-gender environment.[11] However, about 45% of the courses the students in our sample take are taught by male professors. Thus, we can still test for preferential treatment of more attractive female students by male professors.

[11] We thank an anonymous referee for suggesting this channel.

Other than the absence of male classmates, the college from which we obtain our data draws from a pool of students and faculty similar to those of other top-tier universities and liberal arts colleges. Our focus on women also complements some earlier work that looks exclusively at men (e.g., Biddle and Hamermesh 1998; Scholz and Sicinski 2014). Finally, the prior literature has found that the beauty premium exists for both men and women and is similar in magnitude. However, replicating the study in a co-educational setting should be an important validation exercise.

3. Empirical framework

Several mechanisms might be operating to create significant relationships between attractiveness, academic outcomes, and labor market outcomes. First, attractiveness may be correlated with intelligence or other dimensions of academic ability (e.g., Kanazawa 2011; von Bose 2012). Second, beauty might increase self-confidence (e.g., Mobius and Rosenblat 2006; Langlois et al. 2000) or be correlated with another personality characteristic that is important for performance, such as trustworthiness. Third, people may be biased in favor of more attractive individuals, conditional on other characteristics and productivity (e.g., Langlois et al. 2000; Andreoni and Petrie 2008; Ponzo and Scoppa 2012; Ravina 2012). Finally, more attractive people may sort into occupations where beauty is more rewarded, possibly because attractiveness itself may be productive in some settings (Hamermesh and Biddle 1994; Biddle and Hamermesh 1998).[12]

[12] For example, more attractive solicitors may bring in more donations, which would justify paying them a higher salary (Landry et al. 2006).

In theory, it is possible that some portion of attractiveness can be explained by investment rather than inherent beauty. To our knowledge, there is little work addressing the potential endogeneity of beauty and no way to fully eliminate such endogeneity concerns.[13] We control for race and financial aid in all our regressions, which should eliminate some components of beauty that may be correlated with socioeconomic characteristics and thus a student's ability to invest into appearing more attractive. Our results are very robust to excluding these controls, and our summary statistics suggest that beauty is not strongly correlated with most of these characteristics.

We first estimate the relationship between the attractiveness rating and admission ratings. Because the admissions committee does not observe applicant appearance directly, any correlation between attractiveness and the admission rating will be due to more attractive students differing in the quality of their recommendation letters, extracurricular activities, personal essays, interviewer notes, or other application characteristics.

$$Admissions_i = \alpha Rating_i + X_i'\gamma + \varepsilon_i \qquad (1)$$

where i represents the alumna and $Admissions_i$ is the average admission rating assigned to her by three or more raters. The variable $Rating_i$ is the alumna's attractiveness rating, and X_i is a vector of student characteristics, including math and verbal SAT scores, a set of race indicators, the logs of grant and loan amounts, and year-of-enrollment fixed effects. We add 1 to the grant

[13] One paper that explicitly considers investment in attractiveness is Hamermesh et al. (2002), who find that there is a positive relationship between attractiveness and spending on clothing and cosmetics.

and loan amounts prior to taking their logs to avoid missing observations.[14] In a related specification, we allow the coefficient on the attractiveness rating to vary by the attractiveness quintile to test for non-linear effects.

We then estimate the relationship between attractiveness and GPA, controlling for standardized test scores, the admission rating, and student characteristics.

$$GPA_i = \beta Rating_i + X_i'\gamma + \varepsilon_i \qquad (2)$$

where GPA_i is the student's grade point average on a 0–4 scale. In this case, β may be capturing the effect of bias, sorting, or skill differences that are correlated with attractiveness but are not adequately controlled for by our ability measures.[15]

In order to remove the influence of sorting, we also estimate the relationship between attractiveness and course-level grades. Specifically, we include a rich set of course-level controls to eliminate any beauty premium driven by differential course choices.

$$Grade_{ijt} = \beta Rating_i + Ability_i'\delta + X_i'\rho + Z_j'\gamma + \theta_d + \mu_{at} + \pi T_d + \sigma T_d P_t + \varepsilon_{ijt} \qquad (3)$$

where i indexes individuals, j indexes courses, and t indexes semesters.[16] The variable $Grade_{ijt}$ is the course grade, measured on a 0–4 scale. The vector Z_j is a set of course-level characteristics, namely the gender of the instructor, total enrollment (in logs), and whether the

[14] Our results are generally robust to the exclusion of controls for financial aid, year of enrollment, and race.
[15] In theory, β may also be capturing direct productivity differences associated with attractiveness itself (e.g., a more attractive model or actor may earn more money because her attractiveness makes her more productive). However, we think direct productivity differences are highly unlikely to be present in a college setting.
[16] Fall and spring semesters in two different years are treated as different semesters.

course is a beginning, intermediate, or advanced course. Finally, θ_d is a set of department fixed effects (e.g., English, Mathematics, Physics), and μ_{at} denotes course-area-by-semester fixed effects (e.g., humanities in Fall 2005, sciences in Spring 2008). The variable T_d indicates whether the department had a grade average exceeding a B+ prior to the implementation of the anti-grade-inflation policy and P_t is equal to one for the fall semester of 2004 and later. Standard errors in this specification are clustered by student.

Finally, we explicitly estimate the amount of beauty-based sorting into distinct fields of study, using a probit specification.

$$I[Major = M]_i = \beta Rating_i + X_i'\gamma + \varepsilon_i \tag{4}$$

where $I[Major = M]_i$ is an indicator equal to 1 if a student i is majoring in area M and 0 otherwise. We estimate this relationship separately for five areas of study: humanities, sciences, social sciences, economics, and area studies. The classification of majors into these five areas is detailed in Appendix B. We estimate an analogous equation for career choices.[17]

4. Results

4.1 Admission ratings and test scores

Our first line of inquiry is to test whether attractiveness is correlated with the admission rating of the student. This test addresses the important question as to whether more attractive applicants differ from less attractive ones prior to college attendance, at least in our sample.

[17] We also replicate the sorting estimate using a multinomial logit specification and find similar results.

Although the admissions committee does not observe everything about the applicant, the applications contain much more information than is available in our data, including extracurricular activities, recommendation letters, and personal essays. Through these, it is possible that the admissions committee receives signals about other skills that predict college success and that may be correlated with attractiveness. Because the admission rating is assigned without observing the student's appearance, any correlation between the two will be due to beauty-based differences in application characteristics, such as those listed above, rather than bias on behalf of the reviewer. However, there may still be beauty-based bias reflected in the admission rating if, for example, letter writers write better letters for more attractive students, all else equal.

The results of this analysis are shown in Table 3. All specifications include controls for the year of enrollment, the student's race, and logs of financial aid amounts by category (need-based loans, other loans, and grants), with 1's added to avoid missing values. Although the admission ratings of more attractive students are worse on average (Columns 1-4), we find that this is entirely driven by SAT scores. Once we control for math and verbal SAT scores (Columns 5-8), there is no relationship between the admission rating and attractiveness.[18] The non-linear specifications in Columns 3 and 4 shows that the lower admission rating of more attractive applicants is driven mainly by those in the top quintile of attractiveness. However, this difference also disappears once we control for SAT test scores (Columns 7 and 8). Using the estimates in Column 5, we can reject a very small beauty premium of 0.044 or larger in admission ratings with 95% confidence, which is equivalent to about 0.68% of the mean admission rating. Our

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[18] We do not control for the SAT writing section score because it was not offered until 2005, and including it would significantly reduce our sample size.

results are very robust to controlling for the applicant's state or (for international students) country of residence, which proxies both for any geographic differences in beauty and rater fixed effects.

Table 3 provides strong evidence against the possibility that attractiveness is correlated (on net) with characteristics that admissions officers can observe but we cannot, at least in our sample of admitted women. In addition, when we estimate the relationships between attractiveness and observable characteristics that do not directly affect the admission rating but might affect the probability of admission *conditional* on the admissions rating (including race, legacy status, and geography), we find almost no significant correlations. Because appearance is not observed by those making the admissions decisions, it is thus difficult to think of a mechanism through which more attractive students would be more likely to be admitted, all else equal, but would not have better admission ratings. However, because we do not have information on individuals who applied but were not admitted, we cannot fully rule out this possibility.

The summary statistics in Table 1 along with the results in Table 3 suggest that more attractive students in our sample perform worse on standardized tests. To test this directly, we estimate the relationship between (a) SAT and QR scores and (b) attractiveness. Because these tests are scored blindly, there is no concern that examiners are discriminating against or in favor of more attractive people.

The results are shown in Table 4. Columns 1, 3, 5, and 7 show the results of considering a simple linear relationship between attractiveness and test scores. A one s.d. increase in attractiveness is associated with a 0.10 s.d. decrease in the individual's math SAT score, a 0.14

s.d. decrease in the verbal score, and a 0.45 s.d. decrease in the writing score. Finally, more attractive students score about 0.20 s.d. lower on the first-year QR score. These results are very robust to varying the set of included controls.

In Columns 2, 4, 6, and 8, we show the results of allowing the relationship between attractiveness and test scores to vary by attractiveness quintile. For the math SAT section (Column 2), there is a sharp and significant drop in scores only for the top attractiveness quintile: the most attractive students score about 0.29 s.d. lower than the least attractive students. The same pattern holds for the QR test (Column 8). For the verbal section of the SAT, the drop is more gradual, with students in the 3rd, 4th, and 5th quintiles performing significantly and progressively worse than students in the bottom quintile. The most attractive students score about 0.40 s.d. lower than the least attractive students. Finally, we cannot detect any differences by quintile for the writing section of the SAT.

It is important to note that our sample consists of people who have been admitted to the college. A mechanical negative correlation between SAT scores and attractiveness among the sample of admitted women may result from an underlying relationship between attractiveness and unobservable variables that affect the probability of applying to college, such as self-confidence. If more attractive women are more likely to apply to college because of greater self-confidence and the admissions process is somewhat noisy, then there will be a negative relationship between attractiveness and SAT scores in our sample, even if it does not exist in the broader population.[19] Because there is no existing evidence that more attractive individuals are *less* intelligent, self-confidence is a more likely explanation for this result.

[19] We thank the editor for suggesting this channel.

4.2 Grades

The estimates in Tables 3 and 4 demonstrate that more attractive students do not begin college with better credentials. If anything, more attractive students have lower admission ratings because of their lower SAT scores. In addition, they subsequently score worse on a first-year QR test.

A natural follow-up question is whether more attractive students end up performing better in college than their less attractive counterparts. In other words, is there evidence that the beauty advantage develops during college? We should note right away that better performance of more attractive students could occur for a number of reasons: skill, bias on behalf of instructors or classmates, endogenous effort, and selection. We try to directly assess some of these mechanisms below.

Throughout the analysis, we use the math and verbal SAT scores as well as the admission rating as ability controls. The benefit of including the admission rating is that it captures a broader range of skills than SAT scores and appears to be uncorrelated with attractiveness, at least in our sample. However, our results are unchanged if we omit the admission rating from the set of controls.[20]

Table 5 shows the relationship between attractiveness and GPA, with and without controlling for test scores and the admission rating. We consider both first-year and overall GPA. While the latter is a better reflection of overall student performance, the former might be more relevant for our attractiveness measure, which reflects student appearance in their first year.[21]

[20] Our results are also generally robust to including state of high school/international student fixed effects and to not controlling for the anti-grade-inflation policy. A full set of estimates is available upon request.
[21] von Bose (2012) finds that attractiveness is highly correlated within an individual over time.

Overall, there is no significant relationship between a student's attractiveness rating and her first-year GPA, although the quintile specifications indicate that students in the second quintile have marginally lower GPAs than students in the first quintile. Even though the estimated beauty premium in Column 6 is significantly different from zero, the significance is marginal and the magnitude is not large. The 95% upper bound for this estimate is 0.035 points or about 1% of the mean GPA per one standard deviation of attractiveness. The admission rating is highly predictive of GPA, demonstrating that it is a useful measure of ex-ante student ability.

We next examine whether there is heterogeneity by area of study. Specifically, we consider GPA separately for five study areas: sciences, social sciences, humanities, area studies, and economics.[22] There may be less room for instructor discretion in the sciences. Thus, any difference in GPA in this area is more likely to reflect performance differences or selection rather than instructor bias. More broadly, attractive students may select into study areas in which they have a comparative advantage.

Table 6 shows the results. More attractive students have a marginally higher GPA in the sciences, but there is no significant difference between more and less attractive students in any of the other study areas. However, the standard errors on the point estimates are fairly large, and we cannot rule out the possibility that the point estimates in all five areas of study are equal to each other. The magnitudes of all the estimates are fairly small.

We next examine the relationship between course-level grades and attractiveness. The advantage of considering course-level grades is that we can control for possible beauty-based selection into different areas of study. For example, if more attractive students take more

[22] For a discussion of how we classify majors and courses into study areas, see Appendix B.

humanities courses and humanities courses generally have higher grades, then we would find a selection-driven "beauty premium" at the student level. However, at the course level, we can control for this and many other selection channels by including fixed effects for the course type (humanities, sciences, social sciences, area studies, economics, and other) and department (e.g., Mathematics, French, English). We also include course-type-by-semester fixed effects, year-of-enrollment fixed effects, race fixed effects, and financial aid amounts as controls. We exclude independent study courses, which are very different from the typical course in our sample. This omission does not substantively affect our results. Standard errors are clustered at the student level.[23]

The results are shown in Table 7 and indicate that there is no significant correlation between attractiveness and course-level grades. The point estimates are positive and similar in magnitude to those shown in Table 5. The inclusion of SAT scores and admission ratings increases the magnitude of our point estimates, but they remain small and statistically insignificant. The results are robust to excluding the course-level controls listed above, to not controlling for the anti-grade-inflation policy, and to using only QR test scores or admission ratings as ability controls.[24]

Despite the inclusion of extensive controls, our course-level estimate of the effect of beauty in Column 5 of Table 7 is very similar to the corresponding student-level estimate in Column 6 of Table 5. The standard errors are identical to the second decimal point, while the point

[23] Including course fixed effects in the course-level regressions does not alter our results. However, due to the small number of observations per course (mean of 8, median of 5), we do not use course fixed effects in our preferred specification.
[24] For space reasons, we do not show these specifications. Results are available upon request.

estimates only differ by 0.001. Furthermore, the course-level estimate is only marginally *insignificant* at the 10% level, while the student-level estimate is only marginally significant.[25]

We next test for heterogeneity in the beauty premium between small and large courses and between male and female instructors. We use two measures of course size: an indicator for below- and above-median enrollment (18 or fewer v. 19 or more students) and indicators for enrollment size quartiles. We might expect males to be more responsive to female attractiveness than females (e.g., Landry et al. 2006). We might also expect the beauty premium to be larger in smaller courses because the appearance of individual students is easier to observe.[26]

The results are shown in Table 8. Overall, it appears that there is a modest and marginally significant beauty premium in courses taught by female instructors and in courses with above-median enrollment, which is inconsistent with a beauty premium due to bias. There is also a marginally significant beauty premium in the smallest course size quartile (13 students or fewer), with more attractive students receiving grades that are 0.027 points higher. However, as the p-values from the test of equality show, we cannot reject the hypothesis that the rating coefficients in each specification are equal to each other. Moreover, the point estimate for courses with below-median enrollment is actually *larger* than that for courses with above-median enrollment.

Overall, we find little evidence for a meaningful beauty advantage for college grades: while more attractive women have a marginally higher GPA overall, they do not receive significantly higher grades once we control for a rich set of course characteristics. There is also

[25] More generally, estimates from a regression that uses aggregated data can be recovered exactly in a regression that uses the disaggregated version of the same data by utilizing proper weights and clustering. Our course-level regressions exclude some courses that would be used in the calculation of overall GPA, such as independent study. However, if we were to aggregate the course-level data to the student level, we would get estimates that are very similar (and marginally significant) to those in Table 5.

[26] Note that “large” courses have 33 students enrolled on average, with 121 students being the largest class size in our sample.

some evidence of a marginal beauty premium in small courses and in courses taught by female instructors, but we cannot rule out the null hypothesis of no heterogeneity in these course characteristics. Our interpretation of these results is that the role of attractiveness in college grades is at best economically insignificant. The fact that there is no significant heterogeneity across areas of study, instructor gender, or class size suggests that any beauty advantage is not due to bias.

4.3 Sorting

Our final goal is to assess whether more attractive students make systematically different choices in terms of course and major selection. First, we consider the propensity of more attractive students to take courses in five general subject areas: humanities, social sciences, science, area studies, and economics. The dependent variable is the percent of courses taken by the student in that particular subject area.

The results are shown in Table 9. Conditional on their test scores and admission ratings, more attractive students take 1.59 percentage points more economics courses and 1.92 percentage points fewer science courses. There is no selection into other social sciences, humanities, or area studies courses. The pattern of selection by attractiveness quintile suggests that the most attractive women select out of science courses and into economics courses almost one-for-one: women in the fourth and fifth quintile of attractiveness take 3.3 and 4.5 percentage points fewer science courses, respectively, and 3.0 and 4.4 more economics courses, respectively, than the least attractive women. Thus, there is substantial beauty-based course selection.[27]

A natural follow-up question is whether more attractive students are also less likely to major in sciences and more likely to major in economics. We investigate this sorting hypothesis by regressing an indicator variable for whether the student is in a particular major on her attractiveness rating and various controls, using a probit specification. Some students have multiple majors and may thus appear in multiple categories.

The results are shown in Table 10. The estimated coefficients have been scaled by 100 to make them easier to read. As expected given the results in Table 9, more attractive students are significantly less likely to major in the sciences and significantly more likely to major in economics. The marginal effects at the mean indicate that a one s.d. increase in attractiveness is associated with a 5.4% decrease in the probability of majoring in science and a 3.5% increase in the probability of majoring in economics. There is no significant selection into humanities, other social sciences, or area studies majors.[28] The selection out of the sciences and into economics is again driven by the top two quintiles of attractive women, although the likelihoods appear to change monotonically with the quintile.

Finally, we test for beauty-based sorting into occupations, using a probit model. The estimated coefficients, scaled by 100, are shown in Table 11. Because occupation choice occurs shortly before or after final GPA is known, we include it as a control. However, our results are robust to not controlling for GPA.

[27] It does not seem to be the case that more attractive students take easier courses, as measured by the average of other students' grades in those courses or by whether the course was affected by the anti-grade inflation policy.
[28] Other majors that make up a significant fraction of the sample, namely psychology, English, and political science, likewise show no beauty-based selection (results not shown).

We find that more attractive women are much more likely to become consultants or managers and much less likely to enter technical or scientific fields.[29] Specifically, a one s.d. increase in attractiveness is associated with a 6.4% increase in the probability of becoming a consultant or manager and a 2.2% decrease in the probability of becoming a scientist or a technician. This is consistent with our earlier results on major choice. There is no significant beauty-based selection into administrative fields, art and advertising, or teaching. Similarly, we find no selection into the medical or legal professions or into non-profit/government jobs (results not shown). Our results are similar if we do not use any controls.

We lack occupation information for almost half of the alumnae in our sample. However, the fact that the findings in Table 11 mirror those in Tables 9 and 10 makes us more confident that they are not driven by selective reporting. The response rate in our data is similar to (and, if anything, slightly higher than) the response rate of the alumnae pool from which we draw our sample. Finally, we also show the probability of responding to the occupation survey is not affected by attractiveness (see Online Appendix Table A1).

Because the decisions of whether or not to major in economics and science are not independent, we also replicate the analysis in Tables 10 and 11 using a multinomial logit specification.[30] It is not our preferred specification, however, because it does not allow for multiple categories. About 25% of the women in our sample are double majors and about 8% report occupations that can be classified into multiple categories. We address this issue by randomly assigning women who fall into multiple categories into one of them. Based on the

[29] Our results are robust to considering "consultant" and "manager" separately, combining "lawyer" and "doctor," combining "doctor" and "other medical," and considering "art" and "advertising" separately.
[30] We use a multinomial logit model instead of a multinomial probit because the latter does not always converge in our sample. However, the multinomial probit specifications that do converge give very similar results.

results in Tables 10 and 11, we combine social science, humanities, and area studies majors into a single category. Similarly, we combine the administrative, art/advertising, and teaching categories. The results, shown in Appendix Table A2, confirm that more attractive women are more likely to choose to major in economics and less likely to choose to major in science. Similarly, more attractive women are less likely to go into science and technical fields and more likely to become consultants or managers.

We also estimate the amount of sorting taking into account the fact that major and career choices are related. Specifically, we estimate the multinomial logit selection models in a seemingly unrelated regressions framework. The results are shown in Appendix Table A3. The estimated effect of beauty on majoring in economics is no longer significant, likely due to the fall in sample size, although the estimated coefficient remains positive. The other findings are very similar to the simple probit results.

4.4 Heterogeneity

It may be interesting to explore whether there are racial differences in the role of beauty.[31] About one-fifth of the students in our sample are Asian and about sixty percent are white, making it possible for us to look at these two groups separately. Overall, our findings are unchanged, albeit splitting the sample makes our estimates less precise. Specifically, we still find a significant relationship between attractiveness and SAT scores and between attractiveness and the admission rating for white students, but not for Asian students. However, we cannot reject the null hypothesis that the relationship is the same for Asians and whites. More attractive Asian and white students are both less likely to major in science and more likely to major in economics.

[31] Results are available upon request.

The only substantial difference between the two races is that more attractive Asians are significantly less likely than attractive whites to go into science or technical careers. This may be due to cultural differences, which suggests an interesting direction for future research.

We also look at heterogeneity in the beauty premium by whether the course is in the student's own major study area. We find that, unsurprisingly, all students receive higher grades in their chosen study area (Table A4 in the Online Appendix). However, controlling for course- and student-level effects, it appears that more attractive students receive higher grades *outside* of their own major area, which suggests that more attractive students would achieve higher GPAs if they selected a different major. This is not driven by our finding that more attractive students select into economics and out of science courses, as we do not find a beauty premium by course type (Table A5 in the Online Appendix). One possibility is that students take into consideration future career options and the associated beauty premiums that stem from selecting a particular major. If a given major leads to an occupation where one would expect a significant beauty premium, then, regardless of the expected grades, a relatively attractive student may choose that major over another one that would result in a career where beauty does not pay as much.

5. Discussion and Extensions

Our results show that more attractive students do not begin college with better credentials relative to their less attractive peers, as measured by their admission rating. Quite the opposite, more attractive students have lower math and verbal SATs than their less attractive peers. They appear to earn slightly better grades during college, all else equal, but the estimates are only marginally significant and not economically meaningful. However, we find substantial sorting into majors and occupations, with more attractive women being (a) more likely to major in economics and subsequently become managers and consultants and (b) less likely to major in science and subsequently become technicians and scientists. In this section, we consider the implications, interpretations, and robustness of our findings.

First, we consider whether the absence of a correlation between the admission rating and attractiveness implies that more attractive women are no more likely to be admitted to college than their less attractive peers. This will not necessarily be the case. For example, if more attractive women are also more self-confident, they may be disproportionately more likely to apply to a selective college than their less attractive peers. In this case, even if the admissions process is not biased in favor of attractive applicants, there will be relatively more attractive women in the admitted sample. If there is also a random component in the admission decision, the self-confidence hypothesis could also explain the negative correlation between attractiveness and SAT scores in our sample.

Another possibility is that beauty *directly* affects the probability of admission, conditional on the admission rating. Because we do not observe the admission ratings or appearance of those who were not admitted, we cannot test for this directly. However, we can provide some indirect evidence against this hypothesis. First, because the admissions committee does not observe the applicant's appearance, it is unlikely that appearance has an effect separate from the admission rating, unless it is correlated with other observables that are not directly reflected in the admission rating.[32] Second, we test whether beauty is correlated with other factors that might affect admission *conditional* on the admission rating. Specifically, we estimate the pairwise

[32] Factors that may affect the chance of admission conditional on the admission rating include race, the applicant's place of residence (e.g., Massachusetts versus Nebraska), high school quality, parental income, whether the student is the first to go to college in her family, and legacy status, among others.

correlations between beauty and Census region indicators, race indicators, international status, legacy status, and parental income, as proxied for by the amount of grants and loans the student receives. The only variable that is correlated with beauty is the "Latina" indicator. This provides some indirect evidence against the idea that more attractive women are more likely to be admitted to college. Third, we have also broken down the sample into those who are more and less likely to be marginal admits. When we did this, we found no significant relationship between attractiveness and the admission rating among students with either above-median or below-median admission ratings. Finally, we test whether attractiveness moderates the importance of test scores in the admission rating by interacting test scores with the attractiveness rating and find that it does not.[33]

Despite these suggestive patterns, we cannot definitively rule out all selection concerns at the admission stage without information on those who applied but were not admitted. For example, it is possible that the admission committee uses qualitative aspects of the application (such as leadership or extracurricular activities) to a greater extent when making the admission decision for lower ranked applicants. In this case, more attractive individuals would have a higher probability of being admitted *conditional* on their admissions rating. Testing for this kind of selection with appropriate data is a fruitful area for future research.

To our knowledge, the finding that more attractive people perform worse on standardized tests is new: previous work has found that more attractive individuals attain either equal or higher test scores relative to their less attractive peers. Although standardized test scores have been shown to be correlated with broad measures of intelligence and cognitive ability (Frey and

[33] Results are available upon request.

Detterman, 2004; Beaujean et al., 2006; Rohde and Thompson, 2006; Koenig et al., 2008), we do not claim to show that more attractive students are less intelligent or even that they score lower on the SATs in the general population. Because our sample is conditional on being admitted to college, several interpretations are possible, and further investigation is warranted. As discussed above, it may be that this negative correlation arises in our sample because more attractive women are more self-confident, applying to more selective schools. It may be that more attractive individuals invest less (costly) effort into preparing for the SAT because of better outside options than their less attractive counterparts. In this case, we would expect to find a negative correlation between attractiveness and SATs among all SAT takers. Alternatively, it may be that the negative correlation between SAT scores and beauty is only present at the top end of the SAT score distribution. Testing these hypotheses would be a fruitful area for future research.

It is worth considering the implications of our sorting results for earnings. In experimental settings, both Arcidiacono et al. (2011) and Wiswal and Zafar (2012) show that students' perceptions of expected earnings and ability are significant predictors of major choice. Likewise, Berger (1988) finds that individuals choose majors that they perceive as being more likely to provide a larger stream of earnings. Thus, it is likely that some of the beauty-based selection in our sample is driven by earnings expectations.

Similarly, the existence of earnings differentials across majors is well-documented (see, e.g., Daymont and Andrisani 1984, Grogger and Eide 1995, Loury 1997, and Arcidiacono 2004). Overall, researchers find that students majoring in fields such as business/economics, science, and engineering generally earn more than those majoring in humanities, education, and other social sciences. These differences persist even after controlling for selection on observables (Andrews et al. 2012). Because we find that more attractive women are less likely to major in the sciences but more likely to major in economics, this previous research has ambiguous implications for our findings.

Unfortunately, wage information for our sample is not available. However, to see whether career choice can partially explain the beauty premiums found in other literature, we can perform a back-of-the-envelope calculation by matching the occupations chosen by the women in our sample to occupation-specific earnings data. The largest sample of earnings by occupation that we are aware of is the Current Population Survey (CPS). We use data from 2003-2009 and restrict the sample to college-educated women 35 and under to make it comparable to our alumnae data while maintaining a large enough sample size. Whenever possible, we match the occupations and positions provided by the alumnae to the CPS occupational categories. We are able to do so for 369 out of 413 cases. We then calculate the average wage and salary income within each CPS occupation category and apply it to the alumnae who reported a matching occupation category. In most cases, we have a few hundred observations per occupation.

The results, shown in Table 12, provide some suggestive evidence that sorting is important for the beauty premium. The point estimates imply a positive beauty premium of 1.9-2.5%, although we lack the power to detect whether they are different from 0. This range is very similar to the estimates of Scholz and Sicinski (2014), who estimate a baseline beauty premium of 2-2.6% per standard deviation of attractiveness in a sample of men who graduated from high school in 1957.

Because the Scholz and Sicinski (2014) sample has only men and is from a time period when women's labor market participation patterns were very different from today, we turn to another dataset where earnings, attractiveness ratings, and demographic characteristics are available. In the National Longitudinal Study of Adolescent Health (Add Health), which von Bose (2012) uses in her study, we estimate that the beauty premium is 3.7-4.1% per standard deviation of attractiveness.[34] Thus, our back-of-the-envelope calculation implies that career choices may explain at least half of the beauty premium.

In addition to sorting into higher-paying occupations, it may be that individuals are selecting occupations where, conditional on mean earnings, beauty is more rewarded. Our estimates would predict that more attractive individuals earn relatively more money in management and consulting than in science, compared to their less attractive peers. To test this possibility, we again turn to the Add Health dataset, which contains descriptions of respondents' occupations. We use the same method as the one used in our sample of alumnae to classify occupations into broad categories.

The results are shown in Table 13. We estimate a highly significant return to beauty of 9-12% in consulting and management careers. Among college-educated women, it is 9.6%. Our estimates for the beauty premium among scientists are insignificant, possibly because only 150 individuals in the Add Health data can be classified as scientists and only 52 of them are women.

[34] Results are available upon request. The beauty premium for males is similar. In the paper itself, von Bose (2012) uses indicators for attractiveness categories rather than standard deviations.

However, among women, the estimated return to beauty is 4.4%, less than half as large as the return in consulting/management.[35]

Finally, it is possible, but not easily testable, that the observed sorting in our data can be explained by different preferences. For example, if more attractive individuals are also more extroverted, they may prefer to enter jobs where they are more likely to work with others, even if this does not result in higher wages. To our knowledge, however, there is no work showing the existence of a correlation between attractiveness and personality traits that would lead a more attractive person to choose one career over another, all else (including wages) remaining equal.

6. Conclusion

The issue of beauty-based discrimination has gained increasing attention in recent years. Prior literature has found that more attractive people earn more on average. However, much remains unknown about the origins of the beauty premium, including whether there are differences in ability, confidence, or other unobservables between more and less attractive individuals, and the extent of bias and sorting that occurs. We contribute to the literature by considering whether there is a beauty advantage before and during college and by estimating the extent to which beauty-based sorting occurs.

More attractive women do not appear more academically capable at the point of college admissions. On the contrary, they receive lower admission ratings, even though the application

[35] Appendix Table A5 shows the estimated beauty premiums in other occupations. In general, the estimates are imprecise, and, with the exception of one estimate for art and advertising and one for administrative and retail occupations, none is as high as the estimated premium in consulting/management.

readers never directly observe applicant appearance. This is because more attractive women in our sample have lower SAT scores.

We find no meaningful relationships between college grades and attractiveness. However, we find substantial beauty-based sorting into areas of study, with more attractive women being significantly less likely to major in the sciences and much more likely to major in economics. They are also subsequently less likely to work in science-related or technical fields and more likely to become consultants, analysts, or managers.

Given our results and prior literature, the patterns we observe are most consistent with more attractive women having greater self-confidence and thus being more likely to apply to (and subsequently get into) a selective college. There is no evidence that more attractive people are more able on average, although they appear to have comparative advantages in some areas, leading to beauty-based sorting. Finally, there is no evidence of bias in favor of more attractive women at the college level. Overall, our findings show that the main difference between more and less attractive people during college appears to lie not in the grades they receive but rather in the major and career choices they make.

The policy implications of our findings hinge on whether the observed sorting is efficient. It would be efficient, for example, if more attractive students are selecting into certain majors and occupations because of productivity expectations. If, on the other hand, the sorting is due to attractive students' anticipating a pro-beauty *bias* in some professions then it may not be optimal from a social point of view. This line of inquiry falls outside the scope of this paper. However, it is worthwhile to note that even if the observed sorting is not socially optimal, policies designed to prevent it would most likely be impracticable.

The results suggest several directions for future research. First, reproducing the analysis with a mixed-gender group of college graduates would enhance our understanding of gender differences in the role of appearance in undergraduate education. Second, studying more post-graduation outcomes, such as labor force status, earnings, and history of promotions would shed light on how the beauty premium for college graduates evolves after they have entered the labor market.

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Tables

Table 1: Summary Statistics

	Above median attractiveness rating					Below median attractiveness rating				
	Mean	Std. dev.	Min	Max	Obs	Mean	Std. dev.	Min	Max	Obs
Attractiveness rating	0.70***	0.54	-0.03	2.42	397	-0.69	0.47	-2.69	-0.03	397
Admissions rating	-1.37***	0.14	-2	-1	397	-1.34	0.13	-1.83	-1	395
Total GPA	3.48	0.28	2.5	3.98	396	3.48	0.29	2.3	4	396
Humanities GPA	3.50	0.29	2.11	4	397	3.48	0.32	1.34	4	394
Social Science GPA	3.50	0.29	2.44	4	395	3.50	0.29	2	4	393
Science GPA	3.24	0.49	1.56	4	395	3.22	0.52	1.4	4	395
Area studies GPA	3.52	0.38	2.33	4	125	3.48	0.43	2	4	140
Economics GPA	3.23	0.53	1	4	223	3.24	0.57	1	4	204
Math SAT score	678***	62	510	800	387	689	57	490	800	378
Verbal SAT score	696***	61	490	800	387	712	59	450	800	378
Writing SAT score	699*	67	490	800	274	710	66	500	800	277
QR test score	13.08*	2.65	2	18	397	13.42	2.55	4.5	18	397
Passed QR test	0.93	0.25	0	1	397	0.95	0.22	0	1	397
Asian	0.21	0.41	0	1	397	0.22	0.41	0	1	397
Black	0.03	0.16	0	1	397	0.04	0.2	0	1	397
White	0.61	0.49	0	1	397	0.64	0.48	0	1	397
Hispanic	0.05**	0.21	0	1	397	0.02	0.14	0	1	397
Latina	0.07**	0.26	0	1	397	0.03	0.18	0	1	397
Need-based loans ($)	1,759	3,438	0	15,795	397	1,492	3,080	0	17,675	397
Grants ($)	47,524	54,836	0	202198	397	51,202	57,598	0	199368	397
Other loans ($)	891**	3,424	0	24,700	397	500	1,864	0	14,500	397

Stars indicate significant differences in means from the "below median" group. Significance levels: *10 percent, ** 5 percent, *** 1 percent. Social science GPA excludes economics.

Table 2: difference between the general student population and those giving consent

	(1) Math SAT	(2) Verbal SAT	(3) Writing SAT	(4) QR test score	(5) Admission rating	(6) Year enrolled
All students	674	684	683	12.94	6.22	2002
Consenting minus all	9.13***	20.08***	21.36***	0.31***	0.26***	0.53***
Observations	5,894	5,894	4,544	6,158	6,155	6,160

Significance levels: *10 percent, ** 5 percent, *** 1 percent.

Table 3: Attractiveness and admissions ratings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Attractiveness rating	-0.131***	-0.112**			-0.038	-0.034		
	(0.049)	(0.049)			(0.042)	(0.043)		
Attractiveness quintile = 2			0.010	0.005			0.046	0.035
			(0.146)	(0.144)			(0.128)	(0.126)
Attractiveness quintile = 3			0.005	-0.026			0.131	0.081
			(0.138)	(0.135)			(0.121)	(0.122)
Attractiveness quintile = 4			-0.146	-0.147			-0.027	-0.044
			(0.146)	(0.144)			(0.128)	(0.123)
Attractiveness quintile = 5			-0.409***	-0.363**			-0.128	-0.125
			(0.150)	(0.149)			(0.132)	(0.134)
Math SAT score					0.432***	0.428***	0.429***	0.424***
					(0.050)	(0.052)	(0.050)	(0.052)
Verbal SAT score					0.408***	0.388***	0.409***	0.389***
					(0.045)	(0.045)	(0.045)	(0.045)
State/country fixed effects?	No	Yes	No	Yes	No	Yes	No	Yes
Dep. var. mean	6.48	6.48	6.48	6.48	6.51	6.51	6.51	6.51
Observations	791	791	791	791	762	762	762	762
R-squared	0.13	0.23	0.13	0.23	0.35	0.42	0.35	0.42

Robust standard errors in parentheses. Significance levels: *10 percent, ** 5 percent, *** 1 percent. All specifications include year of enrollment and race fixed effects, as well as controls for the amount of financial aid received.

Table 4: Attractiveness and test scores

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Math SAT		Verbal SAT		Writing SAT		QR test	
Attractiveness rating	-0.10***		-0.14***		-0.45*		-0.20**	
	(0.03)		(0.03)		(0.26)		(0.09)	
Attractiveness quintile = 2		0.04		-0.14		-1.37		0.00
		(0.10)		(0.11)		(0.86)		(0.27)
Attractiveness quintile = 3		-0.12		-0.27**		-1.08		-0.20
		(0.10)		(0.11)		(0.83)		(0.29)
Attractiveness quintile = 4		-0.08		-0.30***		-1.43		-0.31
		(0.10)		(0.11)		(0.89)		(0.27)
Top attractiveness quintile		-0.29***		-0.40***		-1.22		-0.55**
		(0.10)		(0.11)		(0.86)		(0.27)
Dep. var. mean	11.37	11.37	11.59	11.59	70.44	70.44	13.25	13.25
Observations	764	764	764	764	551	551	793	793
R-squared	0.22	0.22	0.11	0.11	0.12	0.12	0.12	0.12

Robust standard errors in parentheses. Significance levels: *10 percent, ** 5 percent, *** 1 percent. All specifications include year-of-enrollment and race fixed effects, as well as controls for the amount of financial aid received.

Table 5: Attractiveness and GPA

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	First year GPA				Overall GPA			
Attractiveness rating	-0.003	0.012			0.004	0.016*		
	(0.012)	(0.012)			(0.010)	(0.010)		
Attractiveness quintile = 2			-0.076*	-0.077*			-0.069**	-0.072**
			(0.040)	(0.040)			(0.032)	(0.032)
Attractiveness quintile = 3			0.009	0.013			-0.001	-0.002
			(0.035)	(0.035)			(0.028)	(0.029)
Attractiveness quintile = 4			-0.016	-0.002			-0.003	0.007
			(0.037)	(0.036)			(0.030)	(0.028)
Top attractiveness quintile			-0.041	0.003			-0.020	0.015
			(0.037)	(0.036)			(0.031)	(0.029)
Math SAT score		0.034**		0.035**		0.017		0.019
		(0.015)		(0.015)		(0.012)		(0.012)
Verbal SAT score		0.000		-0.001		0.005		0.004
		(0.013)		(0.013)		(0.011)		(0.011)
Admission rating		0.072***		0.071***		0.059***		0.060***
		(0.010)		(0.010)		(0.009)		(0.009)
Dep. var. mean	3.40	3.41	3.40	3.41	3.48	3.48	3.48	3.48
Observations	793	762	793	762	791	760	791	760
R-squared	0.12	0.20	0.12	0.20	0.10	0.18	0.11	0.19

Robust standard errors in parentheses. Significance levels: *10 percent, ** 5 percent, *** 1 percent. All specifications include year-of-enrollment fixed effects, race fixed effects, and financial aid amounts.

Table 6: Attractiveness and GPA by area of study

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Sciences		Social Sciences		Humanities		Area Studies		Economics	
Attractiveness rating	0.028*		0.016		0.016		0.031		0.022	
	(0.017)		(0.010)		(0.010)		(0.025)		(0.027)	
Attractiveness quintile = 2		-0.073		-0.024		-0.059		-0.054		-0.124
		(0.056)		(0.031)		(0.036)		(0.082)		(0.087)
Attractiveness quintile = 3		0.036		-0.011		0.028		-0.028		-0.023
		(0.053)		(0.031)		(0.029)		(0.076)		(0.085)
Attractiveness quintile = 4		0.035		0.039		0.013		-0.026		0.046
		(0.051)		(0.030)		(0.030)		(0.076)		(0.077)
Top attractiveness quintile		0.036		0.028		0.014		0.077		-0.014
		(0.052)		(0.031)		(0.030)		(0.077)		(0.077)
Math SAT score	0.105***	0.107***	0.000	0.000	0.011	0.012	0.045	0.051	0.128***	0.131***
	(0.022)	(0.022)	(0.012)	(0.012)	(0.012)	(0.013)	(0.034)	(0.034)	(0.031)	(0.031)
Verbal SAT score	-0.017	-0.018	0.013	0.012	-0.002	-0.003	0.010	0.004	0.007	0.007
	(0.020)	(0.020)	(0.011)	(0.011)	(0.011)	(0.011)	(0.032)	(0.032)	(0.027)	(0.026)
Admission rating	0.072***	0.071***	0.055***	0.056***	0.057***	0.057***	0.048**	0.051**	0.079***	0.076***
	(0.017)	(0.017)	(0.010)	(0.010)	(0.010)	(0.010)	(0.021)	(0.022)	(0.023)	(0.023)
Dep. var. mean	3.24	3.24	3.50	3.50	3.49	3.49	3.52	3.52	3.24	3.24
Observations	759	759	756	756	760	760	251	251	412	412
R-squared	0.16	0.17	0.19	0.19	0.18	0.19	0.19	0.19	0.24	0.24

Robust standard errors in parentheses. Significance levels: *10 percent, ** 5 percent, *** 1 percent. All specifications include year and race fixed effects, as well as financial aid controls and controls for math SATs, verbal SATs, and admission rating.

Table 7: Attractiveness and course-level grades

	(1)	(2)	(3)	(4)	(5)	(6)
Attractiveness rating	0.003		0.012		0.015	
	(0.011)		(0.010)		(0.010)	
Attractiveness quintile = 2		-0.044		-0.045		-0.046
		(0.032)		(0.032)		(0.031)
Attractiveness quintile = 3		-0.006		-0.001		-0.003
		(0.030)		(0.030)		(0.029)
Attractiveness quintile = 4		-0.001		0.003		0.009
		(0.030)		(0.029)		(0.028)
Top attractiveness quintile		-0.016		0.010		0.021
		(0.031)		(0.030)		(0.029)
Math SAT score			0.059***	0.060***	0.035***	0.035***
			(0.012)	(0.012)	(0.012)	(0.012)
Verbal SAT score			0.034***	0.033***	0.007	0.006
			(0.011)	(0.011)	(0.011)	(0.011)
Admission rating					0.061***	0.061***
					(0.009)	(0.009)
Dep. var. mean	3.44	3.44	3.45	3.45	3.45	3.45
Observations	19,525	19,525	18,872	18,872	18,832	18,832
R-squared	0.12	0.13	0.14	0.14	0.15	0.15

Standard errors clustered by student in parentheses. Significance levels: *10 percent, ** 5 percent, *** 1 percent. All specifications include fixed effects for: department, course level, semester-by-course type, year of enrollment, and race. In addition, controls include the gender of the instructor, total course enrollment (log), and the amount of financial aid received by the student. Course level is either beginning, intermediate, or advanced. Course type is humanities, social sciences, economics, area studies, sciences, or other. Department fixed effects represent a specific department code, such as English, Economics, Physics, etc.

Table 8: Attractiveness and course-level grades heterogeneity

	(1)	(2)	(3)	(4)	(5)	(6)
Female prof x rating	0.007	0.022*				
	(0.013)	(0.012)				
Male prof x rating	-0.002	0.013				
	(0.013)	(0.012)				
Below median size x rating			0.007	0.026		
			(0.016)	(0.016)		
Above median size x rating			0.004	0.020*		
			(0.012)	(0.011)		
Bottom quartile x rating					0.008	0.025*
					(0.013)	(0.013)
2nd quartile x rating					0.000	0.015
					(0.014)	(0.013)
3rd quartile x rating					0.005	0.019
					(0.016)	(0.015)
Top quartile x rating					-0.001	0.012
					(0.015)	(0.014)
Ability controls	No	Yes	No	Yes	No	Yes
Test of equality p-value	0.35	0.29	0.77	0.57		
1st = 2nd quartile p-value					0.48	0.39
1st = 3rd quartile p-value					0.82	0.66
1st = 4th quartile p-value					0.46	0.30
Dep. var. mean	3.44	3.45	3.44	3.45	3.44	3.45
Observations	19,525	18,832	19,433	18,741	19,433	18,741
R-squared	0.12	0.15	0.12	0.15	0.12	0.15

Standard errors clustered by student in parentheses. Significance levels: *10 percent, ** 5 percent, *** 1 percent. All specifications include fixed effects for: department, course level, semester-by-course type, year of enrollment, and race. In addition, controls include the gender of the instructor, total course enrollment (log), and the amount of financial aid received by the student. Course level is either beginning, intermediate, or advanced. Course type is humanities, social sciences, economics, area studies, sciences, or other. Department fixed effects represent a specific department code, such as English, Economics, Physics, etc.

Table 9: Selection into subject areas

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Sciences		Social Science		Humanities		Area studies		Economics	
Attractiveness rating	-1.92***		0.36		-0.05		-0.01		1.59***	
	(0.62)		(0.67)		(0.63)		(0.21)		(0.45)	
Attractiveness quintile = 2		1.95		-4.64**		1.35		0.67		0.84
		(1.95)		(2.10)		(1.96)		(0.65)		(1.42)
Attractiveness quintile = 3		-1.14		-2.72		1.04		0.19		2.11
		(1.94)		(2.08)		(1.95)		(0.64)		(1.41)
Attractiveness quintile = 4		-3.30*		-1.64		2.45		-0.01		2.96**
		(1.94)		(2.09)		(1.96)		(0.65)		(1.42)
Top attractiveness quintile		-4.48**		-0.82		0.51		0.17		4.37***
		(1.96)		(2.11)		(1.97)		(0.65)		(1.43)
Math SAT score	4.30***	4.25***	-4.34***	-4.29***	-3.72***	-3.74***	0.57**	0.56**	3.23***	3.24***
	(0.75)	(0.75)	(0.81)	(0.81)	(0.75)	(0.76)	(0.25)	(0.25)	(0.54)	(0.55)
Verbal SAT score	-1.86***	-1.81**	1.16	1.06	2.26***	2.32***	0.18	0.18	-1.84***	-1.87***
	(0.70)	(0.70)	(0.76)	(0.76)	(0.71)	(0.71)	(0.23)	(0.23)	(0.51)	(0.51)
Admission rating	1.04*	0.99*	-0.69	-0.63	-0.25	-0.26	-0.09	-0.09	0.08	0.10
	(0.57)	(0.57)	(0.61)	(0.61)	(0.57)	(0.57)	(0.19)	(0.19)	(0.41)	(0.42)
Observations	762	762	762	762	762	762	762	762	762	762
R-squared	0.12	0.12	0.08	0.09	0.15	0.16	0.10	0.10	0.14	0.14

Robust standard errors in parentheses. Significance levels: *10 percent, ** 5 percent, *** 1 percent. Dependent variable is percent of courses taken in a particular subject area. All specifications include year of enrollment and race fixed effects, as well as controls for the amount of financial aid received.

Table 10: Selection into majors

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Sciences		Social Science		Humanities		Area Studies		Economics	
Attractiveness rating	-18.17***		3.84		-5.78		10.91		16.49***	
	(5.51)		(4.88)		(4.97)		(7.00)		(6.05)	
Attractiveness quintile = 2		-9.35		-26.57*		5.03		9.99		8.48
		(15.73)		(15.28)		(15.42)		(22.43)		(19.92)
Attractiveness quintile = 3		-24.64		-5.02		-1.14		-9.25		17.52
		(15.79)		(14.88)		(15.27)		(23.52)		(19.78)
Attractiveness quintile = 4		-53.37***		-1.51		9.40		28.61		35.76*
		(16.68)		(14.96)		(15.32)		(20.35)		(18.97)
Top attractiveness quintile		-45.28***		0.64		-21.36		33.15		45.08**
		(16.69)		(15.19)		(16.09)		(20.42)		(19.13)
Math SAT score	30.84***	31.37***	-28.58***	-28.51***	-17.69***	-18.22***	-5.43	-5.64	47.69***	47.83***
	(6.56)	(6.58)	(5.89)	(5.88)	(5.87)	(5.90)	(8.04)	(8.10)	(7.41)	(7.49)
Verbal SAT score	-13.01**	-13.04**	5.43	5.15	4.39	4.83	9.20	9.01	-20.09***	-20.51***
	(6.07)	(6.09)	(5.34)	(5.33)	(5.70)	(5.68)	(7.86)	(7.82)	(6.55)	(6.55)
Admission rating	4.29	4.11	-3.88	-3.66	-2.03	-2.31	1.60	2.07	-1.69	-1.36
	(4.70)	(4.70)	(4.45)	(4.47)	(4.69)	(4.71)	(6.41)	(6.32)	(5.52)	(5.52)
Dep. var. mean	0.24	0.24	0.40	0.40	0.34	0.34	0.09	0.09	0.17	0.17
Observations	760	760	760	760	760	760	760	760	760	760

Robust standard errors in parentheses. Significance levels: *10 percent, ** 5 percent, *** 1 percent. Regression specification is a probit. Dependent variable is an indicator for majoring in a given subject area. All specifications include year-of-enrollment and race fixed effects, as well as controls for the amount of financial aid received.

Table 11: Attractiveness and career choice

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Consultant/manager		Administrator		Art/advertising		Teacher		Technical		Scientist	
Attractiveness rating	20.42***		0.42		-1.37		-13.20		-22.56**		-28.19**	
	(7.24)		(7.63)		(8.42)		(10.42)		(9.40)		(11.53)	
Attractiveness quintile = 2		4.65		-53.31**		-2.26		-38.58		23.68		12.11
		(23.28)		(22.79)		(29.20)		(29.05)		(27.98)		(27.35)
Attractiveness quintile = 3		8.78		-10.30		-0.21		-30.31		31.16		-43.64
		(22.90)		(21.36)		(29.08)		(28.15)		(28.13)		(36.21)
Attractiveness quintile = 4		26.61		-12.09		27.76		-34.78		-85.87**		-48.02
		(22.14)		(21.91)		(28.04)		(27.71)		(42.42)		(33.80)
Top attractiveness quintile		44.08*		-10.37		-22.55		-41.12		-44.57		-62.57*
		(23.12)		(22.49)		(30.07)		(30.65)		(36.25)		(36.45)
Math SAT score	18.38**	17.80**	-18.14**	-17.67**	-17.65*	-19.04*	-12.92	-12.46	9.53	9.08	4.14	3.06
	(8.92)	(8.94)	(8.27)	(8.29)	(9.96)	(10.11)	(11.17)	(11.24)	(12.75)	(12.84)	(12.58)	(12.58)
Verbal SAT score	-5.34	-5.89	-3.16	-3.10	14.43	15.99	5.25	4.49	5.82	8.40	-5.06	-4.44
	(8.61)	(8.54)	(8.56)	(8.45)	(10.05)	(10.30)	(10.67)	(10.65)	(10.23)	(10.76)	(10.65)	(10.81)
Admission rating	-7.12	-6.44	5.30	5.33	-12.63	-12.83	0.82	1.26	-4.12	-8.02	-1.32	-0.27
	(7.37)	(7.26)	(6.68)	(6.64)	(8.10)	(8.13)	(7.47)	(7.54)	(7.89)	(8.03)	(7.29)	(6.81)
GPA	41.00	39.89	-25.96	-34.41	12.90	17.16	26.44	24.41	7.40	16.12	-58.41	-50.27
	(28.36)	(28.54)	(27.18)	(27.63)	(31.27)	(32.64)	(37.78)	(38.80)	(43.80)	(44.14)	(44.79)	(43.70)
Dep. var. mean	0.27	0.27	0.27	0.27	0.14	0.14	0.09	0.09	0.06	0.06	0.06	0.06
Observations	413	413	413	413	349	349	413	413	413	413	383	383

Robust standard errors in parentheses. Significance levels: *10 percent, ** 5 percent, *** 1 percent. Regression specification is a probit. Dependent variable is an indicator for reporting an occupation in the given area. All specifications include year of enrollment and race fixed effects, as well as controls for the amount of financial aid received.

Table 12: Beauty premium implied by sorting choices (CPS data)

	Log(earnings)			Earnings		
Attractiveness rating	0.025	0.021	0.019	973	736	624
	(0.021)	(0.021)	(0.022)	(1,003)	(1,027)	(1,063)
Additional Controls	None	Chars.	Chars. + test scores	None	Chars.	Chars. + test scores
Observations	369	369	357	369	369	357
R-squared	0.062	0.090	0.130	0.065	0.101	0.139

Robust standard errors in parentheses. Outcome variable shown above regression results. All specifications include year of enrollment fixed effects. "Chars." refers to student-level characteristic controls, namely race fixed effects and controls for the amount of financial aid received. Regressions with "test scores" controls also include math and verbal SAT scores.

Table 13: Add Health beauty premium by occupation category

	Consultant/manager				Scientist			
Attractiveness rating	0.096**	0.086***	0.117**	0.092***	0.044	0.044	0.074	0.004
	(0.041)	(0.029)	(0.051)	(0.031)	(0.082)	(0.084)	(0.076)	(0.076)
Females only	Yes	Yes	No	No	Yes	Yes	No	No
College-educated only	Yes	No	Yes	No	Yes	No	Yes	No
Observations	157	383	305	791	50	52	129	150
R-squared	0.167	0.242	0.086	0.134	0.472	0.598	0.160	0.176

Robust standard errors in parentheses. Outcome variable is log of reported earnings. All specifications include year of birth, race, and education fixed effects. Regressions that include males also include a male fixed effect. "College-educated" refers to individuals with *at least* a college education.