Competing with Confidence:
The Ticket to Labor Market Success for College-Educated Women*

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Abstract

This study examines whether the female earnings gap results from gender differences in preferences for competition and confidence. We use laboratory experiments on college seniors to measure tastes for competition and confidence and then track these subjects' labor market experiences in the early years after college. Women's compensation is positively correlated with preferences for competition coupled with confidence while men's compensation is not. Women who exhibit a taste to compete and are confident about their performance earn substantially more than other women and do not earn less than men. Further, enjoying competition or being confident alone is insufficient to raise compensation. Half of this female earnings' effect is explained by college major and labor market controls, but even controlling for these characteristics, a higher taste for competition for the most confident women results in more than a 7% increase in compensation.

Key words: wage gap, gender, experiment, compete, confidence
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1. Introduction

One of the most persistent empirical regularities in the U.S. labor market is the negative female earnings differential. However, the source of this differential has long been in dispute. The debate has been principally between free market economists, who believe that human capital and women's family choices are the source of the differences, and institutional economists, who believe that discrimination and institutional barriers in labor markets prevent women from succeeding to the same extent as men.[1] Recently, a new explanation focusing on personality attributes has surfaced: women are less willing to compete and perform worse under competitive conditions than men, thus reducing their relative ability to perform in the labor market. This argument derives from the laboratory results of two seminal papers: Niederle and Vesterlund (2007) finds that women are far less likely than men to choose competitive payoffs, and Gneezy, Niederle, and Rustichini (2003) shows that men's performance on tasks improves substantially more than women's when moving from piece rate payment to competitive payment. While there have been studies linking preferences for competition with schooling choices (Kamas and Preston, 2012b, and Buser, Niederle, and Oosterbek, 2014), up to now there has been almost no direct attempt to test this hypothesis with empirical labor market data.[2] This paper seeks to fill this gap by linking results on willingness to compete from laboratory experiments run on college seniors to their labor market performance in the early career years. The goal is to determine whether competitiveness, as measured in the laboratory, is correlated with future labor market outcomes, and if so, whether differences in tastes for competition between men and women can explain some portion of the persistent earnings differential. We also examine the role that self-confidence interacted with preferences for competition might play in determining levels of compensation. By focusing on earnings in the years immediately after graduation from college when family duties are presumably less likely to explain earnings differences, we can better isolate the effects of these behavioral characteristics. This paper makes an important contribution

[1] See Bergmann (1989) and Fuchs (1989) for an early discussion of the opposing points of view.
[2] The exception is Reuben, Sapienza, and Zingles (2015) that examines the effect of choosing to compete on salaries of MBA graduates and that we discuss below.

to the economics literature in that it links behavior in laboratory experiments to labor market earnings of the same subjects in their lives outside of the lab, a relationship that is only beginning to be analyzed.

Our results strongly support the hypothesis that a taste for competition and confidence have positive effects on women's earnings. However, it is only the women who both enjoy competitive tournaments and are confident that they will win who earn substantially more; enjoying competition or being confident alone is insufficient. At the same time, men's labor market performance is uncorrelated with measures of competitiveness or confidence. While roughly half of the effect of competing with confidence on women's earnings can be explained by location in the lucrative college majors and jobs, the remainder continues to be sizeable in magnitude and significant; a one standard deviation increase in our measure of taste for competition increases compensation (salary plus bonus) by roughly 7% for women who rank themselves first in an addition tournament. This magnitude increase is comparable to the negative female compensation differential (-6.2%; p=0.049) for a similar compensation equation run on the total sample without measures of confidence and competition. While other factors, such as family responsibilities, may lead to gender differentials in compensation later in their careers, for the years immediately after graduating from college, confidently competing does lead to higher earnings for women.

2. Related literature

The negative female earnings gap, which was fairly steady up until the 1980's, has been falling in magnitude although at a decreasing rate, and in the 21st century it has been nearly stagnant (Goldin, 2014). According to Blau and Kahn (2006), the early progress in the 1980's was fueled by increases in experience and education that enabled women to enter professions traditionally reserved for men and compete for high paying jobs.[3] They find that the decline in the rate of progress through the 1990's was due, to a large extent, to the slowing of the rate of reduction in the unexplained gap in male and female earnings. Indirect evidence supports their hypotheses that the narrowing of this gap slowed down due to a lower rate of convergence of

[3] Blau, Brummund, and Liu (2013) also find that occupational segregation has been declining but at a slowing rate over the period from 1970 to 2009 with the greatest declines in the 1980s. Goldin (2014) points out that a large majority of the current gender earnings gap is within occupation rather than between occupations.

unobserved characteristics correlated with commitment and an increase in discrimination against women at the highest income levels. In particular, the male-female difference in hours spent at housework decreased much more rapidly in the 1980s than in the 1990s. Also, their estimates reveal that the unexplained gap in male-female earnings actually increased in magnitude at the 90th percentile of earnings, implying that the most successful women were hitting a glass ceiling.

Supporting the importance of unobserved variables related to commitment, a number of recent studies looking at earnings profiles of women with high levels of human capital in professional careers have focused on motherhood as a contributing factor to the divergence of male and female earnings.[4] Bertrand, Goldin and Katz (2010) examine MBAs from a top US business school and find that the growing salary differential between men and women over the first 10-16 career years is largely the result of motherhood, which leads to less experience, fewer hours worked, and greater career discontinuity of women. Herr and Wolfram (2009) find that more than 20 percent of Harvard-educated women graduating between 1982 and 1990 leave the labor force after childbirth. With work environment being an important factor behind this decision, they find that MDs are least likely and MBAs most likely to leave. Sasser (2005) documents the growing wage differential for female MDs as they marry and have children. In response to these findings Goldin (2014) argues that a restructuring of jobs away from those rewarding long and specific hours and toward those allowing temporal flexibility is the solution that will equalize intra-occupation earnings of men and women.

There has been less discussion about whether differences in personal characteristics that men and women develop in the socialization process contribute to the persistent unexplained earnings gap. Babcock and Laschever (2003) show that a lower willingness to negotiate has lasting effects on women's earnings relative to their male counterparts. Niederle and Vesterlund (2007) find that women are less willing to compete in math-related tasks than men, when compete means choosing a winner-take-all payoff rather than a piece rate payoff. They then hypothesize that "Gender differences in preferences for competition may be an additional explanation for differences in labor market outcomes; in particular, it may help explain the absence of women in top-level and very competitive positions." A cottage industry of papers on competition and

[4] Wood, Corcoran, and Courant (1993) early on found that the male-female earnings differential for lawyers graduating from a common law school increases with years in the labor force and is largely the result of reduced work hours by mothers.

gender has shown that the gender difference in willingness to compete is a robust finding when the task is a stereotypical masculine task,[5] but conflicting results are found for gender differences in performance in response to competition. Some studies on U.S. subjects have found that these differences can be explained by lower levels of confidence of women (Kamas and Preston, 2012b), and these results naturally point to differences in confidence as an additional potential determinant of the unexplained earnings gap.

A small number of studies investigate the effects of willingness to compete on decisions and outcomes outside of the lab. Some studies examine whether decisions to compete in the laboratory are also observed in the field. Flory, Leibbrandt, and List (2015) carried out a field experiment where jobs were posted with varying amounts of competitiveness in their compensation packages. The difference between the number of male and female applications more than doubled when half of earnings depended on relative performance. In a study of entrepreneurs, Berge et al. (2015) show that willingness to compete in the laboratory is strongly correlated to competitive choices in real-life business decisions. Other studies relate competitiveness to educational outcomes. Buser, Niederle and Oosterbeek (2014) find that gender differences in competitiveness explain roughly 20% of the gender difference in choice of prestigious academic track by secondary school students in the Netherlands. Similarly, Zhang (2013) finds that middle school students in China who are willing to compete in the lab are more likely to take a very competitive exam for entrance to high school that has important effects on career outcomes. Reuben, Wiswall, and Zafar (2017), in a study of NYU undergraduates, find that competitiveness and confidence are positively related to earnings expectations, and gender differences in these laboratory measured characteristics explain 18% of the gender differences in earning expectations. Interestingly they do not find a link between confidence and competitiveness and college major. Buser, Geijtenbeek and Plug (2015) relate competitiveness to both income and education. Comparing men and women with differing sexual orientation, they find that differences in willingness to compete explain almost 30% of the wage premium for heterosexual men relative to gay men, and much of the effect of competitiveness on earnings works through higher levels of education. Finally, and most closely related to this paper, Reuben, Sapienza and Zingales (2015) examine the effects of willingness to compete on earnings in the

[5] Kamas and Preston (2009), Grosse and Riender (2010), and Shurchkov (2012) all find no gender difference in the choice to compete when a verbal task is utilized.

first job of graduates from a high quality MBA program. They find that earnings of subjects who compete are about 9% higher than those of subjects who do not compete, and willingness to compete explains about 1 percentage point of a 10 percent gender earnings differential. Further, willingness to compete is associated with sorting into higher paying industries. This paper extends that analysis by examining whether differences in laboratory measured characteristics of both competitiveness and confidence might explain a portion of the unexplained gender earnings gap in a broader set of college graduates. We also examine the extent to which any labor market effects of these characteristics are the result of differing educational choices that may be correlated with willingness to compete.

Our sample includes college graduates from two selective institutions, Haverford College and Santa Clara University, many of whom will enter high-powered and well-paid professions. While they will not be at the pinnacle of these professions during the time period in which we observe them, they may be positioning themselves on the ladder to success. The fact that they all graduated from just two colleges reduces the heterogeneity of the sample allowing us to assume that general ability and education are relatively similar, at least within schools. We examine the early years of their careers, which has its benefits and drawbacks. As Goldin (2014) points out, the gender gap in earnings may be very small or even non-existent for these cohorts during these early career years. But the benefit is that most women have not yet started families, so their efforts will be primarily focused on their careers, thus improving our ability to isolate the effects of personality and behavior on earnings.

3. Experiment and survey follow-ups

We ran experiments with seniors at Haverford College and Santa Clara University during the springs of 2011, 2012, and 2013.[6] Subjects were recruited through an email request and promised a show up fee of $10 with the opportunity to earn more. After initial instructions, subjects were told they would be led through some exercises, one of which would randomly be chosen to be paid out in monetary compensation. The first exercise is a dictator allocation

[6] The experiment instructions and exercises are provided in the supplementary materials. This paper is part of a larger project that examines the effects of personal characteristics and behaviors measured in the laboratory on labor market outcomes. Therefore, there are exercises in the experiments that are not reported here. In addition, we also ran the experiment on seniors at Wellesley College and Mills College and on frosh at all four schools in fall 2012 to examine whether these relationships differ for women in coed and same-sex schools. These findings will be provided in a subsequent paper.

exercise that we use to measure social preferences. Exercises 2 and 3 are risk eliciting exercises based on the approach of Holt-Laury (2002). Subjects make 15 choices between a certain payoff of $5 and a payoff of $20 if an orange ball is pulled out of a bag. For each choice, the number of orange balls increases by one, from zero to 14 out of 20 total balls. The round in which the subject switches from the sure $5 to the bet indicates risk attitude: the higher the round, the more risk adverse the person. The risk neutral switching point is 5 balls and those who switch at a later round are categorized as risk adverse.

In exercise 4, students are given a sheet of addition problems, each one consisting of three 2-digit numbers. They have two minutes to solve as many of the addition problems correctly as they can, and they earn 60 cents for each correct answer. The 5th exercise involves solving similar addition problems in two minutes. However, subjects are given a choice as to how they will be paid, similar to that provided in Niederle and Vesterlund (2007). They can be paid piece rate as before (60 cents for each correct answer) or they can choose to enter a tournament with three other randomly chosen anonymous students participating in the experiment and, if they earn the highest score, they earn $2.40 times the number of correct answers. If they do not earn the highest score, they get nothing. The decision as to whether to enter this addition tournament is used for our main measure of willingness to compete.

In the 6th exercise we obtain a second measure of willingness to compete by allocating subjects $10.00 and giving them the opportunity to compete with others by betting any of the $10.00 that they will have the highest score in a random group of four participants. The amount they do not bet they keep. Those who earn the highest score in their groups are paid four times the amount bet. Those who do not earn the highest score lose the amount bet. The amount bet is used as an alternative measure of preferences for competition, providing a more nuanced indicator of willingness to compete than the "in or out" choice provided by the winner-take-all tournament. In the 7th exercise, the task is changed to a word game. Subjects are given an eight-letter word and asked to make as many words (three letters or more) using the letters in the given word as they can in two minutes. They are paid 20 cents for each letter in each valid word, with the amount paid designed to equalize mean payoffs between word and math exercises. After the 7th exercise, the subjects are told that they will have the opportunity to compete in the following exercises and that they can choose to participate in either addition or word tasks that are similar to the preceding tasks. Once the subjects pick their tasks, they then repeat exercise 5 (choice to

enter a tournament) and exercise 6 (betting on winning the tournament) for their chosen task. We also use information on which task is chosen and whether subjects choose to compete in their chosen task to create an additional measure of willingness to compete.

After completing the nine exercises, the subjects fill out a survey. While most of the survey gathers data on demographics and high school and college experiences, there are questions asking the subjects to rate how well they think they performed in a random group of four in the addition task and the word task. This question on rank is incentivized with subjects paid a $1 payment for each correct ranking for each question. These ranking questions help us to refine our measures of taste for competition using an element of confidence. The students also give us email addresses intended for use after college graduation so we can contact them for the survey on labor market activities. The students are assured that their individual decisions in the experiment and responses to the surveys will not be linked to their email addresses and that the analysis will take place using assigned code numbers to protect their privacy.

Once graduated, the students received email requests to fill out a survey on Google Forms. The survey has been conducted each spring for six years, and collects information on employment, post-graduate schooling, family formation, and lifestyle choices.[7] Having completed the survey, they were compensated with a ten dollar gift card of their choice at Amazon or Starbucks in 2012 and 2013. The gift card value was increased to twenty dollars in 2014 to order to increase participation. In the first phase of this project, we are surveying graduates for five years after graduation: currently the 2011 graduates have received five survey requests (2012-2016), the 2012 graduates five requests (2013-2017), and the 2013 graduates four requests (2014-2017). From these data we collect information on employment for those individuals who are working.

Table 1 provides the number of subjects from each school in each year. The total number of students participating in the experiments is 624, with 175 at Haverford College and 449 at Santa Clara University. Haverford is a small school with approximately 300 graduates per year so slightly less than 20% of seniors participated. Santa Clara is much larger, with approximately 1,200 to 1,300 graduating seniors, indicating that about 12% participated in the experiments.

Table 2 gives the responses by survey year and employment status of the responders. The response rate by year (row 2) ranges from just under two thirds to almost three quarters of

[7] The survey questionnaire is provided in the supplemental materials.

sampled graduates. In total 83 percent of original seniors who went through the experiments responded to the post-graduation survey at least once. As we include more people with multiple years outside of college, full-time employment increases from 63.2% (2012) to 73.1.% (2017), and few people (3.3%) are unemployed or out of the labor force for reasons other than school.[8]

4. Measuring attitudes toward competition

Willingness to compete and preferences for competition are two related but different concepts which are often mixed up. We can easily measure willingness to compete by identifying those who choose to compete when given the choice between a tournament payoff and a piece rate payoff. But these people are not necessarily those who have a taste for competition. The decision to compete is made depending on one's expected payoff, risk attitude, and taste for competing, while expected payoff is determined by confidence (expected probability of winning) and ability. Thus, the four main determinants of choosing to compete are confidence, taste for competition, ability, and risk attitude. Previous studies have shown that women are less confident and more risk averse than men but studies trying to estimate gender differences in a taste for competition have been inconclusive. All four factors are incorporated in our empirical analysis below; however, taste to compete is difficult to isolate.

We use a creative way to measure the taste for competition, distinguishing this from the choice to compete in the tournament. We know whether a subject picks the tournament or the piece rate compensation in the exercise 5 addition task. We also have a measure of ability in the task, the score in exercise 4, a Holt-Laury measure of risk aversion, as described above, and a measure of confidence, expected rank when competing in a group of four anonymous people (1 is expect to be first and 4 is expect to be last so higher expected rank implies lower confidence). We run a probit equation for decision to compete with the explanatory variables: score on exercise 4, risk aversion score, and expected rank in tournament.[9] From these equations we calculate a residual, the difference between actual choice and predicted probability of choosing

[8] Ten percent of the respondents are married at the last time we observe them so we can be confident that family choices are only impacting labor market choices and outcomes for a small minority of our respondents.

[9] Some respondents give inconsistent answers for the risk aversion exercise by taking the risky bet when there are no orange balls in the bag or moving from the safe to the risky bet and back again to the safe bet with an increase in orange balls. For these people we give the risk aversion score a 0 and then add a dummy variable equal to one for those with inconsistent answers.

the tournament, and we use this residual as our measure of taste for competing. [10] [11] All of the results of this paper are robust to using the decision to compete rather than the residuals but we believe the residuals better measure the taste for competition.

Table 3 gives the results from the probit equation used to create the residuals (column 1) as well as the results from the same probit equation with the addition of a dummy variable for female. Column 1 reveals that all the explanatory variables except the score on exercise 4 have significant coefficients and about a fifth of the variation in decision to compete can be explained by confidence, ability and risk preferences. Also, according to column 2, controlling for risk preferences, ability, and especially confidence, women are not less likely to choose to compete.[12]

Table 4 gives mean levels of the experimental variables for men and women in the total experimental sample and in the sample who returned the labor market surveys, and the results mirror gender differences in personality characteristics documented in other experimental studies. Men are more likely to choose to compete in the addition exercise than women for both the total sample and the survey respondents (45% of men and 28% of women, row 1). In neither sample are the ability measures, score on exercise 4, significantly different for men and women (row 2). In both samples men are more confident than women, averaging a lower estimated rank in a tournament (row 3A) and being more likely to place themselves first in a tournament (row 3B). Similarly, according to rows 4A, 4B and 4C, men in both samples are significantly less risk averse than women, and they are also significantly less likely to have inconsistent risk preferences than women. The measure of taste for competition (row 5), however, is not significantly different for men and women in either sample, a result that is not surprising given the probit results of Table 3. We also test for differences in the experimental measures between the survey respondents and non-respondents within gender. There are no differences except men

[10] Studies using the zero-one choice to compete in their estimations with other determinants of the taste to compete as independent variables include Buser, Niederle, and Oosterbeek (2014), Reuben, Sapienza & Zingales (2015), and Reuben, Wiswall, Zafar (2017). Zhang (2013) also uses residuals and an estimate from a mixed logit discrete choice model while Reuben, Wiswall, Zafar (2017) create dummies based on an expected utility calculation.

[11] As noted in the description of the experiment, we also ask the participants to bet some portion of 10 dollars on their winning the tournament, and we ask them to choose between a word and a math task and then to choose between a piece rate or tournament pay scheme in the chosen exercise. Because these alternative measures of competition are not as salient to labor market performance, we report results with them only in footnotes or robustness checks.

[12] The coefficient on female remains negative and significant when controls do not include the estimated rank in the tournament, indicating that it is lower confidence that leads women to choose to compete less often than do men.

in the survey sample are less likely to have inconsistent risk preferences than men who did not respond to the survey. The similarities in the experimental measures between the two samples support the conclusion that selection into the survey is not biasing our results.

In order to check further for selection bias into the employment survey, we estimate probits for the probability of responding to the survey as a function of gender, the taste for competition (measured as the residuals in the probit equation), estimated rank in the addition game, attending Santa Clara, ability (measured as GPA), dummies for college major (engineering, business, sciences, and social sciences with humanities the omitted group), whether the student had a job at time of graduation, risk aversion and a dummy variable for inconsistent risk preferences. The results are presented in Table 5. We first estimate the probability of ever responding to the labor survey for the total, male and female samples (columns 1-3). In the total sample only the female dummy has a significant and positive coefficient (row 1). For the male sample, as might be expected, there is a negative significant coefficient on inconsistent risk preferences (row 12) and a positive significant coefficient on the science dummy variable (row 8). However, we cannot reject the hypothesis that the major dummies are jointly equal to zero (p=0.15). For the female sample, there is a significant positive coefficient on the engineering dummy variable (row 6), however, as with the male sample, we cannot reject the hypothesis that the coefficients on the major dummies are jointly equal to zero (p=0.13). Once we change the estimation to the probability of responding to the survey in any given year (columns 4-6), being female (column 4, row 1) continues to be correlated with increased probability of responding and being a Santa Clara alumnus reduces the probability of repeat responses for both men and women (row 4, columns 5 and 6). Further, being an engineer (row 6) and GPA (row 5) increase the probability of women responding in any given year.[13]

5. Measuring labor market outcomes

5.1. Earnings

Turning to labor market outcomes, we measure compensation using several different measures. When asked about earnings, the individual has the opportunity to give an hourly, weekly, monthly, or yearly compensation measure. In addition, they report any bonus they

[13] Re-estimation of these same equations by school does not reveal any new patterns and correlations observed in Table 5 are less significant.

earned for their current job in the last year. The first measure we create is an hourly wage that we construct using the subjects' reported usual hours worked per week if their pay is reported as weekly, monthly or yearly (assuming four weeks in a month and 50 weeks in a working year). The second measure is annual salary that is constructed with the same assumptions used for hourly wages if pay is reported by hour or by week. If monthly pay is reported, we multiply by 12 to get annual salary. The third measure is annual salary plus bonus where bonus is given for the previous year. Any individual who has an hourly wage below six dollars, well below the minimum wage, or weekly hours less than 15 is dropped from the analysis because we are focusing on compensation of men and women in stable, paid employment. Of the full set of wage-year observations (wages for respondents in the six surveys from 2012-2017) 117 or 6.9% are dropped because of this restriction.[14] In addition, because we are trying to understand the source of the gender gap in U.S. earnings, we drop 98 observations related to individuals who are working in foreign countries.[15,16] Table 6 gives the means of these measures for men and women for the pooled set of survey years from 2011 to 2017. In row 1, the constructed hourly wage is not significantly different for men and women. However, there is a significant difference in annual salaries between men and women; men earn 10.0% more than women (row 2).[17] The difference arises because, of those who report annual salaries, men's salaries are higher than women's but the men also report significantly higher average weekly hours worked, as displayed in row 3. Finally, the gender gap in annual salary plus bonus is even larger as men earn 14.0% more than women (row 4). Even at this early stage of their careers, gender differences in salary are starting to appear.

[14] All results are robust to lowering the wage to 5 dollars and the weekly hours threshold to 10 hours which increases the sample by 46 observations.

[15] Respondents working in foreign countries are almost exclusively foreign, and they are working in workplaces where mores and compensation patterns are likely very different than those which define the US labor market.

[16] Once we restrict according to level of wage, hours worked and country of work as explained above, the viable wages (salaries plus bonus) are calculated for 1479 (1483) observations. There are more salary plus bonus observations than salary or wage observations because there were 4 respondents who earned only a bonus, possibly because they were paid by commission.

[17] This early career earnings gap is similar to that found in other studies. For example, a 2013 Pew Research Center survey found that for workers aged 25 to 34, women's hourly earnings were 93% of men's, while for all workers 16 and older, the ratio was 84%.

5.2. Choice of major and competing

In determining the effect of competitiveness on labor market outcomes, we focus almost exclusively on compensation of individuals at work. However, college students often choose majors in anticipation of career earnings potential. Buser, Niederle and Oosterbeck (2014) show that the choice of academic track, as early as during secondary school, is correlated with gender and with preferences for competition. Similarly, Kamas and Preston (2012b) find that willingness to compete differs across majors in a university setting. In Table 7 we present the percentage of men and women who choose different majors, the average compensation for male and female participants in each major grouping, the percentage who compete in each major grouping, and our measure of taste for competition. We create five major groupings: engineering, business, sciences, social sciences, and humanities. These major groupings flow naturally from the two schools' academic organizations. Santa Clara has three undergraduate schools: arts and sciences, business, and engineering. Haverford is a liberal arts college where the disciplines are divided into three divisions: humanities, social sciences and natural sciences. Interestingly, in our sample, men and women are equally likely to major in engineering, sciences, and humanities (columns 1 and 2). However, women are significantly more likely to major in social sciences and less likely to major in business than men. These major distributions do not represent the major distributions of the schools. As in other experimental studies, social science students are over represented, perhaps because these students are more familiar with experimental studies and what participation entails, and humanities majors are underrepresented (see Appendix Table 1). Within major, the gender distribution of the Haverford respondents generally reflects the gender distribution of the student body. However, the Santa Clara engineering experiment participants and survey respondents are more often female than the engineering student body (See Appendix Table 2). Therefore, we do not claim that our sample is representative of the student body; however, we also do all the estimations without engineering students and the results are unchanged.[18]

Columns 3 and 4 present average salary plus bonus of graduates in these majors for the

[18] In general student participants in experimental studies are not a random selection of the student body. Our study is no exception. As the number of studies in the literature grows, the hope is that consistent results will emerge that we can feel are generalizable. This study is an early example of taking experimental results and matching them to real world outcomes and behaviors. As others emerge, we can see if our results generalize to other samples.

pooled (2012-2017) sample of full time workers by gender. As anticipated, among men, engineers earn the highest compensation followed by business majors in second place. Social science majors follow with science majors not far behind. Humanities majors earn the lowest compensation. The one difference for women is that business majors' salaries plus bonuses exceed those of engineers although they are very similar. Columns 5 through 8 give the percentage of each major group that chooses to compete in the addition exercise by gender and the average measure of taste for competition for each major group by gender. Within major, men are still more likely than women to choose to compete (columns 5 and 6), although, given the small numbers within cells, these differences are not significant in all majors. We do not find that men have a significantly higher taste to compete than women within major (columns 7 and 8). In fact, the taste for competition measures are higher for women than for men in engineering and the humanities, although not significantly. While there seems to be a general positive correlation between the average salaries and the measures of competition, men in sciences are more competitive than men in business but earn substantially less. Further, engineering women are the most competitive women yet do not earn the highest salaries.

We estimate multinomial logits to determine how taste for competition correlates with major choice and the results are presented in Table 8, with social sciences as the omitted major. In column 1 we estimate the probability of major choice on the full sample as a function of the taste for completion measure as well controls including the exercise 4 addition score (a measure of math ability), the expected rank in the addition tournament (a measure of confidence), and the risk variable described earlier. We also add a dummy variable equal to one if the person's risk preferences are not rational (i.e. he or she picked the risky bet with zero orange balls in the bag or the subject switched between the sure to risky bet more than once) so that we can include these individuals in the analysis. Taste for competition is positively correlated with majoring in engineering and business relative to social sciences, and the coefficient on engineering is more than twice the size of the coefficient on business. With the separation of the sample into the male and female subsamples (columns 2 and 3), the estimated coefficients reveal that the sorting into majors according to taste for competition is more of a factor for women than for men ($p=0.068$ v. $p=0.388$, row 9). While the magnitudes of the coefficients in the male sample are similar to those for women, they are less precisely estimated and insignificant. Among women, relative to those who do not compete, competitive women are most likely to be engineers (in

comparison to the omitted group of social scientists), followed by business majors.[20] The same pattern prevails for engineering men but other differences between majors are not significant, possibly because small numbers are reducing the power of the tests. Tables 7 and 8 reveal that, among this sample of college graduates, gender explains relatively high numbers of female social scientists and relatively low numbers of female business majors, and controlling for ability, confidence and risk preferences, taste for competition is correlated with choice of major for women.[21] The over-representation of female engineers in the experiment (relative to the student body) and in the labor market surveys (relative to the experiment) coupled with the fact that they are the most competitive women raises concerns that any results we see are driven by these women. As mentioned above, we run all results with and without engineering women, and the results hold across both samples. Engineering women are not driving our results.

6. Estimating effects of competition on labor market outcomes

6.1. Taste for competition in the winner-take-all tournament

In order to analyze the effects of competitiveness on labor market outcomes, we estimate log compensation equations where the compensation measure used is either the salary or the salary plus bonus.[22] Because bonuses are usually given at the end of the year, subjects give current salary (as of the spring) and last year's bonus. As a result the sample we use for both sets of equations are those subjects who are full time and who have been working for the current employer for 8 or more months.[23] Controls in the most basic specification include years since graduation and year of the current post graduation survey fixed effects. The taste for competition measure is the residual from our choose to compete equations of Table 3, column 1.

[20] We replicate Table 8 with the choose to compete measure (rather than the taste for competition measure) and with the sample of survey respondents (instead of all experiment participants) and the results are qualitatively the same regardless of competition measure or sample.

[21] We cannot speak to the direction of causation of this correlation. More competitive women may choose engineering and business, or alternatively these disciplines may foster competition in their students.

[22] The results for log salary and log wage equations will be almost identical when we control for usual weekly hours in the salary equations, but because most college graduates (71% of our sample) are paid with an annual salary, we present the salary equations. Further, because bonus is an important contributor to annual compensation and one that may differentiate men's and women's earnings, we also analyze salary plus bonus as a measure of compensation.

[23] Because we conduct surveys in the spring, working eight or more months ensures that workers were at the current firm for the last quarter of the preceding year when bonuses were most likely distributed. We also drop individuals whose wage is less than 6 dollars an hour since this wage is well below the minimum wage and probably signals an internship or some other temporary or informal employment arrangement.

Table 9 gives the results from these compensation equations run on the full sample with rows 1-6 displaying results from the log salary equations and rows 7-12 displaying results from the log salary plus bonus equations. Beginning with the salary equations, in column 1, we include only a female dummy, and controlling for year of survey and years since graduation, women's salaries are 9.5% lower than men's. In column 2, we add the taste for competition measure, and the coefficient is insignificantly different from zero, while the coefficient on female does not change.in magnitude or significance. Because confidence in one's performance has been shown to be an important determinant of willingness to compete and can explain gender differences in choosing to compete (Kamas and Preston, 2012b), we investigate how confidence interacts with taste for competition in determining earnings. In column 3 we include the competition measure, the estimated rank in the addition task, to determine its impact on compensation, and then in column 4 we add an interaction between the confidence measure and the competition measure to determine whether the effect of competition might be different for more or less confident individuals. While the original confidence measure ranges from 1(highest rank) to 4 (lowest rank), we convert it to 0 (highest rank) to 3 (lowest rank). As a result the coefficient on the taste for competition measure gives the effect of competition on compensation for individuals who rank themselves highest (most confident and ranking 0). We see in column 3 (row 3) that the confidence measure has a negative significant coefficient implying that, as expected rank in the tournament increases by one ranking (confidence falls), salary falls by 5 percent. The interaction term of column 4 is not significantly different from zero, but with its inclusion, the coefficient on the taste for competition measure becomes significant at the 0.10 level. For those who are most confident, a one unit increase in taste for competition increases salary by almost 10 percent. More practically, given that the standard deviation of the taste to compete measure for the full sample is 0.41, a one standard deviation increase in taste for competition is correlated with a 4.1% higher salary for the most confident individuals. With these controls the coefficient on female falls by about 2 percentage points or 20 percent.

The effect of the taste for competition on salary for individuals who rank themselves second, (ranking=1), third (ranking=2), or fourth (ranking=3) is determined by adding the coefficient on the competition measure to one, two and three times the coefficient on the interaction term, respectively. None of these composite coefficients are significantly different from zero. The p-values for the F tests that the sum of the coefficient on the taste for competition

(TFC) measure plus one (two, three) times the coefficient on the interaction term is equal to zero are 0.66, 0.40, and 0.25. Therefore, for the full sample, a taste for competition only increases salary for the most confident individuals.

The results for the log of salary plus bonus equations of rows 7-12 look very similar, although the negative female differential is larger in magnitude by about 4 percentage points. The pattern of changing coefficients across columns observed in rows 1-6 is replicated for the log salary plus bonus equations, and in column 4 the coefficient on the taste for competition measure of 0.126 (p=0.11) implies a 5.2 % increase in salary plus bonus for a one standard deviation increase in a taste for competition for the most confident individuals. As with the salary equations, the effect of taste for competition on salary plus bonus is insignificantly different from zero for individuals who are less confident (rank themselves second through fourth).[24]

Because among these subjects, the decision to compete and the taste for competition is more highly correlated with major decisions for women than for men, we present the results from these same regressions run on the samples of men and women separately in Table 10. Columns 1-3 give the results for men and columns 4-6 present them for women. In columns 1-3, we see that none of the coefficients on taste for competition, confidence, or the interaction term are significantly different from zero. For men, none of these behavioral characteristics measured in the laboratory are correlated with either measure of compensation. The picture is quite different for women. While taste for competition does not impact salary when entered by itself (row 1, column 4), once the interaction term between competition and confidence is included (column 6), the coefficients on both variables are significant (rows 1 and 3). A taste for competition is positively related to salaries but its impact falls with lower confidence. The effect of a taste to compete on salaries for women who expect to be ranked first is 0.311 (the coefficient on TFC), and for those expecting to be second it is 0.074 (0.311 + (- 0.237)). The effect is negative for women expecting to be ranked third (- 0.163 = 0.311 + 2 x (- 0.237)) or fourth (- 0.40 = 0.311 + 3 x (- 0.237)). While the effect for women ranking themselves first is significant at the 0.01 level, the effect for women ranking themselves second is not significantly different from zero (p=0.24). For women ranking themselves third or fourth, the negative effects are significantly

[24] The p-values for the F tests that the sum of the coefficient on the TFC plus one (two, thee) times the coefficient on the interaction term is equal to zero are 0.73, 0.34, and 0.21.

different from zero at the 0.06 and 0.01 levels respectively. These coefficients imply that a one standard deviation increase in taste for competition (0.4 for women responding to the survey) is correlated with a 12.4% increase in salary for someone who ranks herself first in the addition tournament but a 16% reduction in salary for the least confident women.

The results for the log salary plus bonus equations look quite similar. Behavioral characteristics are not correlated with men's salaries plus bonuses. For women, only when the interaction term between competition and confidence is included in the equation (row 8) does the competition variable become a significant determinant of salary plus bonus. The coefficient on taste for competition is 0.336 implying that a one standard deviation increase in the taste for competition measure results in a 13.4% increase in salary plus bonus for women who rank themselves first in the tournament. This increase is enough to erase the negative gender differential estimated in Table 9. However, the increase in salary plus bonus is insignificant for women who rank themselves second and becomes negative and significant for women who are less confident.[25][26]

There might be concern that selection into stable employment (defined by working in a full time job for at least 8 months) may be biasing our results. For the column 3 and 6 models of Table 10 and the column 4 model of Table 9, we run Heckman selection correction regressions. We model selection as a function of the taste for competition residual, estimated rank in the addition exercise, GPA, majors, a set of dummies for social preferences (self-interested, inequality averse, efficiency maximizers, and compassionate social surplus maximizers with

[25] The p values for the F tests that the sum of the coefficient on the TFC plus one (two, thee) times the coefficient on the interaction term is equal to zero are 0.29, 0.07, and 0.012.

[26] The experiment protocol has some other tasks that can be used to measure competition. The first is exercise six where subjects are given ten dollars and then asked to bet any portion of the ten that their performance will be the best of a random four person group. If their score is the highest of the random group, they earn a payoff equal to four times the amount they bet plus the amount they did not bet. If they do not win the tournament, they earn the amount they did not bet. This measure allows a continuous measure which incorporates confidence, ability, risk aversion and taste for competition. We use the betting measure itself and we also estimate a taste for competition residual from tobit equations estimating the amount bet as a function of ability, confidence and risk preferences. We estimate the same equations as those displayed in Tables 9 and 10 and we find no significant results. We also have an exercise where subjects choose whether to compete in a word or addition task, and then they can choose a piece rate or tournament rate of compensation in the chosen task. We calculate a taste for competition residual in the same manner as we did in the required addition task. We run the same models as in Tables 9 and 10 and while the coefficients in the female equations have a pattern similar to that observed in Table 10, they are not significantly different from zero.

unclassified respondents the omitted group),[27] a dummy for whether the respondent practices a religion, a dummy for whether the respondent has a live-in partner, and the respondent's family income. We present the results from the first stage of the Heckman model in which the probability of being in steady employment is estimated on the full sample and by gender in Appendix Table 3.[29] In all models, the correlation coefficient (ρ) between the errors in the selection model and the errors in the compensation model is significantly different from zero, implying that the selection process has the potential to bias the OLS results. However, none of the coefficients on the taste for competition residual and on its interaction with expected rank change appreciably in magnitude or significance once we correct for selection.

In Table 11 we present the female equations for samples of subjects at different stages of their careers: one, two, three, four and five years after graduation. These results provide a robustness check for the basic result, checking that it is not an artifact of some subsample of the women. But also, it seems reasonable that if a taste for competition coupled with confidence leads to higher compensation for women, then this trait is likely to surface over time and the effects may be more evident once the career gets established. As in Tables 9 and 10, the top panel, lines 1-4, presents results from the log salary equations and the bottom panel, lines 5-8, presents results from the log salary plus bonus equations.

For the salary equations (rows 1-4) , the coefficient on the taste for competition (row 1) and its interaction with estimated rank (row 2) are not significant for women a year out of college (column 1), but once we look at women 2, 3, 4, and 5 years out (columns 2-5), the patterns observed in Table 10 emerge. For the most confident women, increases in a taste for competition are correlated with higher salaries, and for the women who are less confident (ranking themselves either 3 or 4) a taste for competition is negatively correlated with salaries. For these three groups, the effects are generally significantly different from zero, especially in

[27] We categorize subjects with these four preference types using dictator allocation decisions based on the method used by Engelmann and Strobel (2004), where money is to be paid to oneself (You) and two others (person X and person Z). The first exercise in the laboratory is four allocation questions which allow us to make these classifications depending on the consistency of the subjects' answers. These four questions are a shortened version of a ten question instrument that has been used extensively to categorize social preferences (see Kamas and Preston, 2009, 2012a and 2015). These questions are included in the laboratory experiment materials in the supplementary materials.

[29] Rows 1-7 present the coefficients on the variables which are in the selection equations but not in any of the log compensation equations. They include having a live-in partner, family income, practicing a religion and dummy variables for social preferences.

the later years (3-5) out of college.

The results from the salary plus bonus equations (rows 5-8) are similar. In the first year after graduation, when very few respondents have established a full time job with eight or more months of experience, the effects of the competition variables are insignificant (column 1). In the samples corresponding to two to five years after graduation, the coefficients become significant and the effect of competition on earnings increases in magnitude. For subjects at full time jobs five years after graduation, a one standard deviation increase in the taste for competition residual is correlated with a 19 percent higher salary plus bonus for women who rank themselves first in the tournament. These results confirm that the basic result that competing with confidence is correlated with higher compensation for women holds for the full sample of women and becomes more evident as women get more experience in the workplace.

7. Why do women who compete with confidence succeed?

7.1. Influence of control variables

The striking finding that women who compete with confidence in a laboratory setting earn comparable amounts to men and out-earn their less competitive and confident female peers raises the obvious question: why? In particular, is this trait just signaling the quantitatively adept individuals who choose majors that earn lucrative rewards or go into high-paying, intense jobs like finance? We try to answer this question in two different ways. First, we focus on women and analyze how the coefficients on taste for competition and its interaction with estimated rank change with additional controls. Second, we compare the effects of competing with confidence on two groups of women: those who choose the addition task and those who prefer the word task, where the latter group might be expected to exhibit less competency or interest in jobs requiring quantitative skills that may be higher paid.

Table 12 presents the coefficients on the taste for competition measure and the interaction term for three log salary equations and four log salary plus bonus equations run on the female sample. Columns 1 and 4 give the results displayed in column 6 of Table 10 where the only controls are year of survey fixed effects and years since graduation. In column 2 we add education controls to the log salary equation; they include GPA, a dummy for Santa Clara University and dummies for major (engineering, business, sciences, and social sciences dummies with humanities the omitted category). The coefficients on the taste for competition variable and

its interaction with estimated rank in the addition tournament (rows 1-2) fall in magnitude but remain large and significant. In column 3 we add labor market controls which include months worked at present employer, hours worked per week, a dummy for having earned a post graduate degree, a dummy for working in a finance, banking, or management consulting occupation, dummies for sector (nonprofit, federal government, state government, local government, self-employed, and family business with for profit the omitted category) and a dummy for non-heterosexual preferences.[30] The coefficients on the competition variables continue to shrink in magnitude but the coefficient on the TFC variable remains significant and the coefficient on the interaction term falls slightly below significance (p=0.11). The effect of these full set of controls is to shrink the salary effect of competing confidently by about half. A one standard deviation increase in the taste for competition variable increases salary for the most confident women by 5.9%. The effects for the women who rank themselves 2, 3, or 4 are generally insignificant. [31]

The results from columns 4-6 where the dependent variable is the log of salary plus bonus look very similar. With the full set of controls the coefficients on the competition residual and the interaction between the residual and estimated rank (rows 1-2) fall by about half but remain significantly different from zero. The effect of taste for competition on salary plus bonus, controlling for education and labor market controls, is only significant for the most confident women. For these women a one standard deviation increase in taste for competition increases salary plus bonus by 6.9%.[32]. In order to put this effect into context we re-estimated the equation of column 6 on the full sample without the competition and confidence variables, and the coefficient on the female dummy is -0.062 (p=0.049). Therefore, this increase in salary plus bonus for women who rank themselves first and have a strong taste for competition erases the negative gender differential.

In column 7 we present results from a Heckman selection correction regression where we use the same variables to predict selection into stable employment as described in the section on

[30] We include the dummy for non-heterosexual preferences because previous work (Black et al. 2003) has found that lesbian women tend to earn higher compensation than their heterosexual counterparts. It is also possible that lesbian women may enjoy competing more than other women, although Buser et al. (2015) find no evidence of this pattern. Our results do not show significant differences in earnings between lesbian and heterosexual women.

[31] The two exceptions are the negative coefficients for women who rank themselves last in the equations that control for education. F tests that the effect of competition on these women's compensation is zero can be rejected at the 0.06 level.

[32] We present the full set of coefficients for the column 3 and 6 models in Appendix Table 4.

the results of Tables 9 and 10 and displayed in column 3 of Appendix Table 3. In the first stage regression, having a live in partner, having self-interested social preferences, and majoring in engineering or business are positively correlated with having steady employment while higher family income is negatively correlated with steady employment. The correlation coefficient (ρ) between the error terms in the selection equation and the compensation equation, is not significant. ($p=0.25$), implying that selection is probably not biasing our OLS coefficients. As expected, the column 7 results which control for selection into stable employment look very similar to the column 6 results; the coefficients on the taste for competition variables (rows 1 and 2) remain significant and a one standard deviation increase in taste for competition for the most confident women increases salary plus bonus by 7.1 %. Therefore, women who compete with confidence earn higher salaries plus bonus than their less competitive or confident peers, even with inclusion of education, labor market, and selection controls.[33] [34]

7.2. Preferences for non-quantitative tasks

In exercise 8 of the initial experiment, we allowed participants to choose between solving the same type of addition problems or doing a word search exercise.[35] Those who chose the addition task may feel more comfortable with numbers and quantitative concepts, a trait that may be rewarded in the workplace, and these may be the subjects who benefit from competing with confidence. There is evidence in the experiment and survey that women who choose the word task may be less well paid. Women are 11 percent more likely than men to choose the word task, and for those who chose the word task, women are14 percentage points less likely than men

[33] We re-estimate this table excluding the engineers, and the results are identical. Therefore we are confident that engineers are not driving our results. We also re-estimate this table excluding those individuals whose risk preferences were inconsistent, and again the results do not change. Finally, we re-estimate this table adding the risk aversion variable, the dummy for inconsistent risk preferences, and both variables interacted with the confidence measure. The results do not change.

[34] We maintain that being confident alone does not increase compensation. Table 12 reveals that the coefficient on confidence (row 3) is insignificantly different from zero in all models. But more important we replicate the Table 12 models but omit the TFC variable and the interaction term so we can see if confidence alone increases compensation. In the column 1 and 4 models which just include controls for time, the coefficients on estimated rank in the addition exercise are -0.05 but only significantly different from zero for the log salary equations ($p=0.09$). With inclusion of the education and then labor market controls, the coefficients become positive, ranging between 0.014 and 0.019, and uniformly insignificant. Therefore, there is no evidence that confidence alone increases compensation for women.

[35] In exercise 7, all participants participated in a word search exercise where the compensation was a simple piece rate of 10 cents per letter for each 3 or more letter word identified. Therefore, all participants had participated in both addition and word exercises before they were given the choice of which exercise to perform.

to choose to compete in the word task exercise. Among women who respond to the labor market surveys, in a probit of choosing the word tournament, coefficients on the four majors, engineering, business, social sciences and sciences, and on a dummy representing employment in finance, banking, or management are all negative and significant. Finally, as one would expect, a taste for competition and confidence in the arithmetic task are both negatively correlated with choosing the word task.[36]

In Table 13 we split the sample by the task chosen in exercises 8 and 9 (addition or word search) and estimate the models of columns 1-6 of Table 12 for the required addition task of exercise 5. We are comparing the effects of taste for competition in an addition task on earnings between women who prefer to perform an addition task to those who would prefer a word task. The results reveal that there is no evidence that the effects on earnings exist only for women who choose the addition task; rather the pattern looks somewhat stronger for women who choose the word task. For women who choose the addition task (rows 1-4) in the log salary models (columns 1-3) the coefficients on the taste for competition and the interaction term (rows 1-2) follow the pattern observed for the full sample, but the coefficient on the taste for competition is only significant in the model with education controls and neither coefficient is significant in the model with education and labor market controls. These same models estimated on the sample of women who choose the word task (rows 5-8) reveal that in the bare model with only the year and experience controls, a one standard deviation increase in taste for competition for a woman who ranks herself first is correlated with a 24.4 percent increase in salary. However, this effect diminishes with controls for education (column 2) and work (column 3). Still, with the full set of controls, women who rank themselves first experience an 8.2 percent increase in salary with a one standard deviation increase in taste for competition. Further, the positive effect (4.2% increase in salary for a one standard deviation increase in the TFC variable) for women who rank themselves second is significantly different from zero (p=0.093).

In columns 4-6 we estimate models explaining the log of salary plus bonus. The results are very similar to those presented in columns 1-3. The most confident women who prefer to do

[36] Interestingly whether the women choose the addition task or the word task, the probability that they pick correctly between the piece rate and the tournament (i.e. pick piece rate when previous score is below the 75th percentile and tournament when previous score is above the 75th percentile) in exercise 8 is the same--roughly 70 percent.

the arithmetic task do not experience a significant positive increase in salary plus bonus with an increase in the taste for competition variable (row 1). However, for those women who choose the word task the coefficient on the taste for competition variable (row 5) is significant in both the bare model and the model with education and labor market controls. In fact, controlling for education and labor market characteristics, a one standard deviation increase in the taste for competition variable increases salary and bonus by 10.4% for women who rank themselves first in the arithmetic tournament and by 5.4% for women who rank themselves second (p=0.090) .[37] We see evidence that taste for competition is an important determinant for both groups but the positive effects are larger and more significant for the women who choose the word task.[38] For this group not only does enjoying competition correlate with higher compensation for the most confident women but also for those who rank themselves second in the tournament. These findings suggest that the positive effects of confidently competing on earnings are not solely relevant to women who prefer and choose to do quantitative exercises.

Given how strongly taste for competition for women confident in the math task affects earnings for women who have a preference for word tasks, we examine whether taste for competition in the word task is also correlated with higher compensation. In Table 14, we present salary and salary plus bonus equations for women separated by choice of task. The taste for compensation residual is calculated for their exercise 8 choice, either the addition task or the word task. For women who chose the word task, we estimate the probit on decision to compete as a function of their score in the exercise 7 word task, their estimated rank in a word task, and the risk preference variables. For women who chose the addition task we estimate the probit on decision to compete on the same variables we used in the probit equation on decision to compete in exercise 5. Similarly, the interaction terms are interacted with estimated rank in a word tournament for women who chose the word task and in an addition tournament for women who chose the addition task.

The results are striking. For the women who chose the addition task, the results presented

[37] A test of the equality of the taste for competition coefficients across the two samples rejects that they are equal at the 10 percent significance level for columns 1 and 4, but cannot reject that they are equal at conventional significance levels in columns 2, 3, 5, and 6. In none of the columns can we reject the hypothesis that the coefficients on the interactions are equal.

[38] For the women who choose the arithmetic task, the significant negative coefficients on the interaction terms in the full models of both the salary and salary plus bonus equations results in significant negative effects of a taste for competition on the compensation of women in the two least confident categories.

in columns 1 and 2 look very similar to the results of columns 1 and 4 (rows 1-3) of Table 13 where we estimated the effects of competing in the exercise 5 arithmetic task. For the women who chose the word task (columns 3 and 4), however, having a taste for competing in the word task coupled with confidence in the word task has no correlation with compensation.[39] This implies that it is only the taste to compete and confidence in carrying out quantitative tasks that is associated with higher earnings for women; these qualities tied to a verbal task do not have the same positive effects.

8. Conclusion and discussion

This paper investigates the hypothesis that differences in willingness to compete and confidence between men and women can help explain the gender gap in earnings for recent college graduates. We track 624 college seniors first as they participate in laboratory experiments designed to measure willingness to compete and confidence in winning a winner-take-all tournament and then as they go on to work in the labor market and begin career development. We analyze earnings for the years immediately after graduation when family duties are presumably less likely to explain gender differences in compensation so that we can better identify the effects of these behavioral characteristics. This paper is innovative in that it is among the first to link behavior in the laboratory to labor market earnings of the same individuals in their lives after graduation.

Similar to other studies, our laboratory experiments find that men are more likely than women to choose to compete in addition exercises; they are also more confident, and less risk averse. Comparing male and female compensation in the first three years after graduation, men's hourly wages are slightly but not significantly higher than women's, but men's annual salaries and salaries plus bonuses are significantly higher than women's by 10% and 14% respectively, partly due to men's greater hours worked and higher bonuses.

We measure the taste for competition as the residual from a probit equation estimating the decision to compete in an addition tournament as a function of ability, confidence and risk preferences. We find that the taste for competition does not differ significantly between men and women. However among women, a higher taste for competition in the laboratory is correlated

[39] Interestingly for these women, more confidence in their ability to perform in a word task is correlated with lower salary plus bonus.

with higher subsequent earnings in the labor force but only for those competitors who believe they will win the tournament (rank themselves as the highest scorer in their group) or, in some instances, come in second. Women with a taste to compete without such confidence do not earn more and in some instances earn less. A taste for competition alone and being confident alone are not enough; it takes both to increase women's compensation. At the same time, men's earnings are not affected by a taste for competing or confidence.

While differences in preferences for competing do not explain the male-female compensation differential, if the labor market did not reward these characteristics of willingness to compete coupled with confidence in women, the gender earnings gap would be much larger. In fact, in the regressions with controls for experience and year of survey, a one standard deviation increase in the taste for competition for women who rank themselves first in the tournament increases salary plus bonus by roughly 13.4%, just enough to erase the gender earnings differential. These results are robust across subsamples of women with varying levels of experience.

We use the data to test hypotheses that might explain the effect of competing with confidence on female compensation. It may be that women who are willing to compete and enjoy competition select into majors and sectors of employment that are more highly paid. We show that decisions to compete and tastes for competition are correlated with major choice and the higher the estimated wage rate of graduates from a given major, the greater percentage of subjects who choose competition. We run a series of regressions to see whether certain controls might eliminate the effect of competing with confidence. Adding extensive educational and labor market controls results in a reduction of the earnings effect of about one half: a one standard deviation increase in a taste for competition is still correlated with roughly a 7% increase in salary plus bonus for women who rank themselves first in the tournament.

Results from regressions run separately on women who, in a subsequent exercise in the experiment, choose to compete in an addition task and on those who choose to compete in a word task may give hints as to a reason for these striking results. Women choosing the word task, who are also less likely to choose high paying majors and sectors, get larger and more significant positive earnings effects than their counterparts who choose the addition task, and this positive earnings effect of competition extends to women who rank themselves second in the

tournament. Further, these same women who choose the word task only see returns to competition in an addition task and not in a word task.

Comparing our results with those of previous studies that examine the effects of a taste for competition on choice of major or sector of employment, our results confirm that taste for competition correlates with major for the total sample and women, which is consistent with Buser, Niederle, & Oosterbeek (2014), who find that choosing to compete predicts subsequent field of study choices of middle school students, and Kamas and Preston (2012b) who find that competitiveness varies by major. In addition, the results of Reuben, Sapienza & Zingales (2015) show that willingness to compete is correlated with working in sectors of the economy that are more highly remunerated. Closely related, Zhang (2012) finds that taste for competition leads students to choose to take a rigorous high school entrance exam. However, Reuben, Wiswall, Zafar (2017) find no connection between two measures of competitiveness and choice of major. Overall, our findings on the effects of taste for competition correlating with choice of major substantiate the results of the bulk of other research and help explain part of the effect of competitiveness on salaries.

Turning to the effects of taste to compete on compensation, the only other work to date that examines the effects of choosing to compete on salaries is that of Reuben, Sapienza & Zingales (2015).[40] Students enrolled in a high quality MBA program participated in experiments, and these competition choices were linked to salary and sector of employment immediately after graduation and to sector of employment after seven years. These salary data are collected from university data sources that are corroborated with companies so they do not suffer from self-reporting bias, a potential problem with our data if highly competitive and confident women overstate their earnings while others do not. The authors find a gender gap in earnings of about 14% at graduation, similar to that in our sample. However, they also find that choosing the tournament is associated with 9% higher salaries while we find no significant and consistent effect of taste to compete on compensation except for the most confident women. How might the difference in findings be explained? The most striking difference between the two studies is in the samples used. Here we survey graduates with bachelor degrees in a wide

[40] Reuben, Wiswall, Zafar (2017) examine the effect of competing on expected earnings after graduation and find a significant effect. However, expectations of highly competitive and confident individuals may be inflated so it is not possible to determine if these individuals will in fact earn more.

variety of majors in arts and sciences, business, and engineering. The Reuben, Sapienza & Zingales paper focuses on graduate students in business only. This is a self-selected group of high performing individuals who have already illustrated a willingness to compete in a competitive graduate program in a competitive field of study so it may be difficult to make generalizations to broader sectors of the population, particularly about gender differences. Women who choose a high quality graduate program in business may be more likely to have competitive tastes or be willing to place themselves in environments where they compete with men and this may have implications for salaries. More importantly, they also may be more confident in their ability to compete along quantitative dimensions that are taught in MBA programs and rewarded in the MBA job market. While we make no claim to having a representative sample, our subjects are far more diverse and may illustrate a broader set of behaviors. Also, the MBA graduates are older and more likely to be at the age of family formation, which might have effects on salaries that differ for men and women. We believe that a virtue of our sample is that the subjects are early in their careers, right after undergraduate graduation, so family responsibilities are unlikely to affect salaries yet. Finally, the MBA graduates earned salaries in their previous careers before attending the program, and while these earlier salaries might influence salaries upon graduation, there is no information provided on them.

Another difference between the studies is that we pay careful attention to differences between men and women as distinct samples. This allows us to show that the positive effects of taste for competition are limited to women who are very confident as well as competitive and that these qualities eliminate gender differences in salaries for this select group of women early in their careers.

Finally, one might ask why women who compete with confidence enjoy a labor market return while men do not. The fact that the effect of competing on compensation only holds for addition tournaments where the task is stereotypically male rather than word tournaments where the task is more likely to be associated with women may be telling for both When asked whether males or females would score higher on the addition exercises on a scale from 1 to 7, with 4 indicating men would score the same and a number higher than 4 signifying that men would score higher, 52.9% of men and 51.5% of women say that men would do better, while only 11.1% of men and 7.3% of women think that women will have a higher score (mean answer is

4.5). On the other hand, when asked the same question about the word exercises, only 6.4% of men and 4.9% of women think men will score higher, while 45.4% of men and 49.2% of women think that women will have a higher score (mean is 3.5).

The labor market for young college graduates seemingly rewards quantitative skills. These strong and erroneous gender stereotypes about the relative abilities of men and women to do even simple math may erode women's confidence and their enjoyment of competition in "masculine" tasks and, as a result, lead to lower earnings for women relative to men. Such stereotypes may also ensure that men, expected to succeed in this labor market, will be given access to high paying jobs without having to prove themselves. On the other hand, women need to signal extra drive to succeed in this labor market, to attain those jobs and the salaries they pay. How they signal this drive can be through locating in quantitative professions such as engineering or business, or possessing personal characteristics that compel them to compete with confidence in quantitative areas even when their interests may be more qualitative. And this signal is bound to be more effective the more established the woman is in her job and career. We conclude that confidently competing is, indeed, the ticket to labor market success for young women.

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Table 1
Experiment participants by school and year graduated

Year Graduated	Haverford	Santa Clara University	Total
2011	53	163	216
2012	70	139	209
2013	52	147	199
Total	175	449	624

Table 2
Survey responders by employment status

	(1) Spring 2012	(2) Spring 2013	(3) Spring 2014	(4) Spring 2015	(5) Spring 2016	(6) Spring 2017 [a]
1. Number of respondents	136	266	443	462	437	271
2. Response rate	63.0%	62.6%	71.2%	74.0%	70.0%	66.4%
3. Number working full time	86 (63.2%)	179 (67.3%)	318 (71.6%)	321 (69.5%)	306 (70.0%)	198 (73.1%)
4. Number working part time	24 (17.6%)	57 (21.2%)	76 (17.1%)	86 (18.6%)	77 (17.6%)	49 (18.1%)
5. Number seeking work	10 (7.4%)	10 (3.8%)	13 (2.9%)	15 (3.2%)	13 (2.8%)	5 (1.8%)
6. Number not working – student	13 (9.6%)	14 (5.2%)	31 (7.0%)	33 (7.1%)	33 (7.6%)	15 (5.5%)
7. Number not working - other	3 (2.2%)	6 (2.2%)	6 (1.4%)	7 (1.5%)	8 (1.8%)	4 (1.5%)

[a] In the spring of 2017 only 2012 and 2013 graduates were surveyed. Figures in parentheses are percentages of respondents.

Table 3
Probit equations on decision to compete in addition tournament

	(1)	(2)
1. Score on exercise 4	0.013	0.013
	(0.013)	(0.013)
2. Risk aversion score	-0.110***	-0.107***
	(0.024)	(0.025)
3. Dummy for inconsistent risk preferences	-1.293***	-1.257***
	(0.340)	(0.341)
4. Estimated rank in addition tournament	-0.827***	-0.814***
	(0.095)	(0.097)
5. Female		-0.079
		(0.119)
6. Pseudo R-squared	0.208	0.209
7. Observations	624	624

Notes: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 4
Competition, confidence, ability, and risk measures
by sex and survey response

	Total experiment sample		Sample of survey responders	
	(1) Men (n=280)	(2) Women (n=344)	(3) Men (n=225)	(4) Women (n=296)
1. Percentage choosing to compete in required addition task	45.0%***	27.9%	44.9%***	28.0%
2. Mean score on exercise 4 (addition task)	17.1	16.6	17.2	16.6
3. Confidence				
A. Mean estimated rank (1 is highest)	1.88***	2.31	1.89***	2.32
B. Percentage ranking self first	33.2%***	13.7%	31.6%***	12.8%
4. Risk preferences				
A. Mean no. of orange balls (out of 20) at switch from certain payoff to bet	7.66***	8.81	7.57***	8.90
B. Percentage risk averse	80.9%**	90.2%	79.5%**	91.2%
C. Percentage inconsistent	4.64%* +++	8.1%	2.67%**	7.4%
5. Mean of taste for competition measure (TFC)	0.011	-0.011	0.007	-0.005

Notes: The taste for competition measure is the residual from a decision to compete probit with explanatory variables including performance on previous math task, estimated rank in group doing math tasks, risk aversion measure and a dummy for inconsistent risk references.. ***, **, * Mean (proportion) for men is significantly different than mean (proportion) of women at 0.01, 0.05, and 0.10 levels using a two-tailed t-test. +++Mean for participants who responded to the survey is significantly different than mean for participants who did not respond (within gender) at the 0.01 level using a two tailed t test.

Table 5

Determinants of the probability of responding to the survey

	Observation=experimental subject Probability of ever responding			Observation=experimental subject year Probability of responding in a given year		
	(1) Total sample	(2) Males	(3) Females	(4) Total sample	(5) Males	(6) Females
1. Female	0.053*			0.077**		
	(0.100)			(0.020)		
2. Taste for competition	0.000	-0.031	0.018	-0.016	-0.050	0.007
	(0.990)	(0.578)	(0.710)	(0.672)	(0.346)	(0.890)
3. Estimated rank	0.029	0.026	0.036	0.001	0.010	-0.003
	(0.138)	(0.403)	(0.127)	(0.966)	(0.748)	(0.904)
4. Santa Clara University	-0.055	-0.049	-0.040	-0.118***	-0.123**	-0.097**
	(0.123)	(0.416)	(0.347)	(0.002)	(0.048)	(0.041)
5. GPA	0.0491	0.047	0.022	0.103**	0.075	0.112**
	(0.227)	(0.439)	(0.685)	(0.015)	(0.228)	(0.050)
6. Engineering major	0.020	-0.169	0.119*	0.106*	-0.083	0.219***
	(0.741)	(0.149)	(0.080)	(0.072)	(0.439)	(0.000)
7. Business major	0.077	0.083	0.075	0.031	0.046	0.025
	(0.110)	(0.288)	(0.181)	(0.561)	(0.562)	(0.729)
8. Science major	0.066	0.130*	0.026	0.029	0.103	-0.024
	(0.170)	(0.082)	(0.643)	(0.575)	(0.176)	(0.721)
9. Social sciences major	-0.022	-0.021	-0.018	-0.054	-0.027	-0.065
	(0.628)	(0.784)	(0.728)	(0.230)	(0.707)	(0.247)
10. Has a job next year	0.006	0.053	-0.022	0.005	-0.001	0.014
	(0.842)	(0.273)	(0.551)	(0.865)	(0.991)	(0.734)
11. Risk aversion measure	-0.003	-0.013	0.010	0.001	-0.009	0.010
	(0.959)	(0.156)	(0.202)	(0.884)	(0.321)	(0.215)
12. Inconsistent risk preferences	-0.141	-0.454***	0.030			
	(0.127)	(0.006)	(0.721)			
13. Observations	622	280	342	2,711	1,252	1,459

Notes: Probit equations run on survey responses; numbers reported are the change in the probability of responding to the survey with a one unit change in the independent variable. TFC measure is the residual from a decision to compete probit with explanatory variables including performance on previous addition task, estimated rank in group doing addition tasks, risk aversion measure and a dummy for inconsistent risk references. Standard errors are clustered by id in columns 4-6. P-values in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 6
Labor market outcomes by sex
(Pooled sample from 2012, 2013, 2014, 2015, 2016, and 2017 surveys)

	Men (1)	Women (2)
1. Hourly wage	$26.17 (19.51)	$25.00 (10.85)
2. Yearly salary	$59,320*** (41,289)	$53,939 (26,608)
3. Usual hours per week	45.56*** (12.47)	42.68 (10.41)
4. Yearly salary plus bonus	$66,097*** (47,681)	$57,826 (33,169)
Sample size	640	843

Notes: The sample excludes subjects with wages lower than $6.00, hours worked per week fewer than 15 hours, and individuals working in foreign countries. *** Mean for men is significantly different than mean for women at the 0.01 level using a two-tailed t-test.

Table 7
Gender, average hourly wage and average salary plus bonus of full-time employees, and choosing to compete by major

	Percentage who majored in:		Average salary plus bonus		Percentage who choose to compete		Average taste for competition measure	
Major	(1) Men (n=279)	(2) Women (n=343)	(3) Men (n=552)	(4) Women (n=736)	(5) Men	(6) Women	(7) Men	(8) Women
1. Engineering	9.0	9.3	84,882* (30,218)	74,096 (28,501)	68.0	59.4	0.120	0.187
2. Business	27.2*	16.3	79,267 (61,206)	75,074 (29,308)	46.1	41.1	0.029	0.031
3. Sciences	19.0	20.4	68,047* (54,843)	53,063 (32,351)	52.8*	30.0	0.041	-0.020
4. Social sciences	38.7*	46.9	69,711* (33,856)	57,580 (31,183)	39.4*	17.8	-0.03	-0.062
5. Humanities	6.1	7.0	40,942 (11,135)	48,739 (35,653)	23.8	17.9	-0.066	-0.012

Notes: Samples for columns 1, 2, and 5-8 include all experiment subjects while columns 3 and 4 include only those responding to the survey. The sample for columns 3 and 4 is the pooled sample of workers over six annual surveys who are working full time for pay in the United States and earning 6 or more dollars per hour. Figures in parentheses are standard deviations. * Proportion or mean for men is significantly different from proportion or mean for women at better than the 0.05 level using a two tailed t test.

Table 8
Coefficients on taste for competition measure and female dummies in multinomial logits to predict college major

Major:	(1) Total sample	(2) Men	(3) Women
Engineering			
1. Female	0.273 (0.329)	___	___
2. Taste for competition (TFC)	1.146** (0.364)	0.834* (0.567)	1.419*** (0.510)
Business			
3. Female	-0.534** (0.239)	___	___
4. Taste for competition (TFC)	0.468* (0.259)	0.325 (0.360)	0.627* (0.370)
Sciences			
5. Female	0.097 (0.236)	___	___
6. Taste for competition (TFC)	0.357 (0.257)	0.368 (0.384)	0.362 (0.359)
Social Sciences	----	----	----
Humanities			
7. Female	-0.432 (0.327)	___	___
8. Taste for competition (TFC)	0.012 (0.427)	-0.305 (0.593)	0.283 (0.609)
9. p-value for H_0: Compete=0	0.022	0.388	0.068
10. Observations	622	279	343

Note: Sample includes all experimental respondents. TFC measure is the residual from a decision to compete probit with explanatory variables including performance on previous math task, estimated rank in group doing math tasks, risk aversion measure and a dummy for inconsistent risk references. Controls including the exercise 4 addition score (a measure of math ability), the expected rank in the addition tournament (a measure of confidence), a variable measuring risk aversion and a dummy variable for inconsistent risk preferences.

Table 9
Effects of competition measures on salary and bonus
Full sample

Variables	(1) Ln(Salary)	(2) Ln(Salary)	(3) Ln(Salary)	(4) Ln(Salary)
1. Female	-0.095***	-0.096***	-0.074*	-0.076*
	(0.037)	(0.037)	(0.039)	(0.039)
2. Taste for competition (TFC)		0.033	0.031	0.109*
		(0.044)	(0.043)	(0.065)
3. Estimated rank: 0(high), 3(low)			-0.050**	-0.049**
			(0.024)	(0.024)
4. TFC * Estimated rank				-0.090
				(0.061)
5. Observations	941	941	941	941
6. R-squared	0.175	0.176	0.185	0.188
	(1) Ln(Salary + bonus)	(2) Ln(Salary + bonus)	(3) Ln(Salary + bonus)	(4) Ln(Salary + bonus)
7. Female	-0.139***	-0.141***	-0.116***	-0.118***
	(0.042)	(0.042)	(0.044)	(0.043)
8. Taste for competition (TFC)		0.034	0.032	0.126
		(0.050)	(0.050)	(0.078)
9. Estimated rank: 0(high), 3(low)			-0.057**	-0.056**
			(0.028)	(0.027)
10. TFC * Estimated rank				-0.109
				(0.071)
11. Observations	941	941	941	941
12. R-squared	0.173	0.174	0.183	0.187

Notes: Sample for regressions includes all respondents working full time in the U.S. at a job they have been at for at least 8 months with an hourly wage $6.00 or above. TFC measure is the residual from a decision to compete probit with explanatory variables including performance on previous math task, estimated rank in group doing math tasks, risk aversion measure and a dummy for inconsistent risk references. Controls include years since graduation and year of post graduate survey fixed effects. Robust standard errors clustered by id in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Table 10
Effects of competition measures on salary and bonus
by gender

	Male sample			Female sample		
Variables	(1) Ln(Salary)	(2) Ln(Salary)	(3) Ln(Salary)	(4) Ln(Salary)	(5) Ln(Salary)	(6) Ln(Salary)
1. Taste for competition (TFC)	-0.009 (0.056)	-0.007 (0.056)	-0.084 (0.080)	0.082 (0.067)	0.076 (0.066)	0.311*** (0.108)
2. Estimated rank: 0(high), 3(low)		-0.050 (0.037)	-0.047 (0.037)		-0.054 (0.033)	-0.044 (0.032)
3. TFC x Estimated rank			0.103 (0.098)			-0.237*** (0.076)
4. Observations	415	415	415	526	526	526
5. R-squared	0.216	0.224	0.228	0.150	0.162	0.184
Variables	(1) Ln(Salary+ bonus)	(2) Ln(Salary+ bonus)	(3) Ln(Salary+ bonus)	(4) Ln(Salary+ bonus)	(5) Ln(Salary+ bonus)	(6) Ln(Salary+ bonus)
6. Taste for competition (TFC)	-0.009 (0.065)	-0.006 (0.066)	-0.070 (0.105)	0.084 (0.076)	0.078 (0.074)	0.336*** (0.123)
7. Estimated rank: 0(high), 3(low)		-0.062 (0.040)	-0.060 (0.040)		-0.057 (0.038)	-0.046 (0.037)
8. TFC x Estimated rank			0.0843 (0.123)			-0.260*** (0.087)
9. Observations	415	415	415	526	526	526
10. R-squared	0.204	0.214	0.216	0.141	0.151	0.173

Notes: Sample for regressions includes all respondents working full time in the U.S. at a job they have been at for at least 8 months with an hourly wage $6.00 or above. TFC measure is the residual from a decision to compete probit with explanatory variables including performance on previous math task, estimated rank in group doing math tasks, risk aversion measure and a dummy for inconsistent risk references. Controls include years since graduation and year of post graduate survey fixed effects. The composite coefficients for the TFC variables together with the estimated rank variables in column 6 for women reveal that the TFC coefficient is significantly different from zero for the most confident (positive) and the two least confident (negative) categories. Robust standard errors clustered by id in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Table 11
Effects of competition measures on salary and bonus
Female sample by years after graduation

	Log salary regressions				
Years after graduation	(1) 1 Year	(2) 2 Years	(3) 3 years	(4) 4 Years	(5) 5 Years
1. Taste for competition (TFC)	-0.0648 (0.640)	0.300* (0.177)	0.313** (0.124)	0.308*** (0.010)	0.317 (0.196)
2. TFC x Estimated rank	0.275 (0.601)	-0.207* (0.115)	-0.270*** (0.086)	-0.237*** (0.081)	-0.316** (0.142)
3. Estimated rank 0(high), 3(low)	-0.059 (0.110)	-0.057 (0.044)	-0.032 (0.046)	-0.035 (0.039)	-0.086* (0.045)
4. Observations	47	127	126	131	95
	Log salary plus bonus equations				
Years after graduation	(1) 1 Year	(2) 2 Years	(3) 3 years	(4) 4 Years	(5) 5 Years
5. Taste for competition (TFC)	-0.011 (0.714)	0.291* (0.166)	0.324** (0.124)	0.309** (0.119)	0.477* (0.268)
6. TFC x Estimated rank	0.189 (0.681)	-0.192* (0.106)	-0.284*** (0.0873)	-0.258*** (0.0921)	-0.442** (0.206)
7. Estimated rank 0(high), 3(low)	-0.080 (0.115)	-0.067 (0.045)	-0.024 (0.051)	-0.036 (0.046)	-0.087 (0.056)
8. Observations	47	127	126	131	95

Notes: Sample for regressions includes all respondents working full time in the U.S. at a job they have been at for at least 8 months with an hourly wage $6.00 or above. TFC measure is the residual from a decision to compete probit with explanatory variables including performance on previous math task, estimated rank in group doing math tasks, risk aversion measure and a dummy for inconsistent risk references. Controls include years since graduation and year of post graduate survey fixed effects. Robust standard errors clustered by id in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Table 12

Effects of competition measures on salary and bonus

Female sample with increasing level of controls

Variables	(1) Ln(Salary)	(2) Ln(Salary)	(3) Ln(Salary)	(4) Ln(Salary+ bonus)	(5) Ln(Salary+ bonus)	(6) Ln(Salary+ bonus)	(7) Ln(Salary+ bonus)
1. Taste for competition (TFC)	0.311*** (0.108)	0.196** (0.093)	0.148* (0.079)	0.336*** (0.123)	0.220* (0.114)	0.172* (0.095)	0.179** (0.087)
2. TFC x Estimated rank	-0.237*** (0.076)	-0.159** (0.072)	-0.097 (0.061)	-0.260*** (0.087)	-0.181** (0.085)	-0.123* (0.075)	-0.130* (0.069)
3. Estimated rank: 0(high), 3(low)	-0.044 (0.032)	0.022 (0.032)	0.015 (0.025)	-0.046 (0.037)	0.023 (0.037)	0.015 (0.029)	0.013 (0.028)
4. Controls	Time controls	Time and education controls	Time, education, and labor market controls	Time controls	Time and education controls	Time, education, and labor market controls	Time, education, and labor market controls with Heckman selection into stable employment
Observations	526	526	500	526	526	500	1,030
R-squared	0.184	0.342	0.544	0.173	0.304	0.529	

Notes: Sample for regressions includes all respondents working full time in the U.S. at a job they have been at for at least 8 months with an hourly wage $6.00 or above. TFC measure is the residual from a decision to compete probit with explanatory variables including performance on previous math task, estimated rank in group doing math tasks, risk aversion measure and a dummy for inconsistent risk references. Time controls include years since graduation, and year of post graduate survey. Education controls include GPA, dummies for major (business, engineering, sciences, and humanities with social sciences the omitted category) and a dummy for Santa Clara University. Controls for labor market include months working at employer, hours worked per week, sector of employment (nonprofit, local government, state government, federal government, self-employed, and family business with for-profit the omitted category), a dummy for having a post-graduate degree, a dummy for banking, management consulting or finance occupations, and a dummy for identifying as non-heterosexual. The variables predicting steady employment in the Heckman selection equations (column 7) are college major, college GPA, the taste for competition residual, the estimated rank in an addition tournament, family income, a dummy for live-in partner and practicing a religion, and dummies for social preference categories. We cannot reject the hypothesis that the coefficient on rho ρ (the correlation coefficient between the errors in the selection equation and in the compensation equation) is zero at conventional significance levels (p=0.25). The composite coefficients for the TFC variables together with the estimated rank variables in column 6 for women reveal that the TFC coefficient is significantly different from zero for the most confident (positive) category in all columns, the least confident (negative) category in columns 1, 2, 4, and 5 and the 2nd least confident (negative) category in columns 1 and 4. Robust standard errors clustered by id in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 13

Effects of competition measures on salary and bonus

Female sample by chosen task

Variables	(1) Ln(Salary)	(2) Ln(Salary)	(3) Ln(Salary)	(4) Ln(Salary+ bonus)	(5) Ln(Salary+ bonus)	(6) Ln(Salary+ bonus
	Panel A: Women who choose to compete in arithmetic task					
1. Taste for competition (TFC)	0.221 (0.154)	0.222* (0.131)	0.142 (0.108)	0.246 (0.175)	0.234 (0.151)	0.150 (0.115)
2. TFC x Estimated rank	-0.341* (0.183)	-0.338** (0.152)	-0.184 (0.122)	-0.415* (0.212)	-0.394** (0.171)	-0.230* (0.133)
3. Estimated rank: 0(high), 3(low)	-0.059 (0.042)	0.027 (0.045)	0.042 (0.040)	-0.072 (0.050)	0.017 (0.053)	0.034 (0.047)
4. Observations	237	237	226	237	237	226
	Panel B: Women who choose to compete in word task					
5. Taste for competition (TFC)	0.605*** (0.159)	0.216 (0.148)	0.205* (0.119)	0.676*** (0.180)	0.262 (0.169)	0.260* (0.143)
6. TFC x Estimated rank	-0.354*** (0.094)	-0.146 (0.089)	-0.099 (0.068)	-0.390*** (0.104)	-0.173* (0.100)	-0.124 (0.078)
7. Estimated rank 0(high), 3(low)	-0.014 (0.050)	0.047 (0.046)	0.018 (0.032)	-0.007 (0.057)	0.060 (0.055)	0.022 (0.036)
8. Observations	289	289	274	289	289	274
9. Controls	Time controls	Time and education controls	Time, education, and labor market controls	Time controls	Time and education controls	Time, education and labor market controls

Notes: Sample for regressions includes all respondents working full time in the U.S. at a job they have been at for at least 8 months with an hourly wage $6.00 or above. TFC measure is the residual from a decision to compete probit with explanatory variables including performance on previous math task, estimated rank in group doing math tasks, risk aversion measure and a dummy for inconsistent risk references. Time controls include years since graduation and year of post graduate survey. Education controls include GPA, dummies for major (business, engineering, sciences, and humanities with social sciences the omitted category) and a dummy for Santa Clara University. Controls for labor market include months working at employer, hours worked per week, sector of employment (nonprofit, local government, state government, federal government, self-employed, and family business with for-profit the omitted category), a dummy for having a post-graduate degrees, a dummy for banking, management consulting or finance occupations, and a dummy for identifying as non-heterosexual. Robust standard errors clustered by id in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Table 14
Effects of competition in chosen tasks on salary/ bonus
Female sample by chosen task in exercise 8

Variables	(1) Ln(Salary)	(2) Ln(Salary + bonus)	(3) Ln(Salary)	(4) Ln(Salary + bonus)
	Women who choose to compete in addition task		Women who choose to compete in word task	
1. Taste for competition (TFC)	0.177	0.209	0.144	0.112
	(0.120)	(0.146)	(0.259)	(0.294)
2. TFC x Estimated rank	-0.192*	-0.231*	-0.011	0.0150
	(0.110)	(0.132)	(0.133)	(0.151)
3. Estimated rank	-0.049	-0.057	0.103*	0.125**
0(high), 3(low)	(0.042)	(0.051)	(0.054)	(0.062)
Observations	237	237	288	288
R-squared	0.214	0.198	0.186	0.189

Notes: Sample for wage regressions includes all respondents working full time in the U.S. at a job they have been at for at least 8 months with an hourly wage $6.00 or above. TFC measure is the residual from a decision to compete probit with explanatory variables including performance on previous addition (word) task for those who chose the addition (word) task, estimated rank in group doing addition (word) tasks for those who chose the addition (word) task, risk aversion measure and a dummy for inconsistent risk references. Controls include years since graduation and year of post graduate survey fixed effects. Robust standard errors clustered by id in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Appendix Table 1
Distribution of majors, by gender and by school

	Haverford student body			Haverford experiment participants			Haverford survey respondents		
Percentage:	Total	Men	Women	Total	Men	Women	Total	Men	Women
Sciences	29.9	29.9	30.1	24.7	26.7	23.2	25.5	26.5	24.7
Social sciences	41.8	43.4	40.7	60.9	61.3	60.6	61.1	62.7	59.8
Humanities	28.2	26.7	29.2	14.4	12.0	16.2	13.4	10.8	15.4
	SCU student body			SCU experiment participants			SCU survey respondents		
Percentage:	Total	Men	Women	Total	Men	Women	Total	Men	Women
Engineering	13.0	20.1	6.9	12.7	12.3	13.1	14.6	11.5	16.8
Business	32.3	37.3	27.8	29.5	37.3	23.0	30.9	40.1	24.3
Sciences	11.8	11.2	12.4	17.8	16.2	19.3	18.4	19.8	17.4
Social sciences	22.5	14.4	25.6	34.6	28.4	39.8	31.2	23.2	37.1
Humanities	20.3	17.2	27.3	5.4	5.9	4.9	4.8	5.3	4.4

Appendix Table 2
Gender distribution within major
by survey, experiment, and school

	Survey		Experiment		Haverford College		Santa Clara University	
	% Female	% Male	% Female	% Male	% Female	% Male	% Female	% Male
Engineering	63.3	36.7	56.1	43.9			27.6	72.4
Business	44.2	55.8	42.7	57.3			45.5	54.5
Sciences	58.2	41.8	56.9	43.1	55.0	45.0	55.4	44.6
Social science	62.2	37.7	60.3	39.7	53.2	46.8	64.1	35.9
Humanities	59.4	40.6	59.5	40.5	57.0	43.0	65.9	34.1

Appendix Table 3

Results from Heckman selection equation estimating the probability of being in steady employment

	Total Sample	Men	Women
1. Taste for competition (TFC)	-0.019 (0.073)	-0.097 (0.108)	0.025 (0.104)
2. Estimated rank in addition exercise 0(high), 3(low)	0.021 (0.039)	-0.004 (0.064)	0.065 (0.053)
3. Grade point average (GPA)	-0.039 (0.086)	0.013 (0.129)	-0.101 (0.123)
4. Engineering major	0.649*** (0.116)	0.443** (0.190)	0.692*** (0.153)
5. **B**usiness major	0.569*** (0.060)	0.489*** (0.165)	0.709*** (0.144)
6. Science major	-0.259** (0.105)	-0.277* (0.164)	-0.216 (0.141)
7. Social sciences major	0.149 (0.093)	0.275* (0.153)	0.093 (0.122
8. Self-interested	0.248*** (0.092)	0.242 (0.167)	0.249** (0.113)
9. Inequality averse	0.013 (0.105)	-0.211 (0.229)	0.113 (0.121)
10. Efficiency maximizer	0.133 (0.095)	0.396*** (0.170)	-0.130 (0.126)
11. Compassionate social surplus maximizer	-0.065 (0.102)	0.036 (0.172)	-0.161 (0.146)
12. Practice a religion	0.059 (0.060)	0.147 (0.094)	-0.10 (0.081)
13. Having a live-in partner	0.234*** (0.085)	0.166 (0.140)	0.276*** (0.112)
14. Family income	-0.005 (0.024	0.067 (0.038)	-0.076** (0.033)
15. Pseudo R squared	0.046	0.062	0.063

Notes: Coefficients in rows 1-7 refer to variables which identify the selection equation and are not included in any of the compensation equations. Probit coefficients are present with robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 4
Full set of coefficients in salary/salary + bonus equations
Female samples

	(3) Ln(Salary)	(6) Ln(Salary+bonus)
1. Taste for competition	0.148* (0.079)	0.172* (0.095)
2. TFC x Estimated rank	-0.097 (0.061)	-0.123* (0.075)
3. Estimated rank 0(high), 3(low)	0.015 (0.025)	0.015 (0.029)
4. Years since graduation	0.073*** (0.025)	0.087*** (0.029)
5. Year 2013	-0.119 (0.094)	-0.055 (0.111)
6. Year 2014	-0.096 (0.076)	-0.053 (0.089)
7. Year 2015	-0.059 (0.0579)	-0.032 (0.067)
8. Year 2016	-0.037 (0.040)	-0.018 (0.044)
9. Santa Clara University	0.092* (0.051)	0.080 (0.061)
10. GPA	0.167*** (0.055)	0.165*** (0.062)
11. Engineering major	0.262*** (0.071)	0.264*** (0.087)
12. Business major	0.069 (0.048)	0.038 (0.058)

13. Science major	0.001	0.021
	(0.057)	(0.069)
14. Humanities major	-0.043	-0.010
	(0.061)	(0.082)
15. Hours per week	0.013***	0.015***
	(0.003)	(0.003)
16. Months at position	0.005***	0.006***
	(0.002)	(0.002)
17. Graduate degree	0.056	0.020
	(0.064)	(0.065)
18. Non-heterosexual	-0.099	-0.101
	(0.069)	(0.078)
19. Job in business/finance/ management	0.104***	0.155***
	(0.038)	(0.049)
20. Self-employed	-0.082	-0.125
	(0.092)	(0.102)
21. Local government	-0.464**	-0.494***
	(0.180)	(0.183)
22. State government	-0.189***	-0.213**
	(0.070)	(0.084)
23. Federal government	-0.175*	-0.170
	(0.095)	(0.111)
24. Family business	0.074	0.084
	(0.195)	(0.219)
25. Constant	9.348***	9.240***
	(0.282)	(0.335)
26. Observations	500	500
27. R-squared	0.544	0.529

Notes: Sample for regressions includes all respondents working full time in the U.S. at a job they have been at for at least 8 months with an hourly wage $6.00 or above. TFC measure is the residual from a decision to compete probit with explanatory variables including performance on previous math task, estimated rank in group doing math tasks, risk aversion measure and a dummy for inconsistent risk references. Time controls include years since graduation, year of post graduate survey, and estimated rank in addition tournament. Education controls include GPA, dummies for major (business, engineering, sciences, and humanities with social sciences the omitted category) and a dummy for Santa Clara University. Controls for labor market

include months working at employer, hours worked per week, sector of employment (nonprofit, local government, state government, federal government, self-employed, and family business with for-profit the omitted category), a dummy for having a post-graduate degree, a dummy for banking, management consulting or finance occupations, and a dummy for identifying as non-heterosexual. The variables predicting steady employment in the Heckman selection equations are college major, college GPA, the taste for competition residual, the estimated rank in an addition tournament, family income, a dummy for live-in partner and practicing a religion, and dummies for social preference categories. We cannot reject the hypothesis that the coefficient on rho ρ (the correlation coefficient between the errors in the selection equation and in the compensation equation) is zero at conventional significance levels ($p=0.25$). The composite coefficients for the TFC variables together with the estimated rank variables in column 6 for women reveal that the TFC coefficient is significantly different from zero for the most confident (positive) category in all columns, the least confident (negative) category in columns 1, 2, 4, and 5 and the 2nd least confident (negative) category in columns 1 and 4. Robust standard errors clustered by id in parentheses: *** $p<0.01$, ** $p<0.05$, * $p<0.1$