

EXPERT REPORT
of
HENRY S. FARBER
In Connection With

Chen-Oster v. Goldman Sachs
February 17, 2014

I. Introduction

1. In this report I re-state opinions previously submitted in my Reports filed on October 30, 2013 and January 28, 2014.¹

II. Qualifications

2. I am the Hughes-Rogers Professor of Economics at Princeton University, where I have served on the faculty since 1991. I served on the faculty of the Department of Economics of the Massachusetts Institute of Technology from 1977 through 1991. I received a Ph.D. in economics from Princeton University in 1977, a Master of Science in Industrial and Labor Relations from Cornell University in 1974, and a B.S. in economics from Rensselaer Polytechnic Institute in 1972. Among other topics, I teach courses in labor economics (the analysis of wages, hours, employment, unemployment, labor unions, and other topics related to the workforce) and econometrics (the application of statistics to problems in economics). I have written numerous scholarly articles in both of these subject areas, and my research has been widely published in academic and professional journals. I am a Research Associate of the National Bureau of Economic Research (NBER) and a Research Fellow of the Institute for the Study of Labor (IZA). I am a Fellow of the Econometric Society, a Fellow of the Society of Labor Economists, and a Fellow of the Labor and Employment Relations Association. I am a member of the Labour

¹ Expert Report of Henry S. Farber in Connection with Chen-Oster v. Goldman Sachs, October 30, 2013 and Expert Rebuttal Report of Henry S. Farber in Connection with Chen-Oster v. Goldman Sachs, January 28, 2014.

and Income Statistics Advisory Committee of Statistics Canada. A complete description of my qualifications is contained in my curriculum vitae and a list of my recent testimony is attached as Appendix A to this report. I have also consulted and testified as an expert witness in numerous cases involving labor economics.

3. My time is being billed at the rate of \$735 per hour for my work in this matter. This is my normal hourly rate for this type of work. Payment to me is not contingent on my opinions in this matter. I reserve the right to supplement this report if and when additional, relevant material becomes known to me.

III. Assignment

4. I understand that the plaintiffs in this matter are a class of women at Goldman Sachs & Co. and The Goldman Sachs Group, Inc. (together “Goldman” or “Goldman Sachs”). The class consists of female financial-services employees who are or have been employed by Goldman as Associates or Vice Presidents at any of its offices in the United States as of September 10, 2004 and/or at Goldman’s New York office as of July 7, 2002.²

5. I have been asked to analyze data concerning financial-services employees in three of Goldman’s divisions: Investment Banking (“IBD”), Investment Management

² First Amended Class Action Complaint, H. Christina Chen-Oster, Lisa Parisi and Shanna Orlich v. Goldman Sachs & Co. and The Goldman Sachs Group, Inc., September 19, 2011 (the “complaint”), ¶¶ 58-59.

(“IMD”), and Securities (which consists of Fixed Income, Currency and Commodities (“FICC”) and Equities (“Equities”)).

6. Counsel for plaintiffs asked me to study:
 - a. Whether there is statistical evidence of discrimination in pay against women who are members of this class.
 - b. To the extent that I find statistical evidence of discrimination in pay against women who are members of the class, the extent to which these differences in pay can be explained by differences between how men and women fare in Goldman’s performance review system.
 - c. Whether there is statistical evidence of a difference in how men and women fare in Goldman’s performance review system.
 - d. Whether there is statistical evidence of disparities between men and women in promotion rates from Vice President positions to positions as Managing Directors through 2008.

IV. Summary of Opinions

7. My opinions are set forth in my opening Report, my deposition testimony, and herein, and are summarized as follows:
 - a. Women are paid less than otherwise similar men, on average, and the difference in pay is statistically significant. I calculate that the average pay difference is about 8 percent for Associates and about 21 percent for Vice Presidents when I adjust for differences between men and women

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in division, year, office, education, affirmative action (“AA”) job group, experience at Goldman, experience at Goldman squared (both from the most recent hire date), relevant experience prior to most recent date at Goldman (including experience in prior employment spells at Goldman), relevant experience squared, whether a direct hire into the Associate or Vice President position and whether a direct hire into the Associate or Vice President position in the current year.

- b. Women are evaluated lower on the 360-degree review and are less likely to be ranked in the top quartile than otherwise similar men
- c. Women are paid less than similar men even when they receive the same quartile score.
- d. Among Associates, differences between women’s and men’s quartile and 360-degree review ratings explain about 4 percentage points of the overall average pay difference or approximately 50 percent of the observed pay difference. Among Vice Presidents differences between women’s and men’s quartile and 360-degree review ratings explain about 5 percentage points of the overall average pay difference or approximately 22 percent of the observed pay difference.
- e. The remaining pay differences between similar men and women of about 3 percent among Associates and 17 percent among Vice Presidents are statistically significant and reflect a difference in average pay between men and women with the same personal characteristics and

jobs groups whose performance is the same according to Goldman's measures of performance.

- f. I also find that during the period 2004 through 2008 (reflecting promotion decisions in 2003-2007) women were promoted from Vice President to Managing Director at a lower rate than one would expect if they were promoted in the same pattern as men were promoted. Comparing men and women Vice Presidents in the same year with the same number of years as Vice Presidents and working in the same division, I also find that during the period 2004 through 2008 (reflecting promotion decisions in 2003-2007) women were promoted at a lower rate than one would expect if they were promoted in the same pattern as men were promoted. Comparing men and women Vice Presidents in the same year with the same number of years as Vice Presidents and also adjusting for differences in division, office, education, AA job group,³ experience at Goldman, experience at Goldman squared (both from the most recent hire date), relevant experience prior to most recent date at Goldman (including experience in prior employment spells at Goldman), relevant experience squared and whether a direct hire into the VP position, women experienced 19 fewer promotions than I would

³ Because promotion is a low probability event, I use a slightly different measure of job group for the promotions analysis than I use in my analyses of earnings. Job groups with fewer than 250 observations in the relevant sample are combined into an expanded "Other" group.

expect in the absence of discrimination. This difference is statistically significant.

V. Background

8. In this section of my report, I briefly discuss areas of background information relevant to my analysis. I first provide a short introduction to those divisions of Goldman that are included in my analysis. I then summarize the components of earnings for Associates and Vice Presidents at Goldman. I also describe Goldman's firm-wide review process. Next I lay out Goldman's promotion policies. Finally, I provide an introduction to my data sources.

A. Divisions

9. My analysis includes financial-services employees who work in three Goldman divisions: Investment Banking ("IBD"), Investment Management ("IMD"), and Securities (consisting of Fixed Income, Currency and Commodities ("FICC") and Equities ("Equities")). I understand that these divisions have the following goals, as described on the Goldman website.⁴

10. IBD works with corporate clients, pension funds, financial sponsors and governments to structure and execute financing and risk management transactions.

11. IMD provides investment management services and offers investment products across all major asset classes to institutional and individual clients. It also offers

⁴ <http://www.goldmansachs.com/careers/why-goldman-sachs/our-divisions> as of October 30, 2013.

wealth advisory services, including portfolio management and financial counseling, and brokerage and other transaction services to high-net-worth individuals and families.

12. Securities deals with interest rate products (such as government bonds, treasury bills and other highly liquid instruments), credit products, mortgages, currencies, commodities, and stocks and other equity-related products (such as convertible securities, options and futures) and other services for institutional investors.

B. Compensation

13. Goldman's Compensation Recommendation System ("CRS") records and maintains a variety of information, including employee earnings during the relevant time frame. Employee compensation is set by senior management at Goldman through common, firm-wide processes. An employee's earnings for Associates and Vice Presidents typically consist primarily of a salary as well as the year-end bonus. Total earnings, including the base salary and bonus, are referred to as "Per Annum Total Compensation" (PATC).⁵ I use the total cost earnings for an individual that measures total year-end compensation.⁶

C. 360-degree Performance Review and Manager Quartiling.

14. Goldman employs a performance evaluation system that consists of a 360-degree performance review and a manager quartiling process.

⁵ Deposition of Stephanie Blinder ("Blinder Tr."), April 30, 2013, at 150:12.

⁶ See Blinder Tr. 150:11-151:17.

15. For the 360-degree performance review, each employee is evaluated by his or her manager and a number of other Goldman employees who are generally a combination of more senior, less senior, and peer reviewers.⁷ Reviews are both solicited and unsolicited.⁸ From 2003-2006, each reviewee was scored on 3 “Firmwide Review Categories” – Leadership, Overall Commercial Effectiveness, and Overall Professional Performance; these three items were averaged to produce the employee’s overall 360-score.⁹ Beginning in 2006, there was a shift to a nine-item average score, where employees were scored on the following criteria firm-wide: Technical Skills, Communication Skills, Judgment/Problem Solving, Teamwork, Compliance, Diversity, Leadership, Overall Commercial Effectiveness, and Overall Professional Performance.¹⁰ Through 2009, each criterion was scored on a scale from 1 to 5; beginning in 2010, this scale was expanded to be from 1 to 9.¹¹

⁷ GS0098769.

⁸ Deposition of David Landman (“Landman I Tr.”), September 5, 2013 at 62:19-63:13. Employees are encouraged to have between 8 and 12 reviewers. GS0119395.

⁹ GS0124240 at -240 and -241; GS0163810 at -811.

¹⁰ GS0003383 at -387; GS0120172 at -177; Deposition of Jessica Kung (“Kung Tr.”), August 1, 2013, at 305:14-18, 307:2-8; GS0120195 at -209 (Exhibit 233); GS0121383 at -388; GS0120828 at -833.

¹¹ GS0004968.

16. 360-scores are typically adjusted to account for the “harshness” or “leniency” of individual reviewers so long as there is sufficient data to do so. The maximum adjustment is +/- 0.25 points.¹²

17. The 360-degree performance review score is an input into the managers’ quartiling decisions. There are a number of other inputs into the quartiling process in addition to the 360-degree score.¹³

18. The manager quartiling process is an assessment tool that Goldman Sachs uses to evaluate the relative performance of its employees and to set bonus compensation.¹⁴ The managers are required, as part of the quartiling process, to distribute employees into four or five “quartiles” based on perceived relative performance.¹⁵ This requirement is sometimes known as “forced ranking.”¹⁶ Quartiling has been used at Goldman Sachs throughout the Class Period.¹⁷ The quartile was also called “Manager Performance Rank” for a portion of the Class Period; the terms are synonymous.¹⁸

¹² GS0003383 at -385. A Goldman witness testified that the fundamentals of the adjustment process remained unchanged when Goldman transitioned from a 5-point score to a 9-point score. Deposition of David Landman (“Landman II Tr.”), October 10, 2013, at 184:7-18.

¹³ GS0153476 at -480.

¹⁴ Landman II Tr. at 8:7-9.

¹⁵ Note that though Goldman refers to these groups as “quartiles,” they are not always quartiles in the usual sense of the word—four equally-sized groups. For the time period I study, there are five “quartiles”, with two middle “quartiles” combined in some years.

¹⁶ GS0153476 at -478, -485.

¹⁷ Landman Tr. at 8:10-15.

¹⁸ GS0153476 at -480.

19. Employees who are on maternity leave for any portion of the year, as well as employees who were on paid medical leave for 8 or more weeks are assigned a quartile, but these employees are not included in the final divisional distribution of quartiles.¹⁹ In 2009, a policy change allowed employees who took a Leave of Absence (“LOA”) of at least 12 weeks during the previous year to count toward the division’s distribution, subject to review from Employee Relations and Employment Law Groups at Goldman Sachs.²⁰

20. Managers were instructed to assign employees into quartiles 1 through 5, with the first quartile comprising about 25% of the top performing employees by rank, the second quartile comprising the next best 25% of the employees (25th to 50th percentile) by rank, the third quartile comprising (approximately) employees in the 50th to 75th percentile by rank, the fourth quartile comprising the next 15% of employees by rank (75th through 90th percentile) and the fifth quartile assigned to the bottom 10% of the employees by rank.²¹

D. Promotions

21. In order to evaluate candidates for promotions from Vice President (“VP”) to Managing Director (“MD”, also referred to as Extended Managing Director), Goldman Sachs uses a process known internally as “cross-ruffing.”²²

¹⁹ GS0109388. Employees anticipating divisional transfers are also assigned quartiles but not included in the final divisional distribution of quartiles.

²⁰ GS0109411.

²¹ GS0153476 at -478.

²² GS0113548 at -556; Deposition of Caroline Heller-Sberloti (“Heller-Sberloti Tr.”), July 10 & 11, 2013, at 213:25-214:8.

22. Goldman generates a list of candidates to be considered for promotion. From 2002-2007, the firm maintained a website where any current MD or Participating Managing Director (“PMD”) could nominate a VP for consideration.²³ Beginning in 2008, the process was modified so that division and regional heads met with current MDs and submitted candidate lists to Human Capital Management (“HCM”).²⁴ The final list of candidates is submitted to a firm-wide committee for review.²⁵

23. The HCM team proposes a selection committee (known as a “cross-ruffing committee”).²⁶ It is finalized by senior divisional leadership, and is approved by a firm-wide committee.²⁷ Each member of the cross-ruffing committee is assigned a list of candidates to evaluate.²⁸ For each candidate, the reviewer interviews MDs who are knowledgeable about the candidate, then prepares a one-page summary review sheet.²⁹ After the reviews are completed, the committee ranks the list of candidates in order of

²³ GS0113548 at -564, GS0004990 at -009.

²⁴ GS0004777 at -779; Heller-Sberloti Tr. at 232:4-233:9.

²⁵ Deposition of Bruce Larson (“Larson Tr.”), June 12, 2013, at 229:6-21 and 232:8-11; Kung Tr. at 415:23-416:2; Heller-Sberloti Tr. at 205:18-23..

²⁶ Kung Tr. at 399:8-24; Larson Tr. at 240:10-21; Heller-Sberloti Tr. at 214:9-215:4.

²⁷ Kung Tr. 399:25-400:21; Larson Tr. at 240:10-21; Heller-Sberloti Tr. at 213:5-12.

²⁸ Kung Tr. at 440:2-9; Larson Tr. at 243:1-4 Heller-Sberloti Tr. at 218:10-13.

²⁹ GS0113548 at -552 and -556. Blank review sheet at -560.

preference for promotion.³⁰ The division heads review this list and create their own ranked list.³¹ Both lists are submitted to the firm-wide executive office for review and approval.³² Goldman decides how many people each division may promote each year, and finalizes the list of ranked candidates in conversation with both the division leaders and the leaders of the cross-ruffing committee.³³

24. There is no requirement that a Vice President attain a certain quartile ranking in order to be eligible for promotion to Managing Director.³⁴

E. Data

25. Goldman made a number of data files available to me, of which I have used:

- extracts from Goldman's PeopleSoft database,
- extracts from the Compensation Recommendation System ("CRS") database,
- extracts from the Firm-Wide Review database.

26. Extracts from the PeopleSoft database contain (among other fields) data on the employee's job history while being employed at Goldman, employee's job title, gender, date of hire at Goldman, job code, job code description, date an employee became

³⁰ GS0113548 at -566; Larson Tr. at 244:14-20.

³¹ GS0113548 at -567; Larson Tr. 246:25-247:3.

³² Larson Tr. at 247:24-248:8; Kung Tr. at 453:13-23; Heller-Sberloti Tr. at 230:6-9; GS0164972; GS0242506.

³³ Larson Tr. at 248:16-149:4; Kung Tr. at 452:19-454:16; Heller-Sberloti Tr. at 230:10-231:19.

³⁴ Kung 428:8-429:20; Larson Tr. at 296:16-297:17.

a Vice President, date an employee became a Participating or an Extended Managing Director, and changes in the employee's status "Active," "Retired," "Terminated," "Leave of Absence," "Leave with Pay," or "Deceased," throughout the course of a fiscal year. The PeopleSoft data also provide information about an employee's personal characteristics such as work experience prior to the current period of employment at Goldman, education, degree, degree description and the date the degree was granted. The PeopleSoft data indicate the type of leave an employee may have taken over the course of a year (FMLA, Maternity, Sick, Personal, Disability, etc.).

27. It is my understanding that prior to 2009 Goldman's fiscal year did not coincide with a calendar year, e.g., Goldman's 2007 fiscal year started on December 1 of 2006 and ended on November 30, 2007. In 2009 Goldman changed this practice by switching to a calendar year definition of the fiscal year. Thus, Goldman's 2009 fiscal year ran from December 1, 2008 through December 31, 2009, and Goldman's 2010 fiscal year ran from January 1, 2010 through December 31, 2010.^{35, 36}

28. The CRS extracts contain (among other fields) information on an employee's year-end earnings (base salary and year-end bonus), job group, and location. In this report I make use of Quartile data derived from CRS.

³⁵ Correspondence from Rebecca Farber, March 19, 2013.

³⁶ Note that because of a change in computer systems in 2004, Goldman provided PeopleSoft data for periods prior to September 1, 2004 only for workers who continued to work at Goldman after that date. Employees who separated from Goldman prior to September 1, 2004 are not included in the data even if they worked at Goldman prior to September 1, 2004 and would otherwise have been included.

29. The FRS extracts contain (among other fields) information on the employee's adjusted and unadjusted average 360-score, an employee's average cumulative 360-score used for ranking, review groups for the employee, both regional and global, employee's rank within his or her group, and the number of people in the review group. I understand that 360-degree performance reviews took place twice a year during the summer and the winter with the majority of the employees being reviewed during the summer cycle. Where an employee has two reviews in the course of the year, I have used the summer 360-score and quartile for that individual. Goldman made FRS data available for years 2003 through 2011 for the summer reviews and for years 2004 to 2011 for the winter reviews.

30. My compensation measure is based on total cost earnings for an individual that measure total year-end compensation.³⁷ This field is called "Total Cost for Equity Calculated Amount."³⁸ I then convert this measure to an annualized basis to account for part-year employment.

VI. Methods

31. In this section of my report, I provide a general description of my methods for testing for the presence of discrimination in Goldman's systems. The methods I apply are standard among labor economists.

³⁷ As described in Blinder Tr. 151:11-152:17

³⁸ Sheet "Equity Compensation" in Compensation_2_Feb.13.2013.xlsx (CRS)

32. Economists define sex discrimination in pay to be differences in pay between men and women that cannot be explained by differences in personal characteristics like education and work experience or differences in the type of work they perform.³⁹

33. An individual's education and work experience are related to his or her pay. Workers who are better educated earn more than those with less education, on average. Similarly, more experienced workers have higher average pay than workers with less experience. These differences reflect the increase in productivity that is associated with additional education or work experience.

34. Average pay also varies across types of jobs, even for workers with otherwise similar characteristics. For example, engineers typically earn more than librarians. This is true even for engineers and librarians with similar levels of education and work experience. These differentials result from differences in supply of workers to the different jobs relative to demand. For example, careers that are less popular, that require unusual skills, or that are in particularly high demand need to offer higher wages in order to attract workers into that type of work.

³⁹ Note that these “personal characteristics” are characteristics that the employee brings to the job and, as a result, are not influenced by Goldman’s employment practices. They are distinct from the “performance and production measures” developed by Goldman, which I discuss in Section VIII of my report.

35. Thus, in studying the salaries of male and female employees at Goldman, I adjusted for differences between them in education, work experience, and job group.⁴⁰

36. The key statistical technique I use is multiple regression analysis of pay. All of my regression analyses also include factors that adjust for differences in pay over time. A multiple regression analysis yields an estimate for each factor of its impact on pay. These estimates are called the coefficients of the model.

37. While the factors listed in the previous paragraph are the central systematic factors that determine pay in a non-discriminatory compensation system, there is substantial variation in pay that is not accounted for by these factors. The multiple regression model accounts for these unmeasured factors through a random component.

38. The coefficients of the model are estimated using multiple regression analysis, and these estimated coefficients are used to compute a prediction of pay for each worker based strictly on the factors included in the model. Estimates of the unmeasured factors are then computed as the difference between the actual pay level and the predicted pay level. This difference is called the residual.

39. If pay is determined in a non-discriminatory fashion, then these residuals will not be systematically related to the sex of the worker. If there is a systematic relationship such that women are paid less, on average, than predicted by the factors

⁴⁰ To allow for a non-linear relationship between experience and pay, my models include both work experience and the square of work experience both at Goldman and prior to the current period of employment at Goldman.

included in the model, then I would conclude that the analysis provides statistical evidence of discrimination.

40. The actual calculation is done in a single step by including in the model a variable that indicates which observations relate to women. The central result of the multiple regression analysis in this case is an estimate of the effect of being a woman on pay, accounting for differences between men and women in the other factors included in the model. The estimated effect of being a woman on pay in this model is a measure of the relationship between sex and the unmeasured factors affecting compensation. If it is found that there is a statistically significant negative effect of being a woman on pay (an effect that was unlikely to have arisen by chance) after accounting for differences in the workers' characteristics and job characteristics included in the model, then I conclude that there is statistical evidence of discrimination against women in pay.

41. In order to draw an inference that there has been discrimination, it is important to determine how likely it would be to find the observed difference in pay if there had not been discrimination. To make this clear, consider the following example. Suppose that, in fact, pay is non-discriminatory so that, all other things equal, men and women would earn the same level of pay. However, there are many factors that affect pay in any particular case. Some of these, such as education, experience, and job group, are measurable and appropriate to consider in pay determination. Others are not measured and assumed to be the same, on average, for men and women. These unmeasured characteristics are captured by the random component.

42. What this means is that, for any group of men and women who are paid on a non-discriminatory basis, there will be some average difference in pay due to variation in the random component even after accounting for individual and job characteristics. The multiple regression analysis provides a measure of how likely it is that the estimated average difference in pay accounting for the included factors is due to random variation (which is assumed equal on average for men and women) rather than to systematic variation in pay by sex (discrimination).

43. A statistic provided by the multiple regression analysis is called a "t-ratio" (sometimes called the "number of standard deviations") on the estimated coefficient in the pay regression on the variable indicating being a woman (the average difference in pay between women and men accounting for the other factors). Larger absolute values of the t-ratio indicate that the estimated pay difference is less likely to have occurred by chance. The usual standard used by labor economists for a conclusion that an estimated pay difference is statistical evidence of discrimination is a t-ratio greater than 1.96 (in absolute value), which indicates that the observed difference would have occurred randomly in the absence of discrimination less than five percent of the time.

VII. Analysis of Earnings

44. In this section, I describe my analysis of differences in pay between men and women who were Associates or Vice Presidents at one of Goldman's US offices from 2005 through 2011 or those who were Associates or Vice Presidents at Goldman's New

York office in 2003 or 2004.⁴¹ Specifically, I include controls for work experience in related areas prior to Goldman, direct hires into Associate and Vice President positions (also called lateral hires),⁴² division, year, office, education, AA job group, experience at Goldman, and experience at Goldman squared (both from the most recent hire date).

45. Some workers had an earlier employment experience with Goldman Sachs, and some workers had experience with other employers in related areas. I include prior years of experience in related areas, including with Goldman Sachs.⁴³ I also include the square of this measure in order to allow for a non-linear relationship between the log of compensation and the additional experience measure.

46. I use the affirmative action job group classification made available by Goldman to account for broad differences in the type of work performed. This classification system is described by the United States Department of Labor Code of Federal Regulations, Title 41 – Public Contracts and Property Management. §60-2.12 (b) states:

In the job group analysis, jobs at the establishment with similar content, wage rates, and opportunities, must be combined to form job groups. Similarity of content refers to the duties and responsibilities of the job titles

⁴¹ While the class periods for the New York class and the national class begin in mid-year 2002 and 2004 respectively, I limit my analysis to those years for which all earnings are in the relevant period of time.

⁴² My controls for direct hires include indicators (separately for Associate and Vice Presidents) for whether the relevant individual was directly hired at the beginning of his or her current period of employment and an additional indicator for whether the current year is the first year of that period of employment.

⁴³ In order to identify which non-Goldman jobs should be considered “related,” I use a definition developed by Goldman Sachs as reflected in their statistician’s prior report. (See [crrrelatedexp.do](#))

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which make up the job group. Similarity of opportunities refers to training, transfers, promotions, pay, mobility, and other career enhancement opportunities offered by the jobs within the job group.⁴⁴

47. By accounting for affirmative action job group, I am relying on Goldman's own classification of affirmative action job groups that are broadly comparable in the dimensions that are relevant for the compensation analysis. Workers within a job group have been classified by Goldman to have similar duties, responsibilities, compensation opportunities, and promotion opportunities.

48. I estimate separate pay differences for Vice Presidents and Associates.

49. I present analyses that do not include measures of performance (quartile and 360 review score) as well as analyses that include these measures. This is important for two reasons. First, at least one of the performance measures is missing for almost one quarter of the sample. Second, the issue of gender bias in the performance measures (360 scores and quartiling) is central to the plaintiffs' allegation of discrimination. As such, these performance measures are potentially tainted, and adjusting for differences between men and women in these measures could mask pay discrimination.

50. I present basic summary statistics for the data I analyze in Tables 1 through 5 (attached). These summary statistics provide an introduction to the data, and I do not draw any conclusion from them. These data are based on the sample I use for my primary

⁴⁴ <http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&sid=3b71cb5b215c393fe910604d33c9fed1&rgn=div5&view=text&node=41:1.2.3.1.2&idno=41#41:1.2.3.1.2.2.1.3>. Accessed January 25, 2014.

regression analysis, and they exclude person years with missing data for the factors included in my regression analyses.

51. In Table 1, I display the number of individuals and person/years in my data by sex. It shows that approximately one quarter of my sample is made up of observations on women. In Tables 2 and 3, I display this same data separately for Associates and Vice Presidents. Table 2 indicates that about 28 percent of Associates are women, while Table 3 indicates that about 22 percent of Vice Presidents are women.

52. I report data on average earnings for Associates in Table 4 and for Vice presidents in Table 5. These tables also contain data on the average natural logarithm (“log”) of annualized earnings. These data, like all earnings data analyzed in my report, are annualized (converted to a full-year equivalent level) to take account of part-years caused by unpaid leaves and by hires that have occurred at some point during a fiscal year. The table shows mean earnings and mean log earnings for men and women separately. I also report the standard deviation of earnings and log earnings. A standard deviation is a commonly used measure of the degree of variation in the data.⁴⁵ The data in the table indicate that, on average, men earn more than women with the mean earnings for male Associates being about [REDACTED] and the mean earnings for female Associates being about [REDACTED]. Among Vice Presidents, men average about [REDACTED] per year and women average about [REDACTED] per year.

⁴⁵ Note that this is a different measure of variation from the measure of variation used to calculate a t-ratio, or the “number of standard deviations.”

53. I present the results of my first analysis of pay differences in Tables 6 and 7. Table 6 contains estimates for the pay gap for Associates. Table 7 contains estimates for the pay gap for Vice Presidents. The first row of each table, labeled “Model 1”, presents results from a model that makes no adjustments for differences between men and women, other than their titles (comparing Vice Presidents to each other and Associates to each other). I present this model as a reference point for the other models and draw no conclusions from these data. The second row, labeled “Model 2”, controls for division, year, office, education, AA job group, experience at Goldman, experience at Goldman squared (both from the most recent hire date), relevant experience prior to most recent date at Goldman, relevant experience squared, whether a direct hire into the Associate or VP position and an indicator for the fiscal year being the year of hire for those hired into Associate/VP positions directly.

54. I report the average logarithmic pay difference in the first column of the table after adjustment for the factors included in the relevant model. Negative differences indicate that women earn less than men who are otherwise the same in terms of the characteristics included in the model. I report the absolute value of the t-ratio for each logarithmic difference in the second column of the table. Generally speaking, values for the t-ratio of 1.96 or higher indicate that the logarithmic difference is statistically

significant at the 5 percent significance level.⁴⁶ In the third column of the table I report the value of the percentage difference in pay calculated from the logarithmic difference in pay.

55. Table 6 indicates that, without adjustments, female Associates earn 9.5 percent less than male Associates, on average. When I calculate the pay gap accounting for differences in the factors included in Model 2 (division, year, office, education, AA job group, experience at Goldman, experience at Goldman squared - both from the most recent hire date, relevant experience prior to most recent date at Goldman, relevant experience squared, whether a direct hire into the Associate or VP position and an adjustment for the fiscal year being the year of hire for those hired into Associate/VP positions directly), the gender pay gap for Associates falls to 7.6 percent. Both of these gender pay gaps are statistically significant, with t-ratios higher than 5.0.

56. Table 7, which presents the results for Vice Presidents, indicates that, without adjustments, female Vice Presidents earn 24.2 percent less than male Vice Presidents, on average. When I calculate the gender pay gap accounting for differences in the factors included in Model 2 (division, year, office, education, AA job group, experience at Goldman, experience at Goldman squared - both from the most recent hire date, relevant experience prior to most recent date at Goldman, relevant experience squared, whether a direct hire into the Associate or VP position and an indicator for the fiscal year being the year of hire for those hired into Associate/VP positions directly), the

⁴⁶ I calculate these t-ratios using Huber-White robust standard errors clustered by individual to allow for the possibility that observations on the same individual in different years are not statistically independent of one another.

gender pay gap for Vice Presidents falls to 21.4 percent. Again, both of these gender pay gaps are statistically significant, with t-ratios larger than 9.

57. To summarize, the results in Table 6 and 7 provide strong evidence that females, both Associates and Vice Presidents, earn significantly less on average than males at Goldman even after accounting for differences in division, year, office, education, AA job group, experience at Goldman, experience at Goldman squared (both from the most recent hire date), relevant experience prior to most recent date at Goldman, relevant experience squared, whether a direct hire into the Associate or VP position and an adjustment for the fiscal year being the year of hire for those hired into Associate/VP positions directly.

VIII. The Role of Goldman's Performance Rating Systems

58. The role of the performance evaluation system at Goldman, measured by the 360 performance review system and the quartiling process, raises important issues, both conceptually and practically for the statistical analysis. The conceptual problem is that the performance evaluation system is alleged to be biased against women. Accordingly, measures of performance are potentially tainted variables whose inclusion in the analysis could lead to underestimating the true pay difference. That is, their inclusion in the statistical model may well reduce the estimated gender pay gap, not because women perform worse than men and earn less as a result but because women of the same true performance level receive lower ratings and are paid less as a result.

59. I present summary statistics for the performance quartiles in Tables 8 (Associates) and 9 (Vice Presidents). These data show that females in each rank were less likely than males to be in the top quartile.

60. I have also studied whether these differences in quartile placement can be explained by differences between men and women in terms of the factors included in my model. I report the results of these analyses in Tables 10 (Associates) and 11 (Vice Presidents). The statistical model used here is called a probit model, which is a version of the linear regression model I used for my analysis of pay that is appropriate for cases where the outcome variable takes on two discrete values (in this case, placement in the top quartile or not). The first row of each table, labeled “Model P1”, presents results from a model that makes no adjustments for differences between men and women, other than their titles (comparing Vice Presidents to each other and Associates to each other). I present this model as a reference point for the other models and draw no conclusions from these data. The second row, labeled “Model P2”, controls for division, year, office, education, AA job group, experience at Goldman, experience at Goldman squared (both from the most recent hire date), relevant experience prior to most recent date at Goldman, relevant experience squared, and whether a direct hire into the Associate or VP position.

61. The first column of Tables 10 and 11 contain the “marginal effect” of being female on the probability of being placed in the top quartile. The marginal effect is the discrete difference between females and males in the probability of being in the top quartile implied by the estimates of the particular probit model referred to in each row. A

negative marginal effect implies the females are less likely to be in the top quartile than males accounting for the factors included in the model referred to in each row.

62. The second column of Tables 10 and 11 contain the Z-score associated with the marginal effect. These are interpreted in the same way as the T-ratios used in earlier tables: values of the Z-score greater than or equal to 1.96 (in absolute value) imply that the marginal effect is statistically significant. This indicates that the observed marginal effect would have occurred randomly in the absence of discrimination less than five percent of the time.

63. Table 10 indicates that, without adjustments (model P1), female Associates are 6.2 percentage points less likely than male Associates to be in the top quartile. When I calculate the difference in the likelihood of being in the top quartile accounting for differences in the factors included in Model P2 (division, year, office, education, AA job group, experience at Goldman, experience at Goldman squared - both from the most recent hire date, relevant experience prior to most recent date at Goldman, relevant experience squared, and whether a direct hire into the Associate position), the gender gap in the likelihood of being in the top quartile for Associates increases to 7.1 percentage points. Both of these gender gaps are statistically significant, with Z-scores higher than 4.

64. Table 11, which presents the results for Vice Presidents, indicates that, without adjustments (model P1), female Vice Presidents are 2.6 percentage points less likely than male Vice Presidents to be in the top quartile. When I calculate the difference in the likelihood of being in the top quartile accounting for differences in the factors included in Model 2 (division, year, office, education, AA job group, experience at

Goldman, experience at Goldman squared - both from the most recent hire date, relevant experience prior to most recent date at Goldman, relevant experience squared, and whether a direct hire into the VP position), the gender gap in the likelihood of being in the top quartile for Vice Presidents increases to 4.5 percentage points. While the gender gap in the likelihood of being in the top quartile for Vice Presidents in model P1 is not statistically significant, the gender gap is statistically significant accounting for the measures used in model P2 (Z-score greater than 3).

65. To summarize, the results in Tables 10 and 11 provide strong evidence that females, both Associates and Vice Presidents, are significantly less likely to be classified in the top quartile after accounting for differences in division, year, office, education, AA job group, experience at Goldman, experience at Goldman squared (both from the most recent hire date), relevant experience prior to most recent date at Goldman, relevant experience squared, and whether a direct hire into the Associate or VP position.

66. I present summary statistics for the adjusted 360-review score in Tables 12 (Associates) and 13 (Vice Presidents). These summary statistics show that mean scores are lower for females than for males.

67. I have also studied whether these differences in 360 Degree Review scores can be explained by differences between men and women in terms of the factors included in my model. I report the results of these analyses in Tables 14 (Associates) and 15 (Vice Presidents). Because the scale on which this review was scored changed from 2009 to 2010, I report two analyses each for Associates and Vice Presidents, once covering the period from 2003 through 2009 and one covering the period from 2010 through 2011.

68. The first model, labeled “Model 360-1”, presents results from a model that makes no adjustments for differences between men and women, other than their titles (comparing Vice Presidents to each other and Associates to each other). I present this model as a reference point for the other model and draw no conclusions from these data. The second model, labeled “Model 360-2”, controls for division, year, office, education, AA job group, experience at Goldman, experience at Goldman squared (both from the most recent hire date), relevant experience prior to most recent date at Goldman, relevant experience squared, and whether a direct hire into the Associate or VP position.

69. I report in Table 14 that in both periods, whether I control for the factors included in model 360-2 or not, women who were Associates score statistically significantly lower on 360 Degree Review than otherwise similar male Associates.

70. I report in Table 15 that in both periods, whether I control for the factors included in model 360-2 or not, women who were Vice Presidents score statistically significantly lower on 360 Degree Review than otherwise similar male Vice Presidents.

71. The practical difficulty with including the performance evaluation measures in the statistical model is that they are missing for almost 25 percent of the sample.

72. Because data are missing, simply dropping the observations with missing data can lead to biased estimates of the model. It is not a solution to include the observations with missing data and include a variable that indicates that data are missing for that observation. Effectively, this treats the missing observations as if they all have the same value of the variable with missing values. This is clearly not the case for something like performance, which almost surely varies across the observations with missing values.

73. With these caveats about using tainted variables and incomplete data, I study the effects of the performance systems on pay. Table 16 contains estimates of the pay gap for Associates using the restricted sample with data on the average 360 score and the CRS quartile. Table 17 contains parallel data for Vice Presidents. The Tables contain results from four models: 2a, 2b, 2c, and 2d.

74. Model 2a is defined in the same way as Model 2 in Tables 6 and 7 above. That is, it adjusts for indicators for division, year, office, education, AA job group, experience at Goldman, experience at Goldman squared (both from the most recent hire date), relevant experience prior to most recent date at Goldman, relevant experience squared, whether a direct hire into the Associate or VP position and an indicator for the fiscal year being the year of hire for those hired into Associate/VP positions directly. It differs from Model 2 only in that it is calculated using the restricted sample.

75. Models 2b-2d include measures of performance. Model 2b includes all the variables in model 2a plus indicators for each CRS performance quartile. Model 2c includes all the variables in model 2a plus the 360 Degree Review score.⁴⁷ Model 2d includes all the variables in model 2a plus indicators for each CRS performance quartile and the 360 Degree Review score.

76. The estimate of model 2a in Table 16 is the baseline specification identical to model 2 in table 6 for Associates. Model 2a is estimated using the sample with non-

⁴⁷ I use two variables for 360 Review score, one for period when the score used a scale of 1 through 5 and one for the period when the score used a scale of 1 through 9.

missing information on quartile and 360 Degree Review score, while model 2 is estimated using the full sample. The estimated pay difference for Associates is virtually identical (rising from 7.6 percent in model 2 to 7.7 percent in model 2a). This provides some justification for using the smaller sample here despite the missing data.

77. Table 16 indicates that, among Associates, the pay difference falls from 7.7 percent to 4.7 percent when I add only controls for Quartile (model 2b), to 3.8 percent when I add only controls for 360 Review score (model 2c) and to 3.3 percent when I add controls for both Quartile and 360 Review score (model 2d). All of these pay differences are statistically significant.

78. The estimate of model 2a in Table 17 is the baseline specification identical to model 2 in table 7 for Vice Presidents. Once again, Model 2a is estimated using the sample with non-missing information on quartile and 360 Degree Review score, while model 2 is estimated using the full sample. The estimated pay difference for Vice Presidents is virtually identical (rising from 21.4 percent in model R2 to 21.8 percent in model 2a). Again, this provides some justification for using the smaller sample here despite the missing data.

79. Table 17 indicates that among Vice Presidents the pay difference falls from 21.8 percent to 17.9 percent when I add only controls for Quartile, to 17.7 percent when I add only controls for 360 Review score and to 16.9 percent when I add controls for both Quartile and 360 Review score. All of these pay differences are statistically significant.

80. The general pattern is that the gender pay gaps are negative and remain statistically significant when the performance measures are accounted for in the model. A

second pattern is that the gender pay gaps are smaller (less negative) when the performance measures are accounted for in the model.

81. Tables 18 and 19 contain summary statistics for pay differences between females and males separately by quartile rank, with Table 18 presenting data for Associates and Table 19 presenting data for Vice Presidents. I present mean earnings by quartile rank for men and for women and also the dollar and the percentage difference in earnings between women and men by quartile rank. These data indicate that among both men and women those in higher quartiles earn more, on average, than those in lower quartiles. These data also indicate that women earned less than men, on average, in quartiles 1 through 3 for Associates and in each quartile for Vice Presidents. In addition, these data indicate that the size of this gap between women's and men's earnings is larger in the higher quartiles than in the lower quartiles.

82. In summary, my analysis indicates that as between men and women who are the same in terms of the factors included in my model, women are less likely to be placed in the top quartile and receive lower ratings on the 360 Degree Review. Among Associates, these differences between women's and men's quartile and 360-degree review ratings explain about 4 percentage points (approximately 50 percent) of the overall average pay. Among Vice Presidents, differences between women's and men's quartile and 360-degree review ratings explain about 5 percentage points (approximately 22 percent) of the overall average pay. On the basis of these findings, I conclude that these data are consistent with Quartile ranks and 360 Degree Review scores being a factor contributing to the overall pay differences I observe in these data.

IX. Analysis of Promotions

83. In this section of my report, I describe the results of my analysis of differences in promotion rates from Vice President to Managing Director between men and women in class positions at one of Goldman's US offices from 2004 through 2008.⁴⁸

84. Because the promotion to VP is a discrete event with two possible outcomes (promotion or not), I use a multivariate statistical model appropriate to discrete outcomes known as a probit model.⁴⁹ I estimate the probit model of the likelihood of promotions as a function of year, the same number of years as Vice President, division, office, education, AA job group,⁵⁰ experience at Goldman, experience at Goldman squared (both from the most recent hire date), relevant experience prior to most recent date at Goldman (including experience in prior periods of employment at Goldman), relevant experience squared, and whether a direct hire into the VP position. I omit observations for employees with "Less than Bachelor's degree" as there are no promotions in my sample for such individuals.

85. In calculating this model, I first assemble a snapshot of Vice Presidents in the three relevant revenue-producing divisions at the end of each fiscal year from 2003 through 2007. I then determine which of these Vice Presidents were promoted to a

⁴⁸ In analyzing promotions, I consider only promotions from positions in Goldman's Securities Division, IBD, and IMD to positions in Securities Division, IBD, and IMD.

⁴⁹ This is the same statistical model I used to study placement in the top quartile. Again, the probit model is analogous to the multiple regression model I used to analyze pay differences.

⁵⁰ Because promotion is a low probability event, I use a slightly different measure of job group for the promotions analysis than I use in my analyses of earnings. Job groups with fewer than 250 observations in relevant sample are combined into an expanded "Other" group.

position as Managing Director in one of the three relevant revenue-producing divisions during the following fiscal year. I thus analyze promotions during the period 2004 through 2008.

86. The approach I use is to estimate a benchmark promotion model for males only and use the resulting coefficient estimates to predict promotion probabilities for females using the observed characteristics (education, experience, direct hire, job group, division, year, and time as VP) of the females. The sum of these probabilities is the number of women one would have expected to be promoted if a woman with a given set of characteristics had the same probability of promotion as a man with the same characteristics.

87. This calculation indicates the number of promotions among women one would expect in the absence of discrimination. This “expected number” of women’s promotions can then be compared to the actual number of promotions among women to determine whether actual promotions are below the number that one would expect in the absence of discrimination.

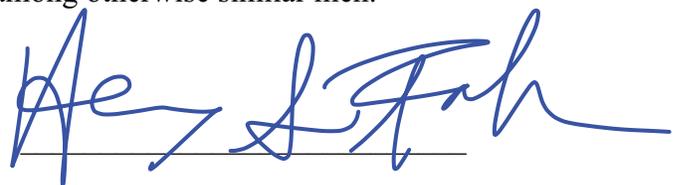
88. I display the results of this analysis in Table 20. I display the total number of observations on men in the first column. This is the number of male person/years contained in my snapshots. It is 6,019. In the second column I report the total number of observations on women. This is the number of female person/years contained in my snapshots 1,592. I report the promotion rate for men in the third column of the table. It indicates that the percentage of male person/years where the individual in question was promoted during the following fiscal year 5.33 percent. The fourth column of the table

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reports the equivalent percentage for the female person/years contained in my snapshots. It is 3.96 percent.

89. I report the actual number of promotions among women (63) in the fifth column of the table. In the sixth column of the table I report the promotion rate among women I would expect if women were promoted using the same model that applies among men. This is 5.12 percent. The seventh column gives the expected number of promotions among women. This is calculated as the sixth column multiplied by the second column (divided by 100), or 82. The eighth column compares the actual and expected numbers of promotions among women. It indicates that women experienced 19 fewer promotions than they would have if they had been promoted according to the model of promotions that applies among men. Column nine, the final column, indicates that the absolute value of the t-ratio for the promotion shortfall is 2.59, indicating that the shortfall is statistically significant.

90. I conclude that these data provide statistically significant evidence of a lower promotion rate among women than among otherwise similar men.



Henry S. Farber
February 17, 2014

TABLE 1: Number of Person-Years by Gender/Number of Individuals, 2003-2011

	Number of Person-Years	Percent	Number of Individuals	Percent
Women	5,899	23.71	1,762	24.63
Men	18,980	76.29	5,392	75.37
Total	24,879	100.00	7,154	100.00

The sample includes all Associates and Vice Presidents, in the New York class from 2003 to 2011, and nationally from 2005 to 2011.

TABLE 2: Number of Person-Years by Gender/Number of Individuals, Associates, 2003-2011

	Number of Person-Years	Percent	Number of Individuals	Percent
Women	2,656	28.11	1,236	28.31
Men	6,794	71.89	3,130	71.69
Total	9,450	100.00	4,366	100.00

The sample includes all Associates in the New York class from 2003 to 2011, and nationally from 2005 to 2011.

TABLE 3: Number of Person-Years by Gender/Number of Individuals, Vice Presidents, 2003-2011

	Number of Person-Years	Percent	Number of Individuals	Percent
Women	3,243	21.02	1,028	22.24
Men	12,186	78.98	3,595	77.76
Total	15,429	100.00	4,623	100.00

The sample includes all Vice Presidents in the New York class from 2003 to 2011, and nationally from 2005 to 2011.

TABLE 4: Mean Annualized Earnings, Associates, 2003-2011

	Mean, Men	SD, Men	Mean, Women	SD, Women
Annualized Earnings	██████	██████	██████	██████
Log of Annualized Earnings	████	████	████	████

The sample includes all Associates, in the New York class from 2003 to 2011, and nationally from 2005 to 2011. The data include 2,656 person-year observations on female and 6,794 observations on male employees. Earnings for part-year workers (new hires) are adjusted to a full-year equivalent level.

**TABLE 5: Mean Annualized Earnings, Vice Presidents,
2003-2011**

	Mean, Men	SD, Men	Mean, Women	SD, Women
Annualized Earnings	██████	██████	██████	██████
Log of Annualized Earnings	██████	██████	██████	██████

The sample includes all Vice Presidents, in the New York class from 2003 to 2011, and nationally from 2005 to 2011. The data include 3,243 person-year observations on female and 12,186 observations on male employees. Earnings for part-year workers (new hires) are adjusted to a full-year equivalent level.

TABLE 6: Regression Analysis of the Male/Female Pay Difference, Associates, 2003-2011

	Log Point Difference	T-ratio	Percentage Difference
Model 1	-0.10	5.10	-9.49
Model 2	-0.08	5.10	-7.62

The table gives an absolute value of the t-ratio for the test of no difference in earnings between men and women. Generally speaking, a t-ratio with an absolute value of 1.96 or higher indicates that the difference is statistically significantly different from zero at the five percent significance level. T-ratios were calculated using robust standard errors clustered by individual. Negative differences indicate that women receive earnings that are lower, on average, than those of men who have the same levels of characteristics included in this model.

Model 1 is the difference between the average earnings of men and women. It is included for reference.

Model 2 includes work experience at GS, work experience at GS squared, relevant experience prior to working at GS, relevant experience prior to working at GS squared, education, year, employee's office and division, whether a direct hire into the Associate position with an adjustment for fiscal year being the year of hire, and AA job group.

The sample includes all Associates in the New York class from 2003 to 2011, and nationally from 2005 to 2011. The data include 2,656 person-years observations on female and 6,794 person-year observations on male employees. Earnings for part-year workers (new hires) are adjusted to a full-year equivalent level.

TABLE 7: Regression Analysis of the Male/Female Pay Difference, Vice Presidents, 2003-2011

	Log Point Difference	T-ratio	Percentage Difference
Model 1	-0.28	10.33	-24.18
Model 2	-0.24	9.88	-21.36

The table gives an absolute value of the t-ratio for the test of no difference in earnings between men and women. Generally speaking, a t-ratio with an absolute value of 1.96 or higher indicates that the difference is statistically significantly different from zero at the five percent significance level. T-ratios were calculated using robust standard errors clustered by individual. Negative differences indicate that women receive earnings that are lower, on average, than those of men who have the same levels of characteristics included in this model.

Model 1 is the difference between the average earnings of men and women. It is included for reference.

Model 2 includes work experience at GS, work experience at GS squared, relevant experience prior to working at GS, relevant experience prior to working at GS squared, education, year, employee's office and division, whether a direct hire into the Vice President position with an adjustment for fiscal year being the year of hire, and AA job group.

The sample includes all Vice Presidents in the New York class from 2003 to 2011, and nationally from 2005 to 2011. The data include 3,243 person-years observations on female and 12,186 person-year observations on male employees. Earnings for part-year workers (new hires) are adjusted to a full-year equivalent level.

TABLE 8: Number of Person-Years by Quartile, Associates, 2003-2011

	Male	Percent, Male	Female	Percent, Female
1	1,347	29.75	413	23.52
2	484	10.69	201	11.45
Combined 2/3	1,433	31.65	612	34.85
3	201	4.44	88	5.01
4	638	14.09	276	15.72
5	424	9.37	166	9.45

The sample includes all Associates in the New York class from 2003 to 2011, and nationally from 2005 to 2011. It is limited to the employees for whom 360-review score and the CRS quartile are available in the data. The data include 1,756 person-year observations on female and 4,527 person-year observations on male employees. Performance quartile comes from the Compensation Recommendation System. Quartile 1 covers top 25% of the employees and quartiles 4 to 5 cover the bottom 25% of the employees, with about 15% assigned to quartile 4, and about 10% assigned to quartile 5.

TABLE 9: Number of Person-Years by Quartile, Vice Presidents, 2003-2011

	Male	Percent, Male	Female	Percent, Female
1	2,780	28.34	673	25.76
2	982	10.01	239	9.15
Combined 2/3	3,305	33.69	873	33.41
3	510	5.20	146	5.59
4	1,424	14.51	432	16.53
5	810	8.26	250	9.57

The sample includes all Vice Presidents in the New York class from 2003 to 2011, and nationally from 2005 to 2011. It is limited to the employees for whom 360-review score and the CRS quartile are available in the data. The data include 2,613 person-year observations on female and 9,811 person-year observations on male employees. Performance quartile comes from the Compensation Recommendation System. Quartile 1 covers top 25% of the employees and quartiles 4 to 5 cover the bottom 25% of the employees, with about 15% assigned to quartile 4, and about 10% assigned to quartile 5.

TABLE 10: Probit Regression Analysis of the Male/Female Placement in the Top Quartile, Associates, 2003-2011

	Marginal Effect	Z-score
Model P1	-0.062	4.06
Model P2	-0.071	4.84

The table gives an absolute value of the z-score for the test of no difference in the top quartile placement between men and women in a probit regression. A z-score with an absolute value of 1.96 or higher indicates that the difference is statistically significantly different from zero at the five percent significance level. Z-scores were calculated using standard errors clustered by individual. The marginal effect is the discrete difference between females and males in the probability of being in the top quartile implied by the estimates of the probit model. A negative marginal effect implies that females are less likely to be in the top quartile than males accounting for the factors included in the model.

Model P1 shows the discrete difference between females and males in the probability of being in the top quartile. It is included for reference only.

Model P2 includes work experience at GS, work experience at GS squared, relevant experience prior to working at GS, relevant experience prior to working at GS squared, education, year, employee's office and division, whether a direct hire into the Associate position, and AA job group.

Models are limited to only those employees for whom the 360-score and the manager's quartile are available. The sample includes all Associates in the New York class from 2003 to 2011, and nationally from 2005 to 2011. The data include 1,756 person-years observations on female and 4,527 person-year observations on male employees. Quartiles come from the Compensation Recommendation System (CRS).

TABLE 11: Probit Regression Analysis of the Male/Female Placement in the Top Quartile, Vice Presidents, 2003-2011

	Marginal Effect	Z-score
Model P1	-0.026	1.68
Model P2	-0.045	3.09

The table gives an absolute value of the z-score for the test of no difference in the top quartile placement between men and women in a probit regression. A z-score with an absolute value of 1.96 or higher indicates that the difference is statistically significantly different from zero at the five percent significance level. Z-scores were calculated using standard errors clustered by individual. The marginal effect is the discrete difference between females and males in the probability of being in the top quartile implied by the estimates of the probit model. A negative marginal effect implies that females are less likely to be in the top quartile than males accounting for the factors included in the model.

Model P1 shows the discrete difference between females and males in the probability of being in the top quartile. It is included for reference only.

Model P2 includes work experience at GS, work experience at GS squared, relevant experience prior to working at GS, relevant experience prior to working at GS squared, education, year, employee's office and division, whether a direct hire into the Vice President position, and AA job group.

Models are limited to only those employees for whom the 360-score and the manager's quartile are available. The sample includes all Vice Presidents in the New York class from 2003 to 2011, and nationally from 2005 to 2011. The data include 2,613 person-years observations on female and 9,811 person-year observations on male employees. Quartiles come from the Compensation Recommendation System (CRS).

TABLE 12: Mean 360-Score, Associates, 2003-2011

	Mean, Men	SD, Men	Mean, Women	SD, Women
2003	3.93	0.41	3.88	0.40
2004	4.00	0.39	3.96	0.36
2005	3.89	0.44	3.80	0.46
2006	4.03	0.30	4.01	0.29
2007	4.13	0.28	4.08	0.30
2008	4.28	0.27	4.27	0.25
2009	4.39	0.29	4.38	0.23
2010	7.69	0.57	7.58	0.55
2011	8.09	0.44	8.00	0.41

The sample includes all Associates in the New York class from 2003 to 2011, and nationally from 2005 to 2011. It is limited to the employees for whom 360-review score and the CRS quartile are available in the data. The data include 2,613 person-year observations on female and 9,811 person-year observations on male employees.

TABLE 13: Mean 360-Score, Vice Presidents, 2003-2011

	Mean, Men	SD, Men	Mean, Women	SD, Women
2003	3.95	0.41	3.79	0.33
2004	4.05	0.36	4.00	0.34
2005	4.12	0.42	4.02	0.39
2006	4.16	0.25	4.12	0.26
2007	4.23	0.24	4.19	0.26
2008	4.32	0.22	4.30	0.22
2009	4.45	0.24	4.40	0.24
2010	7.80	0.46	7.75	0.47
2011	8.17	0.34	8.11	0.32

The sample includes all Vice Presidents in the New York class from 2003 to 2011, and nationally from 2005 to 2011. It is limited to the employees for whom 360-review score and the CRS quartile are available in the data. The data include 2,613 person-year observations on female and 9,811 person-year observations on male employees.

TABLE 14: **Regression Analysis of the Male/Female
360-Score Differences, Associates**

	Difference	T-ratio
Model 360-1, 2003-2009	-0.03	1.98
Model 360-2, 2003-2009	-0.05	4.47
Model 360-1, 2010-2011	-0.10	3.12
Model 360-2, 2010-2011	-0.08	3.01

The table gives an absolute value of the t-ratio for the test of no difference in the 360-scores between men and women. Generally speaking, a t-ratio with an absolute value of 1.96 or higher indicates that the difference is statistically significantly different from zero at the five percent significance level. T-ratios were calculated using robust standard errors clustered by individual. Negative differences indicate that women are less likely to obtain higher 360-scores compared to men with the same levels of characteristics included in this model.

Models 360-1 show the difference in 360-scores for men and women for the time periods when the 360-scores were respectively 1 to 5, and 1 to 9. It is included for reference only.

Models 360-2 include work experience at GS, work experience at GS squared, relevant experience prior to working at GS, relevant experience prior to working at GS squared, education, year, employee's office and division, whether a direct hire into the Associate position, and AA job group, for the time periods when the 360-scores were respectively 1 to 5, and 1 to 9.

Models are limited to only those employees for whom the 360-score and the CRS quartile are available.

The sample includes all Associates in the New York class from 2003 to 2011, and nationally from 2005 to 2011. The data include 1,756 person-years observations on female and 4,527 person-year observations on male employees.

TABLE 15: **Regression Analysis of the Male/Female 360-Score Differences, Vice Presidents**

	Difference	T-ratio
Model 360-1, 2003-2009	-0.05	3.99
Model 360-2, 2003-2009	-0.05	5.15
Model 360-1, 2010-2011	-0.06	2.77
Model 360-2, 2010-2011	-0.04	2.70

The table gives an absolute value of the t-ratio for the test of no difference in the 360-scores between men and women. Generally speaking, a t-ratio with an absolute value of 1.96 or higher indicates that the difference is statistically significantly different from zero at the five percent significance level. T-ratios were calculated using robust standard errors clustered by individual. Negative differences indicate that women are less likely to obtain higher 360-scores compared to men with the same levels of characteristics included in this model.

Models 360-1 show the difference in 360-scores for men and women for the time periods when the 360-scores were respectively 1 to 5, and 1 to 9. It is included for reference only.

Models 360-2 include work experience at GS, work experience at GS squared, relevant experience prior to working at GS, relevant experience prior to working at GS squared, education, year, employee's office and division, whether a direct hire into the Vice President position, and AA job group, for the time periods when the 360-scores were respectively 1 to 5, and 1 to 9.

Models are limited to only those employees for whom the 360-score and the CRS quartile are available.

The sample includes all Vice Presidents in the New York class from 2003 to 2011, and nationally from 2005 to 2011. The data include 2,613 person-years observations on female and 9,811 person-year observations on male employees.

TABLE 16: **Regression Analysis of the Male/Female Pay Difference, Associates, 2003-2011**

	Log Point Difference	T-ratio	Percentage Difference
Model 2a	-0.08	4.22	-7.71
Model 2b	-0.05	2.78	-4.65
Model 2c	-0.04	2.40	-3.83
Model 2d	-0.03	2.08	-3.30

The table gives an absolute value of the t-ratio for the test of no difference in earnings between men and women. Generally speaking, a t-ratio with an absolute value of 1.96 or higher indicates that the difference is statistically significantly different from zero at the five percent significance level. T-ratios were calculated using robust standard errors clustered by individual. Negative differences indicate that women receive earnings that are lower, on average, than those of men who have the same levels of characteristics included in this model.

Model 2a includes work experience at GS, work experience at GS squared, relevant experience prior to working at GS, relevant experience prior to working at GS squared, education, year, employee's office and division, whether a direct hire into the Associate position with an adjustment for fiscal year being the year of hire, and AA job group. It is limited to only those employees for whom the CRS quartile and the 360-scores are available.

Model 2b = Model 2a and in addition: CRS quartile.

Model 2c = Model 2a and in addition: average 360-review score with the effect of the score varying by period for which scores were either 1 through 5, or 1 through 9.

Model 2d = Model 2a and in addition: CRS quartile and the average 360-review score with the effects of the score varying for the appropriate periods.

The sample includes all Associates in the New York class from 2003 to 2011, and nationally from 2005 to 2011. The data include 1,756 person-years observations on female and 4,527 person-year observations on male employees. Earnings for part-year workers (new hires) are adjusted to a full-year equivalent level. Quartiles come from the Compensation Recommendation System (CRS).

TABLE 17: **Regression Analysis of the Male/Female Pay Difference, Vice Presidents, 2003-2011**

	Log Point Difference	T-ratio	Percentage Difference
Model 2a	-0.25	9.65	-21.78
Model 2b	-0.20	9.03	-17.94
Model 2c	-0.19	8.46	-17.67
Model 2d	-0.18	8.50	-16.86

The table gives an absolute value of the t-ratio for the test of no difference in earnings between men and women. Generally speaking, a t-ratio with an absolute value of 1.96 or higher indicates that the difference is statistically significantly different from zero at the five percent significance level. T-ratios were calculated using robust standard errors clustered by individual. Negative differences indicate that women receive earnings that are lower, on average, than those of men who have the same levels of characteristics included in this model.

Model 2a includes work experience at GS, work experience at GS squared, relevant experience prior to working at GS, relevant experience prior to working at GS squared, education, year, employee's office and division, whether a direct hire into the Vice President position with with an adjustment for fiscal year being the year of hire, and AA job group. It is limited to only those employees for whom the CRS quartile and the 360-scores are available.

Model 2b = Model 2a and in addition: CRS quartile.

Model 2c = Model 2a and in addition: average 360-review score with the effect of the score varying by period for which scores were either 1 through 5, or 1 through 9.

Model 2d = Model 2a and in addition: CRS quartile and the average 360-review score with the effects of the score varying for the appropriate periods.

The sample includes all Vice Presidents in the New York class from 2003 to 2011, and nationally from 2005 to 2011. The data include 2,613 person-years observations on female and 9,811 person-year observations on male employees. Earnings for part-year workers (new hires) are adjusted to a full-year equivalent level. Quartiles come from the Compensation Recommendation System (CRS).

**TABLE 18: Comparison of Male and Female Total Earnings
by Quartile, Associates, 2003-2011**

	Mean Earnings, Men	Mean Earnings, Women	\$ Difference	% Difference
1	██████	██████	██████	-28.90
2	██████	██████	██████	-8.27
Combined 2/3	██████	██████	██████	-5.59
3	██████	██████	██████	-4.56
4	██████	██████	██████	3.34
5	██████	██████	██████	6.51

The sample includes all Associates , in the New York class from 2003 to 2011, and nationally from 2005 to 2011. The data include 1,756 person-years observations on female and 4,527 person-year observations on male employees. Earnings for part-year workers (new hires) are adjusted to a full-year equivalent level.

TABLE 19: Comparison of Male and Female Total Earnings by Quartile, Vice Presidents, 2003-2011

	Mean Earnings, Men	Mean Earnings, Women	\$ Difference	% Difference
1	████████	████████	████████	-32.14
2	████████	████████	████████	-20.83
Combined 2/3	████████	████████	████████	-25.56
3	████████	████████	████████	-5.82
4	████████	████████	████████	-20.38
5	████████	████████	████████	-18.95

The sample includes all Vice Presidents, in the New York class from 2003 to 2011, and nationally from 2005 to 2011. The data include 2,613 person-years observations on female and 9,811 person-year observations on male employees. Earnings for part-year workers (new hires) are adjusted to a full-year equivalent level.

Table 20: Comparison of Actual and Expected Promotions to Managing Director, 2004-2008

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Number of Observations on Men	Number of Observations on Women	Promotion Rate for Men	Promotion Rate for Women	Promotions, Women	Expected Promotion Rate for Women	Expected Promotions, Women	Shortfall	t-statistic
		6,019	1,592	5.33%	3.96%	63	5.12%	82

Expected promotion rate for women is calculated using a probit regression model for men only and calculating the probability of promotion for women using men's coefficients. The model includes tenure as VP, tenure as VP squared, experience at GS (since most recent hire date), experience at GS squared, relevant experience prior to most recent hire date at GS, relevant prior experience squared, education, year, division, office location, AA job group, and whether a direct hire into the VP position. (AA job groups with fewer than 250 observations in relevant sample are combined into an expanded "Other" group.)

The table gives the absolute value of a t-statistic for the test that the difference between actual and expected promotion rates is zero. Generally speaking, a t-statistic with an absolute value of 1.96 or higher indicates that the difference is statistically significantly different from zero at the five percent significance level. The t-statistic was calculated using the bootstrapped standard error.

In this table an observation is a person-year. Data include Vice Presidents in the revenue-producing divisions. Promotions are promotions to Managing Director in revenue-producing divisions.