The gender wage gap in top corporate jobs is still there*

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Keywords: Gender wage gap, managerial compensation

JEL Classifications: J31, G3

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We investigate the gender wage gap in top corporate jobs for 2000-2004. We find that female managers receive 24.0% less in total compensation than their male colleagues. When we control for personal, firm and industry characteristics, this difference reduces to 15.9%. Controlling for occupational segregation, i.e. "glass ceiling", reduces the difference to 6.0%. Additional results that fully consider the role of stock option indicate a 9.0 to 12.1% difference. These results suggest that the main sources of the gender wage gap are occupational segregation and a different endowment with stock options.

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1 Introduction

A major development in the US labor market over the last decades has been the increased labor force participation of women. In 1970, their participation rate was 43 percent; in 2004, it was 59 percent. Women also surged ahead into higher paying occupations. In 2004, half of all management, professional, and related occupations were held by women. Women's earnings relative to men's also have risen. From 1979 to 2004, women's earnings as a percent of men's increased from 62 to 80 percent (US Department of Labor, 2005). However, compared to women in other countries the situation of US women is less favorable. Wider pay differentials between high and low paid work have induced a relatively large gender gap compared to other countries (Blau and Kahn, 2000).

A large number of studies since the early 1970s report sizeable although over time decreasing male-female wage differentials across and within occupations.[1,2] While unobserved characteristics of occupations may account for some fraction of the observed gender pay gap, sizeable pay differences have also been reported in studies that look at the male-female pay gap within narrowly defined occupations that typically pay higher wages.[3]

The movement of women into the labor force and into higher paying occupations has been less impressive at the very top of the corporate pyramid. Twenty years after the term "glass ceiling" was coined by the Wall Street Journal to describe the artificial barriers that prevent women (and minorities) from reaching the top of the corporate hierarchy, women still only account for less than 8 percent of the top managers in the USA (Economist, 2005).[4]

While the paucity of women in top corporate jobs has been documented quite extensively, there are only a few academic studies on pay differences between men and women in these jobs. A notable exception is a recent study by Bertrand and Hallock (2001), which analyzes the compensation levels of the top five executives of large US companies for the years 1992-1998 and reports a gender pay gap of 44 percent in the raw data. However, after controlling for personal, occupational,

firm, and industry characteristics, they report an insignificant gap of about 4 percent.[5]

However, the 1992-1997 period has been somewhat of an outlier in the sense that the total realized pay of top executives increased at an unprecedented pace over this period (see Murphy (1999). In addition, there has been a striking change in the structure of executive compensation packages received by top managers. Whereas salary made up 38 percent of the median CEO's total compensation in manufacturing and mining industries in 1992, this fraction fell to 27 percent in 1996. The decrease was even more dramatic in financial services with a drop from 35 to 21 percent. While bonus and other payments remained essentially constant, this drop in base salary was accompanied by a huge increase in the fraction of compensation based on stock options. There is now some evidence that this trend has stopped in 2001 and somewhat reversed afterwards (Economist, 2006).

The objectives of our paper are twofold. We first analyze the gender pay gap in top executive jobs for the years 2000-2004, a period over which the structure of compensation packages in the US is different from the 1992-1997 period. Over the 2000-2004 period, we do not observe the same tremendous increase in total pay as was the case between 1992 and 1997. Second, we have a closer look on the contribution of the use of stock options on the gender wage gap. Not only, that their relative importance in executive payment has increased, but also – to our knowledge – no one has particularly investigated the gender specific aspects of the use of stock options yet.

Similar to Bertrand and Hallock (2001), our findings suggest that female executives are paid a significant 6 percent less than their male colleagues after controlling for a rich set of personal, occupational and firm specific characteristics. Our results show, that one important source of the gender wage gap is occupational segregation. Another important source are stock options. Additional estimation results show, that the pay difference between male and female managers is dramatically higher, reaching a significant 14.9 percent, for the subsample of managers who exercised their stock options. The main reason for the latter difference is that female managers

obtain significantly less stock options than male managers.

2 Data, variables and summary statistics

2.1 The OSIRIS database

The data used for this study come from the OSIRIS database from Bureau van Dyck. OSIRIS contains along with balance sheet and market data information on compensation for top executive officers of publicly listed US companies. The raw data include some 29,000 top executive officers from a total of 3643 companies. There is also information on the name, title, education, age and tenure of these managers, and on firm characteristics such as sales, assets, employees and market-to-book ratio. To collect some missing data on firm characteristics, we also employ the Standard and Poors' Compustat Global database. About 90 percent of the companies in our sample have five or more executives with complete data. About 65 percent of the companies have more than ten and less than 15 executives with complete data. The period covered by OSIRIS is 1998-2004. We restrict our analysis to the years 2000-2004 because there are too many missing observations for the first two years. The structure of our data is that of an unbalanced panel with some individuals being in the sample only once and others being in the sample up to five times.

2.2 Variables and their construction

To assess the gender gap, we construct a variable measuring compensation and various other variables defining gender, firm size, occupation, and human capital variables reflecting the education and experience of the executives in our sample.

The following compensation categories are reported: (1) salary, (2) bonus, (3) other annual payments, and (4) detailed data on stock options. Salary measures the component of compensation that is fixed (or non-contingent). Almost all companies offer an annual bonus plan covering its top executives and paid annually based on a single (last) year's performance. These payments include

the cash contributions to or the cash equivalents of other benefits to executives such as cost of providing a corporate automobile. These payments typically make up a small fraction of the total compensation.

Stock options are the right to purchase a given number of shares of company stock at the "strike" price between the vesting date and the expiration date of the options. The vesting period is the interval between when a company grants the option and when the employee can first exercise the option. If the current market price for a vested option exceeds the strike price, the option is "in-the-money." If in-the-money options are exercised (that is, if the employee decides to purchase the underlying shares), the gain to the employee is the difference between the current market price and the strike price multiplied by the number of shares exercised. If the current market price for a vested option is below the strike price, the option is "out-of-the-money." Although out-of-the-money options have no current value if exercised, they still have positive "option value," which reflects the possibility that the future market price of the stock may rise above the strike price prior to the options' expiration date.

There are three pieces of information on the value of stock options in our dataset. They come from the proxy statements (Def 14A) and are defined as follows. (1) The realized value from exercised stock options: This variable shows the aggregate gain in pre-tax value realized from the exercise of stock options in the last fiscal year. (2) The value of unexercised in-the-money options at fiscal year end: This variable shows the value of exercisable stock options at the time of the proxy statement. This value equals the market value of common stock at the reporting date, less the exercise price, times the number of stock option shares outstanding. (3) The value of unexercisable options: This variable is again based on the closing price of the underlying securities on the date of reporting minus the exercise price of the options, times the number of stock options outstanding.

We add salary, bonus, other annual payments and the value of exercised stock options to

obtain our basic measure of total compensation. This measure does not include unexercised and unexercisable stock options as part of total compensation, and it only reflects current payments. For our second measure of total compensation, which we later use in Section 5, we add salary, bonuses, other annual payments as well as the value of exercised and exercisable stock options to obtain the new measure for total compensation. The valuation of the long-term components like exercisable stock options is problematic. We choose the simplest method and value the stock options at 25 percent of their exercise price.[6]

To construct a dummy variable that is equal to one for females and zero for males, we exploit two sources of information as the database itself does not include such a variable. First, some of the individuals are addressed by "Mister" or "Misses" in a variable that describes their background. With this procedure we can classify about 80% of individuals in our sample. For those individuals who are addressed by their names only, we use the first name to decide gender. To classify first names we rely on name books. When the first name can either be male or female, such as Carol, we drop the observations. Luckily, there were only 46 such observations.

Firm size can be measured either by sales, assets or the number of employees. For the regression analysis we use one year lagged sales. Further firm characteristics are the 3-digit industry and a firm's performance, which we measure by the ratio of a firm's one year lagged market-to-book value relative to that of its 3-digit industry.

OSIRIS further reports the title of each individual. There are a large number of occupational titles and some of the executives report more than one title. We extract the main title and construct 12 broad occupational categories: chief executive officer/chair of the board, vice chair, president, director, chief financial officer, chief operating officer, other chief officers, executive vice president, senior vice president, group vice president, vice president and other occupations.

Since some some of these explanatory variables may change over time, we also want to control for the possibility that changes in these variables are correlated with gender. Women may

move less both across firms and in the hierarchical layer in firms, which can also be a source of the gender wage gap.[7] To control for the first issue we generate a dummy variable, change of firm, which takes the value one, if the individual worked in a different firm in the previous period. We also define a second dummy variable, change of title, that takes the value one, if the individual had a different title in the previous period.

Finally, our data source allows us to define four different dummy variables that reflect the university degrees achieved by executives: Bachelor, Masters, MBA, and PhD. One drawback of OSIRIS concerning the education variables is that for a large fraction of the sample no degree is reported. We assume these individuals hold at least a bachelor degree, but define them as a group of their own.

2.3 Summary statistics

Summary statistics for our sample are detailed in Tables 1-4. We have 16,558 (94.7 percent) male and 932 (5.3 percent) female executives in our sample. Table 1 reports the mean total compensation for all managers as well as separated by gender. It further reports detailed information on the value of stock options. The mean total compensation for all managers in our sample is $1,074,415. If we include the value of exercisable stock options, it is $1,423,008. Basic compensation (salary, bonus and other annual payments) amounts to 64 percent of total compensation, exercised stock options make up the remaining 36 percent. The average total compensation of male managers is $257,665 higher than the average for female managers. This difference of 24 percent is, using a two-sided t-test, significantly different from zero. The difference between male and female managers is larger for our second measure of total compensation (31 percent). It is smaller for basic compensation (16 percent), salary (12 percent) and bonuses (17 percent). It is again higher for other annual pay components (47 percent) and for the value of exercised stock options (41 percent). With the exception of other annual payments, the differences between the various components of compensation

are significantly different from zero.

Table 1 about here

Table 1 further reports the mean value of exercised, exercisable and unexercisable stock options. The number of managers who exercised their stock options is much smaller than the number of managers who hold stock options, which reflects the declining stock market in these years.

Table 2 reports summary statistics on the characteristics of companies in our sample. The average company is quite large with about $1.7 billion in total assets and 5,650 employees. Female managers tend to be active in slightly smaller companies ($1,700 million vs. $1,619 million) even though the differences in firm size are not significantly different from zero and not as large as observed by Bertrand and Hallock (2001), who document that male managers work in companies which are 40 percent larger than the companies of female managers.[8,9] Female managers also tend to be active in slightly more successful companies even though the differences in market-to-book value are not significantly different from zero.

Table 2 about here

Table 2 also reports summary statistics on the characteristics of companies of the sample of managers that exercised their stock options. On average, these firms are larger and more profitable, but there are also no significant differences between male and female managers.

Table 3 provides summary statistics on occupational segregation. Column (1) reports the total number of managers in each occupation category. For example, 3,025 of 17,490 (17.3 percent) are chief executive officers and chairs of the board, 3,057 (17.5 percent) are presidents, and 2,779 (15.9 percent) are chief financial officers. Compared to these figures, the numbers of vice chairs of the board and of chief operating officers in the sample are rather low.

Table 3 about here

Column (2) reports the relative number of female managers in each occupation category. Female managers are less likely to reach the better paid positions such as chief executive officers/chair of the board, or president. For example, the relative numbers of female chief executive officers is 2.3 percent, and of presidents is 3.3 percent. Female managers are more likely to be found in occupations like chief officers (financial, operating and other) or senior vice presidents. This suggests the existence of a so-called glass ceiling in top corporate jobs. Column (3) reports the ratio between mean occupation wage and mean market wage. The numbers show that occupations like chief executive officer/chair of the board, or vice chair of the board are higher paid than the average manager. Column (4) reports the ratio of mean female wage and mean male wage in each occupation. It can be observed that on average female managers are paid roughly the same as male managers in almost all occupations.

Table 4 presents information on three human-capital related characteristics of the managers in our sample. As before, we present the means of the variables for the full sample, and then separately for men and women. The average manager in our sample is about 50 years old. The average female manager is on average three years younger than the average male manager. On the other hand, the means of the tenure variable suggest that men and women have approximately the same level of seniority – almost 4 years. The summary statistics show that women are more likely to have a bachelor degree than male managers (17.6 vs. 13.3 percent), but are less likely to have a master's degree – men (5.3 percent) and women (3.6 percent). On the other hand, the fraction of women with an MBA (9.1 percent) is equal to the fraction of men, and the fraction of men with a PhD (2.9 percent) is slightly greater than for women (2.4 percent).

Table 4 about here

Table 4 also reports summary statistics for a change of the title and a change of the firm. One source for differences in wages might be a promotion within a firm (reflected by a change of the title) or a manager's mobility (reflected by a change of the firm). In our sample, we find that 6.6%

of managers have changed their title and 0.6% have changed the firm. While this number is fairly small we believe it is not surprising as almost two third of our observations are from the years 2003 and 2004. There are no significant differences between male and female managers.

3 Estimation results from wage regressions

To analyze the wage gap between male and female managers, we estimate two specifications of a Mincer-type wage equation with the logarithm of total compensation as the dependent variable. In the first specification, the explanatory variables are a dummy variable for gender, age, age squared, tenure, tenure squared, dummy variables for education, firm size,[10] market-to-book value relative to the 3-digit industry as well as 3-digit industry specific and yearly dummy variables. In the second specification, we add the change of the firm, occupational dummy variables[11] and the change of the title. We report the results for these two specifications as the later added variables might be endogenous and already reflect discrimination. In such a way, we can also measure the effect of a "glass ceiling" on the gender wage difference.

We estimate the wage equation with individual-specific random effects to account for unobserved differences across managers.[12,13] Additionally, we split our sample into managers who did not exercise their stock options and those who did, to investigate the effect of stock options on the gender wage gap. Columns 1 and 4 of Table 5 present estimation results of the two specifications for all managers. Columns 2 and 5 present the results for managers who did not exercise their stock options, and columns 3 and 6 for managers who exercised their stock options.

The estimated coefficient of the female dummy variable in the first specification indicates that the gender pay gap reduces from 24.0 percent in the raw data (implied by Table 1) to a significant 15.9 percent when we control for individual-specific fixed effects (column 1 in Table 5). When we additionally control for the change of the firm, occupational dummy variables and the change of the title, the gender pay gap further reduces to a significant 6.0 percent (column 4 in Table 5).

These results indicate that the gender pay gap in top corporate jobs is still there and that a large proportion of this gap can be attributed to occupational segregation, i.e. “glass ceiling”.

Table 5 about here

The results for other explanatory variables like age, tenure, education, occupational and industrial segregation are as one can expect for wage equations. The overall effect of age and tenure is positive and higher education partly pays off.

The impact of firm size and industrial segregation on executive compensation is also as expected. The estimated coefficient on the natural logarithm of sales is very close to the elasticity figures reported by Murphy (1999) for the 1990s and it is highly significant. A ten percent increase in firm size implies a 3.0 percent increase in total cash compensation. We also control both for industrial segregation by including 263 three-digit industry dummy variables and for any performance effects by including the market-to-book ratio relative to the three-digit industry of each company.

The results with respect to the occupational dummy variables show that chief executive officers earn more than any other manager. The next highest positions are president and vice chair. As women are less likely to be in these positions then men, part of the gender wage gap in top corporate positions is explained by occupational segregation.

A change of the firm has no significant effect on wages. We attribute this result to the relative low number of managers in our sample who have actually moved to another firm. A change of the title has a positive effect on wages.

To analyze the effect of stock options, we split the sample into managers who did and who did not exercise their stock options. The results of the first specification indicate a significant gender gap of 12.9 percent for managers who did not exercise their stock options (column 2 in Table 5) and a significant gender gap of 29.6 percent for managers who exercised them (column 3). When we additionally control for a change of the firm, occupational segregation and a change of the

title, these numbers reduce to an insignificant 4.6 percent for managers who did not exercise their stock options (column 5) and a significant 14.9 percent for managers who exercised them (column 6). For this particular subsample of managers, who have exercised their stock options, the gender wage gap is substantially larger than it is in the overall sample.

4 Decomposition of the wage gap

To assess the amount of discrimination in the top corporate jobs, we calculate Blinder-Oaxaca decompositions.[14] We estimate two separate wage equations for male and female managers and decompose the mean wage difference into the difference in human capital endowment and the difference in the valuation of human capital across groups of individuals. The first part is the difference of the mean characteristics of both groups evaluated at the prices male managers receive for these characteristics. The second part is the difference in prices, evaluated at female managers' mean characteristics. This version of the decomposition is known as the male based decomposition and assumes men to be paid their marginal product. There is also a female based decomposition which assumes women to be paid their marginal product. We calculate both, but comment only on the results of the male based decomposition.

Table 6 reports the decomposition results for all managers. Panel A reports the results for the first specification. The pay difference is equal to 0.161. The decomposition results show that the unexplained part is equal to 0.158 (98.2 percent) and the explained part is equal to 0.003 (1.8 percent). To evaluate the effect of occupational segregation, we additionally report the decomposition results for the second specification in Panel B. The unexplained part is now equal to 0.054 (33.7 percent) and the explained part is now equal to 0.107 (66.3 percent). These results show that most of the raw difference in the gender pay gap can be attributed to occupational segregation. Human capital endowment and other explanatory variables like industrial segregation do not play an important role. The remaining part of the raw wage difference is due to differences in coefficients that

may reflect discrimination stemming from other factors than a "glass ceiling".

Table 6 about here

Table 6 also reports the decomposition results for managers who exercised their stock options. Panel C reports the results the first specification. The pay difference is equal to 0.255. The decomposition results show that the unexplained part is equal to 0.312 (122.4 percent) and the explained part is equal to -0.057 (-22.4 percent). The decomposition results for the second specification reported in Panel D show that the unexplained part is equal to 0.149 (54.3 percent) and the explained part is equal to 0.117 (45.7 percent). For this subsample, most of the total gap in compensation by gender is due to differences in coefficients that may reflect discrimination and occupational segregation is only the second most important reason. While the results depicted in Panel A and B of Table 6 are in line with Bertrand and Hallock (2001), for the results of the subsample of managers who exercised their stock options this is not true. Stock options seem to be more vulnerable to discrimination than basic compensation.

5 The effect of stock options

To further analyze, whether the effect of stock options on the gender wage gap is due to a less profitable trading strategy of female managers or to the size of their stock options, we estimate six additional equations. In particular, we compare the number and the value of exercised and unexercised stock options across male and female managers. The first equation uses the logarithm of the value of exercised stock options as the dependent variable and personal, occupational, firm and industry characteristics as well as yearly dummy variables as independent variables. The second equation uses the logarithm of the number of exercised stock options as the dependent variable and the same independent variables as the first equation. The third and the fourth equations do the same for unexercised stock options.

We hypothesize that if the estimated coefficients of the female dummy variable are of about the same size for the value and the number of stock options then the gender wage gap is not due to a less profitable trading strategy of female managers. This hypothesis can, of course, only be tested with exercised stock options. We use unexercised stock options to test whether male and female managers obtain different stock option packages.

Columns (1) and (2) of Table 7 report the results with the logarithm of the value and number of exercised stock options as dependent variables. Columns (3) and (4) do so for unexercised stock options. The results show that the coefficients for the female dummy variable are roughly the same in all four equations, and that we cannot reject the hypothesis of unequal treatment with regard to the number of stock options. Thus, the difference in the subsample of managers who exercised their stock options can be explained by female managers receiving a different number of stock options. This finding is similar to differences in contingent pay observed by Chauvin and Ash (1994).

Table 7 about here

We then run wage regressions with two samples, namely all managers and managers with exercisable stock options. The estimation results, which are reported in columns (5) and (6) of Table 7, show that the estimated coefficients of the female dummy variable increases from about 6.0 percent (reported in column (2) of Table 5) to 9.0 and 12.1 percent. That is an increase of about 50 percent or three percentage points. This indicates that the main two sources of the gender wage gap are occupational segregation and a different endowment of male and female managers with stock options.

6 Summary and concluding remarks

We analyzed the pay difference between male and female managers of publicly listed US companies for the years 2000-2004. We found that female managers receive 24.0 percent less in total

compensation (salary, bonus, other payments and exercised stock options) than their male colleagues. When we correct for personal, occupational, firm and industry characteristics, the pay difference reduces to a significant 6.0 percent. This is in line with Bertrand and Hallock (2001), who report a wage gap of 4.0 percent for a similar sample of top managers over the period 1992-1998, although insignificant.

One source of the gender wage gap is occupational segregation. Our results showed that the estimated coefficients of the female dummy variable more than double when we omit the occupational dummy variables. Decomposition results further showed that the main part of the gender wage gap can be attributed to occupational segregation, i.e. "glass ceiling". Human capital endowment and other variables like industrial segregation do not contribute.

Additionally, we analyzed the effect of stock options. To do so, we split the sample into managers who did not and who did exercise their stock options. For the first subsample, we observed an insignificant gender gap of 4.6 percent. For the second subsample, we observed a significant gender gap of 14.9 percent. Further regression results showed that the difference in the value of exercised stock options between male and female managers is not driven by a less profitable trading strategy of women, but by the fact that women receive on average 18.0 percent fewer stock options. Including also the present discounted value of exercisable stock options in a new measure of total compensation, the estimated coefficients of the female dummy variable increases from about 6.0 to 9.0 percent.

To summarize, our results indicate that occupational segregation and a different endowment of male and female managers with stock options are the main sources of the gender wage gap. This indicates that unequal treatment of female managers persists. It seems that women have not broken the "glass ceiling" nor have they obtained equal payment, yet.

The international empirical evidence shows that women in general still earn substantially less than men do and that women have been catching up, although at a slow rate. It seems, however,

that female managers in the US have to face the opposite trend. Pay differences across gender were larger for the time period 2000-2004 than they were between 1992-1998. This increase in the gender pay gap was mainly driven by stock options and as these are more prevalent in the top management and in larger firms, our results suggest more discrimination there.

Stock options are assumed to be more performance related than any other compensation component. Recent empirical evidence by Lemieux, Macleod and Parent (2006) shows that the increase in performance related pay has significantly contributed to the increase in (male) wage inequality. The authors' basic assumption is that performance related pay tends to be closer to marginal products than compensation not related to performance. In the light of their results and assumptions one would then conclude that unobserved productivity is the reason for the gender wage gap in different endowments with stock options.

This reasoning, of course, lets one wonder what are the unobserved characteristics of female managers that distinguish them from male managers to justify different endowments with stock options. Recent empirical and experimental research tries to point out such unobserved characteristics that could explain differences between male and female managers. We are going to discuss some of the explanations not only with respect to wages of top managers but also with respect to occupational segregation.

Experimental research has shown that there are differences between women and men in their selection into competitive environments (Niederle and Vesterlund, 2006). Women shy away from competition even when their abilities would suggest otherwise and men compete too much given their abilities. Such differences can explain a lower number of female top managers. The same does other empirical evidence which shows that women are more risk averse then men and thus select into different occupations (DeLeire and Levy, 2004). Although neither authors draw any conclusions about pay differences, a logical consequence of their results – in the absence of discrimination – should be no or a positive pay gap between male and female managers, as only the

best women will make it to the top and these are more competitive and risk loving than the average man who made it to the top.[15] Thus, differences in these unobserved abilities cannot explain pay gaps and the even larger pay gap in the higher management. In contrast, they suggest that discrimination is actually underestimated.

Women, in particular graduating students from business schools, tend to negotiate their first salary less effectively than their male colleagues do (Babcock, 2002). A wage gap in the beginning of a career would then typically cumulate to an even wider gap in later years. And, as negotiating is an integral part of being a manager bad negotiating skills would reflect lower productivity. However, there is other experimental evidence that shows that even though women are less effective in negotiating on their own behalf, they are effective negotiators on behalf of their firms or others (Riley, Babcock and McGinn, 2005). With respect to our results, we would have to conclude that female managers negotiate better for their fixed salaries than for their stock options, or that female managers are more risk averse. However, in that case we would expect a positive gender wage gap for fixed wage components.

Women still do most of the work at home and they are responsible for child care, even when both they and their partners are employed full-time (Biernat and Wortman, 1991; Lennon and Rosenfeld, 1994; Robinson, 1998). This reason is often argued to explain discrimination and the obstinacy of the glass ceiling as men have more leisure time and more time to recover from work and therefore make better employers. Rational employers anticipate that and discriminate accordingly (Francois and van Ours, 2000). However, although female managers obviously earn less than their male colleagues, their salaries are supposedly still high enough to afford professional child care and household help.

Considering these arguments one would conclude that there are no likely explanations other than discrimination for the gender wage gap between female and male managers stemming from stock options. Or, coming back to Lemieux, Macleod and Parent (2006) and their assumption that

performance related pay tends to be closer to marginal products than compensation not related to performance, it could be that there is market power on the side of top managers which is not induced by own negotiating skills or by other unobserved productivity differences. Potential reasons might be male dominated supervisory boards that discriminate accordingly.

Notes

[1]See Weichselbaumer and Winter-Ebmer (2005) or Stanley and Jarrell (1998) for a meta-analysis of gender wage gap studies. See Altonji and Black (1999) for a survey on sex and race discrimination.

[2]Employer-employee based studies, for example, show that a sizable fraction of the gender gap can be attributed to segregation in lower paid occupations but a substantial part of the wage gap is still attributable to the individual's sex (Bayard, Hellerstein, Neumann and Troske, 1999).

[3]For example, Wood, Corcoran, and Courant (1993) report gender pay differences among lawyers, Morgan (1998) for engineers, Gunderson (1975) for narrowly defined occupations within establishments, Chauvin and Ash (1994) for business school graduates and Baker (1996) for experienced physicians. A relatively large number of papers document male-female differences in wages of university faculty (Barbezat, 1987, Barbezat and Hughes, 1990, Ferber and Green, 1982, McNabb and Wass, 1997, and Gander, 1997). There is also some work that reports significant differences for top managers of nonprofit organizations (Hallock, 2002).

[4]Catalyst (2005), using a different way of defining corporate officers, reports that women held 16.4 percent of all corporate officer positions in 2005, up just 0.7 percentage points from 2002. At the estimated growth trend for the past ten years (0.82 percentage points per year), it will take 40 years for women to reach parity with men in corporate officer ranks.

[5]See also Gregg and Machin (1994), who report a 20-30% pay gap for executives in the United Kingdom.

[6]Core, Holthausen and Larcker (1999) use the same approach, which can be defended based on simulation results (for example, Lambert et al. 1991 and McConnell 1993) and show that more sophisticated option pricing models (based on the Black-Scholes or binomial formulas) typically produce values in this range. They also suggest that even if a potentially more sophisticated method for pricing the options is used, one would still have no comparable analytical model for valuating accounting-based long-term incentive plans (performance plans).

[7]We are grateful to an anonymous referee for this point. Empirical evidence provided by Olsen and Becker 1988, Cannings 1988 and Landau 1995 is consistent with this view that a managers's promotion is influenced by gender.

[8]When we compare our sample to the sample Bertrand and Hallock (2001) used in their analysis, we observe the following differences. Their sample contains more observations as their sample includes more years with a comparable number of observations, whereas the majority of our observations comes from the years 2003 (38% of all observations) and 2004 (24% of all observations). Although their overall sample is larger, our sample contains relatively more firms and thus also more smaller firms. This might be one reason why the difference in firm size between male and female managers in our sample is not significant as it is in Bertrand and Hallock (2001)'s sample.

[9]We also find no significant differences in sales, assets and employers when we calculate mean differences per year.

[10]Murphy (1999) documents that the level and composition of CEO pay in the US varies systematically across industries and with company size. According to his study, the best-documented stylized fact regarding executive compensation is that pay is higher in larger firms. This relationship is typically measured as the elasticity of compensation to company revenues.

[11]Studies investigating the gender wage gap frequently notice that occupations where predominantly women work

pay lower wages. Bayard, Kellerstein, Neumark and Troske (1999), for example, have found such a relationship of gender-specific segregation of jobs and wage differences. This suggests the use of variables that control for individuals' occupation.

[12]We do not consider a fixed effects estimator as 27% of our observations come from managers who are only once in the sample. Further, a female dummy variable is then not identified anymore.

[13]We also estimated the wage equation with firm-specific random effects. Part of the wage difference might be due to men working in high wage firms and women in low wage firms. Firm-specific effects account for these differences. There are however only minor differences between the results with firm-specific random effects and individual-specific random effects and we therefore do not report these results.

[14]See for example, Blinder (1973) and Oaxaca (1973).

[15]See also Bertrand and Hallock (2001, p.17) for an analogous argumentation.

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A Appendix: Tables

Table 1: Summary statistics on managers' compensation

Variable	(1) All managers	(2) Male managers	(3) Female managers	(4) p-value
Total compensation				
including exercised stock options	1,074,415	1,088,145	830,480	0.0085
	(22,007)	(23,006)	(58,520)	
	(17,490)	(16,558)	(932)	
including exercised and exercisable stock options	1,423,008	1,446,645	1,003,072	0.0010
	(30,291)	(31,738)	(70,734)	
	(17,490)	(16,558)	(932)	
Wage components				
Basic compensation	689,273	695,185	584,242	0.0097
	(9,637)	(10,017)	(32,005)	
	(17,490)	(16,558)	(932)	
Salary	287,204	289,135	252,992	0.0000
	(1,485)	(1,537)	(5,433)	
	(17,404)	(16,474)	(930)	
Bonus	269,287	271,805	226,486	0.0417
	(5,097)	(5,312)	(16,188)	
	(12,811)	(12,099)	(712)	
Other annual payments	86,212	88,145	46,744	0.3115
	(8,627)	(9,041)	(7,754)	
	(4,199)	(4,003)	(196)	
Stock options				
Value of exercised stock options	1440,575	1475,428	862,758	0.0249
	(63,296)	(66,508)	(144,980)	
	(4,676)	(4,410)	(266)	
Value of exercisable stock options	2040,461	2096,615	1026,191	0.0013
	(74,104)	(77,902)	(117,461)	
	(11,952)	(11,325)	(627)	
Value of unexercisable stock options	1053,742	1080,742	581,443	0.0047
	(39,945)	(42,142)	(43,159)	
	(11,373)	(10,758)	(615)	

Table 1 presents summary statistics on compensation of all, male and female managers. It reports sample means. It further reports standard deviations and the number of observations in parentheses. The data are from the OSIRIS database from Bureau von Dyck for 2000-2004. All (price) data are reported in real 2000 US Dollar adjusted using the US consumer price index. The p-value in column (4) originates from a two-sided t-test testing the significance of the mean difference of the respective variable between female and male managers.

Table 2: Summary statistics on firm characteristics

Variable	(1) All managers	(2) Male managers	(3) Female managers	(4) p-value
All firms				
Sales (in 1000 USD)	1,189,294	1,193,456	1115,356	0.4120
	(21,381)	(22,084)	(83,959)	
Assets (in 1000 USD)	1,695,901	1,700,224	1,619,104	0.5924
	(34,029)	(34,986)	(146,527)	
Number of employees	5,746	5,792	4,920	0.1495
	(135)	(141)	(383)	
Market-to-book value	-0.0086	-0.0093	0.0045	0.7301
(relative to 3-digit industry)	(0.009)	(0.009)	(0.040)	
Number of observations	17,490	16,558	932	
Number of individuals	10,341	9,760	581	
Firms of managers exercising stock options				
Sales (in 1000 USD)	1794,992	1802,658	1667,892	0.5400
	(50,929)	(52,625)	(201,073)	
Assets (in 1000 USD)	2492,367	2490,807	2518,233	0.9347
	(77,500)	(79,389)	(352,350)	
Number of employees	9,152	9,230	7,856	0.4236
	(397)	(418)	(884)	
Market-to-book value	0.3027	0.3001	0.3455	0.5798
(relative to 3-digit industry)	(0.018)	(0.019)	(0.079)	
Number of observations	4,676	4,410	266	
Number of individuals	3,440	3,247	193	

Table 2 presents summary statistics of firm characteristics. It reports sample means and standard deviations in parenthesis for all managers and those managers who exercised their stock options. Each sample is separated into male and female managers. The data are from the OSIRIS database from Bureau von Dyck for 2000-2004. All (price) data are reported in real 2000 US Dollar adjusted using the US consumer price index. The p-value in column (4) originates from a two-sided t-test testing the significance of the mean difference of the respective variable between female and male managers.

Table 3: Summary statistics on occupational segregation

Variable	(1) Number in occupation	(2) % of female managers	(3) Occupation/ market wage	(4) Female/ male wage
Chief executive officer/Chair of the board	3,025	0.023	2.016	0.946
Vice chair of the board	287	0.035	1.659	0.734
President	3,057	0.033	1.142	0.870
Director	384	0.031	0.926	1.000
Chief financial officer	2,779	0.062	0.704	0.735
Chief operating officer	539	0.065	0.826	1.134
Other chief officer	274	0.069	0.542	1.026
Executive vice president	1,573	0.057	0.969	1.134
Senior vice president	1,675	0.075	0.706	0.800
Vice president	2,283	0.075	0.450	1.083
Group vice president	1,389	0.070	0.433	0.897
Number of managers with other titles	225			
Number of observations	17,490	16,558	932	
Number of individuals	10,341	9,760	581	

Table 3 presents summary statistics on occupational segregation. It reports absolute numbers in each occupation, the relative number of female managers in each occupation, the ratio between mean occupation wage and mean market wage and the ratio between mean female wage and mean male wage in each occupation. The data are from the OSIRIS database from Bureau von Dyck for 2000-2004. All (price) data are reported in real 2000 US Dollar adjusted using the US consumer price index.

Table 4: Summary statistics on personal characteristics

Variable	(1) All managers	(2) Male managers	(3) Female managers	(4) p-value
Age	50.44683	50.59506	47.8133	0.0000
	(0.058)	(0.060)	(0.224)	
Tenure	3.742	3.749	3.613	0.3135
	(0.030)	(0.031)	(0.119)	
Education				
No information	0.693	0.694	0.673	0.1778
Bachelor	0.136	0.133	0.176	0.0002
Masters	0.052	0.053	0.036	0.0243
MBA	0.091	0.091	0.091	0.9396
PhD	0.029	0.029	0.024	0.3333
Promotion				
Change of title	0.0661	0.0658	0.0719	0.4644
Change of firm	0.0063	0.0063	0.0076	0.6455
Number of observations	17,490	16,558	932	
Number of individuals	10,341	9,760	581	

Table 4 presents summary statistics on personal characteristics of all, male and female managers. It reports sample means and standard deviations in parenthesis. The data are from the OSIRIS database from Bureau von Dyck for 2000-2004. All (price) data are reported in real 2000 US Dollar adjusted using the US consumer price index. The p-value in column (4) originates from a two-sided t-test testing the significance of the mean difference of the respective variable between female and male managers.

Table 5: Estimation results for wage equations with individual specific random effects

Data set	All managers	Managers not exercising stock options	Managers exercising stock options	All managers	Managers not exercising stock options	Managers exercising stock options
Number of observations	17,490	12,814	4,676	17,490	12,814	4,676
Number of individuals	10,341	8,595	3,440	10,341	8,595	3,440
R-squared	0.4987	0.4885	0.4811	0.5604	0.5556	0.5989
Dependent variable: Ln(Total compensation)						
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Constant	9.5015	9.3095	11.8591	8.8915	8.7216	8.5463
	(11.48)***	(13.21)***	(11.77)***	(11.39)***	(13.17)***	(9.47)***
Female	-0.1585	-0.1293	-0.2963	-0.0600	-0.0464	-0.1493
	(-4.94)***	(-4.15)***	(-4.82)***	(-1.99)*	(-1.59)	(-2.75)**
Age	0.0272	0.0479	-0.0136	0.0385	0.0572	-0.0047
	(2.75)**	(5.12)***	(-0.66)	(4.12)***	(6.49)***	(-0.25)
Age squared $\times 10^{-2}$	-0.0126	-0.0357	0.0341	-0.0329	-0.0524	0.0111
	(-1.29)	(-3.87)***	(1.68)	(-3.57)***	(-6.02)***	(0.61)
Tenure	0.0183	0.0090	0.0003	0.0310	0.0166	0.0259
	(5.38)***	(2.75)**	(0.05)	(9.33)***	(5.20)***	(4.14)***
Tenure squared $\times 10^{-2}$	-0.0490	-0.0197	0.0194	-0.1088	-0.0582	-0.0993
	(-3.06)**	(-1.29)	(0.59)	(-7.08)***	(-3.97)***	(-3.29)**
Bachelor	0.0202	0.0255	0.0176	0.0193	0.0219	0.0210
	(0.95)	(1.27)	(0.40)	(0.96)	(1.16)	(0.54)
Master	0.0920	0.0842	0.1167	0.0747	0.0665	0.0860
	(2.89)**	(2.78)**	(1.89)	(2.50)*	(2.33)*	(1.56)
MBA	0.0729	0.0868	0.1295	0.0471	0.0636	0.0754
	(2.91)**	(3.71)***	(2.43)*	(1.99)*	(2.87)**	(1.58)
PhD	0.0956	0.0774	0.3063	0.0475	0.0331	0.2625
	(2.15)*	(1.88)	(3.08)**	(1.14)	(0.85)	(2.97)**
Firm size	0.2989	0.2360	0.3509	0.3038	0.2409	0.3493
	(79.80)***	(66.95)***	(39.96)***	(85.41)***	(72.02)***	(44.24)***
Market-to-book ratio (relative to 3-digit industry)	0.1082	0.0373	0.1315	0.1103	0.0376	0.1350
	(21.40)***	(7.52)***	(13.31)***	(22.84)***	(7.93)***	(15.07)***

Table 5: Estimation results for wage equations with individual specific random effects continued

Data set	All managers	Managers not exercising stock options	Managers exercising stock options	All managers	Managers not exercising stock options	Managers exercising stock options
Number of observations	17,490	12,814	4,676	17,490	12,814	4,676
Number of individuals	10,341	8,595	3,440	10,341	8,595	3,440
R-squared	0.4987	0.4885	0.4811	0.5604	0.5556	0.5989
Dependent variable: Ln(Total compensation)						
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Chief executive officer/Chair of the board				0.7639	0.6779	1.0950
				(13.91)***	(13.09)***	(9.87)***
Vice chair				0.5100	0.5413	0.6232
				(7.06)***	(7.97)***	(4.41)***
President				0.5452	0.5354	0.6228
				(9.99)***	(10.43)***	(5.63)***
Director				0.4255	0.3585	0.7069
				(6.77)***	(6.19)***	(5.17)***
Chief financial officer				0.1366	0.1681	0.1230
				(2.50)*	(3.26)**	(1.11)
Chief operating officer				0.2588	0.2625	0.2905
				(4.11)***	(4.45)***	(2.32)*
Other chief officer				0.2511	0.2422	0.3231
				(3.50)***	(3.61)***	(2.14)*
Executive vice president				0.2745	0.2921	0.1597
				(4.85)***	(5.43)***	(1.42)
Senior vice president				0.1138	0.1363	0.0677
				(2.03)*	(2.56)*	(0.60)
Group vice president				0.0620	0.0941	-0.0627
				(1.11)	(1.78)	(-0.55)
Vice president				0.0104	0.0400	0.0188
				(0.19)	(0.77)	(0.17)
Change of title				0.0715	0.0242	0.0585
				(3.54)***	(1.30)	(1.56)
Change of firm				-0.0799	-0.0058	-0.0540
				(-1.17)	(-0.10)	(-0.32)
Dummy variables for years	Yes	Yes	Yes	Yes	Yes**	Yes**
Dummy variables for 3-digit industry	Yes**	Yes**	Yes**	Yes**	Yes**	Yes**

Table 5 presents the estimation results from the wage regression model with individual specific random effects. The dependent variable is the logarithm of total compensation. n the columns (1), (2) and (3), the explanatory variables are a dummy variable for gender, age, age squared, tenure, tenure squared, dummy variables for education, firm size, market-to-book value relative to the 3-digit industry, yearly and 3-digit industry specific dummy variables. In the columns (4), (5) and (6), the explanatory variables are a dummy variable for gender, age, age squared, tenure, tenure squared, dummy variables for education, firm size, market-to-book value relative to the 3-digit industry, yearly and 3-digit industry specific dummy variables as well as the change of the firm, occupational dummy variables and the change of the title. Absolute values of t-statistics are shown in parentheses below the parameter estimates. *** (**, *) denotes a 99% (95%, 90%) level of significance. The data are from the OSIRIS database from Bureau von Dyck for 2000-2004. All (price) data are in real 2000 US Dollar adjusted using the US consumer price index.

Table 6: Blinder-Oaxaca decomposition results

Decomposition	Total wage gap	Unexplained wage gap	Explained wage gap
Panel A. All managers Specification without occupational dummy variables			
Male based decomposition	0.161	0.158 98.2%	0.003 1.8%
Female based decomposition	0.161	0.199 123.6%	-0.038 -23.6%
Panel B. All managers Specification with occupational dummy variables			
Male based decomposition	0.161	0.054 33.7%	0.107 66.3%
Female based decomposition	0.161	0.100 62.1%	0.061 37.9%
Panel C. Managers exercising stock options Specification without occupational dummy variables			
Male based decomposition	0.255	0.312 122.4%	-0.057 -22.4%
Female based decomposition	0.255	0.529 207.1%	-0.273 -107.1%
Panel D. Managers exercising stock options Specification with occupational dummy variables			
Male based decomposition	0.255	0.139 54.3%	0.117 45.7%
Female based decomposition	0.255	0.418 163.9%	-0.163 -63.9%

Table 6 presents Blinder-Oaxaca decomposition results based on separate wage regressions for male and female managers and for male and female managers exercising stock options. The dependent variable is the logarithm of total compensation. In Panels A and C, the explanatory variables are a dummy variable for gender, age, age squared, tenure, tenure squared, dummy variables for education, firm size, market-to-book value relative to the 3-digit industry, yearly and 3-digit industry specific dummy variables. In Panels B and D, the explanatory variables are a dummy variable for gender, age, age squared, tenure, tenure squared, dummy variables for education, firm size, market-to-book value relative to the 3-digit industry, yearly and 3-digit industry specific dummy variables as well as the change of the firm, occupational dummy variables and the change of the title. The data are from the OSIRIS database from Bureau von Dyck for 2000-2004. All (price) data are in real 2000 US Dollar adjusted using the US consumer price index.

Table 7: The effect of stock options

Data set	Managers with stock options	Managers with stock options	Managers with stock options	Managers with stock options	All managers	Managers with stock options
Number of observations	4676	4676	11952	11952	17490	11952
Number of persons	3440	3440	7431	7431	10341	7431
R-squared	0.3971	0.3062	0.4039	0.3300	0.5880	0.6185
Dependent variable	Exercised stock options		Exercisable stock options		Total compensation plus exercisable stock options	
	Ln(Number)	Ln(Value)	Ln(Number)	Ln(Value)		
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Constant	4.8017	8.9799	2.5104	10.9562	8.9625	9.1133
	(2.65)**	(5.79)***	(1.30)	(8.01)***	(10.91)***	(11.40)***
Female	-0.2464	-0.2625	-0.1804	-0.2051	-0.0911	-0.1210
	(-2.26)*	(-2.86)**	(-2.03)*	(-3.19)**	(-2.81)**	(-3.32)***
Age	-0.0515	-0.0818	0.0416	0.0761	0.0386	0.0254
	(-1.38)	(-2.60)**	(1.44)	(3.77)***	(3.89)***	(2.15)*
Age squared $\times 10^{-2}$	0.0607	0.0924	-0.0327	-0.0655	-0.0326	-0.0188
	(1.66)	(3.00)**	(-1.15)	(-3.31)***	(-3.33)***	(-1.61)
Tenure	0.0480	0.0242	0.1168	0.0759	0.0452	0.0382
	(3.75)***	(2.23)*	(12.12)***	(12.61)***	(13.25)***	(9.64)***
Tenure squared $\times 10^{-2}$	-0.1726	-0.0784	-0.4007	-0.2615	-0.1564	-0.1213
	(-2.81)**	(-1.50)	(-8.52)***	(-8.83)***	(-9.83)***	(-6.27)***
Bachelor	0.0721	0.1075	0.0422	0.0885	0.0228	0.0316
	(0.91)	(1.61)	(0.71)	(2.18)*	(1.07)	(1.29)
Master	0.1779	0.1721	0.1928	0.1622	0.0879	0.1350
	(1.59)	(1.82)	(2.25)*	(2.78)**	(2.79)**	(3.85)***
MBA	0.1754	0.1342	0.0476	0.0548	0.0440	0.0836
	(1.82)	(1.65)	(0.68)	(1.16)	(1.75)	(2.93)**
PhD	0.2724	0.2526	0.0528	0.1403	0.0500	0.0771
	(1.53)	(1.68)	(0.44)	(1.66)	(1.12)	(1.56)
Firm size	0.4348	0.1559	0.4714	0.0995	0.3283	0.3452
	(27.30)***	(11.59)***	(41.82)***	(12.53)***	(86.67)***	(74.66)***
Market-to-book ratio (rel. to 3-digit industry)	0.2706	0.1371	0.3935	0.0280	0.1509	0.1704
	(14.71)***	(8.77)***	(28.86)***	(3.37)***	(31.00)***	(30.37)***

Table 7: The effect of stock options continued

Data set	Managers with stock options	Managers with stock options	Managers with stock options	Managers with stock options	All managers	Managers with stock options
Number of observations	4676	4676	11952	11952	17490	11952
Number of persons	3440	3440	7431	7431	10341	7431
R-squared	0.3971	0.3062	0.4039	0.3300	0.5880	0.6185
Dependent variable	Exercised stock options		Exercisable stock options		Total compensation plus exercisable stock options	
	Ln(Number)	Ln(Value)	Ln(Number)	Ln(Value)		
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Chief executive officer/Chair of the board	1.3757	1.3152	1.7876	1.6024	0.8457	1.0510
	(6.09)***	(6.87)***	(10.66)***	(14.74)***	(14.88)***	(15.25)***
Vice chair	0.6326	0.8000	1.1837	1.0709	0.5503	0.6521
	(2.20)*	(3.28)**	(5.51)***	(7.85)***	(7.40)***	(7.39)***
President	0.7558	0.7225	1.0737	1.0282	0.5715	0.6810
	(3.35)***	(3.78)***	(6.45)***	(9.56)***	(10.14)***	(9.95)***
Director	0.7748	0.9330	1.2684	1.2132	0.4557	0.7182
	(2.79)**	(3.96)***	(6.36)***	(9.39)***	(7.05)***	(8.76)***
Chief financial officer	0.2109	0.1791	0.4007	0.3517	0.1243	0.1910
	(0.94)	(0.94)	(2.40)*	(3.27)**	(2.20)*	(2.79)**
Chief operating officer	0.3439	0.3269	0.6966	0.6246	0.2588	0.3254
	(1.34)	(1.51)	(3.69)***	(5.16)***	(3.99)***	(4.19)***
Other chief officer	0.5719	0.4487	0.6303	0.4941	0.2716	0.3006
	(1.86)	(1.72)	(2.96)**	(3.59)***	(3.67)***	(3.44)***
Executive vice president	0.2942	0.2886	0.4294	0.5636	0.2513	0.2690
	(1.28)	(1.49)	(2.51)*	(5.10)***	(4.30)***	(3.82)***
Senior vice president	0.2475	0.2238	0.3767	0.3176	0.0930	0.1742
	(1.08)	(1.15)	(2.21)*	(2.90)**	(1.60)	(2.49)*
Group vice president	0.0110	-0.1180	0.0436	0.1712	0.0376	0.0732
	(0.05)	(-0.60)	(0.26)	(1.55)	(0.65)	(1.04)
Vice president	0.2058	0.0672	0.0977	-0.0037	-0.0140	0.0276
	(0.90)	(0.35)	(0.58)	(-0.03)	(-0.25)	(0.40)
Change of title	0.1306	0.0650	0.0620	0.0408	0.0607	0.0386
	(1.63)	(0.94)	(1.21)	(1.49)	(3.22)**	(1.82)
Change of firm	0.3949	0.2777	0.1128	-0.0905	-0.1328	-0.0283
	(1.10)	(0.90)	(0.57)	(-0.85)	(-2.07)*	(-0.35)
Dummy variables for years	Yes	Yes	Yes	Yes	Yes**	Yes**
Dummy variables for 3-digit industry	Yes**	Yes**	Yes**	Yes**	Yes**	Yes**

Table 7 presents the estimation results for additional specifications. The dependent variables are the logarithm of the number or the logarithm of the value of exercised and exercisable stock options or the logarithm of total compensation including the discounted present value of exercisable stock options. The explanatory variables are a dummy variable for gender, age, age squared, tenure, tenure squared, dummy variables for education, firm size, market-to-book value relative to the 3-digit industry, yearly and 3-digit industry specific dummy variables as well as the change of the firm, occupational dummy variables and the change of the title. Absolute values of t-statistics are shown in parentheses below the parameter estimates. *** (**, *) denotes a 99% (95%, 90%) level of significance. The data are from the OSIRIS database from Bureau von Dyck for 2000-2004. All (price) data are in real 2000 US Dollar adjusted using the US consumer price index.