The Gender Promotion Gap: Evidence from Central Banking*

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Abstract

We examine gender differences in career progression and promotions using personnel data from the European Central Bank (ECB) during the period 2003-2017. A gender wage gap emerges within a few years of hiring, despite broadly similar entry conditions. We also find a gender promotion gap prior to 2010 when the ECB issued a public commitment to diversity. Following this change, the promotion gap disappears. Using data on promotion applications, we find that there is a gender application bias, partly driven by preferences for competition. Following promotion, women perform better in terms of salary progression.

Keywords: gender gaps, promotions, competition, central banking.

JEL codes: J16, J31, J41, J63.

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1 Introduction

Economics remains a male-dominated field. In the US, women account for 28.8 percent of PhD graduates but a mere 13.9 percent of full professors in economics (CSWEP 2017). Despite recent efforts to turn the tide, women remain less prone to study economics (Ginther and Kahn 2004). This under-representation of women is perhaps nowhere as visible as in central banks (OMFIF 2019).

Several explanations may account for the lack of women in high-level positions of the economics profession. Women may be less likely to apply for promotions because of gender differences in the preference for competitive environments (Niederle and Vesterlund 2007, Buser *et al.* 2014) or in bargaining abilities in the labor market (Babcock and Laschever 2003, Blackaby *et al.* 2005). The presence of children and trade-offs between family and career may also hold back women from pursuing promotions (Fernndez *et al.* 2004, Goldin 2006, Bertrand 2013, Bertrand *et al.* 2015). These explanations have in common that they are based on gender differences in psychological attributes or identity (Akerlof and Kranton 2000, Bertrand 2011). Whether these differences are shaped by genetics, biological factors, or environmental factors is an open debate. Apart from these supply-side explanations, there could also be gender-based discrimination in promotion decisions. For instance, Goldin and Rouse (2000) find that women are more likely to be selected when the identity of candidates is being concealed.

A complimentary view is that gender differences in labor market outcomes arise from multiple equilibria. The multiple equilibria view is based on the premise that there are no fundamental differences between mens and womens skills or abilities arising from differences of a genetic or biological nature. But the expectation that women will not equally perform in male-dominated fields becomes self-sustaining. For example, in Albanesi and Olivetti (2009) women are paid less for high effort in market work if they are expected to devote more time to home production. Women will then optimally choose to exert less effort in market work, obtain lower pay, and devote more time to home work, thus fulfilling the expectations. According to this view, the social norms that shape gender differences in labor market outcomes are not hard-wired but can be moved by policy.

What holds back the career progression of women? Can corporate diversity policies mitigate gender differences in promotions? Despite a large body of literature on gender differences, a still unsolved issue is whether such policies improve labor market outcomes for women.

In this paper, we use confidential data from the European Central Bank (ECB), one of the major central banks in the world, to investigate two questions. First, why are women underrepresented in senior positions in the economics profession more broadly and in central banks specifically? Central banks are major workplaces for economists but have so far received little attention in the literature on gender differences in careers. We have unique data from the ECB's personnel records and selection campaigns to investigate economists careers in this sector. Given the influence central banks wield over the economic well-being of the public at large, a better understanding of the factors that hold back women at these institutions is of great importance. Research on gender diversity at central banks has thus far focused exclusively on the impact of the composition of the central bank's board on monetary policy decision-making (e.g. Charlty *et al.* 2017). Ours is the first paper to study the career progression of women at central banks.

Second, can a targeted diversity policy increase female representation in senior positions through an increased probability of women being internally promoted? In late 2010, the ECB issued a public statement supporting diversity and took several measures to support gender balance throughout its organization, including the introduction of explicit gender targets. This provides a unique setting to study alternative explanations for the gender differences in career progression in the economics profession. Specifically, we exploit the change in diversity policy to assess the impact of corporate diversity policies on promotion outcomes. Because this policy change did not affect any fundamental differences between men and women, this public commitment to diversity can be interpreted as a coordination device, allowing us to test for the relevance of the multiple equilibrium view. While the economics literature has assessed the impact of gender quotas for corporate board seats on corporate decisions, to our knowledge we are the first to consider the impact of broad-based corporate diversity policies on female promotion outcomes.

By exploiting the complete personnel records of a large organization, we can provide a comprehensive analysis of career progression across job levels within an organization. Moreover, we have data on both promotion applications and decisions and can therefore analyze promotion decisions while accounting for gender gaps in applications, while existing literature has focused on only one of these dimensions. These advantages come at the cost that findings may not carry over to other organizations, even though the gender mix at the ECB is comparable to that of other central banks (IMF 2019).

Our findings are as follows. First, we show that a wage gap emerges between men and women within a few years of hiring, despite roughly similar initial conditions in terms of salary levels and other observables. This wage gap grows steadily with tenure. Second, we find that women are less likely to be promoted to a higher salary band prior to the change in corporate diversity policy in 2010, while this promotion gap disappears after this change. The fact that promotion outcomes responded to this policy change which in and of itself did not affect fundamentals suggests that, at least for this pool of workers, the multiple equilibria view is relevant. Third, using detailed data on selection campaigns available since 2012, we examine the selection process for promotions and find that women are less likely to apply for promotion opportunities, even when they hold the same qualifications and work experience as men. We coin this difference the gender applications gap. Moreover we confirm that during this period women are as likely to be promoted as men. This points to a compositional effect whereby women conditional on applying are more likely to be promoted, other things equal. The gender applications gap is larger for women that compete for promotion within a stronger peer group, suggesting that aversion to more intensive competition partly drives this application gap. Following promotion, women perform better in terms of salary progression, indicating positive selection. We do not find evidence that the presence of children or the composition of the selection committee, including the fraction of women on the panel, alters these results.

Taken together, our results point to the effectiveness of corporate diversity policies in reducing gender bias in promotion rates and lend support to the multiple equilibria view that such policies can act as a coordination device. The results on selection campaigns

show that following this policy change there are remaining gender differences in promotion applications despite a convergence in promotion rates. This suggests that supply-side explanations remain relevant to explain gender differences in promotion applications. In particular, we find that women are less likely to apply when they expect to operate in a more competitive environment, consistent with the experimental evidence in Niederle and Vesterlund (2007) on gender differences in the preference for competitive environments.

Our paper relates to a growing literature on gender gaps. Much of this literature has focused on measuring the wage gap between men and women, and seeking explanations for this gap. These explanations range from differences in abilities and preferences over jobs (e.g., Polacheck 1981, Azmat and Ferrer 2017) to (individual or universal) discrimination (e.g. Goldin and Rouse 2000). Women tend to be more risk averse and less competitive, with women performing more poorly in competitive environments and shying away from competition (Gneezy *et al.* 2003, Niederle and Vesterlund 2007, Buser *et al.* 2014), while men tend to be over-confident (Barber and Odean 2001, Bordalo *et al.* 2019). In terms of biases from social norms and discrimination, there is evidence that following deregulation of banking markets the wage premium of men decreased and the proportion of women in managerial positions increased (Black and Strahan 2001), that both men and women rate male job applicants higher for jobs that require math skills (Moss-Racusin *et al.* 2012), that legislation that increases pay transparency reduces the gender pay gap (Bennedsen *et al.* 2019), that women are more severely punished for financial misconduct (Egan *et al.* 2019), and that female executives are more likely to exit following industry-wide contractions (Landsman 2018). Our results on the link between a competitive environment and the application gap contribute to this literature.

Career-family balance considerations and the presence of children also play an important role, with a close link between career interruptions and earnings growth (Lazear and Rosen 1990). Women remain dominant providers of child care within the household, while many of higher-paying jobs have long hours and inflexible schedules, and many of the financially more rewarding careers require no job interruptions to stay on the "fast track" (Goldin 2014). Career interruptions and weekly hours worked have been found to

be key factors driving the gender pay gap, with the presence of children being a main contributor to this (Bertrand *et al.* 2010). Moreover, selection out of the labor market tends to underestimate this wage gap due to the presence of children (e.g. Kunze 2020). Women tend to find it difficult to *double up* between work and family, with those combining family with a career reporting to be more unhappy, stressed and tired compared to those staying at home (Bertrand 2013). Differences in educational attainment are no longer an important driver with the fraction of female college graduates having caught up to the levels of men (Goldin *et al.* 2006). While many papers in this literature find a positive wage gap between men and women upon entry (e.g. Babcock *et al.* 2003, Bertrand *et al.* 2010), we find that at the ECB men and women with similar characteristics enter at broadly similar wages. Moreover, we do not find that the presence of children explains the gender wage gap at the ECB, likely due to relatively generous childcare facilities and parental leave policies.

Promotion outcomes have been less studied and have focused primarily on academia, arguably because of data availability and academic interest. The key question in this literature has been whether the gender pay gap is largely due to a gender promotions gap or a within-rank gender pay gap. For instance, Ginther and Hayes (1999) using data from the Survey of Doctoral Recipients from the National Science Foundation find that it takes women much longer to obtain tenure and that the gender pay gap can largely be explained by rank rather than within-rank differentials. Moreover, Ginther and Kahn (2004) find using the same survey that this promotion gap is especially true in the field of economics when compared to other fields in social sciences or the humanities. On the other hand, Blackaby *et al.* (2005) provide survey-based evidence for the UK of the existence of both a gender promotions gap and a within-rank gender pay gap among female academic economists. They also find that female academic economists are less likely to be promoted in part because they receive less outside offers. Most of this literature focuses on promotion outcomes, not applications. An exception is Bosquet *et al.* (2019) who analyze the national promotion system of French academic economists and show that women are less likely to enter promotion contests. Promotion gaps have also

been found in non-academic fields. For instance, Azmat and Ferrer (2017), using survey data of US law firms, find that male lawyers perform better in terms of hours billed and new client revenue and that this enhances their subsequent promotion prospects, and Kunze and Miller (2017), using Norwegian register data, find that career progression is faster for women with female bosses. Our finding that salaries progress faster for women following promotion is reminiscent of the work by Card *et al.* (2020) who find that conditional on publication in a top academic journal, women have higher citations, implying that the bar for career progression is higher for women. We contribute to this literature by showing that at the ECB, even in a context where there is no longer a gender promotions gap, there is a gender applications gap, with equally qualified women being less likely to apply for a promotion than men.

The impact of corporate diversity policies on labor market outcomes has primarily focused on the impact of gender quotas for corporate board seats and the role of mentoring in promotion outcomes. Evidence of the success of gender quota policies is mixed. For instance, Bertrand *et al.* (2019) show that while the gender gap in earnings within boards fell following the establishment of such quotas in Norway, there was no such effect on the salaries of similarly qualified women who were not appointed to boards. Moreover, Ferrari *et al.* (2018) find that for Italy, the introduction of quotas increased the educational attainment of board members and had a positive impact on stock returns. On the other hand, Ahern and Dittmar (2012) find that the Norwegian quota led to less experienced boards, prompting declines in firm valuation and deteriorating operating performance, while Matsa and Miller (2013) find that the quota prompted changes in corporate decisions, with affected firms increasing salaries and employment levels. More generally, Matsa and Miller (2011) find that the share of women on corporate boards directly influences the share of female executives. We contribute to this literature by showing that a targeted diversity policy can increase the representation of women in senior positions through an increased probability of women being internally promoted.

The role of mentoring in labor market outcomes has been primarily studied in the management and in the sociology literature. Mentoring has been found to positively

influence the chance of a promotion (Hunt and Michael 1983), and there is some evidence that this may be particularly important for women, both in overcoming organizational barriers and in serving as role models (Noe 1988). Recent experience with mentoring programs for assistant professors in economics shows some benefits in publication and grant application outcomes (Blau *et al.* 2010). More generally, mentoring programs are found to be more effective than unconscious bias trainings in enhancing corporate diversity (Dobbin and Kalev 2013). Consistent with this evidence, we find that being a mentee has a positive impact on promotion applications by women.

Other related work has studied the impact of gender composition of selection committees on the promotion gap. For instance, Bagues *et al.* (2017) analyze data from the Italian and Spanish national academic appointment systems and find that a larger number of women on the evaluation committee does not enhance outcomes for female candidates. Moreover, male committee members become less favorable toward female candidates when women are on the committee, consistent with theories that the entry of women can contribute to strengthen male identity (Akerlof and Kranton 2000). In contrast with this literature, we find no evidence that the size or composition of the selection panel matters for promotion outcomes at the ECB.

More generally, our work relates to an extensive literature on wage and promotion dynamics within firms (e.g., Medoff and Abraham 1980, Baker *et al.* 1994). Like us, this literature also considers career progression within firms. We contribute to this literature by considering the role of gender.

The paper proceeds as follows. Section 2 describes the institutional setting. Section 3 describes the dataset. Section 4 presents results on gender differences in pay, and section 5 presents results on gender differences in promotions, including the impact of the 2010 change in corporate diversity policy. Finally, section 6 concludes.

2 Institutional background

Our analysis is based on the personnel files of the ECB. The ECB is the central bank for the 19 member states of the euro area and was established in 1998. The ECB's workforce consists of over 2,500 staff. Similar to other central banks, it has a gender imbalance, especially at more senior levels: at end-2017, women accounted for 39.6% of staff at professional expert level and 17.1% of senior managers. The ECB is organized into several departments that each have a distinct organizational function. The workforce of each department consists of managers, professional staff, and support staff. Each department consists of several divisions. Each division is overseen by a manager and each department is led by a senior manager.

The focus of this study is on those departments that mainly employ economists – Economics, Monetary Policy, Market Operations, Market Infrastructure, International, Financial Stability, Risk Management, Research, and Statistics – to enhance comparability across individuals.[1] Within these departments, most staff hold a degree in economics or related field. The educational attainment and academic publication record of these experts is similar to that of professional staff at other major central banks. For instance, according to RePEc, the ranking of the ECB's research output is comparable to that of the Federal Reserve Board. Most economists enter the ECB without prior work experience straight from university. There is limited mobility across departments (less than 5% of staff has worked in more than one department) and the attrition rate among professional staff is low at 0.4%. The result is a relatively homogeneous workforce.

Our analysis focuses on professional staff across salary bands F/G, H and I. The usual job titles across these salary bands are Expert for salary band F/G, Principal expert for salary band H, and Adviser for salary band I. Our dataset excludes the managerial levels. Salary band F/G is the level at which experts enter the ECB without work experience.[2]

[1] Banking Supervision, Corporate Services, Communication, and Legal are excluded.

[2] Salary band F/G consists of two bands–F and G–and progression between these bands is based on performance and does not require a promotion decision.

The complexity of tasks and job responsibility increases across these salary bands. The job description for Experts is to conduct policy analysis and research; Principal experts are responsible for leading small teams of Experts, and Advisers are responsible for co-ordinating major policy and research projects and assist management in developing the work program for the department. The work of all three groups of professional staff is overseen by managers. A typical Expert will have a variety of tasks, consisting of a combination of policy and analytical work. Tasks are assigned by the line manager and spread evenly across economists, who receive a mix of low status and high profile tasks. While Experts typically operate in small teams, their own contributions tend to be well specified and delineated, with clear deadlines and deliverables, allowing them to operate independently from other team members for a large fraction of their work. All work except own research is subject to review and approval by the line manager.

Salaries are paid according to different salary bands, and salaries within each band increase in steps, with each step 0.25% above the previous one. Salaries are reviewed annually based on each staff member's performance relative to that of peers in the same department, and annual salary increases range from 0 to 14 steps. In addition, select staff receive a cash bonus of up to 5% of annual salary. Bonuses reward exceptional contributions and take the form of one-off lump sum payouts. Bonuses are awarded to only a small fraction of individuals each year and because they do not alter salary levels have a small effect on life time earnings. Salary increases and bonuses are approved by each departments senior management.

Career progression within a salary band is granted after performance reviews, while promotions to the next salary band require winning a selection campaign. A selection campaign consists of three stages: job application, interview, and selection. Campaigns can be open to competition from external candidates. The selection committee consists of representatives of the hiring department, the human resources department, and a third department, who operate at levels above or at the same level as the advertized position. Following the selection process, the selection committee agrees on a ranking of candidates, and offers the position to the highest ranked candidate.

Employees are eligible for a number of child care benefits, including 20 weeks of fully paid maternity leave, three years of unpaid parental leave, and subsidized childcare. The ECB maintains four childcare facilities that are open to children aged up to six years.

In late 2010, the ECB made a fundamental shift regarding its attitude to gender diversity, taking several steps to raise the awareness of the importance of gender diversity and to enhance the diversity of its workforce. The ECB's Executive Board announced this policy shift by issuing a public statement on diversity indicating that the ECB aims to be a workplace where staff members feel included and respected, and where their individual talents are valued, developed and rewarded. The public statement reads as follows: "Diversity is a key contributor to our success. As a European Union institution, the ECB aspires to be an organization in which diversity is welcomed and appreciated in all its facets for the richness that it offers. The facets of diversity include – but are not limited to – gender, nationality, religion, sexual orientation, ethnic origin, age, cultural background and disability." While the statement refers to diversity and inclusion in a broad sense, it was accompanied with a diversity action plan that centered around gender diversity.

The diversity action plan consisted of several measures including the introduction of gender targets for managerial positions, the use of gender-neutral language in job postings, the requirement of gender-balanced recruitment campaigns for managerial positions, the introduction of a women's leadership program, the introduction of a mentoring program focused on women, and the establishment of a gender diversity committee with staff representatives from each department. By 2014, all these actions were fully implemented.

A key focus of the plan has been the setting of gender targets for managerial positions, to be reached by year-end 2019. The targets are 35% of women in management positions (salary bands I-L) and 28% of women in senior management positions (salary bands K-L). Another key focus has been to enhance the representation of women on selection panels, by allowing the inclusion of one member from another business area if this enhances the gender diversity of the selection committee. Effectively, following this change most selection panels had at least one female member, and at least two female panel members

for positions at the H-band level or above. The plan also includes a mentoring program, starting with a pilot in 2012 that was subsequently formalized in December 2014. Mentors are experienced staff members that are committed to providing support to more junior employees with a view to enhance their career development and upward mobility in the organization. Mentors can be male or female, and participation in the program is voluntary. While the program is focused on women, it is also open to men. In practice, most of the mentees are women. The main aim of the program is helping women overcome social or cultural biases in the workplace.

3 Data

The two datasets that we use in this paper are derived from the personnel records of the ECB and cover the period up to 2017. The information was provided on an anonymous basis and transformed in such a way that while individuals cannot be identified, much of the relevant information is preserved. We limit the sample to professional staff across three different salary bands in the policy areas, the research department and the statistics department. With this selected group we focus on a broadly homogeneous pool of staff in terms of human capital and experience, ensuring comparability across individuals.

Dataset 1: Working histories 2003-2017 The first dataset includes demographic characteristics and working histories of the employees over the period 2003 to 2017. The unit of analysis is the employee by month and year since entry to the ECB. Our salary measure is the number of salary steps, as reported in Table A.1 of the Online appendix. Each step corresponds to a salary level in euros, with salaries increasing in the number of steps. Salaries are set annually, but there may be intra-annual changes in case of promotion. The salary steps in our sample of professional staff go from 263 to 544.

We focus the analysis on the period 2003 to 2017, as coherent information on salaries is available only since 2003. However, we have complete historical information to construct the working histories for each employee going back to the establishment of the ECB in 1998. Our panel consists of 1,082 workers and 85,282 monthly observations in total. We

use this sample to explore the existence of gender pay and promotion gaps over the period 2003 to 2017, including the impact of the change in corporate diversity policy.

Dataset 2: Recruitment campaigns 2012-2017 Our second dataset consists of information on each recruitment campaign since 2012, following the policy change. For each campaign we have information on the characteristics of internal potential candidates, the presence of external candidates, the composition of the recruitment panel, and the salary band and department of the open position. We also know the date of each campaign and use this to match the campaign data to the monthly information on working histories and personnel data.

We limit the sample to all potential candidates for promotion opportunities to the Principal expert level for a total of 62 promotion campaigns, covering 794 applications. The data allow us to distinguish between applications and promotion decisions.

3.1 Variable definitions

Based on these two datasets, we construct a number of variables for the empirical analysis. *Female* is a dummy variable that takes a value of one if the employee is a woman and zero otherwise. *Tenure within band* is the number of months that the employee has been in the current salary band. *Principal expert (Adviser)* is a dummy variable that takes a value of one if the employee is currently in salary band H (I), and zero otherwise. *Age* is the age of the employee in intervals of five years. We construct age dummies for each age bracket. *Salary steps* indicates the salary level, in steps, of the employee. *Children* is a dummy variable that takes a value of one if the employee has dependent children, and zero otherwise. *Top performer* is a dummy variable that takes a value of one if the employee received a salary increase that is among the top 25% in her department at least once in the past two years, and zero otherwise. *Bonus* is a dummy variable that takes a value of one if the employee received cash bonuses at least once in the past two years, and zero otherwise. Since 2012, employees can participate in a mentorship program. Most mentees are women. *Mentee* takes a value of one if the employee participated in the

mentorship program at east once in the past two years, and zero otherwise. Employees receive a head of household allowance if they have a spouse with a gross annual income below a certain level (currently €57,211) or if they do not have a spouse but one or more dependent children. The household allowance treshold is set annually and the allowance is supposed to compensate ECB employees for not being eligible for German tax benefits for households with children and/or single parents. *Head of household* takes a value of one if the employee receives the allowance, and zero otherwise. *External campaign* is a dummy variable that takes a value of one if the campaign is open to external candidates, and zero otherwise. *Share of external candidates* is the ratio of external candidates to total candidates that have applied to a particular selection campaign. *Competition index* is the fraction of potential candidates for promotion in the division that have a salary at the upper end of the salary band, defined as a salary of above 100 steps (up to a maximum of 169 steps). *Female competition* takes a value one if the number of potential female candidates in the division with a salary of above 100 steps in the salary band is more than the 30 percent of the total pool of potential candidates in the division. The candidate in question is excluded from the calculation of the competition variables. *Paid maternity leave* equals the number of months on maternity leave since entry. *Unpaid parental leave* equals the number of months on unpaid leave to take care of children since entry. *Size of selection panel* is the logarithm of the number of panel members on the selection panel. *Share of female panelists* is the number of female panel members divided by the total number of panel members.

3.2 Descriptive statistics

Descriptive statistics of our main variables can be found in Table 1. The data cover 1,082 employees over the period 2003 to 2017, for a total of 85,282 observations. As in the overall economics profession, women are underrepresented, totaling 31% of all employees. Moreover, the number of women decreases at higher ranks, from 36% at *Expert* level to 24% at *Principal expert* level and 17% at *Adviser* level, pointing to a leaky pipeline in women's career progression. Men tend to be slightly older on average at 40 years,

compared to 39 years for women, and salary levels tend to be somewhat higher for men, 382 steps for men against 357 steps for women.

The summary statistics also indicate that women are less likely to be promoted prior to 2011, with only 0.22% of women in the sample receiving a promotion as opposed to 0.49% for men. However, after 2011, following the changes in corporate diversity policies, this difference disappears.

The bottom panel of Table 1 presents descriptive statistics for the campaigns dataset. This dataset covers 794 applicants and 62 winners for a total of 23,209 potential applicant observations over the period 2012 to 2017.[3] Female applicants tend to have been longer in their salary band prior to applying for a promotion, for a total of 99.4 months as opposed to 85.9 months for men. Conditional on applying, women are more likely to win the campaign than men, with a probability of winning of 13% for women compared to 6% for men. Female applicants are more likely to have been top performers, and to have children.

Selection bias is a common problem in many studies that investigate the career progression of men and women. In our case, one concern is that men and women enter the ECB with different characteristics and prior work experiences, and that this could introduce a bias in the estimates. However, one advantage of our setting is that we have a highly homogenous workforce of economists that typically join the ECB directly from graduate school without prior work experience, resulting in a sample of men and women with similar characteristics when they enter. Indeed, most new employees enter at young age with graduate degrees and comparable salaries. Moreover, in Table A.2 in the Online appendix, we compare observable characteristics upon entry at *Expert* level in our sample across two sub-periods (before 2011, and from 2011 onwards). We find that gender differences between newly hired men and women are small among most variables of interest, further allaying concerns about selection bias in our sample. Male employees at entry are slightly older and more likely to have children than females but these differences are not always significant. Salary offers at the ECB for incoming staff are largely

[3]Strictly speaking we observe 62 winners in 61 promotions campaigns.

determined based on the number of years of schooling and work experience. While we do not have information on prior work experience, the data therefore suggests that there are no substantial gender differences in prior work experience for men and women in our sample.

Figure A.1 in the Online appendix shows the variation over time in the proportion of women in each of the salary bands. We see that there is an increase over time in the fraction of women at higher ranked positions, consistent with a narrowing of the promotion gap.

4 Gender wage gap over the career

In this section, we analyze the gender wage gap of professional staff over time and across salary bands. The purpose of this analysis is to assess whether a wage gap exists and whether this is due to a promotions gap or a within-band gender pay gap.

The left-side panel of Figure 1 shows raw salary profiles by gender since entry in the *Expert* level. The initial gender wage gap is small, as one would expect, given the similar initial conditions in terms of human capital and experience between men and women in our sample. This wage gap however increases over time, as the career of the individuals progresses: the initial average gender wage gap of 5 salary steps (1.25%), increases to 8 steps in 1 year, to 25 steps in 5 years, and becomes almost 6 times bigger (30 steps or 7.25%) on average after 10 years. Gender wage gaps are much smaller for workers who stay in the same salary band (see right-side panel of Figure 1): 5 salary steps at entry, 6 steps after 1 year, 8 steps after 5 years, and 10 steps (about 2%) after 10 years. This suggests that promotions are a key contributor to the wage gap over time. Indeed, on average, the gender pay gap is 7% for the whole sample, while it is 1.8% for those employees who stay within the same salary band.

4.1 Wage model

To account for individual features and other potential factors shaping gender wage gaps, we estimate a linear regression model for the log salary steps S_{it} of employee i at time t:

$$S_{it} = \alpha^S + \beta^S Female_i + X'_{it}\gamma^S + \delta_t^S + \epsilon_{it}^S \tag{1}$$

where the dummy $Female$ is equal to one for women, the vector X_{it} includes individual characteristics, such as age, department, salary band, tenure in the band, and family structure, δ_t are time dummies (year and month), and ϵ_{it}^S is a random error term with unrestricted correlation at the individual level. Model (1) is estimated by OLS, and β^S is our coefficient of interest.[4] Regression results are shown in Table 2. All regressions include department and time dummies. Robust standard errors are clustered at the individual level.

The results indicate that once we control for time dummies and observable characteristics of the workers, we move from an unconditional gender wage gap of 7% to a conditional gender wage gap of 3.6% (column (1)). However, when we include salary band dummies in the regression or restrict the sample to those entering at *Expert* level, the estimated conditional gender wage gap drops to 1.1% and 1.5%, respectively (columns (2) and (3)). The lower within-band wage gap suggests that promotions are a major contributor to the gender wage gap.

Thus far, we have not considered the role of children. Children are commonly found to be a key driver of wage gaps (e.g., Babcock *et al.* 2003, Bertrand *et al.* 2010). However, in our sample, the wage gap due to children is not stronger for women than for men. Indeed, when we expand the regression by including a control for the presence of children

[4]We do not include individual fixed effects in these regressions because we are interested in estimating the effect of *Female*. As shown in the Online appendix, column (2) of Table A.3, panels A and B, including individual fixed effects does not add explanatory power and does not qualitatively alter the estimated coefficients on other covariates. We include individual fixed effects when we analyze differential effects in promotion outcomes in the next section.

and its interaction with the *Female* dummy variable, we find that the gender pay gap for women in our sample is not driven by the presence of children (Online appendix, column (2) of Table A.3, panels A and B). This result is confirmed in richer specifications that also consider interaction effects between the presence of children, a head of household dummy, and the female dummy variable (Online appendix, column (4) of Table A.3, panels A and B). This absence of a child penalty could be partly driven by the relatively generous child care benefits at the ECB.

5 Gender differences in promotions

In this section, we document gender differences in promotions using two complementary datasets: data on working histories and data on recruitment campaigns. In the first dataset, promotions are defined as movements across salary bands. This dataset covers the period 2003 to 2017 and allows to test whether there have been any changes in the promotion gap over time, including due to the 2010 public statement on diversity. The second dataset covers only the period 2012 to 2017 but has the advantage of containing detailed information on promotion applicants, thus allowing to study the relevance of a gender promotion application gap.

5.1 Probability of promotion: information on working histories (2003-2017)

The average monthly probability of promotion to a higher salary band in our sample is 0.004 over the period 2003 and 2017. This amounts to a promotion probability of 4.8% in annual terms. Figure 2 shows that this unconditional probability of promotion is lower for women than for men. After 10 years, about 50 percent of men have been promoted to at least the *Principal expert* level while the same is true for only 30 percent of women.

To control for employee heterogeneity and assess the drivers of this gender promotion gap, we estimate the following linear model for the probability that a worker i moves

from the *Expert* level at time t to the *Principal expert* or *Adviser* levels at time $t+1$:

$$P_{it} = \alpha^P + \beta^P Female_i + Z'_{it}\gamma^P + \delta_t^P + \epsilon_{it}^P \tag{2}$$

where, as before, the dummy $Female$ is equal to one for women, Z_{it} is a vector of individual characteristics (such as personal and family characteristics, worker performance measures, and other worker characteristics), δ_t^P are time fixed effects, and ϵ_{it}^P is a random error term with unrestricted correlation at the individual level. Model (2) is estimated among staff at the *Expert* level until the moment of the individual's promotion, and β^P is our coefficient of interest.

Regression results are shown in Table 3, columns (1) to (3). All regressions include department, time and age dummies, with standard errors clustered at the individual level. We find that, on average over the sample period, the estimate of β^P is negative and significant. The probability of promotion for women is substantially lower than for men, with a gap of 0.17 - 0.19%, or about 45% of the average probability of promotion of 0.4%. When looking at other individual characteristics that could influence the probability of promotion, we find that the likelihood of promotion is also larger among those with children. Employees that have recently been top performers or have received bonuses, proxying for performance, are more likely to be promoted, while spending time on unpaid leave to take care of children reduces it. Taking paid maternity leave or having joined the ECB's mentoring program do not appear to influence the probability of promotion. These are average effects over the whole sample period.

In the next subsections, we consider different subperiods and explore differential effects of individual characteristics across genders.

5.1.1 Impact of the 2010 change in corporate diversity policies

In 2010, the ECB's Executive Board issued a public statement on diversity and announced a package of measures to support gender balance, to be implemented in subsequent years. This policy change raised the awareness of the importance of diversity in the workplace.

Figure 3 reports the difference between men and women in the observed annual pro-

motion rates for a given number of years since entry at *Expert* level. To capture the effect of this policy change, the difference in the probability of promotion at entry level is plotted for the period prior to 2011 and the period from 2011 onwards. We find that this change in diversity policies had material effects on gender differences in promotion outcomes: the gender gap in promotions, defined as the difference in the promotion rates of men and women, narrowed from 2011 onwards. While prior to 2011, the gender promotion gap stood at over 37% after ten years since entry, this gap decreased to about 9% on average after 2011, or a decline of about 80 percent.

We next assess more formally the impact of the 2010 change in diversity policies on the gender promotion gap. First, we split the sample into two subperiods, before and after 2011, and, second, we estimate the same specifications of Model (2) for each subsample. The results are presented in columns (4) and (5) of Table 3. They confirm that after 2011 women are as likely to be promoted as men. While prior to 2011, the promotion rate of women was about 0.25% lower than for men, after 2011 women had closed this gap.

Our interpretation of the results critically depends on the shift in the promotion gap to have taken place in 2010, when the ECB announced its corporate diversity policies. To show that the decrease in the gender promotion gap took place in 2010 and not in outer years, we re-estimate Model (2) using three-year rolling samples. The estimates of β^P for all possible three-year sample periods are displayed in Table A.4 in the Online appendix. There is a clear break in 2010: the three-year rolling estimates of β^P are negative and statistically significant in all years prior to 2010, and these estimates are no longer statistically significant from 2010 onwards.

5.1.2 The gender promotion gap and individual characteristics

Thus far we have shown that women have a slower career progression prior to the gender diversity policy change. While the policy change did not alter fundamentals, it could still be that the differences in the promotion gap over time and across individuals are driven by individual traits. To this end, we enrich our empirical specification on promotion outcomes by considering differential effects along individual characteristics. Specifically,

we include interactions between the *Female* dummy variable and a vector of variables capturing other individual characteristics: an indicator whether the individual was a top performer in the past two years based on the annual performance review, an indicator whether the individual received a cash bonus in the past two years, an indicator whether the individual joined the mentorship program, and an indicator whether the individual has dependent children. These regressions also include individual fixed effects. This allows us to more precisely estimate the interaction effects by abstracting from any time-invariant individual characteristics, including the level effect of being a woman.

The results are presented in Table A.5 in the Online appendix. Column (1) presents results for the full sample period 2003-2017. In terms of differential effects, we find that women with children are less likely to be promoted. The other interaction terms do not enter significantly. Next we split the sample in the period before and after the policy change. The results are presented in columns (2) and (3). We find that women that received a bonus are less likely to be promoted prior to 2011. This is consistent with the notion of a performance-reward bias whereby bonuses are used as a consolation prize for not being promoted. Both the performance-reward bias and the effect of dependent children disappear in the period following the policy change. Indeed, following this change we no longer find a differential effect for women along any of the individual characteristics considered.

Taken together, the results in Tables 3 and A.5 show that differences in individual traits no longer impact the promotion gap and that the promotion gap disappears following the policy change. Since the policy change did not induce a change in any fundamental differences between men and women, our interpretation is that the results are consistent with a multiple equilibria view whereby the ECB's commitment to diversity acted as a coordination device to reduce gender bias in promotion rates. Prior to the policy change, the observed low promotion rates resulted in self-sustaining expectations that women will not perform in higher ranked jobs. The policy change, by raising awareness across the organization of this bad equilibrium outcome, shifted the outcome to an equilibrium whereby promotion rates across men and women were equalized.

5.2 Getting promoted: information on recruitment campaigns (2012-2017)

To be promoted, candidates have to go through a recruitment process and for that they need to apply first. There could be a gender bias in the probability of applying and/or the probability of winning the campaign once being a candidate, despite the absence of a gender gap in promotions after 2011. The analysis in this section therefore explores in more depth the selection process by using detailed data on promotion campaigns, which is available for the period 2012 to 2017.

5.2.1 Probability of winning a promotion campaign

For each recruitment campaign at the *Principal expert* level, we collect information on the pool of potential candidates among employees at the *Expert* level and compute the probability of getting a promotion to the *Principal expert* level.[5] We exclude external applications because we miss information on key individual traits for these candidates.[6]

We assume a linear model for the probability that a given worker is promoted after winning a particular campaign c:

$$W_{ic} = \alpha^W + \beta^W Female_i + V'_{ic}\gamma^W + \delta_c^W + \epsilon_{ic}^W \tag{3}$$

where the dummy $Female$ is equal to one for women, V_{ic} is a vector of individual characteristics (such as personal and family characteristics, worker performance measures, and other worker characteristics), and δ_c^W are campaign fixed effects, and ϵ_{ic}^W is a random error term with unrestricted correlation at the individual level. Model (3) is estimated among potential candidates, and β^W is our coefficient of interest.

Table A.6 of the Online appendix reports OLS estimates of the probability of being promoted. All estimations include campaign, department and age dummies. Standard

[5]The dataset only includes a handful of promotions to the *Adviser* level.

[6]In some specifications, we control for the fraction of external applicants in each campaign to account for the degree of external competition for jobs.

errors are clustered at the campaign level. Across specifications, we do not find a negative impact of being female on the probability of winning the campaign. This finding is consistent with the results on promotion probabilities after 2011 in Table 3. In addition, we find for this reduced sample that employees that have recently been top performers or have received bonuses are more likely to be promoted. This likelihood is also larger among those who have joined the ECB's mentoring program. The remaining individual characteristics capturing the presence of children and leave from work do not enter significantly (columns (2) and (3)). Finally, we replace the campaign dummies with variables that capture the composition of the panel–the number of panel members and the share of female panelists–and the share of external candidates. We do not find evidence that any of these variables influences the campaign outcome (column (4)).

The promotion process has stages: the application stage and the decision stage. Formally, the probability of promotion, W, for any employee is the product of the probability of winning the campaign, conditional on having applied, and the probability of applying for the promotion, $\Pr(W) = \Pr(W|A = 1) \times \Pr(A)$.

This has two implications for our empirical analysis. First, the estimation of Model (3) might be biased if the selection of candidates into the candidates pool is not accounted for. Second, even if there is no overall promotion gap, there could still be a gap in the underlying probabilities $Pr(A)$ and $Pr(W|A = 1)$.

To address these issues, we first estimate the probability of applying for a promotion $\Pr(A)$, thus exploring a potential gender applications gap. Then, we estimate the probability of promotion $Pr(W)$ by using the Heckman (1979) selection model approach.

5.2.2 Probability of applying

We consider a linear model for the probability that the potential candidate i applies for a promotion in campaign c:

$$A_{ic} = \alpha^A + \beta^A Female_i + Y'_{ic}\gamma^A + \delta^A_c + \epsilon^A_{ic} \tag{4}$$

where, as before, the dummy *Female* is equal to one for women, the vector Y_{ic} of individual characteristics includes personal and family characteristics, worker performance measures, and other worker characteristics, δ_c^A are campaign fixed effects, and ϵ_{ic}^A is a random error term with unrestricted correlation at the individual level. Model (4) is estimated among the same set of potential candidates as Model (3), and β^A is our coefficient of interest.

Table 4 presents the main results. All the specifications include campaign fixed effects and we consider personal and family characteristics, job features, and worker performance measures. We find that women are less likely to apply than men to an open vacancy. We refer to this difference as the gender applications gap.

The raw gender applications gap is around 1% and statistically significant. This gap remains broadly unchanged after controlling for individual and family characteristics, varying from 1.6% to 1.8% depending on the regression specification. The magnitude of the gender applications gap is substantially large, given that the average application rate in our sample of potential candidates is 3.4%.

Experience on the job (measured by tenure within band) and having received positive performance evaluations in the last two years (in the form of being recognized as a top performer in the annual appraisals, and/or having obtained a bonus) significantly increases the likelihood of applying for a promotion. We also obtain a positive correlation between the likelihood of applying for a promotion and having joined the ECB mentorship program. Moreover, having children and taking unpaid parental leave are negatively associated with applying for promotion, suggesting that work-life balance considerations partly drive the decision to seek a promotion. Being the head of a household is positively associated with applying for promotion.

5.2.3 Probability of winning a campaign accounting for the probability of applying

Next, we model the probability of winning a selection campaign while accounting for the fact that only people who applied for a vacancy have a positive probability of winning

the campaign. The latent probability of winning a campaign, W^*:

$$W_{ic}^* = \alpha^{W^*} + \beta^{W^*} Female_i + V_{ic}'\gamma^{W^*} + \delta_c^{W^*} + \epsilon_{ic}^{W^*} \tag{5}$$

is only observed (that is $W_{ic} = W_{ic}^*$) if the probability of applying is different from zero:

$$A_{ic} = \alpha^A + \beta^A Female_i + Y_{ic}'\gamma^A + \delta_c^A + \epsilon_{ic}^A > 0 \tag{6}$$

Variables and parameters definitions are as in models (3) and (4) above. Model assumptions for the error terms in equations (5) and (6) are that:

$$\begin{aligned} \epsilon_{ic}^{W^*} &\sim N(0, \sigma) \\ \epsilon_{ic}^{A} &\sim N(0, 1) \\ corr(\epsilon_{ic}^{W^*}, \epsilon_{ic}^{A}) &= \rho \end{aligned}$$

Equation (5) is known as the outcome equation and equation (6) as the selection equation.

Identification requires some exclusion restriction, namely some variable that drives the selection into the applicants pool which is not a determinant of the probability of wining the campaign (the outcome equation). In our case, we consider indicators of whether the worker is head of household, has children, and has taken parental leave since entry as valid selection variables. All four variables are expected to influence the decision to apply for promotion but they are not supposed to influence the promotion decisions because the selection panels do not have access to such information (campaign folders do not include information on marital status, children, household income, or leave, and it is illegal for interview panel members to ask applicants for such information during panel interviews).

Table A.7 in the Online appendix shows estimations of the probability of being promoted using the two-step Heckman model. The outcome equation has a linear specification, while the selection equation is a probit. Similarly to what we obtained before

(Table A.6 and the results after 2011 in Table 3), our estimates indicate that from 2012 onwards women are as likely to be promoted as men. The inverse Mills ratio (λ) suggests that selection is positive, though not statistically significant, in our sample.

Our finding of no gender gap in the probability of promotion, $\Pr(W)$, combined with a negative gap in the probability of applying, $\Pr(A)$, suggests that there is a positive gap in the probability of being promoted conditional on having applied $\Pr(W|A=1)$, as $\Pr(W) = \Pr(W|A=1) \times \Pr(A)$. To assess this more formally, we estimate Model (3) for the subsample of applicants, and obtain the results reported in Table A.8 in the Online appendix. Conditional on having applied, women have indeed a higher probability of winning the campaign relative to men. The effect is substantial: following application, the probability of promotion is 7% higher for women than for men. This is a large effect compared to the average probability of promotion among applicants of 8%.

Taken together, we find that after 2011 women are as likely to be promoted as men, women are less likely to apply for promotions, and women are more likely to win the campaign conditional on applying. These results imply that there positive selection bias in the group of women applying for promotions and, since female candidates are positively selected, overall we do not observe a promotion gap.

5.2.4 Determinants of the gender applications gap

In the previous two sections we have uncovered a gender applications gap, whereby average women at the ECB are less likely than average men to apply to an open vacancy. In this section we will test possible explanations for this finding.

Theory offers several explanations of gender differences in career outcomes. Two prominent supply-side explanations are the presence of children (Goldin 2006, Bertrand 2013) and aversion to compete (Niederle and Vesterlund 2007, Buser *et al.* 2014). We will test for differential effects across gender of the probability to pursue a promotion based on measures of the presence of children and of competition from highly-qualified candidates. Specifically, we extend the regression model on the probability of applying for promotion by interacting the *Female* dummy variable with measures capturing the

presence of children and the competitive environment. To capture the presence of children, we include a dummy variable that indicates whether the individual has dependent children.

We consider three indicators of the competitive environment in which potential candidates take the decision to apply, distinguishing between competition from outside and within the organization and between competition from men and women. First, we include a dummy variable for whether the campaign is open to external candidates. Second, we include the ratio of potential candidates in the same organizational division that have a comparatively high salary level, measured as a salary of above 100 steps within the *Expert* level (the maximum salary level within this band is 169 steps). The idea is that individuals that are approaching the top of the salary band are more experienced and therefore expected to perform well during interviews. Third, to capture competition from female candidates we include a dummy variable, *Female competition*, that takes a value of one if the ratio of potential female candidates with a comparatively high salary level in the same organizational division exceeds 30 percent. The candidate in question is excluded from the computation of these competition variables.

The results are presented in Table 5. All the specifications include campaign fixed effects. We do not find a differential effect for women of the presence of children (column (2)). However, the competitive environment does have a differential impact for women on the likelihood of applying for a promotion. Women are less likely to apply to a campaign that is open to external candidates (column (3)) and when they compete with a larger proportion of immediate colleagues with comparatively high salary levels (column (4)). These results support the view that there are gender differences in the preferences for competition, with women shying away from competitive environments, as previously documented by Niederle and Vesterlund (2007) using experimental data. Fear of competition can be interpreted as a fundamental reason why women are underrepresented at the higher ranks of the ECB. However, we also find that women are more encouraged to apply when they expect higher competition from other women (column (5)). These results are consistent with existing evidence that the effect of competition is stronger when women

have to compete against men than against women (e.g., Gneezy *et al.* 2003). Therefore, the results on fear of competition are likely driven by the composition of the perceived applicant pool, which predominantly consists of men.

5.2.5 Wage progression following promotion

We have shown that, conditional on applying, women have a higher probability to win a campaign. Is this due to positive discrimination or positive selection?

To distinguish between these alternative explanations, we analyze the wage progression of candidates after they get promoted. Specifically, we estimate a linear regression model of log salary steps and include interaction terms between the female and the job band dummy variables. A positive coefficient on these interaction terms indicates that women have a more rapid wage progression upon promotion. For these regressions we turn again to our main dataset covering the period 2003-2017. The results are presented in Table 6.

The results in column (1) are for the entire sample period. We find that following promotion women perform better than men in terms of salary progression, consistent with positive selection.

The critic could argue that the policy change may favor women, both in terms of promotions and salaries, as a remedy for the existing gender wage gap, and thus that their compensation does not reflect performance. If this were true, then we should see that the salary progression of women is stronger after the policy change in 2010. However, when we split the sample in the period before and after the policy change in 2010 we find that the effect, if anything, was stronger before than after 2011 (columns (2) and (3) of Table 6).

These results suggest that women who are promoted experience faster salary progression, consistent with the notion that female candidates are positively selected.

6 Conclusions

We have studied gender differences in career progress and promotions at the ECB using personnel data from its professional staff over the period 2003 to 2017. Our analysis generates two main findings. First, a wage gap emerges between men and women within a few years of hiring, despite roughly similar entry conditions in terms of salary levels and other observables. This wage gap reflects that women are less likely to be promoted to higher job ranks until the year 2010, when the ECB issued a public commitment to gender diversity and this gap disappears. The 2010 public statement announcing the ECBs commitment to diversity can be interpreted as an equilibrium selection or coordination device. This change did not affect fundamental differences between women and men. The fact that womens promotion outcomes responded to this change suggests that at least for this pool of workers, the multiple equilibria view is more dominant than explanations based on fundamental forces.

Second, using data on selection campaigns for the period after the policy change, we find that that women are less likely to apply for promotions. This gender applications gap can in part be explained by fear of competition associated with the composition of the perceived applicant pool. Women are less likely to apply when they face more external applicants, when they expect to compete with more experienced colleagues, and when they expect to compete primarily with men. Conditional on applying, women are more likely to win the campaign, and following promotion, their wage progression is faster than that of men, consistent with positive selection.

Since we do not have information on applications prior to the policy change, we cannot analyze whether this application gap was larger prior to the policy change. However, the observed reduction in the wage effect upon promotion in the post-2010 period, against the background of a general decline in the promotion gap over the entire sample period, suggests that, if anything, the application gap was larger prior to the policy change.

Taken together, these results suggest that at least for these workers, the multiple equilibria view of the under-representation of women is relevant. The remaining application gap is likely to shrink if the applicant pool were to become more gender balanced.

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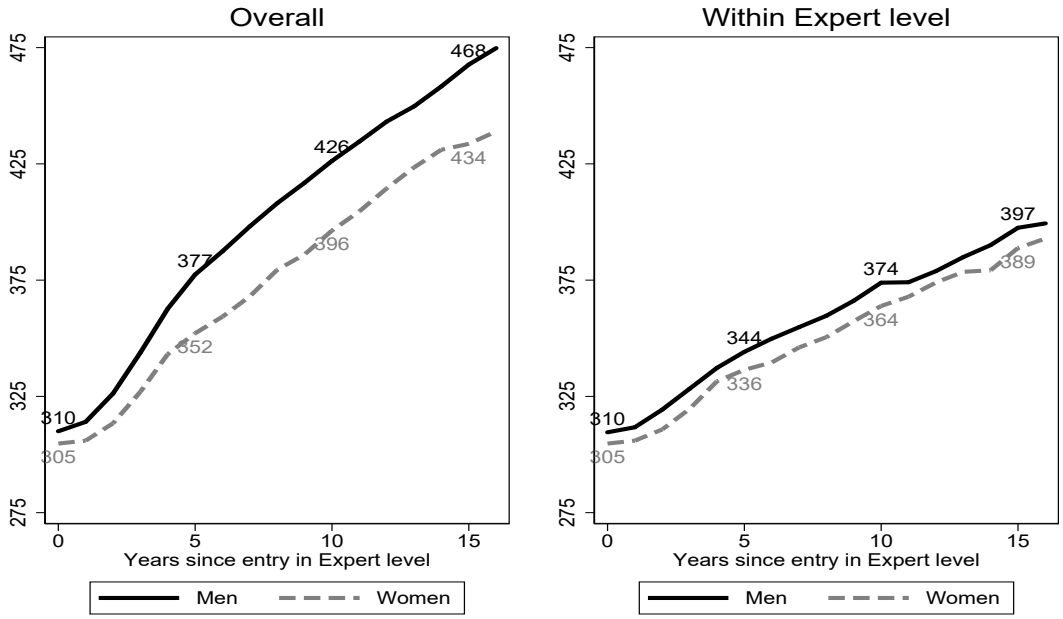
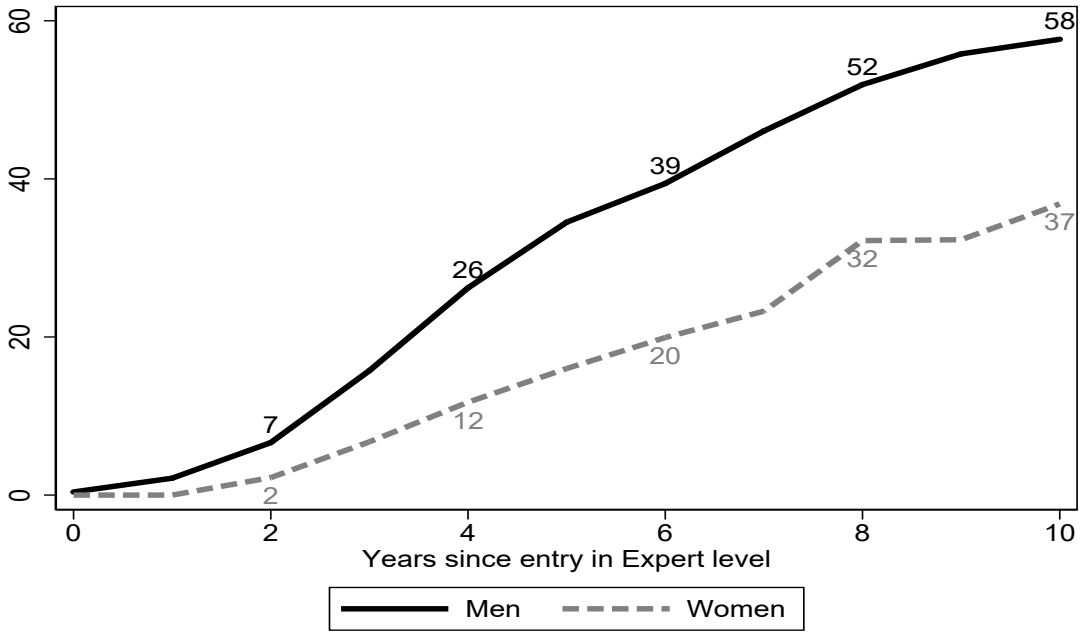
Figures and Tables

Figure 1: Wages since entry at Expert level (2003-2017)



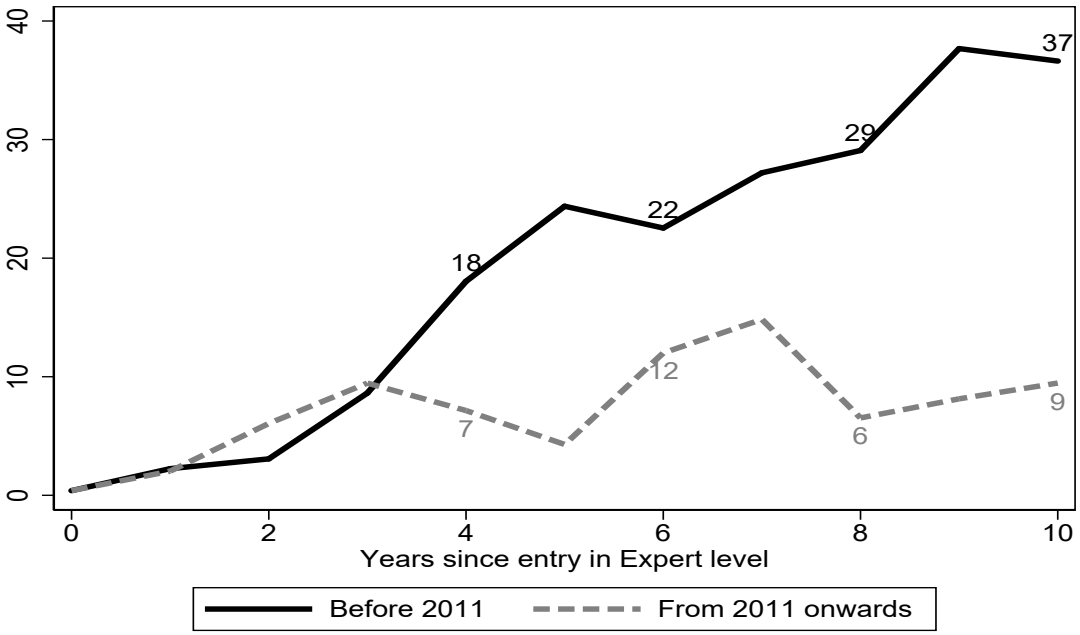
Notes: Left-panel: average step levels by gender since entry at Expert level for all the employees in our sample. Right-panel: average step levels by gender since entry at Expert level for those employees who remain at Expert level.

Figure 2: Probability of promotion at Expert level, % (2003-2017)



Notes: Average annual probability of promotion (moving from Expert level to Principal expert or Adviser levels) by gender since entry at Expert level for all the employees in our sample.

Figure 3: Gender gap in promotion probability before and after 2011, %



Notes: Gender gap on the average annual probability of promotion (moving from Expert level to Principal expert or Adviser levels) since entry at Expert level before 2011 and from 2011 onwards.

Table 1: Descriptive statistics

Dataset 1: Working histories 2003-2017			Total	(1) Male	(2) Female	(1)-(2)
Observations		n, %	85,282	68.84%	31.16%	
Workers		n, %	1,082	68.48%	31.52%	
Obs. Expert level (band F/G)		n, %	58,354	64.38%	35.62%	
Obs. Principal expert level (band H)		n, %	17,641	76.00%	24.00%	
Obs. Adviser level (band I)		n, %	9,287	83.21%	16.79%	
Age		mean	39.66	40.01	38.90	1.11***
Salary steps		mean	374.17	381.94	357.02	24.92***
Tenure within band		mean	61.54	60.96	62.82	-1.86***
Children (yes=1)		mean	0.55	0.55	0.55	0.00
2003-2017:	Promotion	%	0.43%	0.47%	0.34%	0.13%**
	Top performer (yes=1)	mean	0.54	0.51	0.58	-0.07***
	Bonus (yes=1)	mean	0.27	0.27	0.28	-0.01***
	Mentee (yes=1)	mean	0.03	0.01	0.06	-0.04***
	Paid maternity leave	%	0.56	0.00	1.57	-1.57***
	Unpaid parental leave	%	1.35	0.60	2.70	-2.10***
Bef. 2011:	Promotion	%	0.40%	0.49%	0.22%	0.27%***
	Top performer (yes=1)	mean	0.57	0.56	0.60	-0.04***
	Bonus (yes=1)	mean	0.11	0.11	0.10	0.01**
	Mentee (yes=1)	mean	-	-	-	-
	Paid maternity leave	%	0.27	0.00	0.77	-0.77***
	Unpaid parental leave	%	0.63	0.28	1.27	-0.99***
From 2011:	Promotion	%	0.45%	0.45%	0.44%	0.01%
	Top performer (yes=1)	mean	0.51	0.47	0.57	-0.10***
	Bonus (yes=1)	mean	0.41	0.40	0.42	-0.02***
	Mentee (yes=1)	mean	0.05	0.02	0.10	-0.08***
	Paid maternity leave	%	0.81	0.00	2.23	-2.23***

	Unpaid parental leave	%	1.97	0.88	3.89	-3.00***
Dataset 2: Promotion campaigns 2012-2017			Total	(1) Male	(2) Female	(1)-(2)
Obs. Potential candidates		n, %	23,209	64.26%	35.74%	
Obs. Applicants		n, %	794	71.79%	28.21%	
Obs. Winners		n, %	62	53.23%	46.77%	
Prob. of winning (potential candidates)		mean	0.27%	0.22%	0.35%	-0.13%*
Prob. of applying (potential candidates)		mean	3.42%	3.82%	2.70%	1.12%***
Prob. of winning (applicants)		mean	7.80%	5.78%	12.95%	-7.17***
Applicants:	Tenure within band	mean	89.72	85.91	99.42	-13.51***
	Top performer (yes=1)	mean	0.63	0.60	0.71	-0.11***
	Bonus (yes=1)	mean	0.51	0.49	0.55	-0.05
	Mentee (yes=1)	mean	0.11	0.05	0.26	-0.21***
	Head of household (yes=1)	mean	0.38	0.42	0.27	0.15***
	Children (yes=1)	mean	0.49	0.44	0.61	-0.17***
	External campaign (yes=1)	mean	0.18	0.20	0.13	0.06**
	Competition Index	mean	0.24	0.25	0.22	0.03***
	Female Competition (yes=1)	mean	0.03	0.01	0.06	-0.04***
Potential	Tenure within band	mean	75.46	72.35	81.04	-8.68***
candidates:	Top performer (yes=1)	mean	0.50	0.45	0.57	-0.12***
	Bonus (yes=1)	mean	0.39	0.37	0.42	-0.04***
	Mentee (yes=1)	mean	0.06	0.03	0.12	-0.09***
	Head of household (yes=1)	mean	0.32	0.38	0.21	0.18***
	Children (yes=1)	mean	0.48	0.45	0.53	-0.08***
	External campaign (yes=1)	mean	0.17	0.17	0.16	0.01
	Competition Index	mean	0.24	0.24	0.24	0.00
	Female Competition (yes=1)	mean	0.03	0.02	0.03	-0.01***

Notes: * p<0.1, ** p<0.05, *** p<0.01. See subsection 3.1 for variable definitions.

Table 2: Linear regression of logwages

			Within Expert level
	(1)	(2)	(3)
Female	-0.0361***	-0.0108**	-0.0152**
	(0.010)	(0.005)	(0.006)
Tenure within band	-0.0002***	0.0010***	0.0011***
	(0.000)	(0.000)	(0.000)
Principal expert (band H)		0.2660***	
		(0.006)	
Adviser (band I)		0.3532***	
		(0.008)	
Observations	85282	85282	58354
R^2	0.5102	0.8658	0.6426

Notes: Linear regression, monthly data 2003-2017. Robust standard errors in parentheses, clustered by individual. Department, age and time dummies included. * p<0.1, ** p<0.05, *** p<0.01. Sample includes salary band F/G: Experts, H: Principal experts, and I: Advisers. Dependent variable: log of wages (measured as salary steps). See subsection 3.1 for variable definitions.

Table 3: Probability of promotion from Expert level

	(1)	(2)	(3)	(4) Bef. 2011	(5) From 2011
Female	-0.00149***	-0.00188***	-0.00191***	-0.00250***	-0.00135
	(0.00053)	(0.00052)	(0.00053)	(0.00073)	(0.00083)
Tenure within band	0.00004***	0.00003***	0.00003***	0.00004***	0.00003***
	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Children	0.00180***	0.00162***	0.00174***	0.00201**	0.00184**
	(0.00060)	(0.00059)	(0.00063)	(0.00088)	(0.00093)
Top performer		0.00406***	0.00402***	0.00446***	0.00363***
		(0.00054)	(0.00054)	(0.00071)	(0.00078)
Bonus		0.00312***	0.00316***	0.00112	0.00376***
		(0.00079)	(0.00079)	(0.00176)	(0.00088)
Mentee		0.00368	0.00366		0.00354
		(0.00269)	(0.00268)		(0.00270)
Paid maternity leave			0.00018	0.00004	0.00017
			(0.00021)	(0.00037)	(0.00027)
Unpaid parental leave			-0.00013*	-0.00023*	-0.00013
			(0.00007)	(0.00012)	(0.00009)
Observations	59163	59163	59163	27396	31767
R^2	0.003	0.004	0.005	0.005	0.005

Notes: Linear regression, monthly data 2003-2017. Robust standard errors in parentheses, clustered by individual. Department, time and age dummies included. * p<0.1, ** p<0.05, *** p<0.01. Dependent variable: Promotion (dummy), takes value 1 if employee moves to a higher salary band. See subsection 3.1 for variable definitions.

Table 4: Probability of applying: Campaigns data

	(1)	(2)	(3)	(4)
Female	-0.0175***	-0.0169***	-0.0170***	-0.0159***
	(0.0028)	(0.0030)	(0.0028)	(0.0028)
Tenure within band	0.0001***	0.0001***	0.0001***	0.0001***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Top performer	0.0116***	0.0113***	0.0116***	0.0115***
	(0.0028)	(0.0028)	(0.0028)	(0.0028)
Bonus	0.0085***	0.0085***	0.0086***	0.0083***
	(0.0031)	(0.0031)	(0.0031)	(0.0030)
Mentee	0.0274***	0.0272***	0.0273***	0.0270***
	(0.0077)	(0.0077)	(0.0077)	(0.0077)
Paid maternity leave		0.0004		
		(0.0007)		
Unpaid parental leave		-0.0006**		
		(0.0002)		
Children			-0.0053*	-0.0070**
			(0.0028)	(0.0029)
Head of household				0.0052*
				(0.0030)
Observations	23209	23208	23209	23209
R^2	0.022	0.022	0.022	0.023

Notes: Linear regression, campaigns data 2012-2017. The sample includes potential candidates to recruitment campaigns. Robust standard errors in parentheses, clustered

by campaign. Campaign, department and age dummies included. * p<0.1, ** p<0.05, *** p<0.01. Dependent variable: dummy variable that takes value 1 if the employee applies for a promotion (thus participates in a recruitment campaign). See subsection 3.1 for variable definitions.

Table 5: Probability of applying: Differential effects

	(1)	(2)	(3)	(4)	(5)	(6)
Female	-0.0175***	-0.0199***	-0.0154***	-0.0121***	-0.0184***	-0.0088**
	(0.0028)	(0.0036)	(0.0031)	(0.0035)	(0.0027)	(0.0036)
Tenure within band	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Top performer	0.0116***	0.0115***	0.0116***	0.0117***	0.0114***	0.0115***
	(0.0028)	(0.0028)	(0.0028)	(0.0029)	(0.0028)	(0.0029)
Bonus	0.0085***	0.0087***	0.0085***	0.0080**	0.0084***	0.0077**
	(0.0031)	(0.0031)	(0.0031)	(0.0030)	(0.0031)	(0.0031)
Mentee	0.0274***	0.0270***	0.0273***	0.0279***	0.0278***	0.0285***
	(0.0077)	(0.0078)	(0.0077)	(0.0074)	(0.0077)	(0.0074)
Children		-0.0073**				
		(0.0033)				
Female x		0.0059				
Children		(0.0043)				
Female x			-0.0123*			-0.0125**
External campaign			(0.0064)			(0.0058)
Competition				-0.0067		-0.0036
Index				(0.0182)		(0.0185)
Female x				-0.0286**		-0.0393***
Competition Index				(0.0131)		(0.0130)
Female competition					-0.0171*	-0.0170*

					(0.0091)	(0.0092)
Female x					0.0315*	0.0416**
Female competition					(0.0178)	(0.0183)
Observations	23209	23209	23209	22955	23209	22955
R^2	0.022	0.023	0.022	0.023	0.023	0.023

Notes: Linear regression, campaigns data 2012-2017. The sample includes potential candidates to recruitment campaigns. Robust standard errors in parentheses, clustered by campaign. Campaign, department and age dummies included. * p<0.1, ** p<0.05, *** p<0.01. Dependent variable: dummy variable that takes value 1 if the employee applies for a promotion (thus participates in a recruitment campaign). See subsection 3.1 for variable definitions.

Table 6: Wage gap following promotion

	(1)	(2) Bef. 2011	(3) From 2011
Female	-0.0171***	-0.0161*	-0.0160**
	(0.0066)	(0.0083)	(0.0065)
Tenure within band	0.0010***	0.0015***	0.0009***
	(0.0001)	(0.0001)	(0.0001)
Principal expert (band H)	0.2589***	0.2548***	0.2685***
	(0.0062)	(0.0078)	(0.0069)
Adviser (band I)	0.3498***	0.3577***	0.3520***
	(0.0086)	(0.0118)	(0.0085)
Female x Principal expert (band H)	0.0281***	0.0303***	0.0185*
	(0.0090)	(0.0109)	(0.0096)
Female x Adviser (band I)	0.0174	0.0052	0.0146
	(0.0128)	(0.0144)	(0.0131)
Observations	85282	37014	48268
R^2	0.867	0.820	0.899

Notes: Linear regression, monthly data 2003-2017. Robust standard errors in parentheses, clustered by individual. Department, age and time dummies included. * p<0.1, ** p<0.05, *** p<0.01.Sample includes salary band F/G: Experts, H: Principal experts, and I: Advisers. Dependent variable: log of wages (measured as salary steps). See subsection 3.1 for variable definitions.

Online Appendix to Hospido, L., L. Laeven, and A. Lamo, "The Gender Promotion Gap: Evidence from Central Banking," ***Review of Economics and Statistics***

A Additional Figures and Tables

Figure A.1: Share of female employees over time (2003-2017)

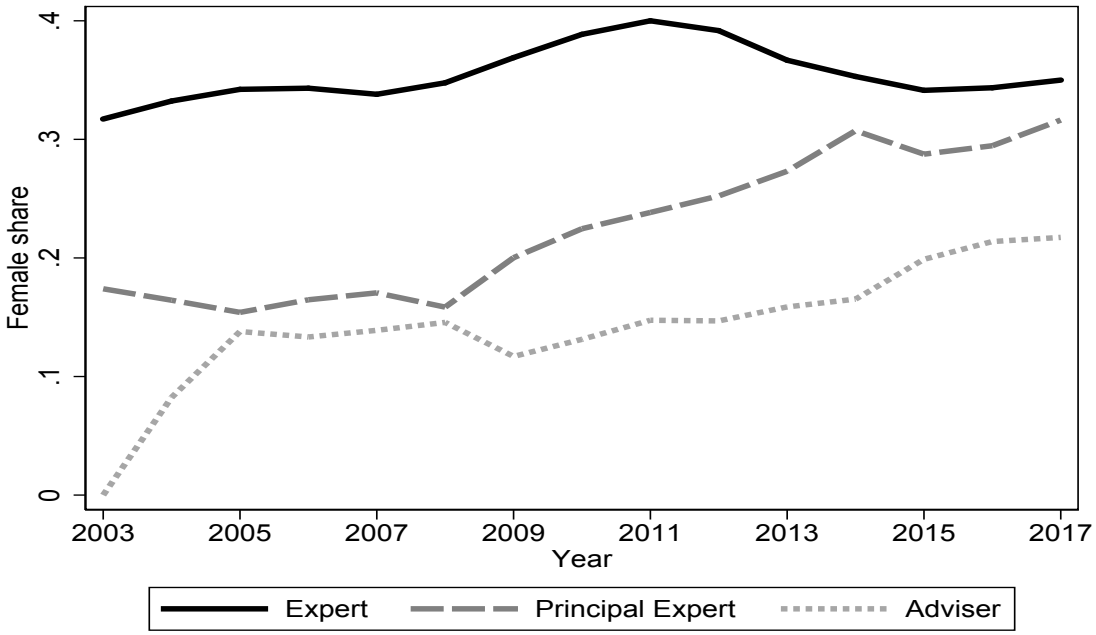


Table A.1: ECB salary structure in steps

A	B	C	D	E	E/F	**F/G**	**G**	**H**	**I**
1	33	75	132	194	194	**263**	**333**	**419**	**454**
2	34	76	133	195	195	**264**	**334**	**420**	**455**
3	35	77	134	196	196	**265**	**335**	**421**	**456**
4	36	78	135	197	197	**266**	**336**	**422**	**457**
55	87	129	186	248	248	**317**	**387**	**473**	**508**
	88	130	187	249	249	**318**	**388**	**474**	**509**
	105	147	204	266	266	**335**	**405**	**491**	**526**
		148	205	267	267	**336**	**406**	**492**	**527**
		163	220	282	282	**351**	**421**	**507**	**542**
			221	283	283	**352**	**422**	**508**	**543**
				284	284	**353**	**423**	**509**	**544**
				285	285	**354**	**424**		
				291	291	**360**	**430**		
				292	292	**361**	**431**		
					294	**363**			
					360	**429**			
						430			
						431			

Notes: Equal steps denote equal salaries across bands. Each step is 0.25% higher than the previous one. Figures in bold denote those included in the analysis.

Table A.2: Descriptive statistics at entry

		Total	(1) Male	(2) Female	(1)-(2)
2003-2017					
Workers	n, %	576	69.79%	30.21%	
Age	mean	33.32	33.62	32.64	0.96*
Salary steps	mean	308.85	309.99	306.22	3.77
Children (yes=1)	mean	0.22	0.25	0.14	0.11***
Entry before 2011					
Workers	n, %	262	66.03%	33.97%	
Age	mean	32.25	32.51	31.74	0.77
Salary steps	mean	317.40	320.01	312.34	7.67*
Children (yes=1)	mean	0.16	0.20	0.08	0.12**
Entry from 2011					
Workers	n, %	314	72.93%	27.07%	
Age	mean	34.22	34.45	33.59	0.86
Salary steps	mean	301.71	302.41	299.81	2.60
Children (yes=1)	mean	0.27	0.29	0.21	0.08

Notes: * p<0.1, ** p<0.05, *** p<0.01. Entry defined as the first month at the ECB.

Table A.3: Linear regression of logwages. Children

A) Experts, Principal experts, and Advisers	(1) OLS	(2) FE	(3) OLS	(4) FE
Female	-0.0111**		-0.0099*	
	(0.0051)		(0.0052)	
Tenure within band	0.0010***	0.0009***	0.0010***	0.0009***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Principal expert (band H)	0.2633***	0.2418***	0.2632***	0.2419***
	(0.0059)	(0.0101)	(0.0059)	(0.0101)
Adviser (band I)	0.3501***	0.3286***	0.3504***	0.3288***
	(0.0079)	(0.0139)	(0.0079)	(0.0138)
Children	0.0113**	0.0108**	0.0089*	0.0109**
	(0.0047)	(0.0044)	(0.0053)	(0.0047)
Female x Children		-0.0059		-0.0083
		(0.0072)		(0.0072)
Head of household			0.0035	-0.0014
			(0.0073)	(0.0041)
Head of household x Children			0.0029	0.0007
			(0.0082)	(0.0047)
Head of household x Female				-0.0027
				(0.0103)
Head of household x Female x Children				0.0098
				(0.0122)
Observations	85282	85282	85282	85282

R^2	0.867	0.871	0.867	0.871
B) Within Expert level (band F/G)	(1) OLS	(2) FE	(3) OLS	(4) FE
Female	-0.0159**		-0.0150**	
	(0.0064)		(0.0065)	
Tenure within band	0.0011***	0.0012***	0.0011***	0.0012***
	(0.0001)	(0.0004)	(0.0001)	(0.0004)
Children	0.0152***	0.0128***	0.0123*	0.0125***
	(0.0058)	(0.0040)	(0.0066)	(0.0043)
Female x Children		-0.0095		-0.0106
		(0.0060)		(0.0065)
Head of household			-0.0003	-0.0015
			(0.0078)	(0.0032)
Head of household x Children			0.0064	0.0011
			(0.0095)	(0.0038)
Head of household x Female				0.0023
				(0.0066)
Head of household x Female x Children				0.0034
				(0.0082)
Observations	58354	58354	58354	58354
R^2	0.646	0.781	0.646	0.781

Notes: Linear regression, monthly data 2003-2017. Robust standard errors in parentheses, clustered by individual. Department, age and time dummies included. Even columns also include individual fixed effects. * p<0.1, ** p<0.05, *** p<0.01. Dependent variable: log of wages (measured as salary steps). See subsection 3.1 for variable definitions.

Table A.4: Gender gap in promotion probability over time: Three-year rolling estimates

Period	Coeff. Female	Obs.
2003-05	-0.0047***	9,165
2004-06	-0.0036***	9,779
2006-08	-0.0020**	10,529
2007-09	-0.0022**	10,910
2008-10	-0.0018*	11,376
2009-11	-0.0007	11,686
2010-12	-0.0011	12,085
2011-13	-0.0007	12,662
2012-14	-0.0016	13,427
2013-15	-0.0014	14,100
2014-16	-0.0019	14,375
2015-17	-0.0019	14,356

Notes: estimated coefficients of the dummy Female for same specification as Table 3, column (2), for three-year rolling samples. * p<0.1, ** p<0.05, *** p<0.01.

Table A.5: Probability of promotion: Differential effects

	(1)	(2) Bef. 2011	(3) From 2011
Tenure within band	0.00009***	0.00012***	0.00008**
	(0.00001)	(0.00003)	(0.00004)
Female x Tenure	-0.00000	-0.00005	0.00002
	(0.00002)	(0.00004)	(0.00004)
Top performer	0.00418***	0.00418***	0.00204
	(0.00096)	(0.00135)	(0.00155)
Female x Top performer	-0.00193	-0.00236	0.00028
	(0.00147)	(0.00212)	(0.00241)
Bonus	0.00439***	0.00488	0.00258*
	(0.00128)	(0.00306)	(0.00157)
Female x Bonus	-0.00081	-0.00736**	-0.00057
	(0.00185)	(0.00359)	(0.00250)
Mentee	-0.00120		0.00087
	(0.00414)		(0.00482)
Female x Mentee	0.00771		0.00392
	(0.00595)		(0.00699)
Children	0.00399*	0.00397	0.00245
	(0.00211)	(0.00327)	(0.00353)
Female x Children	-0.00749**	-0.00682*	-0.00628
	(0.00298)	(0.00388)	(0.00590)
Paid maternity leave	0.00057	0.00070	0.00023

	(0.00044)	(0.00058)	(0.00089)
Unpaid parental leave	-0.00020	-0.00016	0.00007
	(0.00021)	(0.00030)	(0.00053)
Female x Unpaid parental leave	0.00005	-0.00021	-0.00035
	(0.00027)	(0.00043)	(0.00062)
Observations	59163	27396	31767
R^2	0.007	0.008	0.007

Notes: Linear regression, monthly data 2003-2017. Robust standard errors in parentheses, clustered by individual. Individual fixed effects, and department, time, and age dummies included. * p<0.1, ** p<0.05, *** p<0.01. Dependent variable: Promotion (dummy), takes value 1 if employee moves to a higher salary band. See subsection 3.1 for variable definitions.

Table A.6: Probability of promotion: Campaigns data

	(1)	(2)	(3)	(4)
Female	0.00042	0.00046	0.00052	0.00041
	(0.00071)	(0.00080)	(0.00073)	(0.00071)
Tenure within band	0.00001	0.00001	0.00001	0.00001
	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Top performer	0.00191***	0.00193***	0.00189***	0.00194***
	(0.00067)	(0.00068)	(0.00067)	(0.00067)
Bonus	0.00226***	0.00225***	0.00222***	0.00225***
	(0.00075)	(0.00075)	(0.00076)	(0.00074)
Mentee	0.00572**	0.00573**	0.00569**	0.00567**
	(0.00254)	(0.00253)	(0.00254)	(0.00253)
Paid maternity leave		-0.00008		
		(0.00025)		
Unpaid parental leave		0.00005		
		(0.00010)		
Children			0.00029	
			(0.00082)	
Head of household			0.00066	
			(0.00082)	
Share of external candidates				-0.01080
				(0.00794)
Size of selection panel				-0.00023

				(0.00153)
Share of female panelists				-0.00007
				(0.00231)
Observations	23209	23208	23209	23209
R^2	0.003	0.003	0.003	0.003

Notes: Linear regression, campaigns data 2012-2017. The sample includes potential candidates to recruitment campaigns. Robust standard errors in parentheses, clustered by campaign. Department and age dummies included. Campaign dummies also included except in (4). * p<0.1, ** p<0.05, *** p<0.01. Dependent variable: dummy variable that takes value 1 if the employee is offered the promotion after a recruitment campaign. See subsection 3.1 for variable definitions.

Table A.7: Probability of promotion. Heckman selection model

	(1)	(2)	(3)
Received the offer:			
Female	-0.0214	-0.0077	0.0481
	(0.0832)	(0.0960)	(0.0657)
Tenure within band	0.0008	0.0007	0.0003
	(0.0007)	(0.0007)	(0.0005)
Top performer	0.1023*	0.0929	0.0564
	(0.0569)	(0.0648)	(0.0447)
Bonus	0.0856**	0.0789*	0.0543*
	(0.0411)	(0.0461)	(0.0329)
Mentee	0.1471	0.1275	0.0662
	(0.0982)	(0.1088)	(0.0762)
Applying for promotion:			
Female	-0.2670***	-0.2537***	-0.2377***
	(0.0444)	(0.0383)	(0.0394)
Tenure within band	0.0020***	0.0019***	0.0019***
	(0.0004)	(0.0004)	(0.0004)
Top performer	0.1692***	0.1721***	0.1714***
	(0.0362)	(0.0361)	(0.0361)
Bonus	0.1162***	0.1149***	0.1106***
	(0.0358)	(0.0357)	(0.0358)
Mentee	0.2921***	0.2904***	0.2864***

	(0.0616)	(0.0616)	(0.0616)
Paid maternity leave	0.0122		
	(0.0091)		
Unpaid parental leave	-0.0095**		
	(0.0044)		
Children		-0.0603*	-0.0826**
		(0.0347)	(0.0370)
Head of household			0.0662*
			(0.0381)
λ	0.3950	0.3147	0.0667
	(0.3616)	(0.4123)	(0.2753)
Observations	23208	23209	23209

Notes: Linear regression (Probability of promotion) and Probit regression (Applying for promotion), campaigns data 2012-2017. The sample includes potential candidates to recruitment campaigns. Standard errors in parentheses. Campaign, department and age dummies included. * p<0.1, ** p<0.05, *** p<0.01. Dependent variable (Received the offer): dummy that takes value 1 if the employee is offered the promotion. Dependent variable (Applying): dummy that takes value 1 if the employee applies for a promotion. See subsection 3.1 for variable definitions.

Table A.8: Probability of promotion conditional on having applied for promotion: Campaigns data

	(1)	(2)	(3)
Female	0.0805**	0.0630**	0.0606*
	(0.0310)	(0.0314)	(0.0322)
Tenure within band	0.0002	0.0001	0.0001
	(0.0002)	(0.0002)	(0.0002)
Top performer		0.0468**	0.0461**
		(0.0177)	(0.0177)
Bonus		0.0479**	0.0480**
		(0.0222)	(0.0222)
Mentee		0.0495	0.0494
		(0.0420)	(0.0421)
Children			0.0182
			(0.0219)
Observations	794	794	794
R^2	0.087	0.106	0.107

Notes: Linear regression, campaigns data 2012-2017. The sample includes actual candidates who applied to recruitment campaigns. Robust standard errors in parentheses, clustered by campaign. Campaign, department and age dummies included. * p<0.1, ** p<0.05, *** p<0.01. Dependent variable: dummy that takes value 1 if the candidate is offered the promotion. See subsection 3.1 for variable definitions.