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Abstract

Using anonymised personnel records from the Banco de España, we examine gender differences in career progression. This institution features a complex professional development system, in which competitive calls, direct appointments and vertical promotions coexist. We document that the presence of women has increased markedly since the late 1990s, although not always in a monotonic manner. Comparing male and female potential candidates for the same process, we find no significant gender gaps in the probability of promotion in competitive calls, nor in direct appointments or in vertical promotions. Among managers, however, our findings suggest differences between different types of promotion processes. In promotions to/between department director and division head positions, we do find a significantly lower probability of promotion for women relative to men through competitive calls. We also find that women are less likely to apply for managerial positions in competitive calls than men. Finally, in the business areas where most economists work, we find that women are less likely than men to be promoted to/between department director and division head positions in competitive calls, but have a higher probability of achieving vertical promotions to positions immediately below these levels in the hierarchy, such as unit heads. For this group of business areas, gender differences in the probability of application are not significant.

Keywords: gender gaps, working histories, central banking.

JEL classification: J16, J31, J41, J63.

Resumen

Utilizando los registros anonimizados del personal del Banco de España, analizamos las diferencias de género en la progresión profesional. Esta institución cuenta con un complejo sistema de desarrollo profesional, en el que conviven convocatorias abiertas, nombramientos directos y ascensos verticales. Los datos muestran que la presencia de mujeres ha aumentado notablemente desde finales de la década de 1990, aunque no de forma continua. Cuando comparamos los candidatos potenciales masculinos y femeninos para un mismo proceso, no encontramos brechas de género significativas en la probabilidad de promoción ni en convocatorias abiertas, ni en nombramientos directos ni en ascensos verticales. En promociones de puestos directivos, sin embargo, nuestros resultados sugieren diferencias entre los distintos tipos de procesos de promoción. En las promociones para directores de departamento y jefes de división estimamos una menor probabilidad de ascenso para las mujeres en relación con los hombres en las convocatorias abiertas. También es significativamente menor la probabilidad de postularse para las mujeres que para los hombres en las convocatorias abiertas para los puestos de dirección. Por último, y restringiendo el análisis a las áreas en las que trabajan la mayoría de los economistas, los resultados muestran una menor probabilidad de promoción para las mujeres en relación con los hombres en las convocatorias abiertas para los puestos de directores de departamento y jefes de división, pero una mayor probabilidad de obtener ascensos verticales en las posiciones inmediatamente inferiores en la jerarquía, como jefes de unidad. Además, en estas áreas de negocio, las diferencias de género en la probabilidad de postularse no son significativas.

Palabras clave: brechas de género, desarrollo profesional, banca central.

Códigos JEL: J16, J31, J41, J63.

1 Introduction

The economics profession includes disproportionately few women, relative to the general population and other disciplines (Bayer and Rouse (2016)). This under-representation starts at the undergraduate level and increases moving up the academic career ladder. In 2022, the share of women in the US undergraduate population was 55%, being 37% among economics majors. Similarly, women account for 34.3% of new PhDs, 33.2% of assistant professors, 26.5% of associate professors and 17.8% of full professors (CSWEP (2023)). In Europe, the corresponding female shares are higher, but the attrition rate along the career is similar (Auriol et al. (2019)).

Evidence of a leaky pipeline for women in economics is not a new phenomenon. Several studies in the early 2000s documented that women were significantly less likely to be promoted to tenured positions than men (Ginther and Kahn (2004), McDowell et al. (2001)). Even so, economics became less male-dominated over time. In the last decade, however, this growth has stalled (Lundberg and Stearns (2019)), raising concerns about the reasons behind the lack of women in high-level positions in the economics profession.

Central Banks also suffer from this female scarcity among their staff, in particular in managerial positions (OMFIF (2024)). Even though, several of them have shown an strong commitment to increasing gender diversity. In late-2010 the European Central Bank (ECB) made a public statement supporting diversity: "we believe diversity creates excellence: more diverse teams mean a wider range of opinions, leading to better and more robust results [...] We're moving towards being a more diverse institution, which also means an institution that's more flexible in its thinking and more effective in its decision-making". Indeed, it is not only a matter of fairness or a moral issue why gender balance, and more broadly diversity, should be a concern among economists and institutions employing economists. It is also an efficiency argument. As stated by Janet Yellen in her remarks at the Federal Reserve hosted a National Summit on Diversity in the Economics Profession in October 2014: "[W]hen economics is tested by future challenges, I hope that our profession will be able to say that we have done all we could to attract the best people and the best ideas".

The evidence shows that diversity matters because it shapes group dynamics and decision-making outcomes. For instance, in a business-oriented scenario, Hoogendoorn et al. (2013) show that mixed-gender groups display more intense mutual monitoring and produce better outcomes. Also, male and female economists have different views about several policy issues even after controlling for cohort of PhD and employment, hence the prevailing views may be biased by the relative lack of some groups (May et al. (2014)).

The economics literature offers several explanations of gender differences in career outcomes. Two prominent supply-side explanations are the presence of children (Bertrand (2013), Keloharju et al. (2019)) and aversion to compete (Niederle and Vesterlund (2007), Buser et al. (2014)). In the context of the ECB, in which every promotion requires winning a selection process, Hospido et al. (2022) show that female workers are less likely relative to males to apply for promotions. Competition from other candidates partly explains this application gender gap.[1]

In this paper we further explore gender differences in career outcomes by focusing on the case of the Banco de España (BdE). An interesting institutional feature of the BdE, relative to the ECB, is that the BdE has a mixed system of promotions through competitive calls but also through direct appointments. In the paper we compare career progression of male and female employees under this dual system using anonymized personnel records.

We find that while a substantial part of the average gender wage gap in years 2009-2023 is explained by individual characteristics, the two usual suspects are at work: children and promotions. With respect to promotions, when comparing male and female potential candidates for the same process in years 2013-2022, we did not find significant gender gaps in the probability of promotion either in competitive calls, in direct appointments or in vertical promotions. Among managers, however, our findings uncover some differences by type of promotion process. In the promotions to/within department directors and division heads, there is a lower probability of promotion for women relative to men through competitive calls. We also document a lower probability of applying for women relative to men in competitive calls for managerial positions. When we focus on the business areas where most of the staff are economists, we find that there is a lower probability of promotion for women relative to men in competitive calls in the promotions to/within department directors and division heads but a higher probability of getting vertical promotions in positions immediately below in the hierarchy, such as unit heads. For this group of business areas, gender differences in the probability of application are not significant. Finally, regarding the pooled results for promotions within non-managerial positions, we do not find any significant gender gap in the probability of promotion.

The paper proceeds as follows. Section 2 describes the institutional setting and section 3 the dataset. Sections 4 and 5 present our empirical analysis on wages and promotions, respectively. Finally, section 6 concludes.

[1] The focus of this study was 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. Banking supervision, Corporate Services, Communication and Legal were excluded.

2 Institutional background

The Banco de España is the Spanish national central bank and, within the Single Supervisory Mechanism, the supervisor of the Spanish banking system along with the ECB. According to the Law of Autonomy, the governing bodies of the BdE are the Governor, the Deputy Governor, the Governing Council and the Executive Commission. The structure of the BdE is based on six Directorates General (DG) and a General Secretariat: (i) DG Financial Conduct and Banknotes, (ii) DG Economics, Statistics, and Research, (iii) DG Financial Stability, Regulation, and Resolution, (iv) DG Operations, Markets and Payments Systems, (v) DG Services, (vi) DG Banking Supervision, and (vii) General Secretariat.[2]

In the last years, there has been a continuous catching up in gender shares at the BdE which results in gender parity among the overall staff of the institution. As of December 31, 2023, the total workforce of the Bank of Spain was composed of 3,473 people, including branches and other entities, with 51% of women and 49% of men. The share of women has increased by six percentage points since 2014. As of June 1, 2024, the gender profile of the BdE governing bodies was also relatively high compared to other central banks (Comunale et al. (2023)). In the Governing Council, 5 out of the 9 voting members were women, while among non voting members the proportion was 1 women out of 8 members. In the Executive Commission, 2 of the 4 voting members and 1 of the 7 non voting members were women.

This apparent story of success however must be taken with caution, given the remarkable heterogeneity across professional groups. The different professional groups that comprise the BdE include (moving up in the hierarchy ladder): a) support administrative positions and various activities (25.3%), b) senior experts and experts or technical personnel (63.2%), c) people who occupy middle management positions such unit managers or division heads (10.2%), and d) those at the top management positions such as department managers and similar (1.4% of the staff). The share of women ranges from 59% among support administrative positions, to 50% among senior experts, experts and technicians, 43% among middle managers, and 35% among top managers.

In order to promote staff, the BdE uses several procedures. First, *direct appointments* are used for categories considered to be managerial positions of trust. Second, salary increases are directly assigned to some individuals once per year through *vertical promotions*, both at managerial and non-managerial positions. Finally, *competitive calls* are increasingly used to fill all kinds of positions.

[2]See BdE (2024) for the description of duties and responsibilities of each area.

A *direct appointment* responds to the manager's belief that the chosen person will perform well in a position of responsibility, or comes as a recognition for the work already done as a manager in a lower-ranked position. According to the literature, there are several factors that may trigger decisions on direct appointments and are not that favorable to women, such as networking, visibility, their under-representation in the pipeline to be promoted, and even unconscious biases that women will perform worse than men in high positions (Cullen and Perez-Truglia (2023)). Unconscious biases might also be a reason why women are often held to higher standards than men. As documented in recent work for academics, women needed to produce higher quality work than men for referees to recommend publication (Hengel (2022), Card et al. (2020)) or to be accepted for presentation in conferences (Hospido and Sanz (2021)).

A *vertical promotion* grants the worker a permanent salary increase without implying any change in her job responsibilities. In this case, the recognition from the manager does not mean that the employee assumes greater responsibility what can be seen as compensation for the work done.

Finally, *competitive calls* assess merits, particularly the professional ones, of those candidates that have previously applied to the vacancy. Some of these calls can be open to competition from external candidates. The selection process consists of three stages: job application, exam and/or interview, and offer. The selection committee agrees on a short-listed ranking of candidates among those who pass the exam and get interviewed and offers the position to the highest-ranked candidate. In principle, there could be gender gaps in all stages. In addition to the reasons listed above for the possible existence of gender gaps in the assessment of merits and the selection stage, recent evidence shows a substantial gender gap in applications (Fluchtmann et al. (2022), Hospido et al. (2022)).

3 Data

To conduct the analysis in this paper, we have built a dataset that combines personnel files with information on recruitment and selection processes at the worker level. All data have been anonymized by the departments of Human Resources and Information Systems so that no individual information can be identified by the authors. In particular, we constructed a longitudinal dataset at the individual level that allows us to examine gender differences in work trajectories over time, excluding the top management above department directors.[3] Although the raw data contain information from 1959, computerized records for the first few years are incomplete. In addition, in the late 1980s, the BdE performed a complete change

[3] Those we leave outside, due to confidentiality reasons, are the Governor, the Deputy Governor, the six General Directors, and the General Secretary.

of definition of the hierarchical levels from a system of categories to the current system of professional groups. This change made it very difficult to construct comparable time series for the whole period. We also exclude branches and other entities because job position changes there are difficult to classify as promotions. In practice, the dataset we managed to build contains anonymized comparable employee information at the monthly level, from 1987 to 2023. For this period, the panel dataset contains almost 900 thousand monthly observations for 5,754 workers aged 20-75. Annual salaries are available since 2000, contractual hours of work since 2009, and selection processes since 2013. Given the information available, most of our multivariate analysis concerned the decade from 2013 to 2023.[4] However, for documenting the presence of women at the BdE, we also use some prior information. Descriptive statistics for each subperiod can be found in Table 1.

The presence of women has increased markedly since 1987, although not always in a monotonic manner (see Figure 1). Over the period 1987-2023, women accounted for 42.1% of the observations (see left hand side graph of Figure 2). That share increased from 30.8% in 1987 to 53.0% in 2023. The most intense impulse occurred between 2008 and 2014, which coincides with a larger proportion of women among new entrants (see right hand side graph of Figure 2). The BdE, however, did not implement any specific policies targeted at increasing the presence of women around that period.[5]

Initially, the upwards evolution in the presence of women was slightly faster among managers than for the rest of the groups, but more recently it has slowed down (see Figure 3). In general, the increase in the share of women occurred in every professional group, although with important differences in the levels and the growth rates. The female share among managers increased from 9.8% in 1987 to 43.0% in 2023, for senior experts and specialists from 8.3% in 1987 to 46.8% in 2023, for technicians from 34.0% in 1987 to 55.8% in 2023, for administrative staff from 53.8% in 1987 to 82.2% in 2023, and for support services from 7.9% in 1987 to 14.7% in 2023.

Summing up, the BdE currently employs a similar number of men of women. This apparent story of success, however, masks remarkable differences across professional groups. This points to the importance of studying more in-depth gender differences in remuneration and in the movements across levels of the hierarchy.

[4] The wage analysis in Section 4 refers to the period 2009-2023. For the analysis on promotions in Section 5 we consider the period 2013-2022.

[5] In October 2022, the Banco de España approved its first Equality Plan. The Plan is publicly available (only available in Spanish) here. This plan strengthens the institution's commitment to gender equality and the diversity of the people and teams it is made up of. It contains a total of 23 measures that cover aspects such as such as communication, training, selection, work-life balance, and career progression. Likewise, it includes a protocol against sexual harassment. Given the time window covered by our sample, we can not assess its effectiveness yet.

4 The gender wage gap at the BdE

The average wage gap between males and females is commonly used as a summary measure of gender differences in career progression. Table 1 displays the average log annual wages for all employees, as well as for male and for female employees over the time periods 2000-2023, 2009-2023, and 2013-2023.

The average annual wage for women is 20% lower than that for men. This is known as the raw wage gap. This gap, however, might be driven by differences in characteristics and other sources of heterogeneity among individuals that generate wage differences. To account for those factors, we estimate a linear regression model for log wages w_{it} of worker i at time t:

$$w_{it} = \alpha^w + \beta^w Female_i + X'_{it}\gamma^w + \delta^w_t + \epsilon^w_{it} \quad (1)$$

where the $Female$ dummy is equal to 1 for women, the vector X_{it} includes individual characteristics, such as age, age squared, country of birth, cohort of entry to the BdE, birth cohort, educational level, marital status, a dummy of having children and its interaction with the $Female$ dummy, years of experience since entry to the BdE, experience squared, and dummies for each professional group and area of activity, δ^w_t are time dummies, and ϵ^w_{it} is a random error term with unrestricted correlation at the individual level. Model (1) is estimated by OLS.[6]

Regression results are shown in Table 2. Robust standard errors are clustered at the individual level. Once demographic characteristics such as age, age squared, birth country, birth cohort, entry cohort, education, and time dummies are included, the gender wage gap diminishes from 19.71% (column 1) to 14.59% (column 2), and to 12.43% if we also account for experience, business area, being married and having dependent children (column 4). When we introduce the interaction of having children with the $Female$ dummy (column 5) we see that the gap is significantly bigger for women with dependent children (the *Female* x *Children* coefficient is -11.35% and significant), while it halves to -5.8% for women without dependent children). That is, the gap between mothers and women without children is 11.35%, between mothers and men without children is 17.13%, and between mothers and fathers is 28.14%. Finally, including the professional group substantially diminished the gender gap to 3.53% (column 6). In column 7, the interaction term *Female* x *Children* remains significant and equal to -5.12% while the term *Female* is no longer significant, meaning that when accounting for job position characteristics there is no wage gap for women without dependent children relative to childless men.[7] However,

[6] We do not include individual fixed effects in these regressions because we are interested in estimating the effect of *Female*.

[7] When we consider instead as the dependent variable the log hourly wages (Table 3, column 7), both the coefficient on *Female* and on the interaction *Female* x *Children* are no longer statistically significant.

it is important to bear in mind that, unlike the rest of the characteristics that we assume exogenous, the professional group that an employee holds is not independent of her own professional career.

In sum, the two usual suspects are at work when considering the factors underlying the gender wage gap: children and the position of workers in the job ladder. The margin associated to children seems to be fully accounted by differences in hours, whereas the professional group remains relevant. This points again to the importance of promotions and thus they are our focus in the next section.

5 Gender differences in career progression under a mixed system of promotions

Apart from horizontal movements between the different business areas, professional progression at the BdE consists of either ascending hierarchical levels, or - within the same professional group - improving wage levels by being granted a permanent salary increase without changes of duties (*vertical promotion*). Moving up the hierarchy (as illustrated in Figure A1) requires some type of promotion. In some cases, promotions are made through the *direct appointment* of workers to positions of responsibility. For others, the promotions are the result of a *competitive call*. In the case of a competitive call, candidates go through a recruitment process for which they need to apply first.

Given that we have additional information on who applies to each call, the analysis in this section is two-fold. First, we explore the gender differences in the probability of promotion among employees. Second, we define the pool of potential candidates for every promotion, and - within each process - we estimate gender differences in the probability of getting the position. For the case of the competitive calls, we also estimate gender gaps in the probability of applying.

5.1 Gender differences in the probability of promotion among employees

Figure 4 and the bottom part of Table 1 shows that overall the average probability of promotion at the monthly level is 1.17%, being 1.21% for men and 1.13% for women.

These promotion probabilities are unconditional, hence the differences by gender could be due to differences in individual characteristics. To account for composition differences, we estimate a linear regression model for the probability of promotion p_{it} of worker i at time t:

$$p_{it} = \alpha^p + \beta^p Female_i + Z'_{it}\gamma^p + \delta^p_t + \epsilon^p_{it} \tag{2}$$

where the $Female$ dummy is equal to 1 for women, the vector Z_{it} includes a set of individual characteristics such as age, age squared, country of birth, cohort of entry to the BdE, birth

cohort, educational level, marital status, a dummy of having children, years of experience since entry, experience squared, and business area dummies. In model (2), differently to model (1), it is not possible to include a dummy for each professional group because some of the movements we are considering involve changes among those categories. Instead, we include an indicator for administrative and support services staff, as employees on those levels do not switch to higher professional groups. As previously, δ_t^p are time dummies, ϵ_{it}^p is a random error term with unrestricted correlation at the individual level, and β^P is our coefficient of interest. Model (2) is estimated by OLS.

Table 5 shows estimates for the probability of promotion for the whole sample of employees including all the professional groups, over the time period 2013-2023. The raw gender gap, shown in column 1, is negative and significant. Once we consider men and women with similar demographic characteristics, we find that the probability of promotion is still significantly lower for women (column 2). The gap remains negative once we account for family composition (column 3), while it becomes not significant when we include job characteristics (column 4). Finally, column 5 show that the probability of promotion is significantly lower for mothers even accounting for job characteristics.[8]

If we distinguish by promotion type, Figure 4 and the bottom part of Table 1 shows that men always have a higher probability of promotion than women: vertical promotions (0.85% for men and 0.80% for women), direct appointments (0.08% versus 0.05%), or competitive calls (0.28% versus 0.27%). Given that men and women could be taking part in different promotion processes with their specific features, next we move the unit of analysis from individuals to potential candidates within each promotion process. We define the pool of potential candidates as those employees working at the BdE when the selection process took place and at the same professional group and business area of the selected worker for appointments and vertical promotions, and that of most of the actual candidates for competitive calls.[9]

5.2 Gender differences in the probability of promotion within promotion processes

In our data, we observe a total number of 2,781 ascending movements for all types of workers. Of them, as shown both in Figure 5 and in Table 4, 80% are vertical promotions (2,222), 7% are direct appointments for positions of responsibility (187), and 13% were to be decided as the result of competitive calls (372 processes). For promotions outside managerial positions,

[8] This result is robust to the estimation of non linear models such as logit or probit.

[9] We exclude external applications because we miss information on key individual traits for these candidates. Sample sizes are shown in parentheses in Table 4.

91% are vertical promotions (1,749) and 9% the result of competitive calls (178 processes).[10] For promotions within managerial positions, 75% are vertical promotions (473), 14% are direct appointments (92), and 11% are the result of competitive calls (67 processes). For promotions from non-managerial positions to unit head position (the lowest level of the manager hierarchy), 43% are direct appointments (95), and 57% are the result of competitive calls (127 processes).

Given this heterogeneity in the relative importance of each type of promotion, our analysis considers both the type (vertical promotion, direct appointment, or competitive call) and the level in the hierarchy of the offered position (managers vs non-managers). We start by reporting descriptive evidence of the unconditional gender gap on the probability of promotion, and next, we estimate the conditional gender promotion gap.

5.2.1 Share of women in promotion processes

From 2013 to 2023, the female share among selected workers in promotion processes was 49.9%, while among potential candidates was 45.3% (Figure 6). However, by splitting the period in two (2013-2017 and 2018-2023), we observe that in the first subperiod, 2013-2017, the share of women was 51% even when the share of women was 43% among the pool of potential applicants, while in the most recent years, 2018-2023, the share of women among promoted was 49% for a pool of potential candidates with significantly more women than in the past (47%).

Interestingly, if we consider the different types of promotion processes (Figure 7) we see that, over the period 2013-2023, the share of women among promoted workers in direct appointments and vertical promotions has been very similar to that of potential candidates, whereas in competitive calls the share of women promoted has been higher than the one among actual applicants and potential ones. By splitting the period in two, 2013-2017 and 2018-2023, however, we observe that the share of women promoted to positions of responsibility through direct appointments has decreased, while the share of women receiving vertical promotions has increased (although relatively less than the rise among potential candidates).

For competitive calls, it is useful to further distinguish between promotions for managerial positions and non-managerial positions (Figure 8). In this case, for non-managerial positions, the share of women increased at all stages. For managerial positions, on the contrary, the share of women among applicants diminished. Within managerial positions, in promotions for department directors and division heads (top panel of Figure 9) the increase in the share of women promoted through direct appointments is less intense than the increase in the share of women among potential candidates. For unit heads (bottom panel of Figure 9), the increase in

[10] It is important to emphasize that direct appointments are only possible for promotions to or within managerial positions.

the share of women among those winning competitive calls does not compensate for the decrease in the presence of women promoted through direct appointments.

In terms of the unconditional probability of promotion across promotions processes, it is on average 0.75% for males and 0.90% for females; being 0.64% for males and 0.83% for females in processes for non-managerial positions, and 1.40% for both, men and women, in managerial positions. By type of promotion, the probability is 1.00% for men and 1.40% for women in competitive calls (being 1.17% for males and 1.67% for females in processes for non-managerial positions, but 0.71% for men and 0.64% for women, in managerial positions); 1.93% for men and 1.89% for women, in the case of direct appointments (only possible for promotions to or within managerial positions); and 0.65% for men and 0.71% for women, in vertical promotions (being 0.54% for males and 0.61% for females in processes for non-managerial positions, and 2.02% for men and 2.30% for women, in managerial positions).

5.2.2 The conditional gender promotion gap among potential candidates

As before, previous promotion probabilities are unconditional, hence the differences by gender could be due to differences in individual characteristics and/or characteristics of the promotions processes. To account for composition differences, we consider a linear model for the promotion probability of a given worker i in a selection process s of whatever type:

$$p_{is} = \alpha^s + \beta^s Female_i + V'_{is}\gamma^s + \delta^s_s + \epsilon^s_{is} \tag{3}$$

where the dummy $Female$ is equal to one for women, V_{is} is a vector of individual characteristics (such as age, age squared, country of birth, cohort of entry to the BdE, birth cohort, educational level, marital status, a dummy of having children, years of experience since entry to the BdE, experience squared, and dummies for each area of activity), δ^s_s are selection process fixed effects, and ϵ^s_{is} is a random error term with unrestricted correlation at the individual level. We estimate model (3) among *potential candidates* and β^s is our coefficient of interest.

Competitive calls In the case of competitive calls, the promotion process has two stages: first, the application stage, and second, the selection contest among applicants.

Formally, for a given employee i and selection process s, the probability of promotion is the product of the probability of applying for a promotion following a competitive call $\times$ the probability of winning the call conditional on having applied, that is, $\Pr(a) \times \Pr(p|a = 1)$. Even if there is no gender gap in the promotion probability, there could still be gender gaps in the underlying probabilities $\Pr(a)$ and $\Pr(p|a = 1)$. Hence, we proceed sequentially. First, we estimate the gender gap in the probability of promotion; and, second, we estimate the

probability of applying for a promotion, thus also exploring a potential gender application gap.

In practice, in addition to the estimation of model (3), we consider another linear model for the probability that the potential candidate i applies for a promotion in the selection process s:

$$a_{is} = \alpha^a + \beta^a Female_i + Y'_{is}\gamma^a + \delta^a_s + \epsilon^a_{is} \tag{4}$$

where, as before, the dummy $Female$ is equal to one for women, the vector Y_{is} of individual characteristics includes age, age squared, country of birth, cohort of entry to the BdE, birth cohort, educational level, marital status, a dummy of having children, years of experience since entry to the BdE, experience squared, and dummies for each area of activity, δ^a_s are promotion process fixed effects, and ϵ^a_{is} is a random error term with unrestricted correlation at the individual level. Model (4) is estimated among the set of potential candidates and β^a is our coefficient of interest.[11]

Estimation results Table 6 reports OLS estimates of the probability of promotion among potential candidates. Standard errors are clustered at the individual level. Panel A shows estimates pooling together all types of promotions. Panel B reports estimates for the three types of promotion: competitive call, direct appointment, and vertical promotion.

Column 1 shows the raw gender gap which is positive for females relative to males overall, in competitive calls and vertical promotions, but not significant in direct appointments. Controlling for age, country of birth, birth cohort, entry cohort, educational level, and year, the magnitude of the gaps decreases minimally (column 2). If we also account for marital status, children, experience, experience squared, and business area, the higher probability of selection for women becomes insignificant both overall and for vertical promotions, while it gets reduced

[11] Alternatively, we could model the probability of winning a competitive call accounting for the fact that only people who applied for a vacancy have a positive probability of winning the selection process. The latent probability of winning a call, p^*, would be:

$$p^*_{is} = \alpha^{s^*} + \beta^{s^*} Female_i + V'_{is}\gamma^{s^*} + \delta^{s^*}_s + \epsilon^{s^*}_{is} \tag{5}$$

that is only observed ($p_{is} = p^*_{is}$) if the probability of applying is strictly positive:

$$a_{is} = \alpha^a + \beta^a Female_i + Y'_{is}\gamma^a + \delta^a_s + \epsilon^a_{is} > 0 \tag{6}$$

where the dummy $Female$ is equal to one for women, V_{is} is the same vector of individual characteristics as in model (3), δ^w_s are selection process fixed effects, and variables and parameters definitions in equation (6) are as in model (4). Model assumptions for the error terms in equations (5) and (6) are that:

$$\epsilon^{s^*}_{is} \sim N(0,\sigma) \tag{7}$$

$$\epsilon^a_{is} \sim N(0,1) \tag{8}$$

$$corr(\epsilon^{s^*}_{is}, \epsilon^a_{is}) = \rho \tag{9}$$

In this setup, equation (5) is known as the outcome equation and equation (6) as the selection equation. Identification would require some exclusion restriction, namely some variable that drives the selection into the applicants' pool which is not a determinant of the probability of winning the promotion (the outcome equation), not readily available in our dataset.

substantially in competitive calls (column 3). Finally, if we compare male and female potential candidates within the same process, none of the gender gaps in the probability of promotion are statistically significant (column 4).

Table 7 shows the results depending on the managerial level of the selection process. Most of the unconditional positive gap we observe in favour of women comes from promotions within non-managerial positions (panel 2), whereas for promotions to/within managerial positions (panel 1), the probabilities are almost equal for both men and women. If we compare male and female potential candidates within the same process (column 4), even for promotions within non-managerial positions the gender gap in the probability of promotion is not statistically significant.

In the promotions to/within department directors and division heads (panel 1.1), there is a lower probability of promotion for women relative to men, although imprecise in the pooled results (panel 1.1.A). When we distinguish by promotion type (panel 1.1.B), the probability of promotion for women in competitive calls is consistently lower, even in the most complete specification (column 4). On the contrary, for unit head positions (panel 1.2), the difference by gender in the probability of promotion is not significant either in the pooled data (panel 1.2.A), or for any type of process (panel 1.2.B).

Table 8 considers, as in Hospido et al. (2022), the set of business areas where most economists work.[12] In the promotions to/within department directors and division heads (panel 1.1.S.), as it happened for the whole institution, there is a lower probability of promotion for women relative to men (panel 1.1.S.A), coming from a significantly negative gender gap in the probability of being selected in competitive calls (panel 1.1.S.B).

In addition, only in this subsample, we uncover a higher probability of promotions for women relative to men within positions of unit heads (panel 1.2.S.A). This gap in favour of women is due to a higher chance of getting vertical promotions (panel 1.2.S.B). These vertical promotions, however, do not yield any change in duties. For the promotions that do imply acquiring some managerial role as a unit head position from a non-managerial level, either trough a competitive call or a direct appointment, we do not find any significant gender gap (panel 1.2.S.B).

Finally, Table 9 reports OLS estimates of the probability of applying to competitive calls. Standard errors are clustered at the individual level. Controlling for the same observable characteristics as before (columns 2-3), the gender gap in applications in favor of women gets reduced from 1.6 to 1.0, but it remains significant. If we, in addition, compare male and female potential candidates for the same process (column 4), the difference is not longer significant. Panel

[12] Descriptive statistics for this subsample can be found in Table A1.

1 shows results for promotions to/within managerial positions. In this case, the probability of applying is lower for women relative to men even in the most complete specification (column 4). Panels 1.1 and 1.2 show the same qualitative pattern both in promotions to department director and division head positions, and to unit head positions. On the contrary, panels 1.1.S and 1.2.S report the results for promotions to/within managerial positions in the areas where most economists work, showing no significant gender gaps in the probability of applying. This result allows us to clarify that, unlike the case of the ECB, at the BdE the lower probability of selection for women relative to men in competitive calls for division heads or department directors in the business areas where most economists work is not due to a lower probability of applying.[13]

6 Conclusions

The under-representation of women in senior and managerial positions is an ongoing cause of concern in most International Financial Institutions (Comunale et al. (2023)). This under-representation is perhaps nowhere as visible as in central banks (OMFIF (2024)). Recent evidence from the ECB (Hospido et al. (2022)), an institution where promotions are exclusively the results of competitive calls, shows that female workers are less likely than males to apply for promotions. Competition from other candidates partly explains this application gender gap. In this paper, we use anonymized personnel records from the BdE to examine gender differences in career progression in an institution with a mixed system of promotions, that combines competitive calls with vertical promotions and direct appointments.

We first document that the presence of women at the BdE has increased markedly since the late 1990s, although not always in a monotonic manner. The strongest impulse corresponds with periods when females dominate the pool of new entrants.

Second, by comparing wages, we show a substantial part of the average gender wage gap is explained by individual characteristics, such as age or experience. In addition, the two usual suspects - children and promotions - are also at work.

When it comes to promotions, if we compare potential candidates for the same process, we find no significant gender gaps in the probability of promotion in competitive calls, nor in direct appointments or in vertical promotions. Within non-managerial positions, we do not find any significant gender gap in the probability of promotion. Among managers, on the contrary, our

[13] The negative gender gap in the probability of applying is only present in other areas of the BdE, different from those where most of the staff are economists.

findings suggest some differences depending on the type of promotion process. In the promotions to/within department directors and division heads, there is a lower probability of promotion for women relative to men, in particular through competitive calls. This is also the case for the group of business areas where most of the staff are economists. In contrast, for that subsample, there is a higher probability of getting vertical promotions for women relative to men in positions immediately below in the hierarchy, such as unit heads. Notably, we do not find any significant gender gap in the probability of becoming a unit head from a non-managerial level, nor through a competitive call or a direct appointment.

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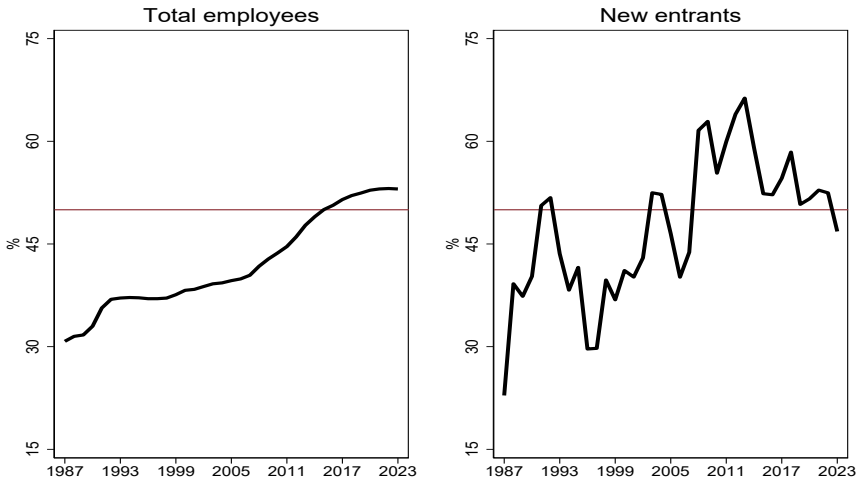
Figures and Tables

Figure 1: Share of women and data availability

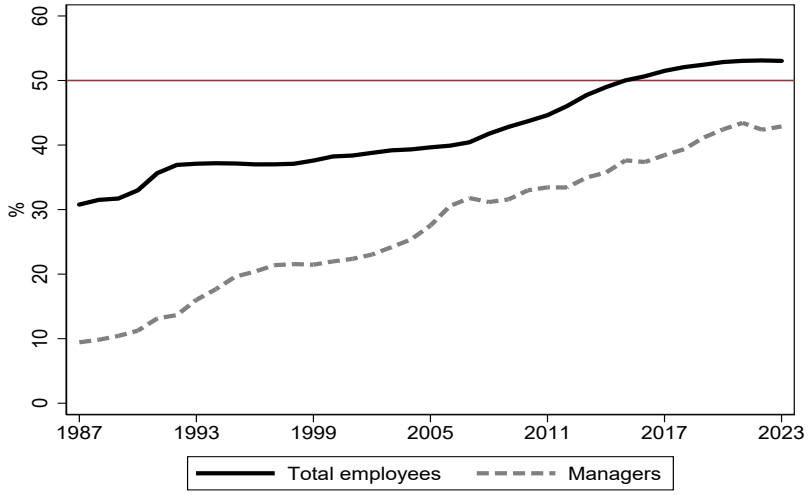
Notes: Employees aged 20-75, excluding branches and other entities.

Figure 2: Share of women among total employees, and among new entrants



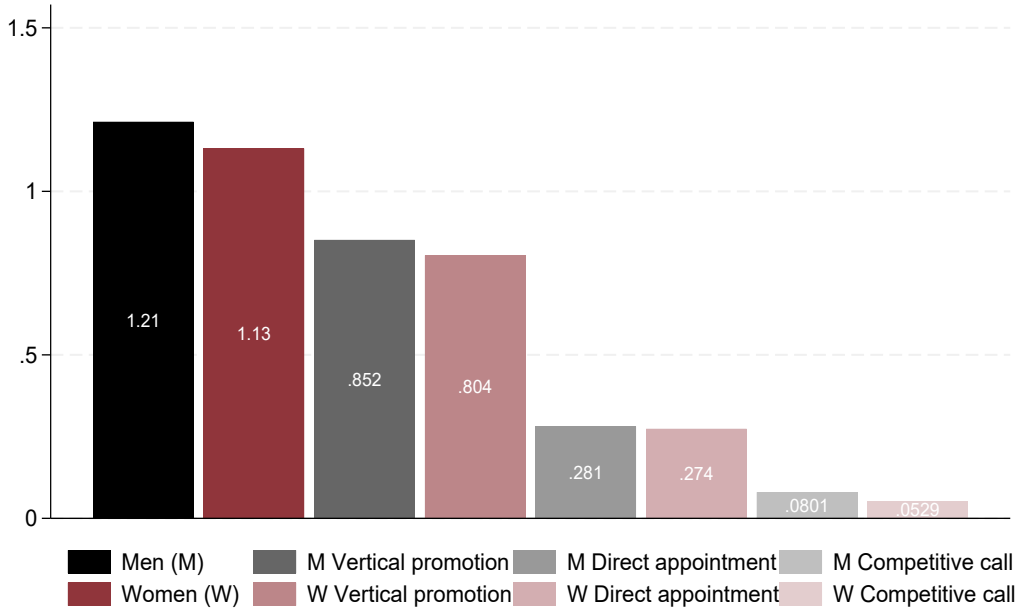
Notes: Employees aged 20-75, excluding branches and other entities.

Figure 3: Share of women among total employees, and among managers



Notes: Employees aged 20-75, excluding branches and other entities.

Figure 4: Probability of promotion among employees



Notes: Employees aged 20-75, excluding branches and other entities.

Figure 5: Type of promotion processes

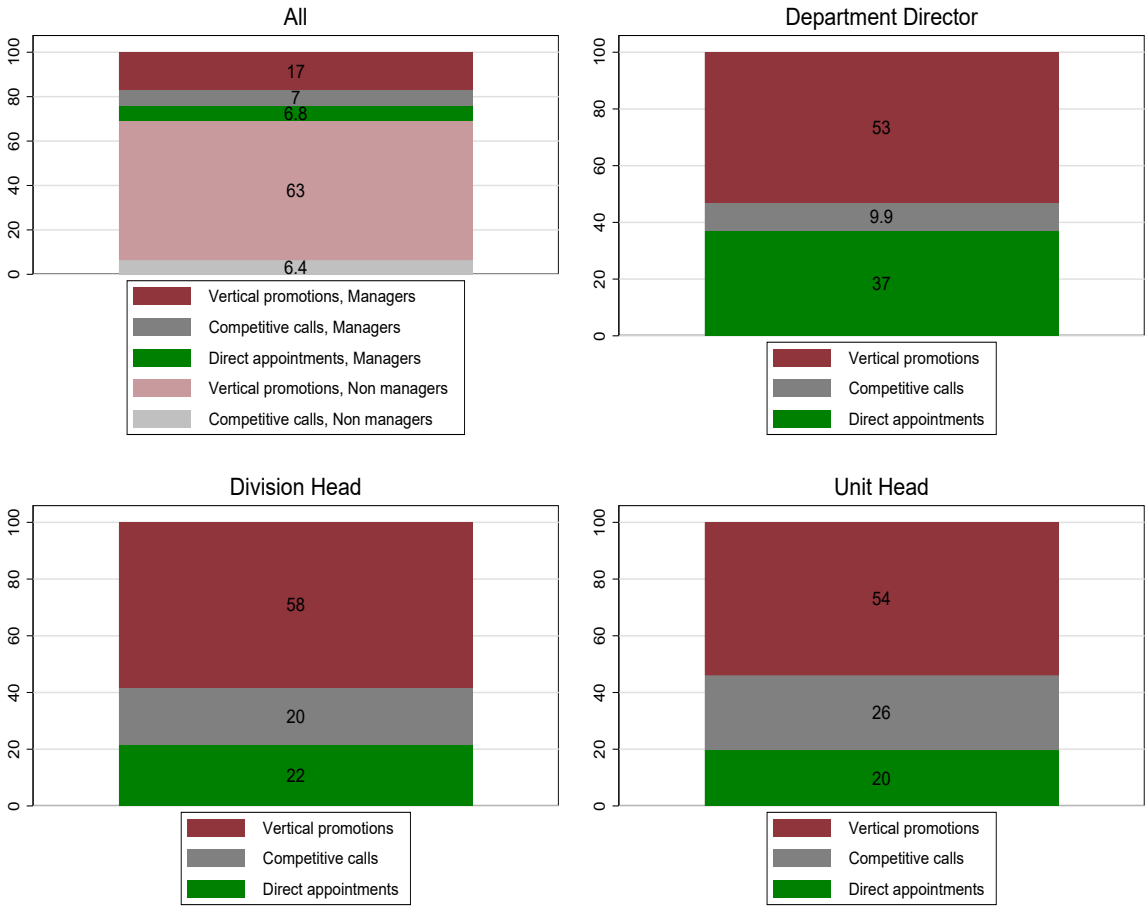


Figure 6: Share of women in promotions processes

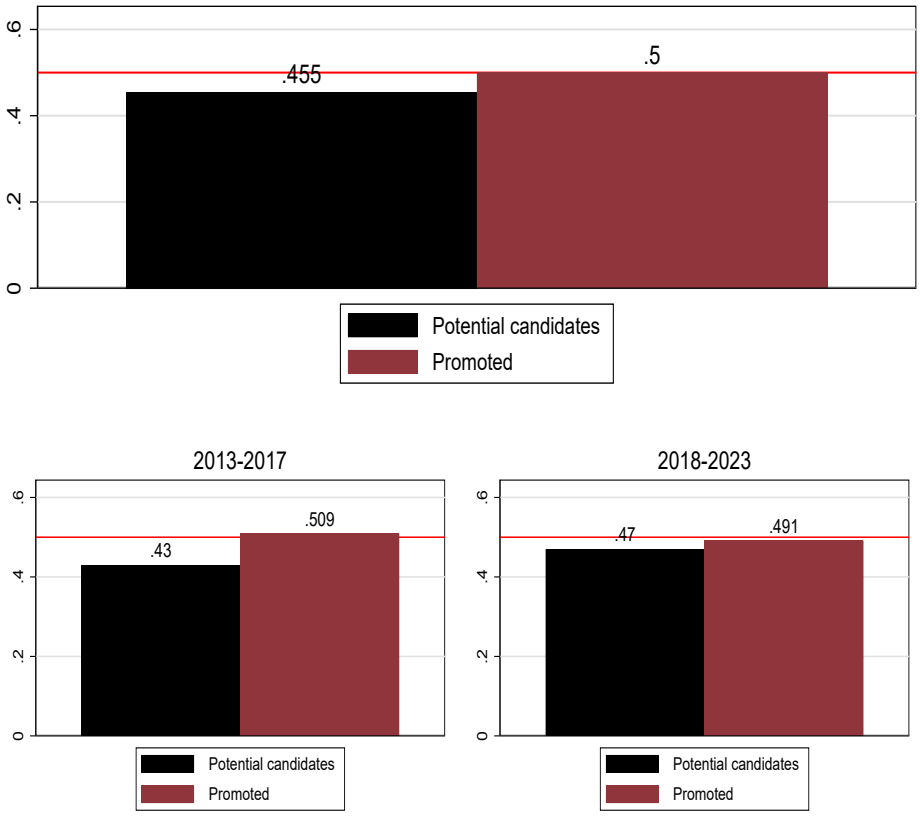


Figure 7: Share of women in promotions processes by promotion type

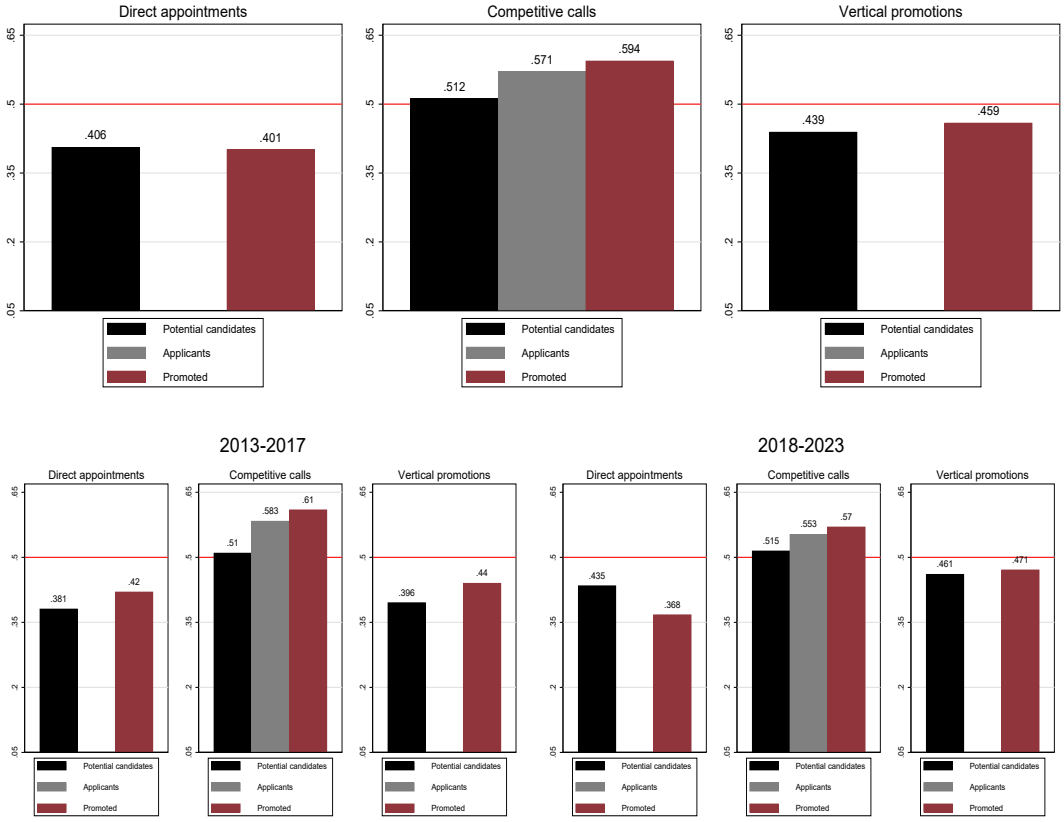


Figure 8: Share of women in promotions processes by promotion type and responsibility

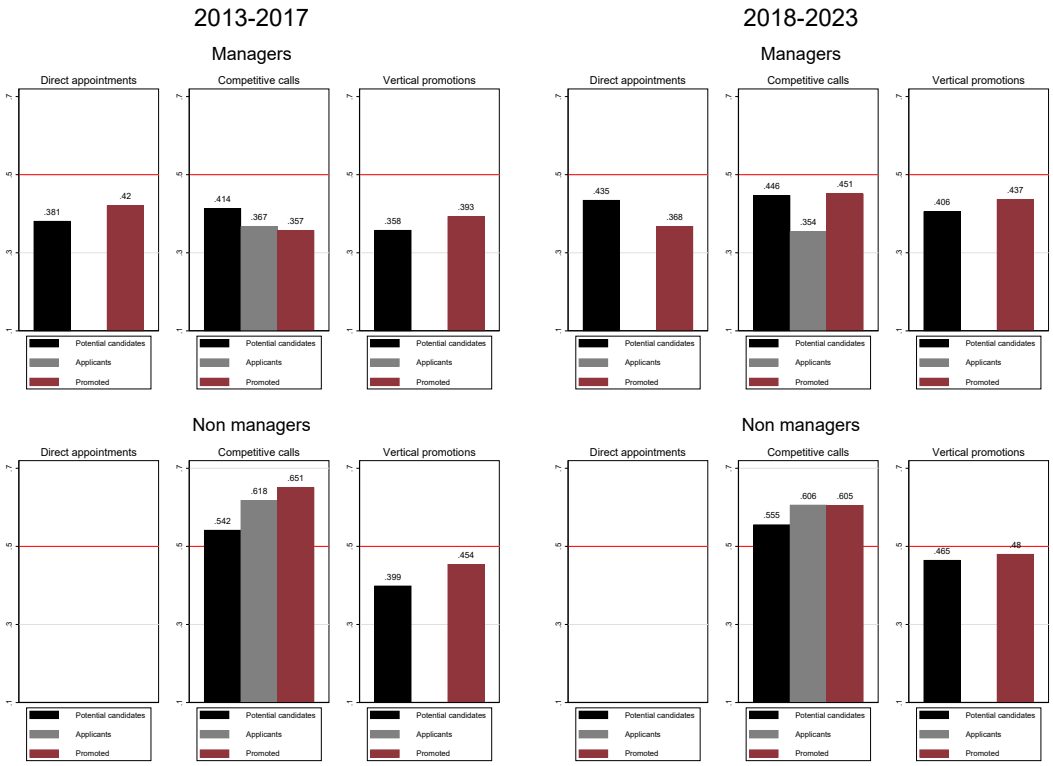


Figure 9: Share of women in promotions processes by promotion type and level on the hierarchy

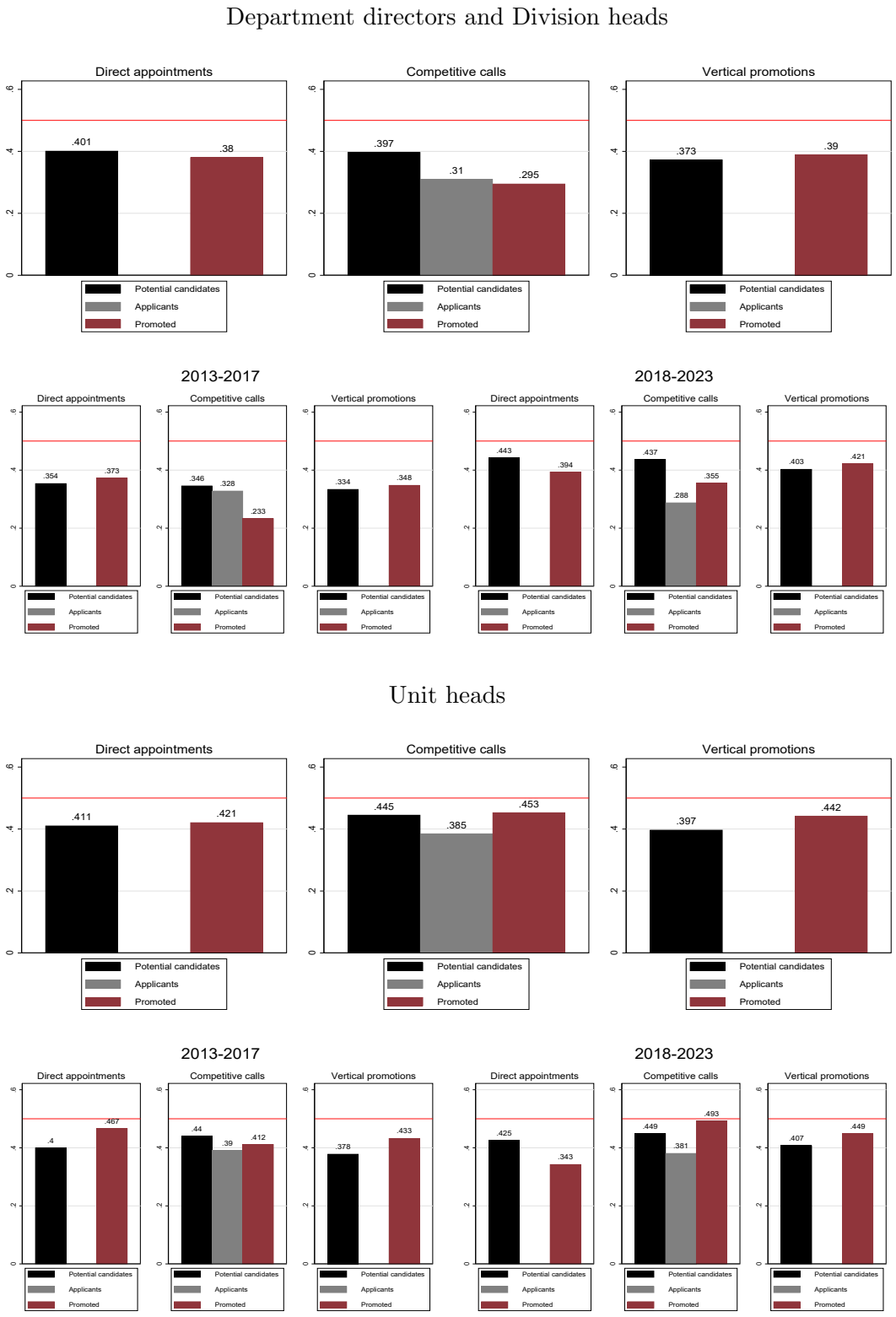


Table 1: Descriptive statistics

		Total	Men	Women
Time period: 1987-2023				
Observations (year-month)	n, %	897,716	57.07	42.93
Workers	n, %	5,754	54.43	45.57
Entry age (years)	mean	30.55	30.16	31.00
Age (years)	mean	43.99	44.84	42.87
Experience (years)	mean	15.86	16.82	14.58
Married	mean	0.68	0.73	0.61
Children	mean	0.62	0.66	0.57
Time period: 2000-2023				
Observations (year-month)	n, %	605,353	53.48	46.52
Workers	n, %	5,202	52.08	47.92
Entry age (years)	mean	30.84	30.49	31.21
Age (years)	mean	44.59	45.49	43.56
Experience (years)	mean	15.53	16.77	14.11
Married	mean	0.67	0.71	0.63
Children	mean	0.61	0.64	0.58
Log(wages)	mean	11.18	11.27	11.07
Time period: 2009-2023				
Observations (year-month)	n, %	406,180	50.04	49.96
Workers	n, %	4,436	50.32	49.68
Entry age (years)	mean	31.28	30.72	31.85
Age (years)	mean	44.39	45.42	43.37
Experience (years)	mean	14.15	15.59	12.72
Married	mean	0.65	0.68	0.62
Children	mean	0.59	0.60	0.57
Log(wages)	mean	11.16	11.26	11.06
Log(hourly wages)	mean	3.69	3.76	3.61
Hours of work	mean	36.59	37.15	36.03
Managers	mean	11.64	14.27	8.98
- Department director (DD)	mean	1.14	1.69	0.59
- Division head (DH)	mean	4.03	5.25	2.80
- Unit head (UH)	mean	6.46	7.34	5.58
Senior Experts	mean	37.76	43.55	31.89
Experts	mean	27.90	25.18	30.66
Administrative	mean	17.71	8.90	26.64
Support services	mean	4.99	8.10	1.83
Time period: 2013-2023				
Observations (year-month)	n, %	314,708	48.39	51.61
Workers	n, %	3,957	49.46	50.54
Entry age (years)	mean	31.39	31.04	31.72
Age (years)	mean	44.23	45.23	43.30
Experience (years)	mean	13.28	14.63	12.02
Married	mean	0.64	0.66	0.62
Children	mean	0.58	0.59	0.57
Log(wages)	mean	11.13	11.23	11.04
Log(hourly wages)	mean	3.66	3.74	3.59
Hours of work	mean	36.69	37.30	36.13
Managers	mean	11.62	14.35	9.03
- Department director (DD)	mean	1.20	1.83	0.60
- Division head (DH)	mean	3.98	5.12	2.90
- Unit head (UH)	mean	6.43	7.41	5.51
Senior Experts	mean	38.78	44.49	33.37
Experts	mean	29.09	26.73	31.32
Administrative	mean	16.17	7.07	24.79
Support services	mean	4.34	7.36	1.48
General Secretariat	mean	7.85	5.45	10. 13
Services	mean	28.71	30.99	26.56
Banking supervision	mean	19.94	22.34	17.67
Financial stability	mean	7.90	6.97	8.78
Financial conduct	mean	7.57	6.80	8.29
Operations	mean	12.91	12.65	13.15
Economics	mean	15.11	14.79	15.42
Probability of promotion	mean, %	1.17	1.21	1.13
- Vertical promotion	mean, %	0.83	0.85	0.80
- Direct appointment	mean, %	0.07	0.08	0.05
- Competitive call	mean, %	0.28	0.28	0.27

Table 2: Linear regression of log wages

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Female	-0.1971***	-0.1459***	-0.1266***	-0.1243***	-0.0578***	-0.0353***	-0.0058
	(0.0164)	(0.0137)	(0.0130)	(0.0130)	(0.0175)	(0.0086)	(0.0125)
Experience (years)			0.0565***	0.0551***	0.0554***	0.0406***	0.0408***
			(0.0027)	(0.0027)	(0.0027)	(0.0016)	(0.0016)
Squared experience			-0.0008***	-0.0008***	-0.0008***	-0.0005***	-0.0005***
			(0.0001)	(0.0001)	(0.0001)	(0.0000)	(0.0000)
Services			-0.0133	-0.0157	-0.0181	0.0023	0.0012
			(0.0251)	(0.0248)	(0.0247)	(0.0127)	(0.0127)
Banking supervision			0.1911***	0.1880***	0.1839***	0.0400***	0.0383***
			(0.0260)	(0.0257)	(0.0257)	(0.0148)	(0.0147)
Financial stability			0.0756**	0.0771***	0.0762***	-0.0038	-0.0042
			(0.0299)	(0.0296)	(0.0294)	(0.0168)	(0.0168)
Financial conduct			-0.0916***	-0.0930***	-0.0953***	-0.0417***	-0.0431***
			(0.0301)	(0.0295)	(0.0294)	(0.0157)	(0.0157)
Operations			-0.0431	-0.0375	-0.0390	-0.0200	-0.0212
			(0.0296)	(0.0294)	(0.0294)	(0.0202)	(0.0201)
Economics			-0.0115	-0.0105	-0.0128	-0.0301*	-0.0314*
			(0.0293)	(0.0290)	(0.0290)	(0.0176)	(0.0176)
Married				0.0751***	0.0725***	0.0229**	0.0219**
				(0.0152)	(0.0150)	(0.0107)	(0.0106)
Children				0.0510***	0.1101***	0.0253**	0.0521***
				(0.0174)	(0.0198)	(0.0121)	(0.0129)
Female x Children					-0.1135***		-0.0512***
					(0.0238)		(0.0157)
Senior Experts						-0.2086***	-0.2069***
						(0.0137)	(0.0137)
Experts						-0.5829***	-0.5796***
						(0.0149)	(0.0149)
Administrative						-0.8313***	-0.8278***
						(0.0128)	(0.0128)
Support services						-0.9646***	-0.9646***
						(0.0160)	(0.0159)
Observations	383992	383992	383992	383992	383992	383992	383992
R^2	0.027	0.269	0.332	0.339	0.341	0.539	0.539

*Notes: Linear regression, sample 2009-2023. Robust standard errors in parentheses, clustered by individual. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Age, age squared, birth country, birth cohort, entry cohort, education, and time dummies included except in column 1.*

Table 3: Linear regression of log hourly wages

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Female	-0.1615***	-0.1086***	-0.0891***	-0.0873***	-0.0585***	-0.0046	-0.0082
	(0.0164)	(0.0134)	(0.0127)	(0.0125)	(0.0170)	(0.0087)	(0.0122)
Experience (years)			0.0610***	0.0592***	0.0594***	0.0457***	0.0457***
			(0.0027)	(0.0027)	(0.0027)	(0.0016)	(0.0016)
Squared experience			-0.0009***	-0.0009***	-0.0009***	-0.0006***	-0.0006***
			(0.0001)	(0.0001)	(0.0001)	(0.0000)	(0.0000)
Services			0.0021	-0.0023	-0.0033	0.0120	0.0122
			(0.0246)	(0.0242)	(0.0242)	(0.0122)	(0.0122)
Banking supervision			0.1936***	0.1886***	0.1868***	0.0486***	0.0488***
			(0.0256)	(0.0252)	(0.0252)	(0.0144)	(0.0144)
Financial stability			0.0955***	0.0959***	0.0955***	0.0161	0.0162
			(0.0293)	(0.0289)	(0.0288)	(0.0171)	(0.0171)
Financial conduct			-0.0715**	-0.0738***	-0.0748***	-0.0286*	-0.0284*
			(0.0293)	(0.0285)	(0.0285)	(0.0155)	(0.0155)
Operations			-0.0104	-0.0051	-0.0058	0.0016	0.0017
			(0.0291)	(0.0287)	(0.0287)	(0.0200)	(0.0199)
Economics			0.0149	0.0154	0.0144	-0.0084	-0.0082
			(0.0287)	(0.0284)	(0.0284)	(0.0174)	(0.0175)
Married				0.0699***	0.0687***	0.0219**	0.0220**
				(0.0151)	(0.0150)	(0.0108)	(0.0107)
Children				0.0884***	0.1140***	0.0658***	0.0626***
				(0.0171)	(0.0194)	(0.0122)	(0.0131)
Female x Children					-0.0492**		0.0061
					(0.0232)		(0.0158)
Senior Experts						-0.1804***	-0.1806***
						(0.0136)	(0.0136)
Experts						-0.5049***	-0.5053***
						(0.0147)	(0.0147)
Administrative						-0.7784***	-0.7788***
						(0.0124)	(0.0124)
Support services						-0.9283***	-0.9283***
						(0.0146)	(0.0147)
Observations	383992	383992	383992	383992	383992	383992	383992
R^2	0.018	0.276	0.343	0.353	0.354	0.532	0.532

*Notes: Linear regression, sample 2009-2023. Robust standard errors in parentheses, clustered by individual. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Age, age squared, birth country, birth cohort, entry cohort, education, and time dummies included except in column 1.*

Table 4: Promotion processes

	Total	Competitive calls	Direct appointments	Vertical promotions
Time period: 2013-2023				
Promotion processes	2,781	372	187	2,222
(potential candidates monthly observations)	(432,920)	(95,451)	(9,789)	(327,680)
Promotions to/within managerial positions	854	194	187	473
(potential candidates monthly observations)	(61,405)	(29,415)	(9,789)	(22,201)
Promotions to/within department directors and division heads	365	60	92	213
(potential candidates monthly observations)	(21,468)	(7,712)	(4,599)	(9,157)
Promotions to/within unit heads	489	134	95	260
(potential candidates monthly observations)	(39,937)	(21,703)	(5,190)	(13,044)
Promotions within non-managerial positions	1,927	178	-	1,749
(potential candidates monthly observations)	(371,515)	(66,036)	-	(305,479)
Time period: 2013-2017				
Promotion processes	1,198	207	119	872
(potential candidates monthly observations)	(162,565)	(49,003)	(5,187)	(108,375)
Promotions to/within managerial positions	412	97	119	196
(potential candidates monthly observations)	(25,983)	(12,163)	(5,187)	(8,633)
Promotions to/within department directors and division heads	180	29	59	92
(potential candidates monthly observations)	(9,480)	(3,360)	(2,159)	(3,961)
Promotions to/within unit heads	232	68	60	104
(potential candidates monthly observations)	(16,503)	(8,803)	(3,028)	(4,672)
Promotions within non-managerial positions	786	110	-	676
(potential candidates monthly observations)	(136,582)	(36,840)	-	(99,742)
Time period: 2018-2023				
Promotion processes	1,583	165	68	1,350
(potential candidates monthly observations)	(270,355)	(46,448)	(4,602)	(219,305)
Promotions to/within managerial positions	442	97	68	277
(potential candidates monthly observations)	(35,422)	(17,252)	(4,602)	(13,568)
Promotions to/within department directors and division heads	185	31	33	121
(potential candidates monthly observations)	(11,988)	(4,352)	(2,440)	(5,196)
Promotions to/within unit heads	257	66	35	156
(potential candidates monthly observations)	(23,434)	(12,900)	(2,162)	(8,372)
Promotions within non-managerial positions	1,141	68	-	1,073
(potential candidates monthly observations)	(234,933)	(29,196)	-	(205,737)

Table 5: Linear regression of the probability of promotion among employees

	(1)	(2)	(3)	(4)	(5)
Female	-0.0008**	-0.0012***	-0.0011***	-0.0004	0.0003
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0005)
Married			0.0024***	0.0018***	0.0018***
			(0.0005)	(0.0005)	(0.0005)
Children			0.0003	-0.0000	0.0007
			(0.0005)	(0.0005)	(0.0006)
Experience (years)				0.0009***	0.0009***
				(0.0001)	(0.0001)
Squared experience				-0.0000***	-0.0000***
				(0.0000)	(0.0000)
Administrative				-0.0057***	-0.0057***
				(0.0004)	(0.0004)
Female x Children					-0.0013*
					(0.0007)
Observations	314708	314708	314708	302351	302351
R^2	0.000	0.001	0.001	0.002	0.002

*Notes: Linear regression, sample 2013-2023. Robust standard errors in parentheses, clustered by individual. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Age, birth country, birth cohort, entry cohort, education, business areas, and time dummies are included except in (1).*

Table 6: Linear regression of the probability of promotion among potential candidates

	(1)	(2)	(3)	(4)
A) Pooled results				
Female	0.0015***	0.0015***	0.0005	-0.0002
	(0.0003)	(0.0003)	(0.0003)	(0.0002)
Observations	432920	432920	432920	432920
R^2	0.000	0.001	0.004	0.000
B) Results by promotion type				
Female	0.0040***	0.0037***	0.0029***	-0.0002
	(0.0008)	(0.0008)	(0.0007)	(0.0007)
Direct appointment	0.0092***	0.0095***	0.0097***	-0.0045
	(0.0019)	(0.0019)	(0.0019)	(0.0490)
Female x Direct appointment	-0.0044	-0.0045	-0.0048*	-0.0009
	(0.0030)	(0.0030)	(0.0029)	(0.0030)
Vertical promotion	-0.0035***	-0.0027***	-0.0003	0.1407
	(0.0005)	(0.0005)	(0.0005)	(0.3271)
Female x Vertical promotion	-0.0034***	-0.0031***	-0.0031***	0.0001
	(0.0008)	(0.0008)	(0.0008)	(0.0007)
Observations	432920	432920	432920	432920
R^2	0.001	0.002	0.004	0.019

Notes: Linear regression, sample 2013-2023. Robust standard errors in parentheses, clustered by individual. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. *Age, birth country, birth cohort, entry cohort, education, and time dummies are included except in (1). (3) as (2) plus family situation, experience, experience squared, and business areas. (4) as (3) plus selection process fixed effects.*

Table 7: Linear regression of the probability of promotion among potential candidates by professional group

	(1)	(2)	(3)	(4)
1. Promotions to/within managerial positions				
A) Pooled results				
Female	-0.0000	-0.0005	-0.0011	-0.0006
	(0.0011)	(0.0010)	(0.0009)	(0.0009)
B) Results by promotion type				
Female	-0.0008	-0.0010	-0.0020**	-0.0013
	(0.0010)	(0.0009)	(0.0009)	(0.0009)
Direct appointment	0.0121***	0.0119***	0.0113***	-0.0152
	(0.0020)	(0.0020)	(0.0020)	(0.0556)
Female x Direct appointment	0.0004	-0.0001	0.0001	-0.0003
	(0.0031)	(0.0031)	(0.0030)	(0.0032)
Vertical promotion	0.0131***	0.0133***	0.0127***	-0.0348
	(0.0014)	(0.0014)	(0.0014)	(0.0489)
Female x Vertical promotion	0.0036*	0.0029	0.0032	0.0023
	(0.0021)	(0.0021)	(0.0020)	(0.0020)
Observations	61405	61405	61405	61405
1.1. Promotions to/within managerial positions as department director or division head				
A) Pooled results				
Female	-0.0012	-0.0015	-0.0028	-0.0026
	(0.0023)	(0.0022)	(0.0021)	(0.0021)
B) Results by promotion type				
Female	-0.0034*	-0.0035*	-0.0043**	-0.0044**
	(0.0019)	(0.0019)	(0.0019)	(0.0019)
Direct appointment	0.0114***	0.0110***	0.0099***	0.0016
	(0.0029)	(0.0029)	(0.0030)	(0.0677)
Female x Direct appointment	0.0016	0.0020	0.0012	0.0018
	(0.0049)	(0.0048)	(0.0048)	(0.0049)
Vertical promotion	0.0134***	0.0111***	0.0106***	-0.0043
	(0.0023)	(0.0026)	(0.0026)	(0.0398)
Female x Vertical promotion	0.0050	0.0041	0.0032	0.0034
	(0.0035)	(0.0035)	(0.0034)	(0.0035)
Observations	21468	21468	21468	21468
1.2. Promotions to/within managerial positions as unit head				
A) Pooled results				
Female	0.0008	0.0003	-0.0001	0.0007
	(0.0013)	(0.0012)	(0.0012)	(0.0011)
B) Results by promotion type				
Female	0.0002	0.0001	-0.0008	0.0001
	(0.0011)	(0.0011)	(0.0011)	(0.0011)
Direct appointment	0.0117***	0.0121***	0.0119***	0.0057
	(0.0026)	(0.0027)	(0.0027)	(0.0508)
Female x Direct appointment	0.0006	-0.0001	0.0005	-0.0004
	(0.0041)	(0.0041)	(0.0041)	(0.0043)
Vertical promotion	0.0121***	0.0140***	0.0134***	-0.0027
	(0.0017)	(0.0018)	(0.0017)	(0.0368)
Female x Vertical promotion	0.0036	0.0027	0.0033	0.0021
	(0.0027)	(0.0027)	(0.0027)	(0.0028)
Observations	39937	39937	39937	39937
2. Promotions within non-managerial positions				
A) Pooled results				
Female	0.0019***	0.0019***	0.0009***	-0.0001
	(0.0003)	(0.0003)	(0.0003)	(0.0002)
B) Results by promotion type				
Female	0.0050***	0.0049***	0.0041***	0.0002
	(0.0010)	(0.0010)	(0.0010)	(0.0007)
Vertical promotion	-0.0062***	-0.0053***	-0.0031***	-0.0848
	(0.0007)	(0.0007)	(0.0007)	(144.0445)
Female x Vertical promotion	-0.0044***	-0.0043***	-0.0042***	-0.0005
	(0.0010)	(0.0010)	(0.0010)	(0.0007)
Observations	371515	371515	371515	371515

Notes: Linear regression, sample 2013-2023. Robust standard errors in parentheses, clustered by individual. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. *Age, birth country, birth cohort, entry cohort, education, and time dummies are included except in (1). (3) as (2) plus family situation, experience, experience squared, and business areas. (4) as (3) plus selection process fixed effects.*

Table 8: Linear regression of the probability of promotion among potential candidates by professional group (subsample)

	(1)	(2)	(3)	(4)
1.1.S. Promotions to/within managerial positions as department director or division head (subsample)				
A) Pooled results				
Female	-0.0096**	-0.0102***	-0.0113***	-0.0106***
	(0.0040)	(0.0039)	(0.0038)	(0.0038)
B) Results by promotion type				
Female	-0.0103***	-0.0108***	-0.0116***	-0.0112***
	(0.0032)	(0.0033)	(0.0032)	(0.0031)
Direct appointment	0.0110*	0.0099	0.0075	0.0170
	(0.0063)	(0.0068)	(0.0067)	(0.0353)
Female x Direct appointment	0.0024	0.0020	0.0021	0.0025
	(0.0097)	(0.0098)	(0.0099)	(0.0101)
Vertical promotion	0.0134***	0.0124**	0.0120**	0.0306
	(0.0042)	(0.0052)	(0.0050)	(0.0330)
Female x Vertical promotion	0.0021	0.0014	0.0010	0.0004
	(0.0063)	(0.0064)	(0.0064)	(0.0064)
Observations	7812	7812	7812	7812
1.2.S. Promotions to/within managerial positions as unit head (subsample)				
A) Pooled results				
Female	0.0029	0.0029	0.0028	0.0042**
	(0.0022)	(0.0021)	(0.0021)	(0.0020)
B) Results by promotion type				
Female	-0.0003	-0.0007	-0.0013	-0.0005
	(0.0017)	(0.0017)	(0.0017)	(0.0017)
Direct appointment	0.0159***	0.0162***	0.0157***	0.3258***
	(0.0051)	(0.0053)	(0.0053)	(0.0305)
Female x Direct appointment	0.0142	0.0140	0.0146	0.0109
	(0.0097)	(0.0097)	(0.0096)	(0.0097)
Vertical promotion	0.0128***	0.0147***	0.0152***	0.1619***
	(0.0026)	(0.0028)	(0.0029)	(0.0398)
Female x Vertical promotion	0.0114**	0.0116**	0.0127***	0.0117**
	(0.0050)	(0.0050)	(0.0049)	(0.0050)
Observations	15513	15513	15513	15513

*Notes: Linear regression, sample 2013-2023. Robust standard errors in parentheses, clustered by individual. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Age, birth country, birth cohort, entry cohort, education, and time dummies are included except in (1). (3) as (2) plus family situation, experience, experience squared, and business areas. (4) as (3) plus selection process fixed effects.*

Table 9: Linear regression of the probability of applying among potential candidates

	(1)	(2)	(3)	(4)
Pooled results				
Female	0.0156***	0.0109***	0.0102***	-0.0032
	(0.0033)	(0.0030)	(0.0029)	(0.0025)
Observations	95451	95451	95451	95451
1. Promotions to/within managerial positions				
Female	-0.0105***	-0.0109***	-0.0138***	-0.0121***
	(0.0041)	(0.0040)	(0.0041)	(0.0040)
Observations	29415	29415	29415	29415
1.1. Promotions to managerial positions as department director or division head				
Female	-0.0101**	-0.0104**	-0.0134***	-0.0117***
	(0.0042)	(0.0041)	(0.0041)	(0.0040)
Observations	28475	28475	28475	28475
1.2. Promotions to managerial positions as unit head				
Female	-0.0079*	-0.0080*	-0.0108**	-0.0097**
	(0.0044)	(0.0044)	(0.0043)	(0.0043)
Observations	21703	21703	21703	21703
1.1.S. Promotions to managerial positions as department director or division head (subsample)				
Female	-0.0029	-0.0022	-0.0026	-0.0029
	(0.0047)	(0.0046)	(0.0039)	(0.0038)
Observations	11302	11302	11302	11302
1.2.S. Promotions to managerial positions as unit head (subsample)				
Female	-0.0017	-0.0012	-0.0022	-0.0029
	(0.0052)	(0.0052)	(0.0041)	(0.0041)
Observations	8814	8814	8814	8814
2. Promotions within non-managerial positions				
Female	0.0212***	0.0171***	0.0174***	0.0002
	(0.0043)	(0.0038)	(0.0037)	(0.0031)
Observations	66036	66036	66036	66036

*Notes: Linear regression, sample 2013-2023. Robust standard errors in parentheses, clustered by individual. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Age, birth country, birth cohort, entry cohort, education, and time dummies are included except in (1). (3) as (2) plus family situation, experience, experience squared, and business areas. (4) as (3) plus selection process fixed effects.*

A Additional Figures and Tables

Figure A1: Hierarchical levels

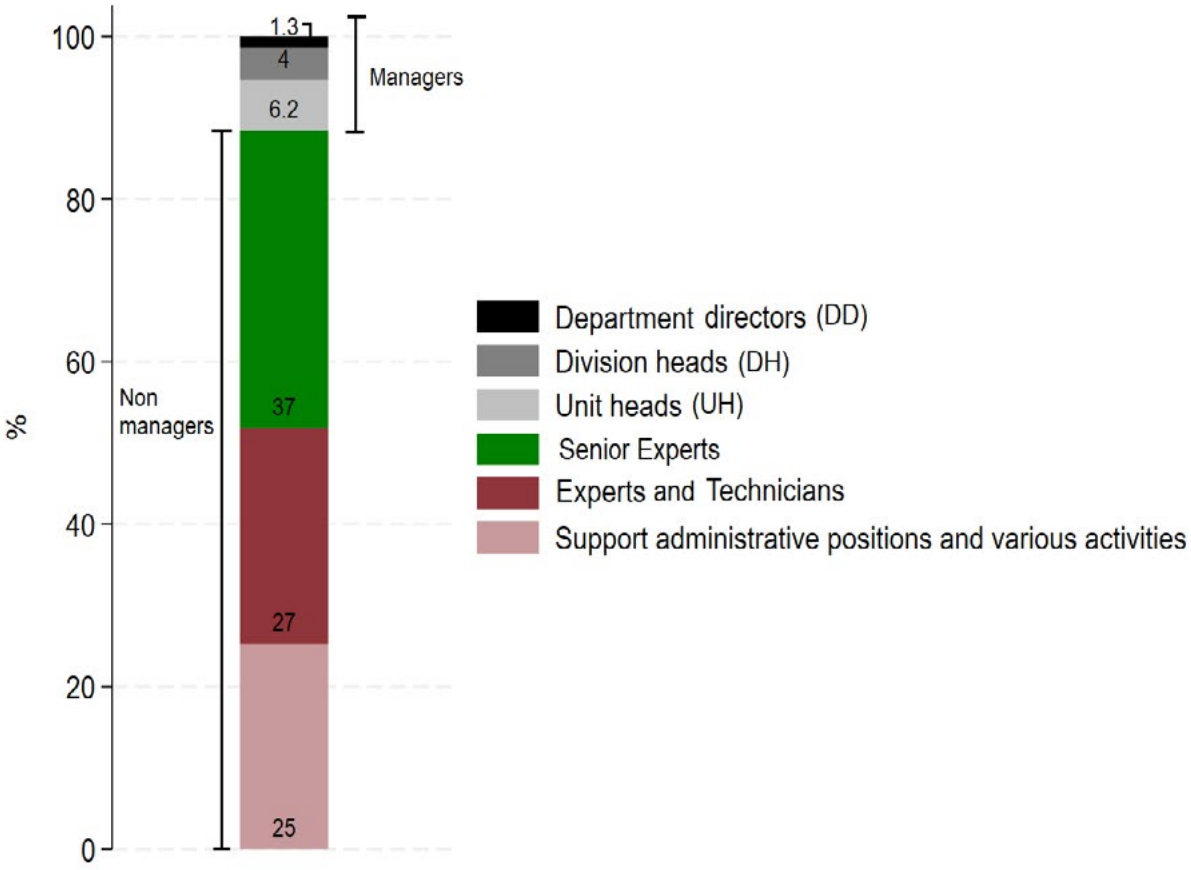


Table A1: Descriptive statistics (Subsample)

		Total	Men	Women
Time period: 2013-2023				
Observations (year-month)	n, %	90,806	51.27	48.73
Workers	n, %	1,524	51.64	48.36
Entry age (years)	mean	30.35	30.63	30.05
Age (years)	mean	42.24	42.65	41.81
Experience (years)	mean	12.74	13.05	12.43
Married	mean	0.59	0.59	0.58
Children	mean	0.52	0.51	0.52
Log(wages)	mean	11.20	11.27	11.14
Log(hourly wages)	mean	3.75	3.79	3.70
Hours of work	mean	36.27	36.89	35.63
Managers	mean	16.14	20.05	12.03
- Department director (DD)	mean	1.39	2.02	0.73
- Division head (DH)	mean	4.78	7.11	2.34
- Unit head (UH)	mean	9.97	10.92	8.96
Senior Experts	mean	36.75	37.48	35.97
Experts	mean	47.11	42.46	51.99
Probability of promotion	mean, %	1.38	1.42	1.34
- Vertical promotion	mean, %	0.90	0.92	0.87
- Direct appointment	mean, %	0.09	0.09	0.08
- Competitive call	mean, %	0.40	0.40	0.39

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