Evaluating the state and future prospects of gender balance and gender equality at a case company

Lappeenranta–Lahti University of Technology LUT

Master's thesis in Business Analytics

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Rahel Worku

Examiners: 1st Supervisor: Associate professor Jan Stoklasa

2nd Supervisor: Professor Pasi Luukka

ABSTRACT

Lappeenranta–Lahti University of Technology LUT

LUT School of Business and Management

Business Administration

Rahel Worku

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The objective of this master's thesis is to examine the state and the future prospects of gender representation and gender's impact on career development in a case company. The thesis consists of quantitative empirical research and a comprehensive literature review, which also includes suggestions on supporting gender equality at a workplace. There are four research questions in total, of which two are related to gender balance and representation, and two questions examine gender equality from the perspective of career development.

The first research question examines the trend of change in the proportion of women in new hires. Overall, the case company has hired relatively more women since 2010, and the overall result is statistically significant. This reflects on the result of the main research question which examines the overall gender balance ratio by 2030. The estimate is simulated using data on turnover and recruitment as input. The simulations end up in increased proportion of women by 2030. One reason for the increased proportion of women is the change in the case company's employee category distribution.

Gender's impact on promotion and resignation rates is examined using qualitative comparative analysis (QCA) as a research method. The overall gender difference in promotion rates is not significant, but the QCA provides evidence that belonging to a gender minority within a group of employees might be beneficial for both men and women. The overall gender difference in resignation rates is not significant, and the QCA was not able to detect patterns regarding gender resignation gap.

TIIVISTELMÄ

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Kauppatieteet

Rahel Worku

Sukupuolijakauman ja sukupuolten välisen tasa-arvon nykytila ja tulevaisuudennäkymät case-yrityksessä

Kauppatieteiden pro gradu -tutkielma

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Tämän pro gradu -tutkielman tarkoituksena on tutkia sukupuolijakauman sekä naisten ja miesten urakehityksen nykytilaa ja tulevaisuudennäkymiä case-yrityksessä. Tutkielma koostuu kvantitatiivisesta empiirisestä tutkimuksesta sekä kattavasta kirjallisuuskatsauksesta, joka sisältää myös ehdotuksia tasa-arvon tukemiseksi työpaikalla. Tutkimuksessa on neljä tutkimuskysymystä, joista kaksi keskittyy sukupuolijakauman ja representaation tutkimiseen, ja kaksi tarkastelee sukupuolten välistä tasa-arvoa urakehityksen näkökulmasta.

Ensimmäinen tutkimuskysymys tarkastelee muutostrendiä naisten määrässä uusien työntekijöiden keskuudessa. Case-yritys on palkannut suhteellisesti enemmän naisia vuodesta 2010, mikä on myös tilastollisesti merkitsevä tulos, ja mikä heijastuu päätutkimuskysymyksen vastaukseen. Päätutkimuskysymys estimoi case-yrityksen sukupuolijakauman kehitystä vuoteen 2030 mennessä, ja estimaatti simuloidaan yrityksen vaihtuvuudesta kerätyn datan perusteella. Simuloitujen tulosten mukaan naisten määrä kasvaa vuoteen 2030 mennessä. Yksi syy naisten kasvaneelle määrälle on muutos case-yrityksen työntekijäkategorioiden jakaumassa.

Sukupuolen vaikutusta ylennys- ja irtisanoutumisasteisiin tarkastellaan kvalitatiivisella vertailevalla analyysilla. Sukupuoliero ylenemismäärissä ei ole merkittävä, mutta analyysi osoittaa viitteitä siitä, että sekä naiset että miehet saattavat hyötyä edustaessaan vähemmistöä ryhmän keskuudessa. Sukupuoliero irtisanoutumismäärissä ei ole merkittävä, eikä analyysi havainnut viitteitä mahdollisille syille tähän liittyen.

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1 Introduction

The global gender gap in labor force participation was 27 percentage points in favor of men in 2020 (United Nations, 2021a). Women are underrepresented also in companies' strategic functions: globally, 28% of managers and 18% of chief executive officers were women in 2020 (United Nations, 2021b). Even though women have more educational attainments at the tertiary level than men (World Economic Forum, 2019), they are less likely to achieve power in politics, managerial positions, or high salary (World Economic Forum, 2021). Companies should promote gender balance because it is a matter of equity and social development – gender equality contributes to economic growth by increasing employment (European Institute for Gender Equality, n.d.). Furthermore, companies are proven to be more profitable and successful when they are more diverse (Chang & Milkman, 2020).

The topic of this master's thesis is gender balance which covers issues such as gender representation and equal opportunities. The main objective is to estimate the trend of change in the case company's gender balance ratio during 2010-2021 and to examine gender's effect on other career prospects within the same time period. The study is based on annual personnel reports and data gathered from recruitment, promotions, and terminations. These processes are chosen because they affect the most directly the number of employees in the company and its levels of hierarchy. The research methods are quantitative, which means that research questions are answered based on statistical and data analyses – however, the objective is also to review the literature regarding gender's role in working life and to gather suggestions on different actions for companies to take to achieve a diverse and inclusive workplace.

The case company operates in the chemical industry. Its headquarters is located in Finland, but it also has international operations. In December 2021, the proportion of female employees was 32.9%. One reason for the imbalanced gender distribution is the low proportion of women in blue-collar employees that work mostly in production lines – female employees are more represented in white-collar and upper white-collar employee categories.

As a concept, diversity covers other aspects than just gender. This thesis limits the examination of diversity to the gender aspect, but there are other aspects, such as ethnicity and age, that should be considered when examining diversity, equity and inclusion in the workplace. Furthermore, this thesis is limited to the female-male binary due to the lack of data points representing other gender identities. Additionally, the research papers used for the literature review were mostly concerned about examining the topic through the comparison of women and men, excluding gender minorities who do not fit the binary perception of gender.

The following subsections will provide a more in-depth introduction to the thesis topic, which includes a summary of previous research and the formation of research questions. The study structure is described in section 1.3.

1.1 Introduction to the topic

Gender equality is a matter of representation and equal opportunities. To be equally represented, resources and possibilities should be the same regardless of gender. Diversity, equity and inclusion (often shortened as DE&I) is a concept that aims to improve equality not only via representation but also through distribution of power, decision making, and inclusiveness. By utilizing for instance machine learning methods, companies could potentially explain gender differences in processes and events such as turnover, career development, and job satisfaction.

Recruiting is a direct way for a company to affect its gender balance ratio. Recruitment processes can be influenced by unconscious biases which means that gender stereotypes affect companies' hiring decisions or interview invitations. Multiple studies test for gender bias by sending identical resumes with both male and female names. The dependent variable used to measure the bias varies – some studies use the number of call-backs, and some studies use feedback from the recruiter as the explained variable. Moss-Racusin et al. (2012) implemented a randomized double-blind study for science faculty participants. The participants rated male applicants more competent and suggested that they should be offered more pay and mentoring (Moss-Racusin et al., 2012). A bit contrastingly, Booth and Leigh (2010) found a pro-female bias in received call-backs for occupations that were already more

represented by women (e.g., waitstaff). The outcomes of previous research differ, but some interesting findings are that the recruiter's gender (Cole et al., 2004; Erlandsson, 2019), the dominant gender in the workplace or industry (Riach & Rich, 2006; Birkelund et al., 2019), or the level of applied job (von Stockhausen et al., 2013) can explain the possible gender bias in recruitment. It could be assumed that these factors could also have an impact on career development via promotion decisions.

The findings of many studies on gender differences in career development suggest that gender has a significant impact on promotion possibilities (see e.g. Benson et al., 2021; Blau & DeVaro, 2007; Kauhanen, 2017). Kauhanen and Napari (2011) investigated gender differences in the careers of Finnish white-collar workers in the manufacturing field. They found out that men start their careers in higher positions than women and that men are more likely to get promoted than women. According to the study, educational choices and other background statistics have an impact on career development, but an unexplained gap remains even when those factors are controlled. (Kauhanen & Napari, 2011). Lyness and Heilman (2006) suggest that the gender promotion gap is due to stricter standards for women, i.e. female employees need to perform better to get promoted. Lack of promotion possibilities increases turnover intentions (Lee et al. 2019) thus career growth opportunities should be considered when examining gender balance.

A company's gender balance ratio is directly affected by new hires and terminations. As discussed above, promotion possibilities can have an impact on terminations. In addition to Lee et al. (2019), Shah and Khan (2015) also suggest that promotion opportunities, as well as job satisfaction, have a significant impact on turnover intentions. Thus, a significant gender resignation gap could indicate that there is a factor that causes gender differences either in career development opportunities or job satisfaction. The decision of leaving a company is affected not only by job satisfaction or career opportunities but also by demographic factors such as age, gender, marital status, and education (Emiroğlu et al., 2015).

Imbalance in different industries and occupations is called horizontal segregation, whereas vertical segregation refers to an imbalance in management positions and career development (Finnish institute for health and welfare, 2021a). From the perspective of a company that

wants to improve its gender balance, horizontal segregation has a direct impact on potential employees – companies can ensure that their recruitment processes and job advertisements are equal and inclusive, but they have virtually no opportunities to control the number of potential applicants (e.g., graduating students or professionals). However, companies can avoid vertical segregation and unconscious biases in decision-making. HR analytics frameworks offer a way to locate potential problems and explore the prospects of different strategies.

According to Blanks (2019), there are three types of HR analytics: descriptive, predictive and prescriptive analytics. Descriptive statistics can offer essential information on processes and states related to gender balance but to make predictions or assess event probabilities, more developed HR analytics tools are needed. Liu et al. (2020) discuss the benefits of predictive analytics and present an HR framework that consists of three stages – pre-analysis, analysis, and post-analysis. They mention that due to lack of data, small companies may have limited possibilities of developing predictive models but important insights can be found also in descriptive statistics (Liu et al. 2020).

According to Boudreau and Ramstad (2002), companies need to compete in the capital market, the customer market, and the talent market to be successful. Companies can utilize well-known practices in the capital markets (financial frameworks) and the customer markets (marketing frameworks). Talent markets, which are connected to talent and career management (i.e. HR organizations) lack practices that would support strategic decision making. (Boudreau & Ramstad, 2002). In this case, exploratory data analysis would give a good understanding of the current situation and the development of gender balance – however, causal relationships between factors such as gender and promotion probabilities when other features are controlled could be more accurately detected when using more advanced HR analytics.

1.2   Research questions

The general topic of this thesis is gender balance and equality working life. Gender balance is examined by analyzing the proportion of women in all employees, new hires and terminated employees. Gender equality is examined by analyzing gender's impact on career

development. The main objective is to estimate the overall gender balance ratio (i.e. the proportion of female employees in all employees) by 2030. The main research question is "*What will be the gender balance ratio of the case company in 2030?*". The answer to the main research question is provided at a company level and it will be simulated based on personnel reports from 2010 to 2021.

To provide further information and understanding on the development of gender balance, the trend for the gender distribution of new hires will be reviewed more in detail. The first research question is "*What has been the trend of change in gender distribution of new hires over the last years?*". The purpose is to test with statistical methods whether the observed trend of change has been significant or not.

According to previous research, gender has an impact on promotion probabilities (see e.g., Kauhanen, 2017). To provide information on internal career opportunities and possible gender inequalities, data on promotions will be examined. The second research question is "*Does gender affect promotion rates?*". Demographic variables and features that describe employees' positions in the company will be controlled in the analysis.

The third research question is "*Does gender affect resignation rates?*". Job satisfaction affects turnover intention, so the result of gender affecting resignation could indicate possible gender discrimination or other issues that decrease the level of job satisfaction only for men or women.

1.3   Study Structure

The goal of the thesis is to implement an in-depth analysis for the case company and to offer theoretical knowledge about the discussion around gender balance and gender equality. The introduction section presents the topic and its background. The literature review will provide theoretical background around the topic. Research methodologies and exploratory data analysis are presented in sections 3 and 4. The data process and possible limitations are explained in the 4th section. The results are presented in section 5, and they are discussed more in-depth in section 6. Conclusions and suggestions for the future are provided also in section 6.

2   Literature review

This chapter reviews literature related to gender equality in working life. Gender equality in recruitment, promotions, and turnover are discussed. The literature review consists of six subsections. Section 2.1 introduces the concept of diversity, equity and inclusion at work. Section 2.2 presents statistics related to gender equality. Sections 2.3, 2.4 and 2.5 review previous studies on gender in working life. Section 2.6 provides suggestions on how to promote gender equality at work.

2.1   Diversity, equity and inclusion

Diversity, equity and inclusion (often shortened as DE&I) is a concept that promotes equality. Diversity is related to representation (Heinz, 2021), and in the context of gender balance in working life, it could be measured by the gender distribution in a company. Equity refers to justice and fairness, and inclusion denotes a supporting and welcoming environment regardless of for example gender, age, race, ethnicity, disability, or sexual orientation (Heinz, 2021). DE&I initiatives support equal rights and opportunities regardless of one's background, and the intent is to pay attention to unconscious biases and accustomed norms (see sections 2.3, 2.4, and 2.5 for further discussion on biased behavior).

Hunt et al. (2015) detected a positive relationship between diversity and company financial performance – according to the research, companies in the top quartile of gender diversity or racial/ethnic diversity were more likely to outperform the industry median by 15% and 25% respectively. The research data included companies from United Kingdom, Canada, Latin America, and the United States. The authors suggest that diverse companies perform better due to a wider talent pool, stronger customer orientation, increased employee satisfaction, more efficient decision-making, and better company image (Hunt et al., 2015). For more support to this finding, see e.g. Lückerath-Rovers (2013). Thus, companies can benefit financially from supporting DE&I practices and initiatives.

Some professions have a strong gender imbalance which makes it difficult for companies to reach gender balance when hiring or promoting employees (see section 2.3 for further discussion on recruiting in sectors that have gender imbalance). However, equality or equity and inclusion can be measured by other metrics than representation statistics. Romansky et al. (2021) suggest that inclusion can be measured by asking employees' opinions on prospects such as fair treatment, decision making, and belonging. In addition to the level of inclusiveness (Romansky et al., 2021), answers to these questions can reflect perceived career opportunities or job satisfaction, which enables examining possible gender differences in the workplace. To conclude, DE&I initiatives strive to improve the representation of women and minorities, but their objective is also to create a genuinely inclusive and fair working environment where employees feel valued and supported.

2.2   Gender distribution in educational institutions and workplaces

Gender equality has improved significantly in the last half-century (see e.g., World Bank, 2020). However, the World Economic Forum (2021) reports that the global gender gap, which consists of dimensions of "Economic Participation and Opportunity", "Educational Attainment", "Health and Survival", and "Political Empowerment", will take 136 years to close worldwide. Key findings of Eurofound's (2020) report on gender equality in working life show that the main dimensions of job quality do not have major gender differences, but there are significant differences in many sub-dimensions that put women in a worse position compared to men. According to the report, men have better pay, slightly better career prospects, and better access to training. On the other hand, men are more likely to work in demanding physical environments and have also worse working time quality compared to women. The report states that mixed occupations that have a balanced gender distribution show better job quality in most dimensions and also report the smallest gender differences. (Eurofound, 2020).

Statistics on education are often used to describe the level of gender equality. Globally, women outnumber men in bachelor's and master's graduates, but only 43% of doctorates and 28% of researchers are women (Huyer, 2015). In OECD countries, the share of tertiary-level degrees earned by women aged 25-64 was 54% in 2018 (OECD, 2019). Even though women are more highly educated than men in many countries, the impact of degree does not

reflect in salaries and the distribution of top management positions – in 2019, the raw wage gap between men and women in OECD countries was 12.5% (OECD, 2019). An equal share of men and women graduate secondary school worldwide (World Economic Forum, 2019) so factors causing differences in further education attainment levels could also indicate prospects of working life.

Gender distribution by industry is another matter of interest when discussing gender balance in education. Multiple studies and statistical sources bring up gender segregation in the STEM (Science, Technology, Engineering, and Mathematics) sector where men form a vast majority – imbalanced gender distribution in a certain industry or educational field is called horizontal segregation (Finnish institute for health and welfare, 2021a). Horizontal segregation partly explains the raw gender wage gap (see e.g., Hegewisch et al., 2010) and therefore it could be considered a relevant factor in gender inequality. According to Leuze and Strauss (2016), occupations dominated by women have lower wages for two possible reasons. Devaluation theory suggests that the connection between lower wages and female-dominated occupations is that women and things associated with women are less valued in society. The other suggested reason is "female-typical" work-time arrangements, i.e. flexibility and the prevalence of part-time work which is usually due to childcare and domestic work. (Leuze & Strauss, 2016) Thus it could be concluded that horizontal segregation, the gender wage gap, and gender balance are strictly connected.

The headquarters of the case company and a majority of its workforce are located in Finland. When considering different prospects of working life, Finland is one of the most gender-equal countries in the world when measured by legal rights (see e.g. Women, Business and the Law 2020 report by World Bank, 2020). Labor force participation rates do not have major differences in Finland (OSF, 2021b), but it is more common for women to work part-time (OSF, 2021c). Educational requirements are common in Finnish working life. Horizontal segregation is very strong in Finnish educational institutes and workplaces – for instance, in 2018 only 9.2% of the Finnish workforce worked in professions that were not dominated by either men or women (Finnish institute for health and welfare, 2021a). The World Economic Forum (2021) ranks Finland as the second most gender-equal country out of 156 countries when measured by different criteria of economy, education, politics, and health. However, when examining only the criterion on the gender distribution of

"Legislators, senior officials and managers, %", Finland ranks only 51st place (World Economic Forum, 2021). According to the Finnish institute for health and welfare (2021b), horizontal segregation can be considered one of the reasons for the low share of women in top management positions in Finland.

2.3   Gender equality in recruitment

The Finnish Act on Equality between Women and Men states that employers should promote gender equality in recruitment by creating equal opportunities for career advancement and by ensuring that job vacancies are attractive for both men and women (Act on Equality between Women and Men, 2016). Even if equal recruitment was ensured by law, men and women do not always get the same treatment – discriminatory practices are sometimes due to conscious or unconscious biases. The difference between them is whether the bias is acknowledged: conscious bias refers to attitudes or intentions that one is aware of whereas unconscious biases are attitudes outside awareness (Laboy, 2021). Both unconscious and conscious biases can be discriminative but one separating factor between them is that unconsciously biased people are usually more willing to change their behavior. Shappell and Schnapp (2019) state that when "fit" is used or understood as a synonym for "similarity", the impact of unconscious biases could be reinforced which might maintain (cultural) homogeneity. They argue that homogenous communities might miss "opportunities to add valuable new perspectives" (Shappell & Schnapp, p. 635, 2019). By paying attention to biased behavior and attitudes, companies can reduce potential sources of discrimination and also gain valuable insights and different talents.

The scientific literature does not suggest that either women or men would be clearly in favor or discriminated against in recruitment. Findings on gender balance in recruitment are more mixed than research results on glass ceilings or gender wage gap which often suggest a pro-male bias. This could be due to the high proportion of women working in human resource organizations i.e. in recruitment – Erlandsson (2019) presents evidence for recruiters or recruiting managers being more likely to approach applicants that share their gender (except in male-dominated occupations where both female and male recruiters had a pro-male bias). The findings of Carlsson and Eriksson (2019) support this result: according to their study,

female recruiters and companies with a high share of female employees favor women in their hiring decisions. However, no such evidence was found in the case of men. (Carlsson & Eriksson, 2019). Bertogg et al. (2020) examined gender discrimination in recruitment in the mechanics and IT sectors. The study was implemented in Bulgaria, Greece, Norway, and Switzerland. Discrimination against women was detected in Bulgaria, Greece, and Switzerland, but not in Norway, and the degree of discrimination was higher in mechanics than in IT. (Bertogg et al., 2020). To conclude, gender has some impact on recruiting decisions, but it depends on the situation whether the bias is pro-male or pro-female.

There are two theories for explaining the cause of discrimination: taste-based discrimination theory and statistical discrimination theory. Taste-based discrimination theory assumes that the cause of discrimination is in prejudices and negative attitudes. According to statistical discrimination theory, discrimination is caused by stereotypes about productivity-related characteristics of a certain group and it is suggested to be a rational response to uncertainty. (Thijssen, 2016). González et al. (2019) investigated gender discrimination in recruitment by sending two pairs of equivalent resumes to 1372 job offers. The first pair differed by gender and qualifications (meeting standards or higher) and the second pair by gender and parenthood status. The researchers were able to detect a pro-male bias – furthermore, the bias was reduced when women had higher qualifications and increased when they had children. The authors suggest that gender bias in recruitment is caused by statistical discrimination (stereotypes about productivity) rather than prejudices against women. (González et al., 2019)

Recruitment is a direct way to impact the gender distribution of a company. To ensure gender equality in recruitment and hiring, companies and recruiters need to detect possible causes for discrimination, e.g. discriminatory behavior caused by unconscious bias. It is challenging to recruit equally from an unevenly distributed applicant population: the main reason for an uneven gender distribution is horizontal segregation. However, sometimes intentions to apply depend for instance on the job description or company reputation – to attract a diverse pool of applicants, these factors should be considered. Section 2.3.1 discusses factors that influence especially women's application intentions.

2.3.1 Recruitment, application intentions and gender

Assuming that gender discrimination or unconscious biases would not exist, the gender distribution of hired people should be directly dependent on the applicant pool's gender distribution. This subsection examines factors that affect the diversity of applicants. In addition to macroeconomic variables, company reputation, job characteristics, and social norms are discussed. Kazmi et al. (2021) state that the applicant pool's diversity should be increased to ensure inclusivity: "If URM [underrepresented minorities] and women do not apply, they cannot be hired" (p. 2). They also claim that when the representation of women or underrepresented minorities is low, their skills might be undervalued by employers which leads to lower probabilities of getting hired. The research results suggest that more women and underrepresented minorities apply for jobs when there are search committee members of respective groups. (Kazmi et al., 2021)

The number of women has increased in the workplaces mostly due to family reasons and changed gender norms as well as legislation such as the Equality Act 2010 that is applied in Great Britain (Jones, 2017; Government Equalities Office, 2015). However, horizontal segregation still causes imbalanced gender distribution in different occupations. Das and Kotikula (2019) argue that occupational segregation is dependent on still existing social norms where men are seen as providers and women as household managers: according to Muñoz Boudet et al. (2013), this leads to that female-dominated occupations such as teacher or nurse are just extensions of the image of a caretaker. A bit unexpectedly, it is argued that the level of gender segregation does not decrease in more egalitarian or more developed countries – this is called the "gender-equality paradox" (Breda et al., 2020). It is rather hard to determine the reasons behind the paradox or suggest actions to reduce segregation in developed and egalitarian countries. On the other hand, careers in science, technology, engineering, and mathematics (industries dominated by men) provide high wages and good employment opportunities, which could be one possible reason for women pursuing those careers in less egalitarian countries. Horizontal segregation is partly due to social norms, but there might also be economic factors that affect the segregation that vary between countries.

Russo and Ommeren (1998) examined the relationship between the gender balance ratio of the applicant pool and the hired applicants. They were not able to find a relationship between

economic conditions and the share of women. However, they found out that hiring probabilities for either gender are almost directly dependent on the applicant pool's gender balance ratio, i.e. a gender-imbalanced applicant pool would contribute to gender imbalance among recruited employees. The study suggests that job characteristics (e.g., firm size, type of employment), hiring standards (e.g., education), and occupational sector affect the applicant pool's gender diversity. (Russo & Ommeren, 1998). This leads to at least two separate conclusions: first, companies have limited possibilities of achieving gender balance in sectors that are heavily dominated by men or women. Furthermore, companies can change their standards so that job descriptions and job characteristics would be more attractive to both men and women.

Hentschel et al. (2020) explored the impact of gender-stereotypical wording in job advertisements and recruiter's gender on career opportunity evaluations. They found out that female-typical wording increased application intentions for women in the case of a male recruiter (the same relationship was insignificant in cases of a female recruiter). Advertisement wording or recruiter's gender did not affect men's evaluations on career opportunities. (Hentschel et al., 2020) In addition to paying attention to gendered wording, companies can impact the attractiveness of the job advertisements by providing additional information about the job characteristics. A large study conducted with LinkedIn data suggests that by describing the salary range and benefits, qualifications needed, day-to-day tasks of the role, company culture, and long-term career opportunities, companies can significantly increase applicants' interest in a position – the first four of the characteristics appeal more to women's than men's intentions. According to the study, by providing the salary range and benefits, intentions to apply increased by 68% for women and by 57% for men. (Ignatova & Tockey, 2019). In addition to job characteristics, diversity programs can also be important to the organizational attraction (Kecia & Wise, 1999).

Mohr (2014) surveyed over 1000 applicants who had not applied for a job because they did not meet the job requirements. The results suggest that women might be more prone to follow the rules or given guidelines but also to avoid failure (Mohr, 2014), which contributes to fewer applied jobs. The LinkedIn study revealed that women apply for 20% fewer jobs than men but once applied, they are 16% more likely than men to get recruited (Ignatova & Tockey, 2019). These findings indicate that women are more likely to apply for jobs when

they fully meet the criteria and because of that are more likely to be hired than men when they apply. Barbulescu and Bidwell (2013) studied job application behavior between similarly qualified female and male MBA students. Two of their objectives were to examine how identification with certain jobs and expectations about succeeding affect intentions to apply, and whether those factors differ between men and women. They found out that when applying for jobs in finance, women identified less with the masculine-stereotyped jobs which lowered their expectations of succeeding and thus intentions to apply. The researchers found this to be surprising, given that the women were already studying in a masculine environment (MBA program) and also that the women in the sample were more likely to have prior experience in finance than the men in the sample. (Barbulescu & Bidwell, 2013).

When considering the population of all potential applicants, horizontal segregation can be considered the main reason for possible gender imbalance. This applies also to the applicant pool – for instance, considering the current gender representation in health care workers and students, the probabilities that the applicant pool for a job in health care would be male-dominated are low. However, companies can ensure that their recruitment practices and job descriptions are inclusive and attract both men and women – for further discussion on inclusive recruitment, see section 2.6.

2.4   Gender balance in career development

Multiple studies have detected a pro-male gap in promotion probabilities (see e.g., Busch & Holst, 2011; Kauhanen, 2017). When employees are promoted internally, they typically move to a higher level in the company hierarchy. Thus promotions are connected to vertical segregation and the concept of the gender promotion gap is a matter of gender balance and equality. This section discusses the gender promotion gap in different situations and the reasons behind the phenomenon.

The glass ceiling refers to the difficulties women encounter when applying for managerial or top management positions. Busch and Holst (2011) examined the impact of the glass ceiling on the gender wage gap in managerial positions. They found out that 9.43% of the wage gap in their sample could be explained by the difference in promotion probabilities. Other exploratory factors in the model turned out to be human capital (49.6%), family

circumstances (1.08%), horizontal segregation (3.23%), and other control features (1.35%) so 35.31% of the wage gap remained unexplained (here, human capital refers to duration of education and factors that are related to work experience) The authors suggest that the unexplained gap might be due to discriminatory policies in the labor market. (Busch & Holst, 2011).

Benson et al. (2021) investigated the influence of employee "potential" ratings on gender promotion gaps in a sample of 30000 management-track employees. They found out that when controlling for job performance, women's potential was significantly underestimated compared to men's – and that the lower potential ratings were not forecasting accurately for the future. Up to 50% of the observed gender promotion gap could be explained by the lower potential ratings. (Benson et al., 2021). Lyness and Judiesch (1999) studied gender differences in promotions of financial service managers (N = 30996). They found out that relative to men, women were more likely to be promoted than hired into management positions. The researchers suggest that this might be due to the larger number of men in external candidates, or because male-dominated executive search firms (headhunters) might prefer male candidates over women. (Lyness & Judiesch, 1999). However, this finding would also be consistent with the research of Benson et al. (2021) since external hiring does not offer as much information about the employee potential as internal promotion – thus, women might have better chances to advance in their careers when the progression is dependent on their performance rather than potential. Cassidy et al. (2016) state that women's promotion probabilities are more sensitive to educational attainment, which also supports the argument of women needing more "proof" of their performance to get promoted.

Multiple studies investigate promotion probabilities by examining top management positions. This is probably because the proportion of women typically decreases when proceeding to higher levels in a hierarchy. However, the gender differences in promotion rates in earlier stages of career development are sometimes found to be more significant (e.g. Kauhanen, 2017) and therefore their impact on further career development and gender balance should be investigated. Women in the Workplace 2021 (Thomas et al., 2021) presents interesting statistics of 423 companies from the United States and Canada. According to the report, the talent pipeline i.e. the number of women in entry-level positions

compared to mid-managerial and top management positions differs by industry. By comparing the relative proportions of women in different industries, it would appear that a higher proportion of women at the entry-level reduces gender differences in probabilities of getting promoted to the middle management level. (Thomas et al., 2021). Hospido et al. (2019) investigated promotion rates among entry-level economists in the European Central Bank (ECB) from 2003 to 2017. They found that before 2011 there was a significant difference in promotion probabilities in favor of men. In 2010, ECB stated their support for diversity and initiated practices to support gender balance – from 2012, gender's impact on promotion probabilities was no longer significant. (Hospido et al., 2019). The ECB case is a great example of companies' possibilities of promoting equality and gender balance.

According to Kauhanen (2017), men have higher promotion rates than women, but the overall promotion probabilities as well as the relative gender difference decreases after the first years in the labor market. The study of Yap and Konrad (2009) supports this phenomenon. They examined the promotion probabilities of women and visible minorities at all job levels of a large Canadian company (N = 22 000). In the study, levels 4 and 5 presented the "feeder group" i.e. the intermediate level of hierarchy. They found out that at levels 4 and 5, white females, minority males, and minority females were less likely (5.6%, 10.1%, and 17.3% respectively) to be promoted than white male employees. The results suggest that the gender and minority differences in promotions decrease as moving higher in the company hierarchy. The only exception to this pattern were minority males that had higher probabilities of promotion in the intermediate than in the lowest level of hierarchy (but still lower probabilities than white males had). (Yap & Konrad, 2009). These findings indicate that gender differences in promotion rates are higher in the early stages of a career, i.e. men are moving for instance to mid-managerial positions faster than women.

The gender promotion gap and vertical segregation are connected to the gender wage gap and the distribution of power in society. The result of most studies is that women are less likely to get promoted than men, even when performance and human capital are controlled. According to Mengel (2020), potential explanations for the gender promotion gap are differences in personal characteristics, family-related reasons, cultural pressures, and gender discrimination. Section 2.4.1 discusses common explanations behind the promotion gap.

2.4.1   Reasons behind the gender promotion gap

Benson et al. (2019) investigated data on 214 sales firms to find out whether performance has an impact on promotion to a manager position. They found out that the firms prioritized sales performance in their promotion decisions (Benson et al., 2019). Performance is not the only thing that has an impact on promotion rates. Beehr and Taber (1993) list four components that affect promotion probabilities based on employees' perceptions: exceptional performance (e.g., leadership ability, long working hours), reliable role performance (e.g., good attendance, seniority), personal characteristics (e.g., gender, educational level) and luck and favoritism (e.g., how well your supervisor likes you). The last two of the components are described as "role-irrelevant" (Beehr & Taber, 1993). When discussing the gender promotion gap, the role-irrelevant factors can be connected to discrimination and biases for instance in cases where gender congruence affects the supervisor's preferences of who to promote. Performance-related factors can be affected by gender as well. For example, assuming that long working hours would indicate good performance, men and women might have differences in the possibilities or in willingness to work late. According to a Canadian study, women spent 5.6 hours less per week in paid work than men in 2015. The report author suggests that women working fewer paid hours is due to the amount of time spent in childcare and housework (Moyser, 2017).

The gender promotion gap is sometimes explained by the challenges involved in reconciling work and family life. Smith et al. (2013) estimated promotion probabilities for VP (vice president) and CEO (chief executive officer) positions using data on Danish companies from 1997 to 2007. The researchers were able to detect a raw gender promotion gap of 0.6 percentage points when promoting potential top executives into VP positions, and a gap of 1.7 percentage points when promoting VPs into CEO positions. The study objective was to examine possible factors explaining the gap, and the explanations were sought both for employee characteristics (e.g., time on parental leave) and company characteristics. A part of the CEO promotion gap could be explained with the area of specification – VPs of HR, R&D and IT have significantly lower probabilities of getting a CEO promotion than CFOs (chief financial officers) or VPs of sales or production, and since women in top management tend to cluster in HR positions, their promotion probabilities are lower. Time out of the labor market and child-related decisions explained a significant part of the gender promotion gap.

In detail, having children increased promotion probabilities for men, but not women. On the contrary, taking parental leave had more strong negative effects on men's career prospects. For women, the age at first childbirth had a strong negative correlation with CEO promotion probabilities, i.e. having children at a relatively young age increased the chances of being promoted to the CEO position. One of the study hypotheses was that female-led companies hire more women into top positions, but the hypothesis could not be confirmed – in some cases, female-led companies actually hired fewer women into top positions. (Smith et al., 2013)

Researchers have examined the impact of social networks on career development (see e.g., Renneboog & Zhao, 2011; Beaman & Magruder, 2012). Barnard-Bahn (2021) states that in addition to performance, promotions are often dependent on relationships at work. Mengel (2020) conducted a laboratory experiment to investigate whether men and women differ in terms of networking and how the possible differences affect the gender promotion gap. The networks of men were found to be more homophilous than women's networks, i.e. men had more same-sex ties compared to women. Men also had slightly more out-going ties in their networks. These differences were not systematically related to promotions, and no gender discrimination was observed. However, a tendency for favoring "network neighbors" was detected for men. Mengel (2020) concludes that this tendency combined with homophilous networks might explain the gender promotion gap. They also remind that the experiment was gender-balanced, whereas in real life the gender distribution of managers or other decision-makers is often male-dominated – therefore the relationship between men-favoring-men and the gender promotion gap might be more significant than in this experiment. (Mengel, 2020)

Multiple studies have investigated whether men and women differ in characteristics such as competitiveness and risk aversion that would explain the gender promotion gap (see e.g. Gupta et al., 2013; Flory et al., 2015). Niederle and Vesterlund (2007) conducted a laboratory experiment that examined whether men and women of the same ability differ in their preferences for competition. The participants in the experiment first had to complete a task under a "piece rate" (each correct answer yields money) and then in a competitive tournament (each correct answer yields four times more money compared to the piece-rate scheme, but the tournament winner is the only one receiving money). After participating in

both schemes, men were twice as likely than women to choose the tournament option for the next performance. The authors suggest that the gender differences in preferences for competition might partly explain the low number of women in top management or very competitive positions. (Niederle & Vesterlund, 2007). In addition to gender differences in competitiveness, it is sometimes discussed whether women earn less money than men because they do not "ask" (Bowles & Babcock, 2012). Bowles and Babcock (2012) argue that women face a dilemma when negotiating higher compensation because they are then considered less nice and more demanding – and that men do not suffer as much of these negative social consequences (pay rise can, to some extent, be equated with promotions).

In general, the gender promotion gap and career development opportunities are affected by social and cultural norms, behavioral differences (e.g. risk aversion), and preferences (e.g. unconscious bias). Section 2.6 presents actions for companies to take to reduce the possible gender promotion gap.

2.5   Gender and turnover

Employee turnover refers to employees who are leaving a company for any reason. Some common reasons for termination of employment include dismissal and layoffs (both at the employer's initiative), retirement, expiry of a fixed-term contract, and resignation (voluntary termination at the employee's initiative). Since there might be gender differences between employees who have left (e.g., of retired people a majority is men), examining turnover is relevant to the gender balance topic. A high turnover rate is expensive for companies directly due to costs incurred by recruitment and induction. Agyeman and Ponniah (2014) state that in addition to increased costs, high turnover also reduces production and might cause problems in cooperation and coordination between employees. They state that strategies for minimizing the turnover rate are increasing job satisfaction and providing good career development opportunities. (Agyeman & Ponniah, 2014).

According to data collected from LinkedIn users, the top three industries with the highest turnover rates are technology (software), retail and consumer products, and media and entertainment (Petrone, 2018). Petrone (2018) suggests that high turnover in technology is likely due to increasing demand for employees. For retail, the reason for high turnover is the

changing industry, i.e. more traditional sales channels are giving way to e-commerce platforms. High turnover in media and entertainment is also reasonable since it is a project-focused industry and the demand for employees is constantly changing. (Petrone, 2018). Since turnover rates are affected by industry, gender differences in turnover behavior are probably affected by the industry as well. Furthermore, women are significantly more likely to work in the public than in the private sector (see e.g., OSF, 2018). Thus, workforce supply and demand have an impact on employee turnover. The data for this thesis is collected from one company, and occupational differences can be controlled by including variables such as business unit – the interest is to see whether gender has an impact on turnover if relevant features, that describe the type of employment, are controlled.

This section will mainly focus on resignation. An employee's propensity to resignation is often referred to as "turnover intention" in scientific literature. Turnover intention is affected by job satisfaction (Sousa-Poza & Sousa-Poza, 2007; Lai & Chen, 2012), and possible gender differences in either of them could indicate favoring men or women in the workplace, discriminatory practices, or poor career prospects – thus, the turnover intention is a matter of gender equality and inclusion. Turnover intention is also negatively related to organizational commitment and loyalty (Aguwamba et al., 2019). Redmond and McGuinness (2019) detected greater job satisfaction among women than men using data from 28 EU countries, which is consistent with previous research. The gender gap emerged even when controlling for personal, job, and family characteristics, but when including job preferences such as prospects of career development and work-life balance as explanatory variables, the gap disappeared. (Redmond & McGuinness, 2019).

Ladik et al. (2002) examined the relationship between job satisfaction and propensity to leave the firm while using gender, performance, and duration of employment as moderating variables. The research data was conducted in the field of sales. The results suggest that job satisfaction affects turnover intention more significantly for low-performing than for high-performing employees. The researchers also found out that high-performing men had a greater propensity to leave than high-performing women, indicating that high-performing women might be more loyal to the company. (Ladik et al., 2002). Callister (2006) investigated how gender and perceived department climate affect job satisfaction and turnover intention in science and engineering faculties. On the contrary to the research of

Ladik et al. (2002), Callister (2006) detected lower levels of job satisfaction and higher intentions to resign for female faculty members compared to male faculty members. However, perceived department climate was found to completely mediate gender's impact, suggesting that women might put more value on department climate whereas the job satisfaction levels of men might not suffer as much from negative department climate. (Callister, 2006). Sousa-Poza and Sousa-Poza (2007) investigated the relationship between job satisfaction and turnover intention, and whether gender has an impact on the possible relationship. They found out that low job satisfaction does not affect the decision to leave the labor market altogether. It was discovered that the decision to change jobs is influenced by low job satisfaction – however, no gender differences were detected in the relationship. The study sample consisted of data from Swiss households (N = 14134) in 1999 and 2000. (Sousa-Poza & Sousa-Poza, 2007). Studies on job satisfaction and turnover intention report varying results on gender's impact on the relationship, and the impact seems to be moderated on factors such as performance.

Aguwamba et al. (2019) detected a negative relationship between career progression and turnover intention. Previous research suggests that employees that are not encouraged career progression have a lower organizational commitment and higher intentions of leaving the company (Aguwamba et al., 2019; Nouri & Parker, 2013). Career growth opportunities are related to the glass ceiling phenomenon and gender promotion gap which was discussed more in detail in section 2.4 – in general, women have lower promotion probabilities than men (see e.g. Kauhanen, 2017). Lyness and Judiesch (2001) investigated the relationship between gender, promotions, and voluntary turnover for financial service managers (N = 26359). They found out that promoted managers were less likely to resign than managers who were not promoted, but the difference was significant only in cases where the promotion had occurred within the past 11 months. Contrary to their hypothesis, female managers had overall lower turnover rates than male managers, and this was also the case when comparing managers who had been promoted. (Lyness & Judiesch, 2001). Yun (2014) studied employee turnover behavior in the hotel industry. When controlling for variables such as compensation, marital status, and job level, the turnover rates for men turned out to be over twice as large compared to women. However, job level did not affect male employees' turnover rates, while it had a strong negative relationship with female employee's turnover. The author reminds that the hotel industry is very female-dominated (Yun, 2014) which

could also have some influence on the turnover behavior of both men and women. Therefore industry and company characteristics should be considered when examining gender's impact on turnover behavior.

Personal characteristics are sometimes used to explain turnover behavior. Khalid et al. (2009) examined the relationship between OCB (organizational citizenship behavior) and turnover intention using gender as a moderator. The detected relationship was negative, meaning that employees that are more patient, conscientious, and helpful are more likely to stay. Gender moderated the relationship between helping behavior and turnover intentions so that the negative relationship was stronger for women compared to men. (Khalid et al., 2009) In addition to organizational commitment, turnover intention can be explained by risk aversion – according to van Huizen and Alessie (2013), job mobility is risky due to the limited information regarding outside job offers. Therefore it could be assumed that employees that avoid risks are less likely to resign. Van Huizen and Alessie (2013) examined this assumption using Dutch panel data and were able to detect a negative relationship between risk aversion and turnover intentions. Women tend to be more risk-averse than men (Borghans et al., 2009) so given all else equal, these findings could indicate that women are less likely to resign in general. Mano-Negrin (2003) investigated gender differences in the relationship between career opportunities and turnover behavior. According to the study results, men are more affected by "objective" opportunities which refer to company characteristics such as company size and affiliation (type of ownership, e.g. public and private companies). Women, on the other hand, are more affected by perceived career opportunities, i.e. women's turnover behavior is more dependent on "social-role-filtered" prospects. (Mano-Negrin, 2003) This indicates that poor internal career growth opportunities might have a larger negative impact on female employees' turnover intentions.

The impact of gender distribution in a workplace on recruitment and promotions was discussed in sections 2.3 and 2.4. Nielsen and Madsen (2017) examined how gender diversity correlates with job satisfaction and turnover intentions, and whether the relationship is different for men and women. The researchers included employees of 13 different occupations in the study sample, and the gender diversity variable was determined based on the gender distribution in the workplace. A correlation between organizational gender diversity and job satisfaction could not be detected for either men or women.

However, it was found that organizational gender diversity is negatively correlated with turnover intentions among female employees, i.e. the more diverse the organization is, the lower the turnover intentions among female employees. (Nielsen & Madsen, 2017). This finding is consistent with some previous research – the level of gender diversity is sometimes found to affect more female employees' behavior (for recruitment decisions, see e.g. Carlsson & Eriksson, 2019). However, these studies do not consider the manager's gender or gender congruence (whether the manager and employee represent the same gender) as an explanatory variable. Grissom et al. (2012) examined whether a manager's gender and gender congruence affect job satisfaction and turnover. Their sample consisted of 33900 public school teachers and principals. Overall, women were more satisfied with their jobs and less likely to resign than men. The researchers were able to detect a general preference for male managers and masculine leadership. The preference for male managers was the most significant among men with female managers – male teachers with female principals were more likely to resign and had lower job satisfaction. (Grissom et al., 2012).

Scientific literature offers mixed results when considering gender's impact on resignation. On the other hand, the negative relationship between job satisfaction and turnover intentions has been detected in several studies. Therefore, gender differences in job satisfaction might also indicate gender differences in voluntary terminations. According to Agyeman and Ponniah (2014), demographic variables such as gender moderate the impact of workplace characteristics on job satisfaction – indicating that men and women might have different preferences regarding workplace characteristics such as career development opportunities.

2.6   Strategies for promoting gender equality

Companies can communicate their gender equality initiatives both internally and externally. One way of internal communication is arranging training related to diversity and gender equality. Using unconscious bias training as an example, Madsen (2017) suggests that training should include examples of typical workplace situations to make it more relatable. They also suggest that training should offer strategies to reduce the impact of unconscious bias (Madsen, 2017), which in this context could, for instance, refer to practices for recruitment. Another example of internal communication is transparency – the objectivity of

decision-makers (e.g., managers) can be increased by enhancing the level of transparency of promotion decisions and other selection criteria (Government Equalities Office, 2017). From a gender balance perspective, successful external communication makes the employer more attractive to a wider pool of talent, so strategies for improving the employer image are mostly focused on recruitment channels. For instance, avoiding gendered wording and expressions in job advertisements (Collier & Zhang, 2016) and using a variety of communication channels (Tipper, 2004) could attract a more diverse applicant pool.

It is argued that balancing work and home might be harder for women due to the norms in society where women are expected to do more of the domestic work. According to Bohnet (2021), employers should offer flexible options for working (e.g., remote and part-time work options) to increase the level of work-life balance and job satisfaction. They suggest that employers should also support employees taking parental leaves and encourage especially men to do so. Flexible work opportunities have proven to attract more candidates, but especially more women, which increases the number of potential applicants (Bohnet, 2021).

Several recruitment strategies can help companies correct the possible gender imbalance, and some of the practices can be applied to internal promotion processes as well. A structured interview means that all candidates are asked the same questions in the same order, and answers are then scored individually based on predefined criteria – the purpose is to increase candidate comparability and focus on information that is relevant for job performance (Bohnet, 2016; Government Equalities Office, 2017). For similar reasons, work sample tests or tasks can be performed during a recruitment process (Knight, 2017). Some companies have introduced blind recruitment as a recruitment strategy, which means that information that reveals a candidate's identity (e.g., features such as gender, race, and age) are removed from job applications (Rinne, 2018). According to Rinne (2018), blind recruitment can increase applicant comparability and prevent discrimination, but it can also postpone discrimination and the impact of unconscious bias later in the recruitment process. Johnson et al. (2016) suggest that including more diverse candidates in a selection pool might reduce the impact of unconscious bias – according to their research, if a job applicant is a woman or belongs to a minority, their chances of being recruited are minimal when they are the only representation of their group in the applicant pool.

Gender equality and gender representation can be improved also by setting guidelines for employee selection. Gender quotas set a limit for gender imbalance for instance in corporate boards (e.g., at least 40% representation of both men and women). Gender quotas are sometimes criticized because their use might be seen as unjust and because they can lead to tokenism or potential stigma for the underrepresented group (He & Kaplan, 2017). However, having more female representation through gender quotas can improve the career opportunities of other women in the organization (Smith, 2018), and it could be assumed that the impact would apply to other women in the society as well. Positive action means that when candidates are equally qualified, candidates of the underrepresented gender are preferred. Positive action is legal, but using it should be decided in advance and it should be implemented only in situations where underrepresentation or discrimination is present. (Non-Discrimination Ombudsman, n.d.). Making positive action could be relevant in industries that are significantly dominated by either men or women.

3   Methodology

Section 3 presents the methodologies used to answer the research questions. The general goals and practices are described, as well as method justification. Three different methodologies are used to answer the research questions, and the same method (QCA) is applied for research questions 2 and 3.

3.1   Time series regression

Time series regression is a method that forecasts the time series Y (dependent variable) assuming that it is in a linear relationship with time series X (Hyndman & Athanasopoulos, 2018). In this research, the dependent variable Y is the proportion of women in new hires, and the predictor variable X represents time which is converted to an integer array. The trend regression formula is

$$y_t = B_0 + B_1 x_t + \varepsilon_t \tag{1}$$

where B_0 represents the intercept (the value for Y when X is 0), and where B_1 represents the slope i.e. the average change in Y when X increases by 1 (Hyndman & Athanasopoulos, 2018). The error term ε_t denotes the "unexplained" part of the model (Hyndman & Athanasopoulos, 2018). In addition to examining the size of coefficients B_0 and B_1, the coefficient significance needs to be reviewed. Test statistic t that determines the coefficient significance is calculated as follows

$$t = \frac{B_1}{S_b} = \frac{B_1}{S_e / \sqrt{(x - \bar{x})^2}} \tag{2}$$

where B_1 is the slope and S_e is the residual standard error (the t-statistic follows the t-distribution with n-2 degrees of freedom) (Hartmann et al., 2018). According to Hartmann et al. (2021), the null hypothesis for the slope significance is that B_1 equals 0. At a 5% significance level, the null hypothesis is rejected if the absolute value of t is greater than

1.96, or if the p-value is less than 0.05 (Hanck et al., 2021). The threshold of 1.96 for the t-statistic applies to large sample sizes (University of Washington, n.d.) – for small sample sizes, the threshold is larger (Dougherty, 2002) which contributes to a stricter limit for rejecting the null hypothesis. The p-value is calculated based on the t-statistic, so the interpretation of either p-value or t-statistic corresponds to each other (Hanck et al., 2021).

Linear regression is a widely used tool for examining the relationship of two or more independent variables. The interpretation of the regression results is quite intuitive, which is why it is chosen for gathering statistical support for the first research question. For further knowledge on time regression analysis, see e.g. Hanck et al. (2021), Hyndman and Athanasopoulos (2018), or Ostrom (1990).

The first research question examines the historical trend related to the gender balance ratio of new hires during 2010-2021. The main objective of the first research question is to gain an understanding of the development to make assumptions regarding the main research question. The trend is reviewed both visually (see section 4.2) and statistically (see results in 5.1).

3.2   Qualitative comparative analysis (QCA)

The research method used in the second and the third research question is qualitative comparative analysis (QCA). According to Legewie (2013), QCA seeks to detect complex causal connections by combining within-case analyses and formalized cross-case comparisons. Within-case analysis refers to in-depth analysis of the case, e.g. gaining relevant knowledge of the case by using either qualitative or quantitative methods. Formalized cross-case comparison refers to detecting causality by using QCA tools such as a truth table and boolean minimization. In QCA, the analyzed phenomenon (Y) is called an *outcome*, and the cause for the outcome (X) is called a *condition*. Causality is examined between the outcome and different combinations of the conditions (also called configurations), and one definition for complex causality is that one causal factor (condition) might have an opposite effect on the outcome depending on how it is combined with other causal factors (conditions). (Legewie, 2013).

According to Ragin (2009), there are two types of QCA; crisp-set qualitative comparative analysis (csQCA), and fuzzy-set qualitative comparative analysis (fsQCA). Crisp-set QCA uses boolean logic for membership assignment which means that each case is either in/present (1) or out/not present (0) within a certain domain (Ragin, 2009). Fuzzy-set QCA uses fuzzy logic for membership assignment which means that membership scores are scaled between the range of 0 and 1, and therefore cases can be partially present within a certain domain (Ragin, 2009). The method chosen for this research is crisp-set QCA (referred to as QCA from now on), so the conditions and the outcome are either "fully" in or out in a certain domain.

A couple of things should be considered when performing QCA. First, there should be at least 10 separate cases in the analysis to perform well and get interpretable results (Simister & Scholz, 2017). Simister and Scholz (2017) also remind that QCA cannot cope with missing data – if there is not enough data on a certain case or a certain condition, the case or condition should be removed which can lead to ignoring important factors or misinterpretation of necessary and sufficient conditions.

According to Legewie (2013), causality between conditions or configurations and an outcome is examined via necessity and sufficiency in QCA. Necessity refers to a situation where the outcome is not possible without a certain condition, i.e. the condition is necessary for the outcome to be present. Sufficient conditions are always present when the outcome occurs, but the outcome can occur also without the condition being present (i.e. other conditions or configurations can produce the outcome). In real-life cases, it is common that a condition is not completely necessary or sufficient for an outcome – the level of necessity or sufficiency can be measured with QCA metrics consistency and coverage. Consistency denotes the level of necessity or sufficiency between a condition and an outcome, and coverage measures empirical relevance. (Legewie, 2013). The formulas for calculating consistency and coverage are

$$\text{Consistency } (X \rightarrow Y) = \Sigma \, [\min (X_i , Y_i)] \, / \, \Sigma \, (X_i) \qquad (3)$$

and

$$\text{Coverage } (X \leftarrow Y) = \Sigma \, [\min (X_i , Y_i)] \, / \, \Sigma \, (Y_i) \qquad (4)$$

where X equals the condition (or configuration) and Y equals the outcome, and where min(X_i, Y_i) refers to their intersection (adapted from Cotte Poveda & Pardo Martínez, 2013 and Wagemann & Schneider, 2007). In other words, in crisp-set QCA the sum of min(X_i, Y_i) equals to the number of all cases where both X and Y are present.

QCA seeks to detect causality. One way of identifying patterns i.e. sufficient and necessary conditions for an outcome is *boolean minimization* (Legewie, 2013). According to Legewie (2013), the goal of boolean minimization is to generalize configurations. Following the example of Legewie (2013, section 3.4.1); if there were three conditions A, B, and C and an outcome Y was produced both when all three conditions were present and also when conditions A and B were present but condition C was not, it could be concluded that the presence of A and B is sufficient for the outcome Y to occur (regardless of the presence of condition C) – see Table 1 for visual presentation of the example.

Table 1. Example of boolean minimization in QCA

Case	A	B	C	Y
1	1	1	1	1
2	1	1	0	1
3	1	0	1	0
4	0	1	1	0
5	1	0	0	0
6	0	1	0	0
7	0	0	1	1
8	0	0	0	0

The example of sufficient configurations is presented in Table 1. The configuration of conditions A and B being present is sufficient, but it is not necessary since case 7 also produces the outcome Y. There are software packages that can perform the boolean minimization process (see e.g. Legewie, 2013; Longest & Vaisey, 2008) but when the number of configurations producing an outcome is low, the minimization i.e. the process of detecting sufficient and necessary conditions can also be done manually.

Schneider and Wagemann (2010) state that "QCA should be perceived of both as a research approach and a data analysis technique" (p. 19). One of the objectives of QCA is to capture case characteristics accurately, which refers to the qualitative aspect of the method. Thus, QCA should not be applied only in a mechanical way (e.g., entering input data and interpreting the resulting consistency and coverage values). (Schneider & Wagemann, 2010). QCA is sometimes compared to statistical methods such as regression analysis; according to Vis (2012), regression analysis seeks to assess the net or average effects (coefficients) of "X" on "Y", while QCA accounts for configurations and the magnitude of impact is described with consistency and coverage values. They conclude that QCA helps to identify the "effects-of-(multiple)-conditions-of-causes" in a broad picture and that "adding a configurational approach to a regression analysis helps to uncover patterns in the empirical data that otherwise would have remained hidden" (Vis, 2012, p. 192). Thus, since the qualitative aspect of QCA is essential, QCA as a methodology should not be compared directly to quantitative methods that rely mainly on statistical inference. Rather than considering QCA as an alternative to quantitative methods (e.g., regression analysis), QCA could be used as a supplement for these methodologies (Vis, 2012).

Roig-Tierno et al. (2017) have explored the use of QCA methodology in scientific articles – according to their research, QCA is most used in the areas of "comparative politics", "business and economics", "sociology", "management and organization" and "research and political health". Roig-Tierno et al. (2017) argue that QCA is popular in these areas since they involve more human characteristics compared to areas such as economics "where statistical data weigh more heavily in the description of reality" (p. 19). Human resources is an area where human characteristics play an important role, and therefore the use of QCA is justified in this research. Some examples of the research topics that are examined by using QCA are gender time equality (see Gasser et al., 2014), the relationship between human resource management practices and radical innovations (see Backes-Gellner et al., 2016), and the relationship between gender equality and female entrepreneurship (see Li et al., 2021).

QCA methodology is chosen for this research for a couple of reasons. First, many of the relevant variables affecting career development are categorical (e.g., employee category) with which QCA copes well. Job Family feature is relevant for the research since it could be

assumed that internal promotions or resignation rates are depending also on organizational changes and business needs; hypothetically, if a male-dominated job family would expand and a large share of employees would be promoted, that would increase the overall promotion rates for men even if the expanding job family would promote women and men at an equal rate. QCA is built for detecting complex causality and non-linear relationships, which is another reason why it is implemented in this study. For instance, in the "expanding job family" example, employee tenure could have a different impact on turnover intentions depending on the gender of an employee. Furthermore, QCA can detect patterns in cases where the sample size is small, which might be interesting in real-life situations (e.g. a very significant gender difference in a small unit of people) – regression-based methods would not necessarily detect the smallest patterns.

In the study, employee characteristics such as job family and employee category will represent the QCA conditions i.e. the dividing factors between employee groups. The outcome Y describes the gender difference within a group. The significance of the gender difference is "confirmed" by using a two-proportion z-test (see section 3.2.1).

3.2.1   Two-proportion z-test

To determine whether the gender difference within a case is statistically significant, a two-proportion z-test will be performed. The two-proportion z-test tests if two proportions are the same. The formula for the z-statistic is

$$z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}(1-\hat{p})(\frac{1}{n_1}+\frac{1}{n_2})}} \tag{5}$$

where $\hat{p}_1$ and $\hat{p}_2$ describe the two separate proportions, and n_1 and n_2 describe the relative sample sizes (Kumar, 2022). The overall sample proportion is described with $\hat{p}$ (Kumar, 2022.), and it can be calculated as follows

$$\hat{p} = \frac{n1\hat{p}1 + n2\hat{p}2}{n1+n2} \tag{6}$$

According to Glen (n.d.), the null hypothesis (H0) in the two-proportion z-test is that the two proportions p_1 and p_2 are the same, and the alternate hypothesis (H1) is that the two proportions are not the same. The null hypothesis can be rejected if the calculated z-statistic (converted to an absolute number) is larger than the z-score associated with the chosen confidence level. Using a confidence level of 95%, the threshold (z-score) for rejecting the null hypothesis is 1.96. If the absolute z-statistic calculated is larger than 1.96, the null hypothesis can be rejected and the two proportions are not the same. (Glen, n.d.). When performing a two-proportion z-test, the sample size should be greater than 30 (Glen, n.d.; Afthanorhan et al., 2014).

Two-proportion z-test was chosen for this part of the analysis because it is a simple way to gain statistical support to compare two samples. Also, the formula of the z-statistic takes the sample sizes into account, which is convenient when two samples differ significantly in sample size (e.g., an imbalanced gender distribution).

3.3   Monte Carlo simulation

The research method used in the main research question is the Monte Carlo simulation. The main research question examines the gender balance ratio of the case company, and the idea is to consider recent changes in the personnel data and build an estimate for the future based on that. Things that directly affect future changes in the gender balance ratio are the number of recruited employees, the number of terminated employees, the gender balance ratio of the recruited employees, and the gender balance ratio of the terminated employees. There are a lot of internal and external factors that contribute to these four parameters, so the development of the gender balance ratio can be considered very uncertain. However, if assuming no radical changes (e.g., doubling the headcount annually), some limits can be set for the parameters.

The Monte Carlo simulation method is used to predict or forecast uncertain situations (Kenton, 2021) which is why it is used to answer the main research question. According to Kenton (2021), the goal of Monte Carlo simulation is to achieve an estimate for a certain outcome by simulating its probability distribution. The probability distribution is modeled

by repeating the process of assigning a random value for the uncertain variable(s) and calculating the outcome with the random value. In addition to estimating the average value for an outcome, Monte Carlo simulation models can be used to describe risk or uncertainty related to a certain outcome. (Kenton, 2021).

The Monte Carlo method can be used for a wide set of applications. The technical aspect (implementation) of Monte Carlo is not complex, and it is quite intuitive to understand. The uncertain variable is defined based on the minimum and maximum values which are based on inputs defined by the user. What needs to be defined as well is the type of the probability distribution for the uncertain variable. Some common probability distributions used in Monte Carlo simulations are normal distribution and uniform distribution (Palisade, n.d.). When the range for the uncertain variable is defined, the calculation is repeated multiple (e.g., thousands or tens of thousands) times which will produce a probability distribution for the outcome.

According to Pfau (2016), the advantage of using Monte Carlo is that it permits a more extensive variety of scenarios to be produced than the possibly limited historical data can provide. In other words, the relationship between the input and output can be analyzed more deeply in Monte Carlo compared to other methods. According to Howard (2019), a disadvantage concerning the Monte Carlo method is that it is computationally inefficient since its implementation takes a lot of time compared to other methods. Furthermore, the reliability or "goodness" of the results are strictly connected to the input variable definition, i.e. if the uncertain variable is defined poorly, the results will also be poor (Howard, 2019). Thus, there needs to be an understanding of how the uncertain variable might behave, e.g. what are the realistic minimum and maximum values it can take.

Monte Carlo is often used in financial applications (Kenton, 2021), but there are examples of its use in the field of social sciences as well. For instance, Milbank (2020) simulated employee turnover using the Monte Carlo method and defined the uncertain variable based on the historical turnover rate. According to Milbank (2020), human resources organizations could use Monte Carlo simulation for resource planning because the method offers a range of possible outcomes (e.g., "with a probability of 90%, at least 100 people will leave during next year"). Monte Carlo method is often used for modeling non-linear cases (see e.g.,

Gardner & Sood, 2004) which might be an advantage in social science studies or real-life management/human resource organization studies, and which is one reason why it is applied in this study. Even though some linearity could be detected from the historical data (e.g., change in headcount, change in the gender balance ratio), the future is always uncertain what comes to business needs, organizational changes, trends in the workforce markets, and the population of potential job applicants (see e.g. section 2.3.1).

4   Data

Section 4 presents exploratory data analysis regarding the data used in the study. To understand the structure of the case company, descriptive statistics on employee characteristics are presented in section 4.1. The data are from 31.12.2010-31.12.2021 and reports used in the exploratory data analysis and in the study are from the last day of the report year (31st of December) if not mentioned otherwise. The reports are exported from two separate HR databases with data on a large majority of employees. Most temporary employees work during the summer season so it should be kept in mind that they are not included in the statistics of section 4.1. Sections 4.2, 4.3, 4.4, and 4.5 focus on each research question separately.

4.1   Company characteristics

The case company is a publicly listed industrial company and its head office is located in Finland. A large share of the case company's employees works in production, maintenance, and logistics, which are usually industries dominated by men. Table 2 describes statistics on employee characteristics in the years 2010, 2014, and 2021 (2010 and 2021 describe the earliest and most recent states of the data, and 2014 describes the initial state for the second research question). There might be some inaccuracies regarding the age variable in reports from 2010 to 2013 since age (rounded as whole years) was merged from reports that weren't from the last day of the year. The rounding errors do not affect the study because age is used as a control variable only in research questions 2 and 3 that use data from 2014 onwards. Between 2010 and 2021, the proportion of women has increased from 23.8% to 32.9%, i.e. there has been an increase of 9.1 percentage points. To compare, in 2020 the proportion of women working in the manufacturing industry in Finland was 26.4% (OSF, 2021a).

Table 2. The case company characteristics in 2010, 2014 and 2021

Variable	Class	2021 (n)	2021 (%)	2014 (n)	2014 (%)	2010 (n)	2010 (%)
Headcount							
	Total headcount	4550	100,0%	3809	100,0%	3699	100,0%
Gender							
	Female	1499	32,9%	1014	26,6%	881	23,8%
	Male	3051	67,1%	2795	73,4%	2816	76,1%
	Not available	0	0,0%	0	0,0%	2	0,1%
Age in years							
	<30	480	10,5%	435	11,4%	395	10,7%
	30-39	1488	32,7%	1043	27,4%	978	26,4%
	40-49	1317	28,9%	905	23,8%	951	25,7%
	$\geq$50	1265	27,8%	1339	35,2%	1280	34,6%
	Not available	0	0,0%	87	2,3%	95	2,6%
	Average	42,7		43,7		44,0	
Employee category							
	Blue-collars	987	21,7%	1222	32,1%	1562	42,2%
	White-collars	1019	22,4%	894	23,5%	771	20,8%
	Upper white-collars	2437	53,6%	1624	42,6%	1304	35,3%
	Top Management	107	2,4%	69	1,8%	62	1,7%
Permanent/Temporary							
	Permanent	4327	95,1%	3590	94,3%	3534	95,5%
	Temporary	223	4,9%	219	5,7%	165	4,5%
Company tenure							
	<2	616	13,5%	366	9,6%	383	10,4%
	2-9	2123	46,7%	1523	40,0%	1292	34,9%
	10-19	1037	22,8%	748	19,6%	576	15,6%
	$\geq$20	759	16,7%	1172	30,8%	1448	39,1%
	Not available	15	0,3%	0	0,0%	0	0,0%
	Average	10,3		14,2		14,9	

The case company's total headcount has increased by over 800 employees between 31.12.2010 and 31.12.2021. In addition to the increased proportion of female employees, the average values of age and company tenure have decreased. Furthermore, the distribution of "Employee Category" has changed: the proportion and the absolute number of blue-collar employees have decreased while the proportion and the absolute number of upper white-collar employees have increased. The share of both white-collar employees and top management has been stable, but the absolute number of employees has increased in both categories. Changes in the distribution of "Employee Category" might explain the increased share of women in all employees. The missing values of "Gender" are labeled as "Unknown" in the original dataset and those observations are excluded from the study and following tables.

4.1.1 Gender distribution by employee category

Employee category describes what area of business the job supports. Employee category is an important feature in this study due to the differences between the categories: blue-collar employees work mostly in production, and white-collar and upper-white collar employees work mostly in business development (e.g., engineering and research) and/or business support (e.g., finance and human resources). Top management is formed by the company CEO, vice presidents, and top executives.

Table 3. The proportion of women by employee category in 2010, 2014 and 2021

Employee Category/Year	2021	2014	2010	Mean 2010-2021
Blue-collars	5,5%	4,9%	6,7%	6,1%
White-collars	44,8%	47,7%	48,2%	47,2%
Upper white-collars	39,3%	31,5%	30,0%	34,0%
Top Management	28,0%	24,6%	22,6%	24,9%

Table 3 presents the proportion of women by employee category and by year. The proportion of women has increased over time in the categories of upper white-collars and top management. For blue-collar and white-collar employees, the proportion of women has slightly decreased but the change is not as significant as for the other two categories. Table 2 showed that the number of upper white-collar employees has increased the most over time – since the proportion of women in upper white-collars has increased by over 9 percentage points over time, it could be concluded that the trend of change in the proportion of women in new hires has been increasing. Section 4.2 presents data on new hires (research question 1) and section 4.5 presents more details on the overall development of the gender balance ratio over time (main research question).

4.2 Trend of change in recruitment and gender over time

The data used in the first research question is different from the other questions since it is continuous for the period 1.1.2010-31.12.2021, thus it includes all new hires during that period. In the other questions, the data used is collected annually from the last day of the

report year. Table 4 presents the proportion of women in all new hires in the years 2010 and 2021 by employee permanence and by employee category. Upper white-collars and top management are combined into one category in this analysis.

Table 4. The proportion of women in new hires by employee permanence and by employee category

Sample	Sample size, 2021	% of women, 2021	Sample size, 2010	% of women, 2010
All	830	39.04 %	1060	21.42 %
Temporary	427	40.98 %	879	20.82 %
Permanent	402	36.82 %	181	24.31 %
Not available	1	0 %	0	-
Blue-collars	113	15.93 %	788	11.68 %
White-collars	399	43.11 %	205	52.20 %
Upper white-collars & Top Management	318	42.14 %	67	41.79 %

The number of new hires was lower in 2021 (830) than in 2010 (1060). This might be explained by the number of temporary recruitments: in 2010, 83% of all new hires were temporary, whereas in 2021 temporary recruitments made up only 51% of all new hires. In the annual reports (Table 2), the share of temporary employees is relatively low (around 5%), so it could be assumed that most temporary employees are hired for the summer period (or some other period within one year).

Overall, the share of women in new hires has increased significantly between 2010 and 2021 (21% vs. 39%). It seems that the change is mostly due to the change in the distribution of the employee category of new hires. When comparing the numbers of 2010 and 2021, it seems that the share of women in new hires has increased for blue-collars and decreased for white-collars, and for upper white-collars and top management the share of women in new hires has been quite stable (around 42%).

Figure 1 presents the share of women over time in all new hires and by employee permanence. Figure 2 presents the development by employee category. In Figures 1 and 2, bubble size indicates sample size, and the trendline is marked in a dashed line. For quarterly visualization of Figures 1 and 2, see Appendix 1.
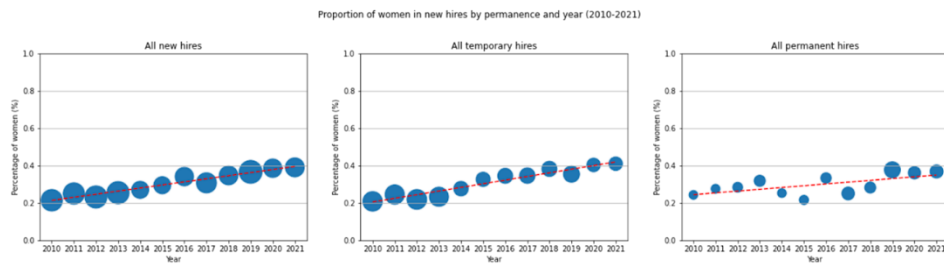
Figure 1. Proportion of women in all new hires and by employee permanence

According to Figure 1, the trend of change in the proportion of women in all new hires has been increasing steadily over time. The number of new hires has also been quite steady. For temporary hires, the trend has been increasing as well, but the number of hires has been decreasing (the bubble size gets smaller over time). The number of permanent hires has been increasing, but the trend for the proportion of women has fluctuated more compared to the other two plots. However, the proportion of women in permanent hires has been around 40% in the last three years, which is over the current company average (32.9%).
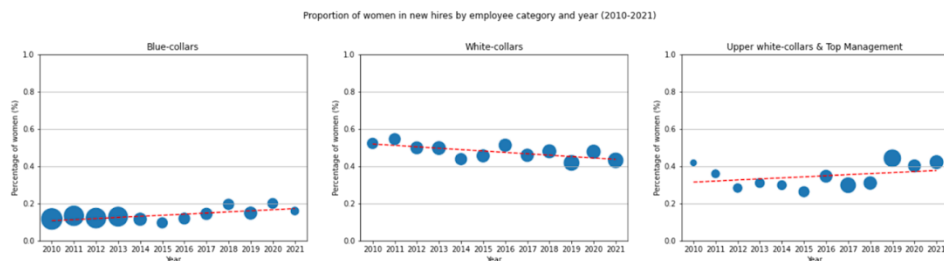
Figure 2. Proportion of women in new hires by employee category

Figure 2 presents the proportion of women in new hires over time by employee category. The number of blue-collar hires has decreased over time, and the share of women has increased – there even are years when the share of women in blue-collar new hires has been around 20%. The proportion of women in white-collar new hires has decreased, but the share of women is still higher than the company average in 2021 (32.9%). For upper white-collar and top management new hires, the trend for the new hires' gender balance ratio is increasing with some fluctuation in the trendline. Furthermore, the sample sizes of upper white-collar and top management new hires have increased, which has an increasing effect on the overall gender balance ratio.

Based on Table 4, Figure 1, and Figure 2, the trend for the gender balance ratio in new hires has increased, except for a slightly decreasing trend in the category of white-collar employees. It is difficult to accurately estimate the future trend, also because the ratio cannot exceed 1 (i.e., it cannot be assumed that a trend for a ratio, even if steadily and significantly increasing, would continue increasing forever). However, the figures give a good understanding of the current state and help build assumptions for the main research question. Section 5.1 presents statistical inference on the trendline (i.e., whether the trend by different categories has been statistically significant).

4.3 Promotion rates and gender

The second research question examines whether gender has an impact on promotion rates. The dependent variable is a binomial variable that takes the value of 1 if an employee has been promoted in the following 12 months from the report date. The data on promotions is available from 1.9.2015 to 31.12.2021, so personnel reports from 31.12.2015 to 31.12.2020 can be used as explanatory data (personnel report from 31.12.2014 cannot be used since not all promotions from 1.1.2015 to 31.12.2015 are available). Promotion is determined based on an "Event" feature which describes the latest change in employee profile data, and there are 8 different events that indicate promotion. Since there are relatively few promotions per year, different promotion types are not separated (i.e., event code "promotion" and "promotion and pay change" are considered the same). Event codes that indicate pay rises are also considered promotion since they are related to an increase in responsibilities rather than index increases in pay that are related to tenure.

Table 5. Average promotion rates by gender

	All	Female	Male
Average promotion rate	10.25 %	9.99 %	10.35 %

Table 5 presents the average value of the dependent variable overall and by gender. The share of positive cases (10.25%) in the dataset is relatively small, i.e. the dependent variable is imbalanced. The average promotion rate is higher for men by 0.37 percentage points compared to the promotion rate of women, so the overall gender promotion gap does not seem to be high given all else equal.

Table 6. Average promotion rates by employee category

	All	Blue-collars	White-collars	Upper white-collars & Top Management
Average promotion rate	10.25 %	13.11 %	9.06 %	9.19 %

Table 6 presents the average promotion rates in the dataset by employee category. The difference between blue-collar workers and other categories seems to be significant, so the employee category feature should be considered (controlled) when building the statistical model. Promotions are usually related to performance and/or experience. Company tenure and employee age indicate experience and it is interesting to see whether they have any relationship with promotion rates. Figures 3 and 4 present the average promotion rates by company tenure (Figure 3) and by age (Figure 4).
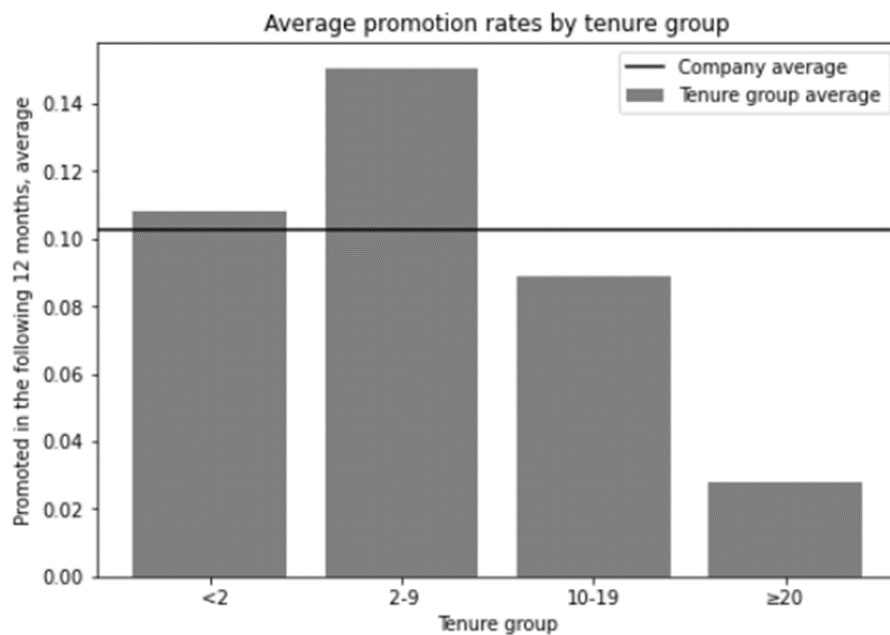
Figure 3. Average promotion rates by tenure group
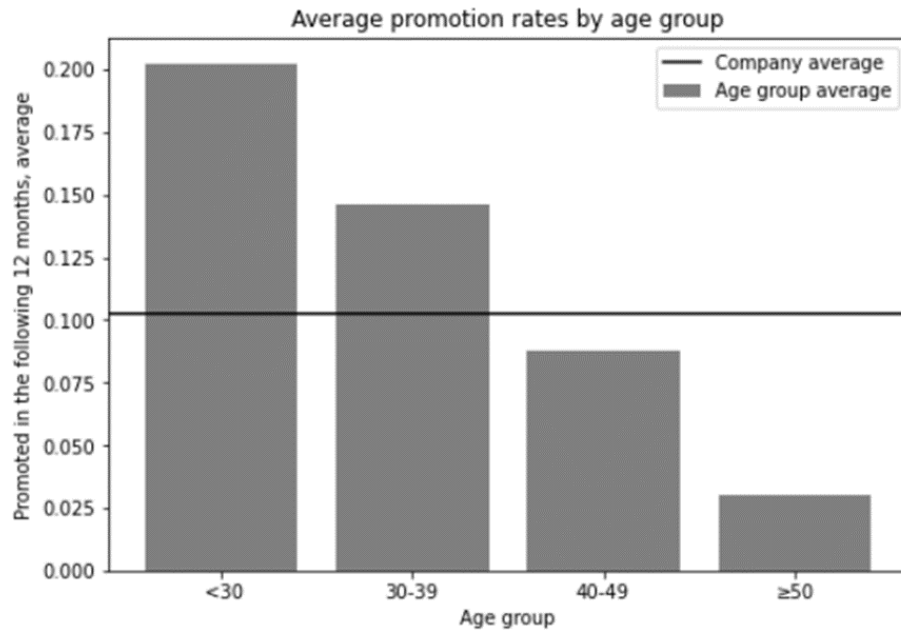
Figure 4. Average promotion rates by age group

Age and tenure have a negative relationship with promotion probabilities, i.e. younger employees and employees that have worked for the company for fewer years have higher promotion rates compared to the company average. According to Kauhanen (2017), the gender promotion gap is dependent on the stage of a career. Thus, age and tenure should be controlled when examining gender's impact on promotion rates. In addition to age and tenure, being in a manager position could indicate experience and also possible previous promotions. Table 7 shows the distribution of managers and non-managers and their average promotion rates in the dataset.

Table 7. Average promotion rates for managers and other employees

	Not a manager	Is manager
Frequency	86.15 %	13.85 %
Average promotion rate	10.61 %	7.97 %

According to Table 7, the average promotion rates are higher for non-managers, which makes sense considering the higher promotion rates for younger employees and employees with lower tenure. Furthermore, it could be assumed that while employee moves higher in a company hierarchy, the potential number of positions to be promoted for decreases.

To conclude, gender does not have a significant effect on promotion rates when nothing else is taken into account. Section 5.2 presents the results of QCA and the final conclusion on the gender promotion gap when relevant factors are controlled.

4.4 Turnover rates and gender

The third research question examines gender's impact on resignation rates. The dependent variable is a binomial variable that takes the value of 1 if an employee has resigned in the following 12 months from the report date. The data used for the dependent variable is from 1.1.2015 to 31.12.2021, so annual personnel reports from 31.12.2014 to 31.12.2020 can be used as explanatory data. Resignation is defined based on an "Event Reason" feature in the report of all terminations. Terminations due to other reasons, such as an end of a temporary contract, retirement or a dismissal, are excluded from the analysis (i.e. sections 4.4 and 5.3). Temporary employees are excluded from the analysis.

Table 8. Average resignation rates by gender

	All	Female	Male
Average resignation rate	3.73 %	3.42 %	3.84 %

Table 8 presents resignation rates by gender. The average resignation rate is 3.73% which means that on average 3.73% of all permanent employees resign annually. The average resignation rate is higher for men, and the gender difference is 0.42 percentage points. Potential reasons for high resignation rates could be good external career opportunities or reduced job satisfaction.

Table 9. Average resignation rates by employee category

	All	Blue-collars	White-collars	Upper white-collars & Top Management
Average resignation rate	3.73 %	1.61 %	2.06 %	5.36 %

Table 9 presents resignation rates by employee category. The difference between upper white-collar employees & top management and blue-collar and white-collar employees seems to be significant. Thus the employee category feature should be taken into account when analyzing the gender difference in resignation rates.

Turnover intention is affected by job satisfaction, and internal career opportunities (i.e. promotions) affect job satisfaction. Furthermore, it could be assumed that similar factors have an impact on promotion probabilities and turnover intentions since they are related to overall job mobility and career development. Figures 5 and 6 present average resignation rates by company tenure group (Figure 5) and by age group (Figure 6).
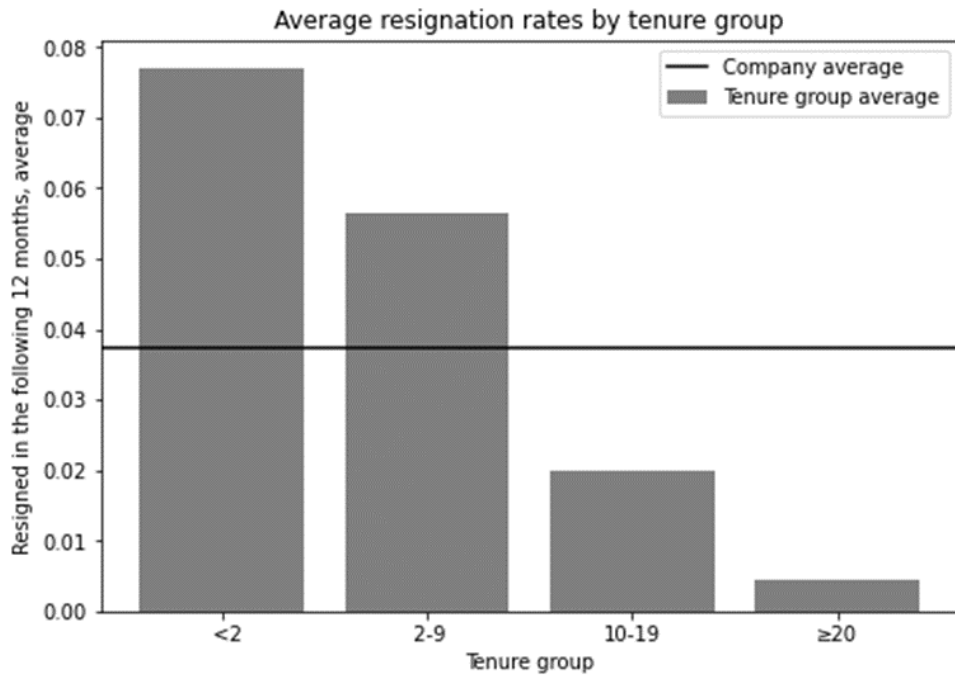
Figure 5. Average resignation rates by tenure group

According to Figure 5, resignation rates decrease as the company tenure increases. Employees that have worked in the company over 20 years have an average resignation rate below 1% which is many percentage points lower compared to tenure group 1 (company tenure below 2 years).
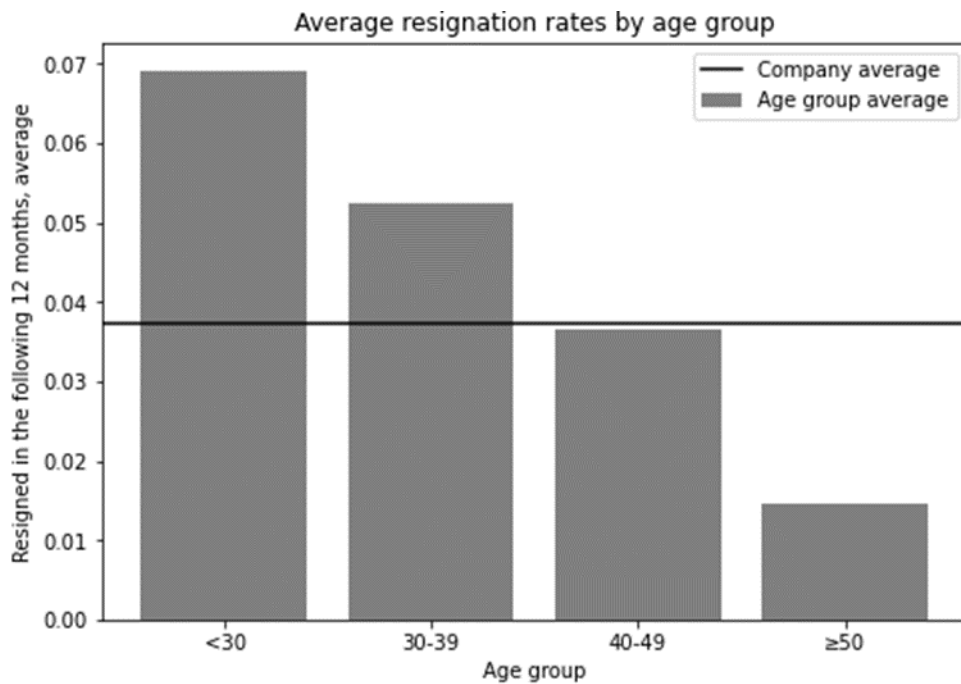
Figure 6. Average resignation rates by age group

The relationship between age and average resignation rate is negative (Figure 6) which is not surprising given the interpretation of Figure 5 and Figures 3 and 4 (age/tenure vs. promotion rates). The impact of age and tenure on resignation seems to be significant, so they should be included in the analysis as explanatory variables.

Table 10. Average resignation rates for managers and other employees

	Not a manager	Is manager
Frequency	84.88 %	15.12 %
Average resignation rate	3.73 %	3.73 %

Table 10 presents average resignation rates by manager position. The average resignation rate is 3.73% (company average) regardless of being a manager or not. The result is surprising because it could be assumed that having subordinates affects resignation intentions through job satisfaction (either by increasing or decreasing it).

The overall resignation rate is slightly higher for men compared to women (Table 8). Section 5.3 presents the results of QCA and the conclusion on the gender resignation gap.

4.5   Gender balance over time

The main research question examines the case company's overall gender balance ratio over time. The data used is collected annually from 31.12.2010 to 31.12.2021. No delimitations are made, i.e. all employees that were present on the report day (31.12.20xx) are included in the analysis. Terminations and new hires are determined based on the presence of employee ID in consecutive reports. Thus, all terminations regardless of the reason for termination are included in the analysis. Summer trainees who have not continued their contract after summer or employees who have worked in the case company during one year (e.g., started in March and terminated in October) are excluded from the analysis since their employee IDs cannot typically be found in the annual reports. The purpose of this section is to examine the overall historical changes and make assumptions regarding the case company's future. Section 5.4 presents the simulation results i.e. the estimate for the gender balance ratio by 2030.
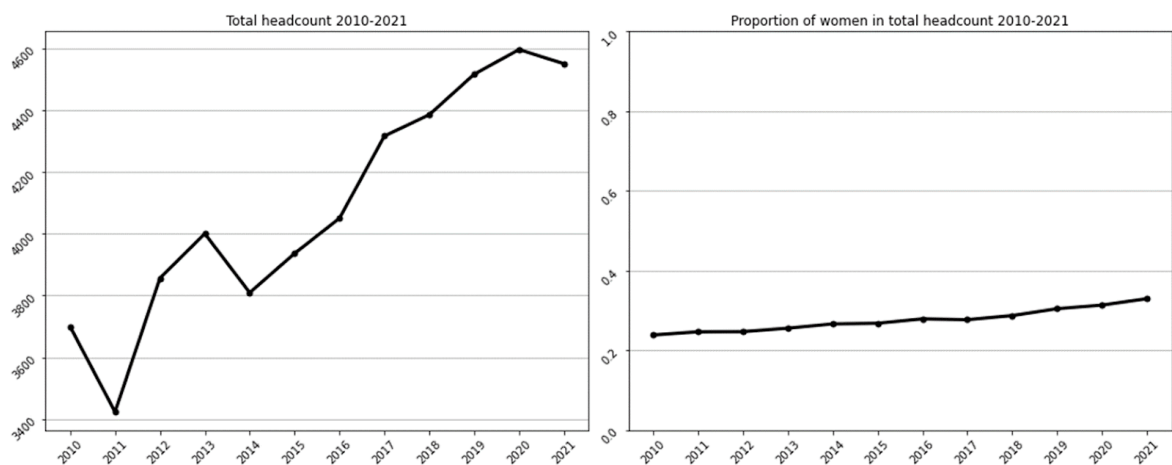
Figure 7. Total headcount and gender balance ratio over time

Figure 7 presents the overall change in headcount and in gender distribution over time. The proportion of women has increased steadily. The number of employees has increased as well, with some fluctuation. Based on Figure 7, it can be assumed that the simulation will result in an increased headcount and a larger proportion of female employees.
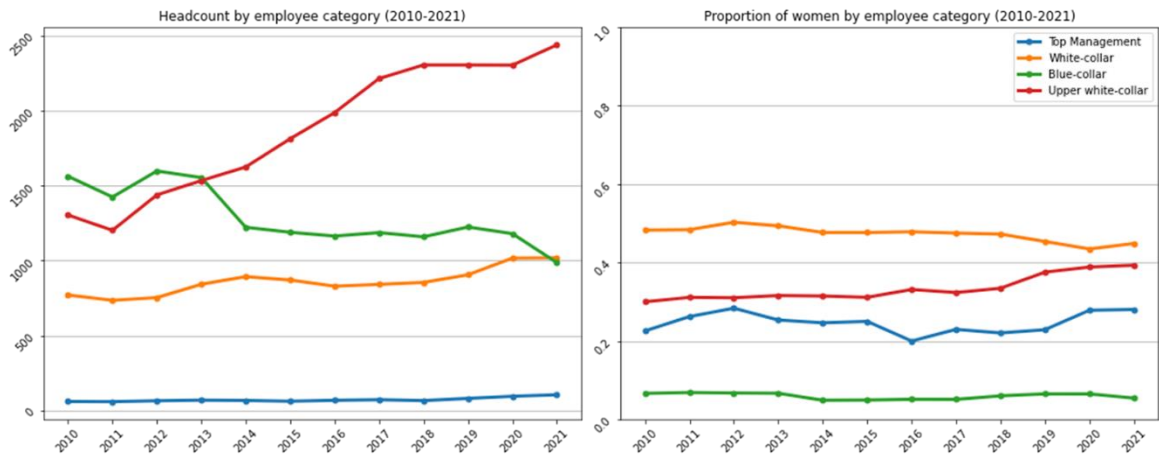
Figure 8. Total headcount and gender balance ratio over time by employee category

Figure 8 presents the number of employees and the proportion of women over time and by employee category. As discussed in section 4.1, the number of upper white-collar employees has increased, while the number of blue-collar employees has decreased. The proportion of women has increased most significantly in the category of upper white-collar employees, while the gender balance ratio of white-collar and blue-collar employees has been quite steady. The proportion of women in top management has increased over time.

Appendix 2 presents the change in headcount and gender balance ratio by business function. The company is divided into functions that describe the area of business. Some functions are combined with each other in this study, mainly because the function names have changed over time, and also because some functions are small in sample size. The function names are anonymized in this study. The Monte Carlo simulation is applied by business function because the organizational development (e.g., expanding in some area of business, while having a stable headcount in other functions) can be detected well from the changes in functions.
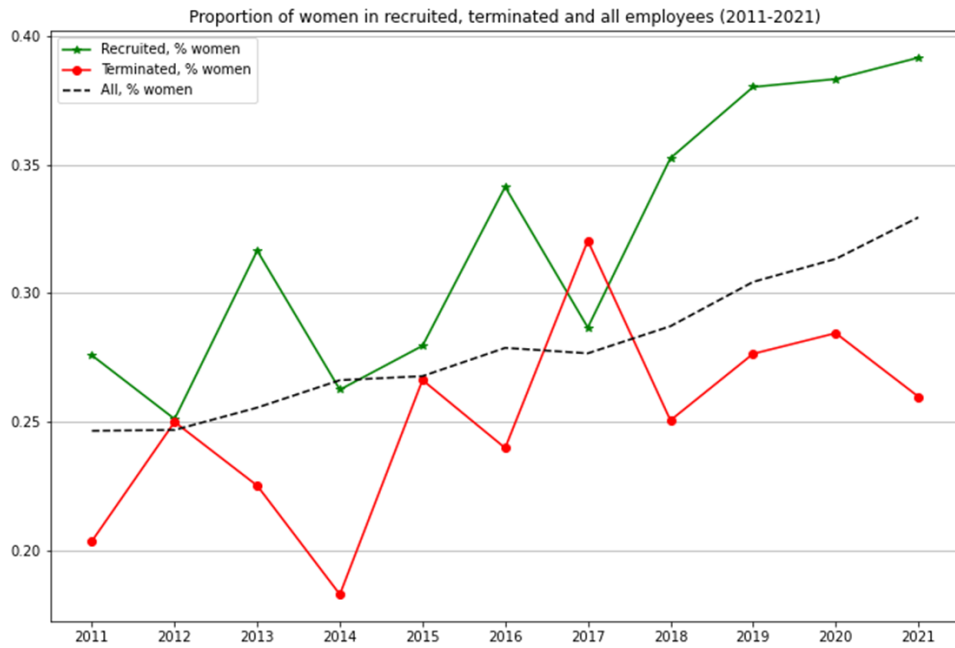
Figure 9. Proportion of women in new hires, terminations and all employees over time

Figure 9 presents the proportion of women among new hires, terminations, and all employees. The lines for both recruited and terminated employees' gender balance ratio describe the proportion of women recruited/terminated during a given year – for instance, the gender balance ratio of employees who were recruited during 2011 is around 28%, and the gender balance ratio of employees terminated during 2011 is around 20%. The year 2010 is excluded from Figure 9 since the variable that determines a "new hire" does not take value in the report of 2010. With two exceptions, the proportion of women in new hires has been higher than the proportion of women in terminated employees and in all employees which means that relatively more women are coming than leaving. The interpretation of Figure 9 is essential regarding the Monte Carlo simulation: it can be seen that the gender balance ratios of new hires, terminations, and all employees correlate with each other to some extent, but not completely – thus, it is justified to simulate the gender balance ratio of new hires and terminations separately.
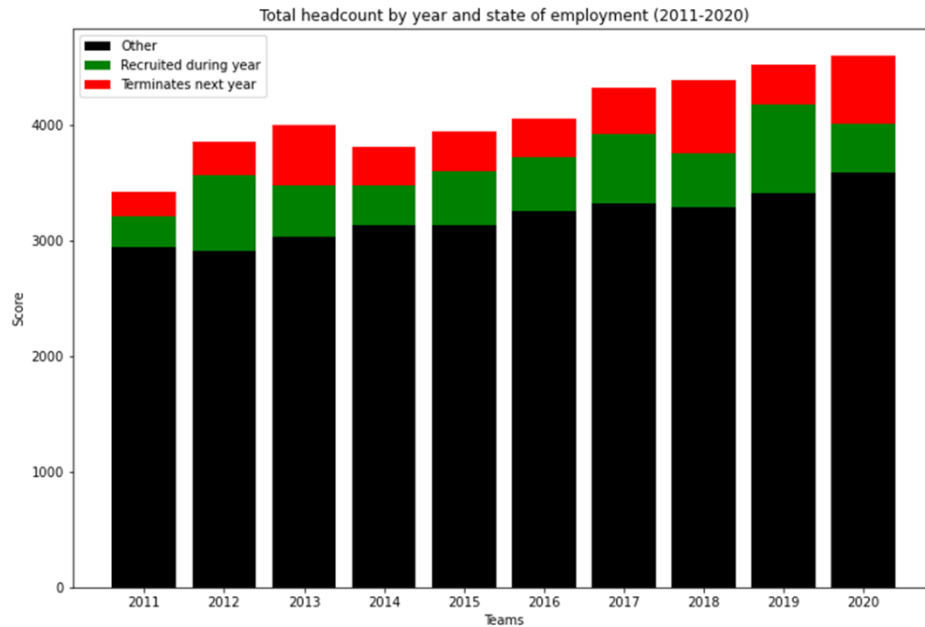
Figure 10. Total headcount by year and state of employment

Figure 10 presents the proportion of new hires and terminating employees in all employees during a year. The black bar presents the "stable" part of personnel, i.e. employees that have worked in the company for over a year, and who will work in the company in the upcoming 12 months. Figure 10 describes the average turnover, and it seems that the share of new and terminating employees in all employees seems to be quite steady over time.

5   Results

Section 5 presents the results. The research process, model modifications, and final results are presented in this section. Section 6 consists of conclusions on the results and suggestions for further research based on the discussion.

5.1   Research question 1: the proportion of women in new hires

The first research question examines the historical development of the gender balance ratio of new hires during 2010-2021. The time series regression analysis is applied for the whole sample of new hires, but also separately by employee permanence status, and then by employee category. Temporary hires cover a large share of new hires (Table 4), but the share of temporary employees is small in the annual reports (Table 2). Thus, the time series for the proportion of women in new hires should be examined by employee permanence. Furthermore, the gender balance ratio differs by employee category – therefore the time series is also examined by employee category. The x-variable used in the time series regression describes time, and it is converted to an integer (starting from 0) to make the regression results more interpretable.

Tables 11 and 12 present the time series regression results. In Tables 11 and 12, each row represents the results of one regression (i.e. the results on different rows are not related to each other). The first two columns in the tables describe the sample that the regression is applied to. The estimated intercept is presented in the third column, and the last three columns present the estimated slope and the p-value and standard deviation related to it. The results can be interpreted as follows: the intercept describes the initial state of the share of women in new hires, and the slope describes the average annual/quarterly change in percentage points (assuming coefficient significance). If the p-value is below 0.05, the estimated slope is statistically significant.

Table 11. Time series regression results for annual data on new hires

Sample description and sample size		intercept	slope	p-value	std
All new hires	11076	21.38	1.6490	0.0000	0.1228
Permanent	3555	24.44	0.9543	0.0250	0.3625
Temporary	7516	20.52	1.9467	0.0000	0.1754
Blue-collars	4607	10.72	0.5922	0.0169	0.2071
White-collars	3575	51.87	-0.7488	0.0128	0.2474
Upper white-collars & Top Management	2893	31.45	0.5670	0.2912	0.5088

Table 11 presents results for the time series regressions that are applied for annual data. The estimated slope is statistically significant in five out of six cases – the trendline for the proportion of women in upper white-collar and top management new hires was slightly increasing with some fluctuations (Figure 2) so the result is not surprising. The slope is positive in all cases except for the white-collar new hires so it can be concluded that overall the company has increased the proportion of women. It should be taken into account that each case overlaps with at least three other cases, which means that the trend for the proportion of women in new hires is probably connected to more than one attribute.

Table 12. Time series regression results for quarterly data on new hires

Sample description and sample size		intercept	slope	p-value	std
All new hires	11076	19.06	0.5125	0.0000	0.0521
Permanent	3555	22.95	0.2872	0.0028	0.0911
Temporary	7516	18.66	0.5712	0.0000	0.0573
Blue-collars	4607	8.68	0.2479	0.0075	0.0886
White-collars	3575	51.41	-0.0947	0.1839	0.0702
Upper white-collars & Top Management	2893	32.93	0.0996	0.3603	0.1078

Table 12 presents results for the time series regressions that are applied for quarterly data. The estimated slope is statistically significant in four out of six cases – the trendlines for the proportion of women in white-collar, and upper white-collar and top management are not statistically significant. The slope is positive in all cases except for the white-collar new hires' case. Compared to the annual regressions (Table 11), the only difference is that the slope for white-collars is statistically insignificant in the quarterly analysis. Thus, this might provide stronger evidence on the overall increasing trend observation since the only negative slope is not statistically significant.

To conclude the time series regression results, the overall trend for the proportion of women in recruited employees is increasing. Furthermore, it is assumed that the Monte Carlo simulation (section 5.4) will result in an increased gender balance ratio.

5.2 Research question 2: gender promotion gap

The research process for answering the second research question goes as follows: first, preliminary suggestions for the result and feature selection are presented in section 5.2.1. Section 5.2.2 presents the QCA process and final results.

5.2.1 Preliminary analysis on promotion rates

The null hypothesis for the two-proportion z-test is that the averages (proportions) of two samples are the same. Therefore some assumptions can be made before performing the QCA. Table 13 presents the results from separate two-proportion z-tests: each row presents the two-class (binary) variable that is used to split the dataset, and the promotion rates of the two samples are compared in the z-test.

Table 13. Z-test results for the promotion rates: isolated effects of single variables

Variable	Average promotion rate by group		Two proportion z-test	
Gender	Female	Male	z-statistic	p-value
	9.99 %	10.35 %	-0.8774	0.3803
Tenure over median	Below median	Above median	z-statistic	p-value
	14.31 %	6.19 %	21.4322	0.0000
Age over median	Below median	Above median	z-statistic	p-value
	15.70 %	4.80 %	28.7680	0.0000
Is Manager	No	Yes	z-statistic	p-value
	10.61 %	7.97 %	4.8212	0.0000
Permanent/Temporary	Temporary	Permanent	z-statistic	p-value
	17.21 %	9.73 %	10.0208	0.0000

The average promotion rate is not significantly different for men and women (the absolute z-statistic is below the threshold of 1.96 and the p-value is above 0.05). This means that the overall gender promotion gap is not statistically significant. However, the possible gender promotion gap might occur when other features such as age and tenure are controlled. When the dataset is split by the other factors ("Tenure over median", "Age over median", "Is Manager" and "Permanent/Temporary"), the z-test gives a statistically significant result which could be interpreted as a significant relationship. Thus, these features will be considered as conditions in the QCA.

5.2.2 Qualitative comparative analysis on promotion rates

The QCA process is applied as follows: first, the data will be divided into groups (cases) based on features "Job Family", "Tenure over median", "Employee Category", "Age over median", "Is Permanent" and "Is Manager". The within-group gender promotion gap and the outcome variable "Gender in favor" are defined based on the result of two-proportion z-tests. The outcome variable can have values "Female", "Male" or "Equal". Only groups with at least 30 women and 30 men are included in the analysis because the z-test does not cope well with sample sizes smaller than 30.

"Job Family" and "Employee Category" are not binary variables, but they are used in the analysis to locate possible promotion gaps. If the QCA truth table was analyzed by a computer, non-binary features should be converted to dummy variables. However, to make the resulting tables more interpretable, these features are presented in one column. It must also be mentioned that this process does not follow all "rules" of cs-QCA (e.g., the outcome variable has three different options), but the objective, i.e. detecting sufficient and necessary configurations can be achieved in the following analysis.

The initial and more detailed QCA "truth table" is presented in Appendix 3. Table 14 presents cases where a statistically significant gender promotion gap was detected. If the outcome would have been "Promoted in the following 12 months", the "Overall promotion rate" column would have described the case consistency. In Table 14, the coverage columns describe the share of the within-group promotions in all promotions. For instance, the last

row of Table 14 has a coverage value of 3.67% which means that out of all promotions in the sample, 3.67% were given to employees in that group. It should be noted that all promotions in 2016-2020 are not included in this part of the analysis due to excluding groups with small sample sizes. The groups of employees presented in Table 14 cover 29% of the whole dataset, and the number of promoted people in those groups cover only 16% of all promotions.

Table 14. QCA results: gender promotion gap by all conditions

Job Family	Tenure over median	Employee Category	Age over median	Is Permanent	Is Manager	Count	% of women	Gender in favor	Overall promotion rate	Coverage	Promotion rate, women	Coverage, women	Promotion rate, men	Coverage, men
R	No	3	No	No	No	88	42.0 %	Male	27.3 %	0.65 %	10.8 %	0.11 %	39.2 %	0.54 %
D	Yes	3	Yes	Yes	Yes	131	38.2 %	Male	5.3 %	0.19 %	0.0 %	0.00 %	8.6 %	0.19 %
R	Yes	3	Yes	Yes	No	188	64.9 %	Male	2.7 %	0.14 %	0.8 %	0.03 %	6.1 %	0.11 %
I	No	3	Yes	Yes	No	97	50.5 %	Female	4.1 %	0.11 %	8.2 %	0.11 %	0.0 %	0.00 %
D	No	3	Yes	Yes	No	133	28.6 %	Female	3.0 %	0.11 %	7.9 %	0.08 %	1.1 %	0.03 %
K	Yes	3	Yes	Yes	No	266	14.3 %	Female	4.5 %	0.32 %	13.2 %	0.14 %	3.1 %	0.19 %
J	Yes	3	Yes	Yes	No	322	21.7 %	Female	2.8 %	0.24 %	8.6 %	0.16 %	1.2 %	0.08 %
P	Yes	1	Yes	Yes	No	1641	5.2 %	Female	2.6 %	1.16 %	8.2 %	0.19 %	2.3 %	0.97 %
B	No	3	No	Yes	No	1069	21.1 %	Female	12.7 %	3.67 %	22.6 %	1.38 %	10.1 %	2.30 %

Three out of the 48 groups have a pro-male gender promotion gap. The only necessary condition on pro-male gap regards "Employee Category": in all pro-male groups, the Employee Category is "3", which equals the category of upper-white collars and top management. To detect sufficient configurations, Appendix 3 needs to be reviewed – it seems that no clear sufficient conditions or configurations can be detected based on Table 14 and Appendix 3.

Six out of the 48 groups have a pro-female gender promotion gap. There are two necessary conditions: in all pro-female groups, the "Is permanent" feature is 1, and the "Is manager" feature is 0. However, this is not a sufficient configuration since there are cases where the combination of these two conditions produces another outcome (see Appendix 3).

"Age over median", "Tenure over median", "Is Permanent" and "Is Manager" are related to work and company experience, at least to some extent. As discussed in section 2.4, the gender promotion gap might be dependent on the stage of a career. Therefore, the QCA approach is applied also by using the "experience" features as conditions – see Table 15 for the results.

Table 15. QCA results: gender promotion gap by experience variables

Tenure over median	Age over median	Is Permanent	Is Manager	Count	Gender in favor (outcome)	% of women	Promotion rate	Coverage	Promotion rate women	Coverage, women	Promotion rate men	Coverage, men
No	No	No	No	1467	Male	36.4 %	19.5 %	10.9 %	16.1 %	3.27 %	21.4 %	7.6 %
No	No	Yes	No	7116	Equal	29.5 %	17.6 %	47.6 %	16.4 %	13.06 %	18.1 %	34.5 %
No	No	Yes	Yes	684	Equal	25.0 %	12.0 %	3.1 %	9.4 %	0.61 %	12.9 %	2.5 %
Yes	No	Yes	Yes	555	Equal	18.2 %	13.2 %	2.8 %	12.9 %	0.49 %	13.2 %	2.3 %
Yes	No	Yes	No	2986	Equal	28.0 %	10.8 %	12.2 %	10.8 %	3.43 %	10.7 %	8.8 %
No	Yes	Yes	Yes	816	Equal	32.1 %	4.9 %	1.5 %	5.0 %	0.49 %	4.9 %	1.0 %
Yes	Yes	Yes	No	7762	Equal	28.2 %	4.0 %	11.8 %	4.1 %	3.43 %	4.0 %	8.4 %
No	Yes	No	No	263	Equal	38.4 %	7.2 %	0.7 %	7.9 %	0.30 %	6.8 %	0.4 %
Yes	Yes	Yes	Yes	1483	Equal	26.8 %	5.9 %	3.3 %	6.3 %	0.95 %	5.8 %	2.4 %
No	Yes	Yes	No	2463	Female	29.2 %	6.4 %	6.0 %	7.9 %	2.17 %	5.7 %	3.8 %

According to Table 15, only two groups have a within-group gender promotion gap – the group that has a pro-male promotion gap consists of temporary, non-manager employees who have tenure and age below median values, while the pro-female group is formed by permanent non-manager employees, whose age is over the median value, but who have company tenure below the median. These results do not indicate that there would be any patterns that could be used as causal factors when explaining the gender promotion gap. Appendix 4 presents the information of Table 15 more in detail.

If ignoring the statistical significance (the result of the two-proportion z-test), Table 15 can be interpreted by comparing the promotion rates of women and men (columns "Promotion rate women" and "Promotion rate men"). It seems that all groups that consist of employees with age above the median have higher promotion rates for women. Additionally, but with one exception, the groups that consist of employees whose age is below the median, have higher promotion rates for men. This would be consistent with previous research: it was discussed in section 2.4 that women might need more "proof" of their competence to get promoted. Here, age can be considered as a proxy for work experience because it could be assumed that work experience strongly correlates with age. However, this observation cannot be considered very reliable due to the ignorance of statistical significance. Furthermore, there might be an explanation for age's impact on promotion rates (e.g., due to imbalanced age and gender distributions in job families where promotion rates are higher or lower compared to the average).

According to Table 14, in all pro-male cases, the share of women was relatively high, at least compared to the company average in 2021 (32.9 %). Additionally, in most pro-female groups

the share of women is less than 32.9%. This indicates that in some cases, the less represented gender might actually be in favor when considering promotion rates. Table 16 presents the examination of the gender promotion gap by dividing job families into groups based on their gender balance ratio. Job families are grouped by their gender balance ratio with the interval of 20%, i.e. group "1" consists of job families that have less than 20% female employees. Appendix 5 presents the data in Table 16 in more detail.

Table 16. QCA results: gender promotion gap by within-group gender balance ratio

Group	Count	Gender in favor (outcome)	% of women	Overall promotion rate	Coverage	Promotion rate women	Coverage, women	Promotion rate men	Coverage, men
1	11260	Female	9.10 %	12.24 %	52.46 %	14.54 %	5.67 %	12.01 %	46.78 %
2	6522	Female	28.73 %	8.20 %	20.37 %	10.46 %	7.46 %	7.29 %	12.90 %
3	4408	Equal	47.19 %	8.80 %	14.77 %	9.33 %	7.38 %	8.33 %	7.38 %
4	2476	Male	64.78 %	10.78 %	10.16 %	9.54 %	5.82 %	13.07 %	4.34 %
5	971	Equal	86.20 %	6.08 %	2.25 %	5.85 %	1.87 %	7.46 %	0.38 %

According to Table 16, women have higher promotion rates in groups where they are in the minority (groups 1 and 2). The promotion rates are higher for men in group 4, and if the statistical significance of the z-test is ignored, the pro-male gap can also be detected in group 5. Group 3, which has almost an equal number of men and women, does not have a statistically significant gender promotion gap – the promotion rates are slightly higher for women, but the absolute number of promoted employees is exactly the same (coverage columns). These observations indicate that both men and women might have an advantage regarding promotions in groups or teams where they are less represented. This might be a positive thing regarding the general state of gender representation and gender imbalance, especially for units and sectors that are horizontally segregated.

To conclude the results on the second research question, the overall state of promotion rates does not seem to favor either male or female employees: the overall gender promotion gap is very small (Table 13). The results of Tables 15 and 16 suggest that age and gender balance might have an impact on the gender promotion gap. Section 6 discusses the results more in-depth.

5.3 Research question 3: gender resignation gap

The research process for answering the third research question goes as follows: first, preliminary suggestions for the result and feature selection are presented in section 5.3.1. Section 5.3.2 presents the QCA process and the final results. Temporary employees are excluded from this analysis.

5.3.1 Preliminary analysis on resignation rates

Table 17 presents the results from separate two-proportion z-tests: each row presents the two-class variable that is used to split the dataset, and the resignation rates of the two samples are compared in the z-test.

Table 17. Z-test results for the resignation rates: isolated effects of single variables

Variable	Average resignation rate by group		Two proportion z-test	
Gender	Female	Male	z-score	p-value
	3.42 %	3.84 %	-1.6778	0.0934
Tenure over median	Below median	Above median	z-score	p-value
	6.25 %	1.26 %	22.0455	0.0000
Age over median	Below median	Above median	z-score	p-value
	5.37 %	2.09 %	14.4492	0.0000
Is Manager	No	Yes	z-score	p-value
	3.73 %	3.73 %	-0.0054	0.9957
Promoted this year	No	Yes	z-score	p-value
	4.04 %	0.00 %	9.5669	0.0000

The average resignation rate gap does not seem to be statistically significant at a 5% significance level when the dataset is split by gender. However, if the threshold for p-value significance was set to 10%, the difference in resignation rates of men and women would be statistically significant. Men have slightly higher resignation rates, which could be explained by other features in the data.

The z-test returns a statistically significant result when the dataset is split by "Tenure over median", "Age over median" and "Promoted this year". In fact, none of the employees who

were promoted during a year resigned during the following year – according to Aguwamba et al. (2019), good internal career opportunities reduce turnover intentions, thus this observation is consistent with previous research. However, the promotion feature is not available for the whole dataset, which is why it is not used as a condition in the QCA.

The resignation gap between managers and other employees is not statistically significant, and their resignation rates are the same (3.73%). "Is manager" is not used as a condition in the initial QCA – at this point, it seems that being a manager does not have any impact on resignation behavior, and good practice regarding the implementation of QCA is to keep the number of conditions as small as possible.

5.3.2 Qualitative comparative analysis on gender resignation gap

The QCA process is applied similarly than in section 5.2.2. The data will be divided into groups based on features "Job Family", "Tenure over median", "Employee Category" and "Age over median". The outcome variable "More likely to resign" can have values "Female", "Male" or "Equal". Only groups with at least 30 women and 30 men are included in the analysis. The detailed QCA "truth table" is presented in Appendix 6. Table 18 presents cases where a statistically significant gender resignation gap was detected. Not all resignations in 2015-2020 are included in this part of the analysis due to excluding groups with small sample sizes.

Table 18. QCA results: gender resignation gap by all conditions

Job Family	Employee Category	Tenure over median	Age over median	Count	% of women	More likely to resign (outcome)	Overall resignation rate	Coverage	Resignation rate women	Coverage, women	Resignation rate men	Coverage, men
N	3	0	0	424	21.23 %	Male	9.91 %	5.14 %	2.22 %	0.24 %	11.98 %	4.90 %
B	3	0	0	1496	22.93 %	Male	10.49 %	19.22 %	7.29 %	3.06 %	11.45 %	16.16 %
M	2	0	0	192	55.21 %	Female	2.60 %	0.61 %	4.72 %	0.61 %	0.00 %	0.00 %
C	1	1	1	506	7.31 %	Female	0.40 %	0.24 %	2.70 %	0.12 %	0.21 %	0.12 %
P	1	1	1	1733	5.02 %	Female	0.52 %	1.10 %	2.30 %	0.24 %	0.43 %	0.86 %

The gender resignation gap was detected only in five out of all 55 employee groups. The resignation rates of men were higher in two groups that differ only in job family: both groups consist of upper white-collar/top management employees with tenure and age below median

values. These two groups also have an overall resignation rate above average (company average is 3.73%), which is not surprising given the findings of Table 8 and Table 17 – age and tenure have a negative relationship with resignation rates, and the resignation rate of the upper white-collar and top management employees is above the company average.

There are three groups where women have significantly higher resignation rates compared to men. It should be noted that the coverage values of these three groups are very low, indicating that the absolute number of resigned employees is very small – thus, this result might not describe the gender resignation gap well. What applies to two of the three groups is that they consist of blue-collar employees whose age and tenure are above the average values, and also that women are in a significant minority within the group (the proportion of women is below 10%). The third group (in the third row) is different from the other two groups in all conditions. However, it is interesting that no male employees resigned from the third group, while the resignation rate of women was almost 5%. This observation is not very useful considering the examination of sufficient configurations – however, findings like this could be useful for human resources organizations since there might be some internal factors that have caused the resignation of only female employees.

Table 19 presents a QCA truth table where only features "Is Manager", "Tenure over median" and "Age over median" are used as conditions (see Appendix 7 for a more detailed view). Even though the "Is Manager" feature did not show any impact in the z-test comparison (Table 17), it is still included here since it indicates experience to some degree.

Table 19. QCA results: gender resignation gap by experience variables

Is Manager	Tenure over median	Age over median	Count	% of women	More likely to resign (outcome)	Overall resignation rate	Coverage	Resignation rate women	Coverage, women	Resignation rate men	Coverage, men
0	0	1	2871	29.68 %	Male	5.40 %	14.86 %	3.99 %	3.26 %	5.99 %	11.60 %
1	1	1	1597	26.24 %	Male	1.19 %	1.82 %	0.24 %	0.10 %	1.53 %	1.73 %
0	0	0	9086	28.22 %	Male	6.52 %	56.76 %	5.69 %	14.00 %	6.84 %	42.76 %
0	1	1	8656	28.71 %	Equal	0.79 %	6.52 %	0.80 %	1.92 %	0.78 %	4.60 %
1	0	1	913	31.43 %	Equal	5.70 %	4.99 %	5.92 %	1.63 %	5.59 %	3.36 %
1	0	0	947	26.50 %	Equal	6.86 %	6.23 %	7.17 %	1.73 %	6.75 %	4.51 %
1	1	0	702	19.23 %	Equal	2.71 %	1.82 %	4.44 %	0.58 %	2.29 %	1.25 %
0	1	0	3225	25.24 %	Equal	2.26 %	7.00 %	3.07 %	2.40 %	1.99 %	4.60 %

According to Table 19, there are no groups where women would have significantly higher resignation rates (in all "Equal" groups, women have higher rates, but the gap is not statistically significant). In three groups, men have higher resignation rates, and one sufficient configuration can also be detected: male employees have higher rates compared to women among non-manager employees with tenure below the median value. The total coverage of these two groups is around 70% i.e. most resigned employees are in non-managerial positions and have low tenure – this means that there might be a condition that could potentially explain the gap, and also that it is difficult to draw conclusions based on the large majority.

In the "initial" QCA (Table 18), there were two groups that had a low gender balance ratio and where women were more likely to resign. The workplace gender distribution is sometimes used to explain the gender resignation gap (see e.g. Nielsen and Madsen, 2017). Therefore, it is examined whether the gender distribution of job families has any impact on the gender resignation gap. Table 20 presents the examination of the gender promotion gap by dividing job families into groups based on their gender balance ratio. Appendix 8 presents the data in Table 20 in more detail.

Table 20. QCA results: gender resignation gap by within-group gender balance ratio

Group	Count	% of women	More likely to resign (outcome)	Overall resignation rate	Coverage	Resignation rate women	Coverage, women	Resignation rate men	Coverage, men
1	11985	8.33 %	Equal	2.62 %	30.11 %	2.91 %	2.78 %	2.59 %	27.33 %
2	10650	31.21 %	Male	5.50 %	56.18 %	4.51 %	14.38 %	5.95 %	41.80 %
3	2001	54.22 %	Equal	1.65 %	3.16 %	1.75 %	1.82 %	1.53 %	1.34 %
4	2317	65.52 %	Equal	3.93 %	8.72 %	3.69 %	5.37 %	4.38 %	3.36 %
5	1044	84.48 %	Equal	1.82 %	1.82 %	1.47 %	1.25 %	3.70 %	0.58 %

Compared to the promotion gap analysis (Table 16), the relationship between gender balance ratio and gender resignation gap does not seem to be as significant. The resignation rate has been higher for men in group 2 (20%-40% gender balance ratio), but no conclusions regarding the gender distribution's impact cannot be made because the resignation gap is probably explained by other factors: the overall resignation rate in group 2 is 5.5%, which is almost 2 percentage points higher compared to company average, so it could be assumed

that group 2 consists of employees who for instance have low tenure and/or age, or who belong to the employee category of upper-white collars and top management.

The coverage values for the groups where men have higher resignation rates are quite high, so there is some indication that overall, men might be more likely to resign. However, it seems that there might be an unobserved factor that could potentially explain the resignation behavior better than the conditions used (see the interpretation of Table 19). In other words, there are not very clear or significant configurations regarding the gender promotion gap thus it is difficult to state whether the slightly higher promotion rate for men is caused by gender.

5.4 Main research question: Gender balance ratio by 2030

The answer to the main research question is given based on the results of the Monte Carlo simulation. The historical data used is from 31.12.2010-31.12.2021 and the estimates are made annually until 31.12.2029. The uncertain variables to simulate are:

1. the number of recruited employees
2. the proportion (%) of women in recruited employees
3. the number of terminated employees and
4. the proportion (%) of women in terminated employees.

Section 5.4.1 describes the research settings, e.g. the logic behind the uncertain variable value assignment, and section 5.4.2 presents the final results.

5.4.1 Research settings

The uncertain variables are assigned values based on previous years' data, i.e. the minimum and the maximum values for the uniform distribution are determined based on the state and possible trends of recent years. Uniform distribution was chosen because it allows a wider range for a scenario to be examined. The idea is to examine the trends in the historical data

and assign values based on that. The logic for the minimum/maximum value assignment is the same for all four parameters, but there are slight differences regarding how the input data is defined. Figure 11 presents the general logic briefly, and a detailed explanation of the logic is described in Appendix 9.

Logic for assigning value for parameter A in year t

Data and inputs:
$$r = [A_{t-3}, A_{t-1}]$$
$$h = [A_{t-11}, A_{t-4}]$$
$$r\_avg = \text{average of } r$$
$$h\_avg = \text{average of } h$$
$$sh = \text{standard deviation of } [A_{t-11}, A_{t-1}]$$
$$vr = \text{manual input}$$

uniform(*min,max*) = a random value between *min* and *max*

1. Compare r and h using two sample t-test:
→ If **r_avg** and **h_avg** are equal, define A based on 2
→ If **r_avg** > **h_avg**, define A based on 3
→ If **h_avg** > **r_avg**, define A based on 4

2. $A_t = \text{uniform}((r\_avg - sh/vr), (r\_avg + sh/vr))$

3. $A_t = \text{uniform}((r\_avg - sh/vr), (r\_avg + sh))$

4. $A_t = \text{uniform}((r\_avg - sh), (r\_avg + sh/vr))$

Figure 11. Logic for uncertain variable assignment used in Monte Carlo simulation

To summarize the "simulation logic", the purpose is to compare data from the previous three years with data from eight years before that by using two-sample t-tests (see e.g. Kim, 2015 for the description of t-test; t-tests are used to determine whether two sample means are equal) and see if there are any indications of an increasing or decreasing trend. The significance level used in the t-tests is 5%.

If the two means are equal, the uncertain value is assigned based on the recent years' data with some variation that is based on the standard deviation of the previous 11 years. The parameter *vr* (see Figure 11) is used to modify the result variation: if *vr* is set to 1, the range of the possible values for the uncertain variable will result as large, while *vr* of 10 would smoothen the simulations due to a smaller range for possible parameter values.

If the two means are not equal, it is interpreted as a trend in data. For instance, if the average number of terminated employees during the previous three years would be significantly larger than the number of terminated employees during the previous eight years before that, the maximum value for the range of possible values would be increased by the manual vr input (see Figure 11). It should be noted that if vr is set to 1, the minimum will be as "far" from average as the maximum, i.e. this would exclude the trend aspect from the simulation. If vr was set to a very large number, that would ultimately produce a constantly increasing trend since the minimum could basically never take value lower than the recent years' average.

In the final models (see section 5.4.2), vr is set to 5, which means that for increasing trends the minimum is the average of the previous three years deducted by 20% of the previous 11 years' standard deviation, and for decreasing trends, the maximum is the average of previous three years plus the 20% of the previous 11 years' standard deviation.

The Monte Carlo simulation is applied for 5 different scenarios separately. Table 21 presents the scenario descriptions. The "simulation logic" refers to the logic described in Figure 11.

Table 21. Monte Carlo simulation: scenario descriptions

Model	Simulated by	Description
1	Function	Simulating the number and the gender balance ratio of recruited employees and the number and the gender balance ratio of terminated employees based on *simulation logic*
2	Employee Category	Simulating the number and the gender balance ratio of recruited employees and the number and the gender balance ratio of terminated employees based on *simulation logic*
3	Function	Simulating the number and the gender balance ratio of recruited employees and the number of terminated employees based on simulation logic, assigning the GBR of terminated employees in year t equal to the overall GBR in year t-1
4	Function	Simulating the number of recruited employees, and the number and the gender balance ratio of terminated employees based on simulation logic, assigning the GBR of recruited employees to 50%
5	Function	Simulating the number of recruited employees and the number of terminated employees based on simulation logic, assigning the GBR of recruited employees to 50%, assigning the GBR of terminated employees in year t equal to the overall GBR in year t-1

Models 1 and 2 use simulation logic for all four parameters and they differ only by the feature the data is split on (e.g., logic in the uncertain variable assignment is the same). There are 10 functions in total, which means that the Monte Carlo simulation is applied to smaller samples of data in model 1 compared to model 2 which is simulated by the employee category.

Four out of the five simulation models simulate changes in the personnel by function. The changes in headcounts of the functions indicate organizational changes since they are focused on different areas of business. Thus, it might be more descriptive to simulate the personnel data based on functions rather than employee categories. Therefore, the results of model 1 might be more interesting and potentially more descriptive compared to the results of model 2.

Model 3 assumes that the gender balance ratio of left employees is the same as the overall gender balance ratio. Since other settings are similar to model 1, the result of model 3 will also indicate if the gender balance ratio of terminated employees during 2010-2021 has been at the same level as the gender balance ratio in all employees. If the resulting gender balance ratio of model 3 is lower compared to the result of model 1, it indicates that relatively more male employees are terminating than working for the company.

Model 4 simulates the personnel development by setting the gender balance ratio of new hires to 50% while simulating other three parameters using the simulation logic. The result of model 4 could be considered as a description of a "50%-50%" recruitment strategy when everything else follows the historical development.

Model 5 combines the assumptions of model 3 (assuming that the gender balance ratio of terminated employees equals the overall gender balance ratio) and model 4 (assuming an gender-equal recruitment rate). The result for model 5 indicates the possibilities of achieving gender balance among employees while the current staff turnover follows the historical development and when gender is not considered to have an impact on termination probabilities.

5.4.2 Monte Carlo simulation results

Results for the five Monte Carlo simulation models are presented in Table 22. Models 1 and 2 are run 10000 times since they have more uncertainty in the parameters compared to models 3, 4 and 5 which are run 1000 times. Table 22 presents the range (minimum and maximum), and average and median values for the simulation results.

Table 22. Monte Carlo simulation results for all scenarios

Model	Result	Average	Median	Min	Max
Model 1					
	Proportion of women	39.50 %	39.38 %	23.17 %	62.63 %
	Headcount	5401	5387	3984	7494
Model 2					
	Proportion of women	44.38 %	44.12 %	25.04 %	67.35 %
	Headcount	5568	5576	3691	7425
Model 3					
	Proportion of women	37.62 %	37.54 %	25.99 %	49.58 %
	Headcount	5385	5369	4129	6883
Model 4					
	Proportion of women	52.96 %	52.79 %	43.79 %	66.14 %
	Headcount	5398	5377	3694	7046
Model 5					
	Proportion of women	45.33 %	45.32 %	42.66 %	48.06 %
	Headcount	5397	5382	4239	6920

The simulated average for the proportion of women in model 1 is 39.5%. Compared to the state in 2021 (32.9%) the result seems realistic considering the recent changes in the case company's gender distribution. The minimum for the proportion of women is 23.2%, and the maximum is 62.6% thus the range for simulation outcomes is wide. The simulated average for the headcount is 5401 in model 1, which is 851 employees more compared to the state of 2021. Model 1 can be considered as a reflection of history, and it should also be considered as an indication of what would happen if the development regarding all aspects (e.g., organizational changes, or the increase in headcount) would continue. The simulated average for the proportion of women in model 2 is 44.4%, which is almost 5 percentage points higher compared to the result of model 1. Gender balance ratio of 44.4% would require an annual change of over 1 percentage point.

The simulated average for the proportion of women in model 3 is 37.6% which is almost 2 percentage points lower compared to the result of model 1. That means that historically, the gender balance ratio of terminated employees has been smaller than the gender balance ratio

of all employees, i.e. relatively more men than women have left the company, which is consistent with the interpretation of Figure 9 presented in section 4.5. The result of model 4 supports this observation: the average simulated gender balance ratio is 53.0% which means that if the company hired employees at an equal gender balance ratio, the number of women would end up exceeding the number of men meaning that the historical data indicates a larger share of men forming the group of terminated employees.

Model 5 is a combination of models 3 and 4 – it assumes that the share of women in terminated employees follows the overall gender balance ratio and that an equal number of men and women would be hired to the company in the future. The average simulated proportion of women by 31.12.2029 is 45.3% in model 5 which is not very far away from an equal gender balance ratio. This also means that if the goal would be achieving "50%-50%" by 2030, it would require hiring significantly more women than men assuming that the average employee turnover would stay at the same level.

Figure 12 presents the simulated time series for all five models. The equal gender balance ratio (50%) is marked in black in the plots that present the development of the proportion of women. The total headcount on 31.12.2021 (4550) is marked in black in the plots that present the development for the total headcount.

Figure 12. Simulated time series for all five scenarios

Figure 12 presents simulated time series for all five models. The plots on the left present the simulated gender balance ratio, and the plots on the right present the simulated total headcount. In all models, the average proportion of women approaches the threshold of 50%,

and the number of employees exceeds the 2021 state in most simulation rounds. It can be seen from the plots that the fewer parameters are simulated, the smaller the range of final outcomes (state of 31.12.2029) gets – for instance, in model 1 the range for final outcomes for the proportion of women is 23.2%-62.6%, while the range is 42.%7-48.1% for model 5.
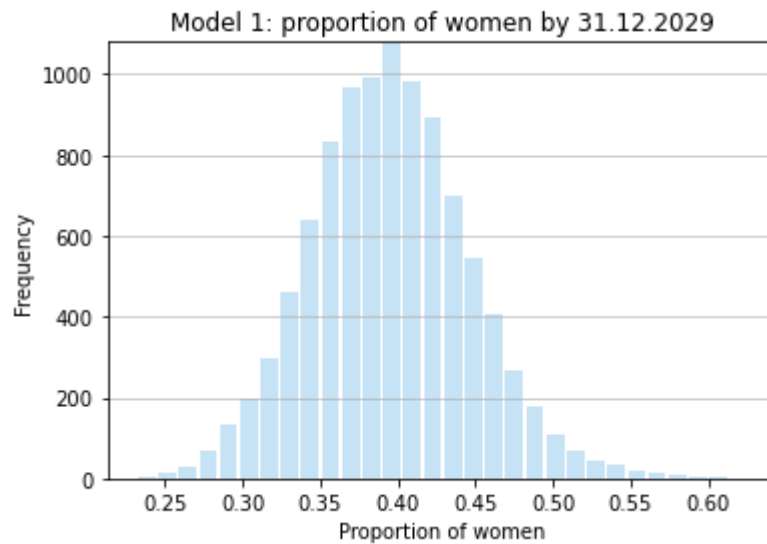
Figure 13. The probability distribution of simulated values for the proportion of women by 2030 in Model 1
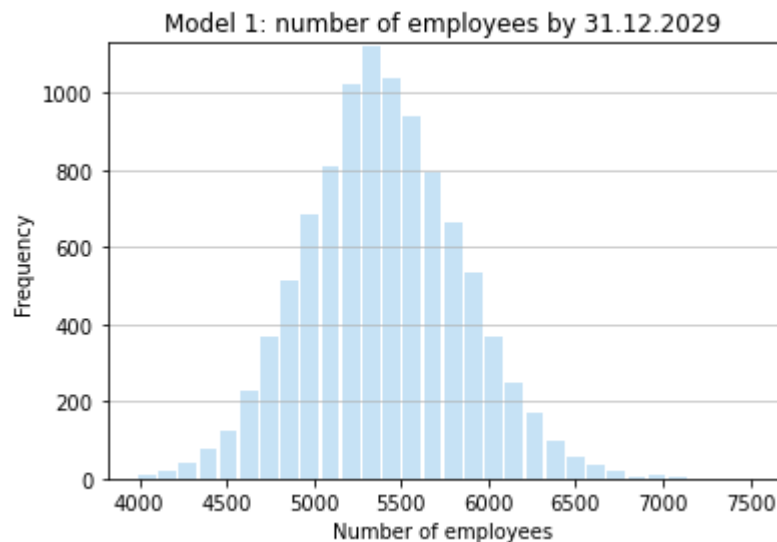
Figure 14. The probability distribution of simulated values for total headcount by 2030 in Model 1

Figures 13 and 14 visualize the final outcomes for the proportion of women and total headcount in 31.12.2029 in model 1 (see Appendices 10-17 for the probability distributions of models 2-5). The histogram in Figure 13 looks normally distributed. Figure 14 shows that

in most cases, the simulated value for the headcount on 31.12.2029 is larger than the case company's headcount on 31.12.2021 (4550). Appendices 18 and 19 present the simulation results by function (model 1) and by employee category (model 2).

Based on the historical data, the trend for the overall gender balance ratio is increasing. As mentioned, the significant difference in the results of models 1 and 2 shows that the simulation is uncertain. Furthermore, it can be seen from the results of models 3, 4 and 5 that internal events and strategies can have a great impact on the future (e.g., if the company decided that an equal number of men and women would be hired during the next eight years). Thus, it can be concluded that the future is dependent on many aspects, of which some are dependent on internal decisions (e.g., who to hire), but of which the company cannot have an impact on (e.g., who are applying and who are voluntarily leaving the company). Section 6 presents more conclusions on the main research question and discussion regarding the future.

6   Conclusions and discussion

The objective of this thesis was to review the state of gender equality and the development of gender representation in a case company. In addition to examining the gender balance ratio, the goal was also to examine whether the internal career development opportunities are the same for men and women. The topic is relevant to this day – several companies have launched strategies and other initiatives for improving gender balance. The concept of diversity, equity, and inclusion concerns other aspects than gender, and a suggestion for further research could be to examine personnel diversity more widely. The thesis consists of a comprehensive literature review and an empirical study divided into four research questions.

The first research question examines the development in the proportion of women in new hires from 2010 to 2021. The trendline was examined visually in section 4.2 and statistically in section 5.1. Overall, the proportion of women in new hires has increased, which is mostly due to organizational changes – the share of blue-collar employees in all employees has decreased while the share of employees in other employee categories has increased. Additionally, the share of women has increased among the upper white-collars which was the largest employee category by the end of 2021.

A large share of the case company's operations is in areas that can be considered horizontally segregated with a male majority, which is an essential observation regarding the future: for some functions, it might not be realistic to reach gender balance (i.e., having as many female and male employees). For horizontally segregated functions or occupations, the goal of gender equality could be in ensuring fair treatment in recruitment and making sure that the job advertisements are appealing to both men and women rather than pursuing a gender balance ratio of 50%. Additionally, diversity training for instance on unconscious bias could be arranged to promote gender diversity and equality. Some suggestions for future research topics could be examining what affects the potential applicant pool's application intentions, or whether the gender distribution in new hires of a certain profession is the same compared

to the market situation – for instance, whether the gender distribution of recent graduates in engineering fields corresponds to the gender distribution among entry-level engineers.

The second research question examines the gender promotion gap. According to the two-proportion z-test (Table 13), the overall gender promotion gap is not statistically significant. The qualitative comparative analysis detected eight groups where a statistically significant gender promotion gap was present. Additionally, there was some indication that a within-group gender balance ratio has an impact on the gender promotion gap – both men and women might benefit from belonging to a minority. Another finding was that age might have an opposite effect on the promotion rates of men and women, but this observation was not statistically significant. Thus, the overall impact of gender on promotion rates does not seem to be major, but there are some indications of gender having an impact on promotions in certain samples. The gender promotion gap analysis could be continued by using data on performance or data on employee motivation (e.g., data from personnel surveys) since these factors play an important role regarding promotion probabilities – however, this kind of data might be biased due to the human input and perceptions especially in fields where performance cannot be measured by quantitative metrics. For instance, sales performance could be measured by revenue assuming that the possibilities for performing are equal.

The third research question examines gender's impact on resignation. The overall resignation rate was 3.73% which means that the share of "positive" cases was relatively low, and the overall gender resignation gap was not statistically significant (Table 17). The qualitative comparative analysis did not manage to describe clear patterns that would explain the gender resignation gap in groups where a statistically significant gap was detected. This could indicate that there might be data that would explain employee turnover intentions better than the data used in the analysis. A suggestion for future research would be using data on job satisfaction as an explanatory variable since the relationship between job satisfaction and turnover has been detected in multiple studies (see section 2.5). The relationship between career opportunities and turnover rates could also be an interesting research topic.

The main research question examines the development of the case company's gender balance ratio – the goal was to estimate the overall gender balance ratio by 2030. The

proportion of women in all employees has increased in the previous years due to organizational changes but also due to recruiting relatively more female employees. The final analysis was made using Monte Carlo simulation as a research methodology, and the parameters were simulated using data gathered from personnel reports from 2010 to 2021 – therefore, the results reflect the historical development and trends of change. It should be taken into account that the simulation results are sensitive to research settings i.e. adjustments to the simulated parameters and the samples used (i.e., whether the simulation is made by business function or employee category). Therefore, the results should be considered descriptive and indicative rather than an accurate forecast for the future. Five separate scenarios were simulated in the analysis: the result of the first scenario (all parameters simulated by business function) was a gender balance ratio of 39.5% by 2030 which would require an annual increase of 0.83 percentage points in the overall proportion of women. A suggestion to improve the analysis would be to utilize public data sources such as data on educational attainment in estimating future prospects of the applicant pools' gender distribution.

From the perspective of statistical and predictive modeling, the use of employee (HR) data might be less straightforward compared to for instance financial modeling. First, there might be very relevant data that is missing: either that data has never been collected, or it cannot be accessed for instance because of legal issues (e.g., information regarding health). Additionally, when considering for instance personnel survey data, the data might be biased because of social or psychological reasons (on *response bias*, see e.g. Bogner and Landrock, 2016). Furthermore, since a majority of companies are not large corporates, there might not be enought data points to gain statistically significant results to support further decision-making. For these reasons, descriptive analytics i.e. reporting should not be underestimated because it is an efficient way to gain understanding on a certain situation. In addition to more traditional modeling and analytics methods, a lot of insight can be produced for instance with text mining methods to analyze answers gathered from personnel surveys.

Another limitation regarding HR analytics is that career development is not always very straightforward, and causal relationships regarding the development might be complex (see the example of Smith et al., 2013 in section 2.4.1 as an example). In this research, the QCA approach was selected as a research method for this reason since the benefit of QCA is in

detecting complex causalities. Even though QCA does not provide the net effects of single variables, it can be very descriptive and provide more in-depth interpretations of a current situation compared to models that assume linearity.

The state of gender equality has improved from many perspectives over time, but there are still dimensions of working life where inequality is present (e.g., Eurofound, 2020). Many of the dimensions have been acknowledged – HR analytics can be a great tool for examining these topics internally to support gender equality.

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Appendices

Appendix 1. The proportion of women in new hires by employee permanence and employee category (quarterly data)

Proportion of women in new hires by quarter (2010 Q1 - 2021 Q4)

Appendix 2. Total headcount and the proportion of women by function (2010-2021)
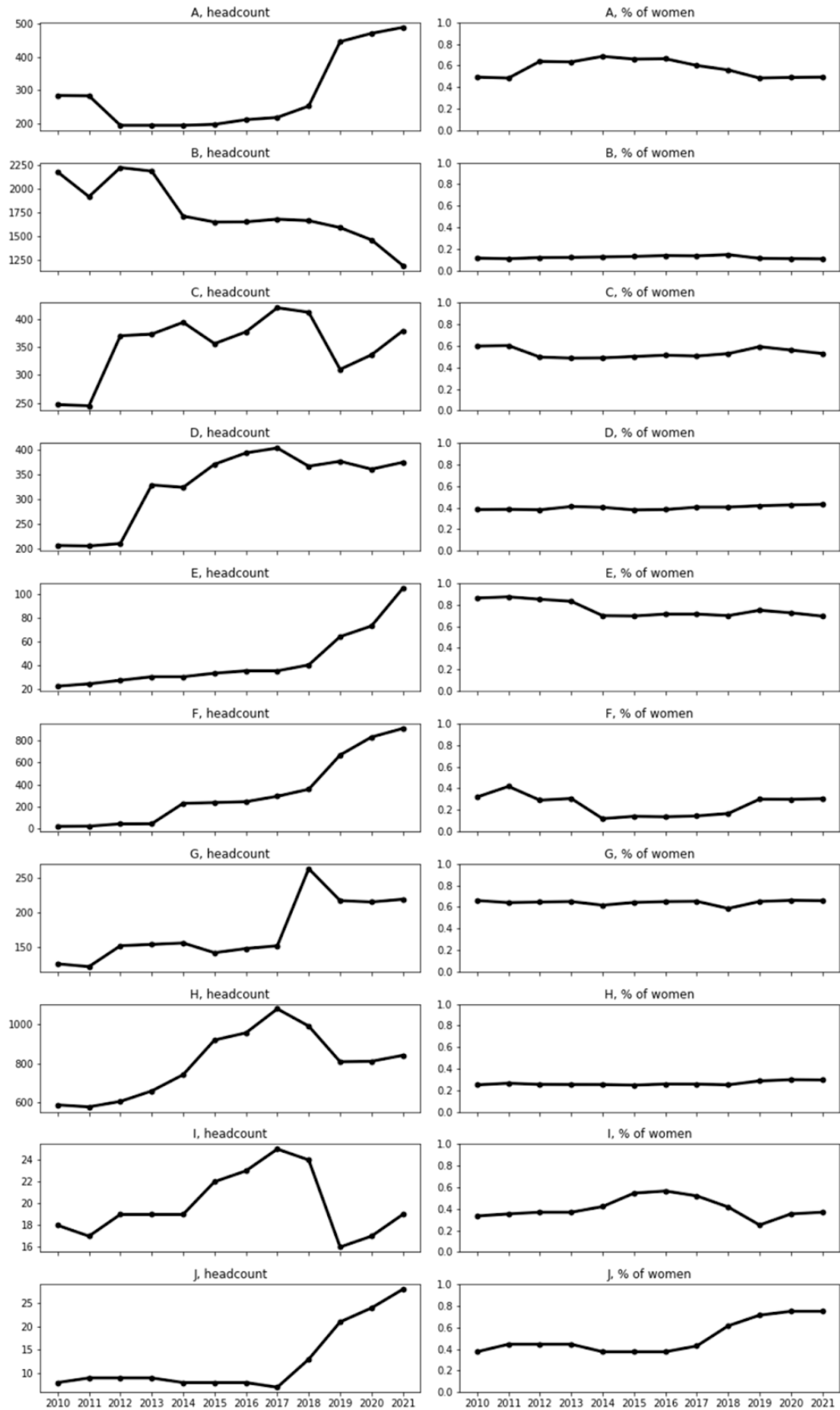
Appendix 3. Detailed view of QCA results regarding gender promotion gap by all conditions

Job Family	Tenure over median	Employee Category	Age over median	Is Permanent	Is Manager	Count	Proportion of women	Promotion rate	Promotion rate women	Promotion rate men	z-statistic	p-value	Gender in favor
R	0	3	0	0	0	88	42.05 %	27.27 %	10.81 %	39.22 %	-2.9534	0.0031	Male
D	1	3	1	1	1	131	38.17 %	5.34 %	0.00 %	8.64 %	-2.1366	0.0326	Male
R	1	3	1	1	0	188	64.89 %	2.66 %	0.82 %	6.06 %	-2.1317	0.0330	Male
R	0	3	0	1	0	303	45.21 %	17.49 %	13.87 %	20.48 %	-1.5082	0.1315	Equal
C	1	1	1	1	0	457	6.78 %	5.03 %	0.00 %	5.40 %	-1.3276	0.1843	Equal
E	0	3	0	1	0	128	45.31 %	12.50 %	8.62 %	15.71 %	-1.2080	0.2270	Equal
E	1	3	1	1	0	148	50.68 %	2.70 %	1.33 %	4.11 %	-1.0413	0.2977	Equal
R	0	2	0	0	0	88	52.27 %	19.32 %	15.22 %	23.81 %	-1.0197	0.3078	Equal
L	1	2	1	1	0	98	45.92 %	4.08 %	2.22 %	5.66 %	-0.8572	0.3913	Equal
D	0	2	0	1	0	168	52.38 %	13.10 %	11.36 %	15.00 %	-0.6978	0.4853	Equal
R	0	3	1	1	0	98	64.29 %	4.08 %	3.17 %	5.71 %	-0.6088	0.5426	Equal
N	0	3	0	1	0	272	22.06 %	20.59 %	18.33 %	21.23 %	-0.4893	0.6246	Equal
P	1	3	0	1	0	126	23.81 %	11.90 %	10.00 %	12.50 %	-0.3691	0.7121	Equal
F	0	3	0	1	0	283	36.04 %	11.66 %	10.78 %	12.15 %	-0.3449	0.7302	Equal
P	0	3	0	1	0	185	32.97 %	19.46 %	18.03 %	20.16 %	-0.3438	0.7310	Equal
J	0	3	1	1	0	95	47.37 %	5.26 %	4.44 %	6.00 %	-0.3390	0.7346	Equal
F	1	3	1	1	0	234	25.21 %	5.98 %	5.08 %	6.29 %	-0.3364	0.7366	Equal
K	0	3	0	1	0	355	38.87 %	14.93 %	14.49 %	15.21 %	-0.1842	0.8539	Equal
M	1	2	0	1	0	130	68.46 %	6.92 %	6.74 %	7.32 %	-0.1201	0.9044	Equal
I	1	3	1	1	0	156	23.72 %	5.13 %	5.41 %	5.04 %	0.0875	0.9303	Equal
P	0	1	0	0	0	345	16.81 %	33.91 %	34.48 %	33.80 %	0.1005	0.9200	Equal
D	1	3	0	1	0	106	41.51 %	8.49 %	9.09 %	8.06 %	0.1868	0.8518	Equal
D	0	3	0	1	0	248	39.92 %	7.66 %	8.08 %	7.38 %	0.2025	0.8396	Equal
P	1	1	0	1	0	946	7.40 %	9.30 %	10.00 %	9.25 %	0.2088	0.8346	Equal
B	1	3	0	1	0	200	33.50 %	12.50 %	13.43 %	12.03 %	0.2831	0.7771	Equal
I	0	3	0	1	0	280	47.50 %	13.57 %	14.29 %	12.93 %	0.3320	0.7399	Equal
P	0	1	0	1	0	1295	7.64 %	29.73 %	31.31 %	29.60 %	0.3587	0.7198	Equal
M	0	3	0	1	0	231	50.65 %	22.94 %	24.79 %	21.05 %	0.6747	0.4998	Equal
A	0	3	0	1	0	188	52.13 %	16.49 %	18.37 %	14.44 %	0.7241	0.4690	Equal

B	0	3	1	1	0	363	9.92 %	5.51 %	8.33 %	5.20 %	0.7823	0.4340	Equal
M	1	2	1	1	0	423	74.94 %	1.89 %	2.21 %	0.94 %	0.8276	0.4079	Equal
F	1	3	0	1	0	83	36.14 %	9.64 %	13.33 %	7.55 %	0.8581	0.3908	Equal
I	1	3	0	1	0	95	43.16 %	15.79 %	19.51 %	12.96 %	0.8671	0.3859	Equal
B	1	3	1	1	0	484	15.08 %	5.99 %	8.22 %	5.60 %	0.8702	0.3842	Equal
D	1	3	1	1	0	246	34.55 %	3.25 %	4.71 %	2.48 %	0.9341	0.3503	Equal
M	1	3	1	1	0	226	44.25 %	7.96 %	10.00 %	6.35 %	1.1968	0.3140	Equal
J	0	3	0	1	0	133	30.83 %	4.51 %	7.32 %	3.26 %	1.0408	0.2980	Equal
A	1	3	1	1	0	84	54.76 %	5.95 %	8.70 %	2.63 %	1.1692	0.2423	Equal
M	0	2	0	1	0	146	53.42 %	12.33 %	15.38 %	8.82 %	1.2029	0.2290	Equal
Q	0	3	0	1	0	121	73.55 %	19.83 %	22.47 %	12.50 %	1.2132	0.2250	Equal
M	0	3	1	1	0	105	46.67 %	9.52 %	14.29 %	5.36 %	1.5549	0.1200	Equal
F	0	3	1	1	0	113	46.02 %	5.31 %	9.62 %	1.64 %	1.8846	0.0595	Equal
I	0	3	1	1	0	97	50.52 %	4.12 %	8.16 %	0.00 %	2.0216	0.0432	Female
D	0	3	1	1	0	133	28.57 %	3.01 %	7.89 %	1.05 %	2.0871	0.0369	Female
K	1	3	1	1	0	266	14.29 %	4.51 %	13.16 %	3.07 %	2.7739	0.0055	Female
J	1	3	1	1	0	322	21.74 %	2.80 %	8.57 %	1.19 %	3.3143	0.0009	Female
P	1	1	1	1	0	1641	5.18 %	2.62 %	8.24 %	2.31 %	3.3281	0.0009	Female
B	0	3	0	1	0	1069	21.14 %	12.72 %	22.57 %	10.08 %	5.2012	0.0000	Female

Appendix 4. Detailed view of QCA results regarding gender promotion gap by experience variables

Tenure over median	Age over median	Is Permanent	Is Manager	Count	Proportion of women	Promotion rate	Promotion rate women	Promotion rate men	z-statistic	p-value	Gender in favor
0	0	0	0	1467	36.40 %	19.50 %	16.10 %	21.44 %	-2.4800	0.0131	Male
0	0	1	0	7116	29.45 %	17.57 %	16.36 %	18.07 %	-1.7211	0.0852	Equal
0	0	1	1	684	25.00 %	11.99 %	9.36 %	12.87 %	-1.2233	0.2212	Equal
1	0	1	1	555	18.20 %	13.15 %	12.87 %	13.22 %	-0.0927	0.9262	Equal
1	0	1	0	2986	27.96 %	10.75 %	10.78 %	10.74 %	0.0311	0.9752	Equal
0	1	1	1	816	32.11 %	4.90 %	4.96 %	4.87 %	0.0545	0.9566	Equal
1	1	1	0	7762	28.21 %	4.01 %	4.11 %	3.97 %	0.2898	0.7720	Equal
0	1	0	0	263	38.40 %	7.22 %	7.92 %	6.79 %	0.3445	0.7305	Equal
1	1	1	1	1483	26.77 %	5.93 %	6.30 %	5.80 %	0.3580	0.7203	Equal
0	1	1	0	2463	29.23 %	6.37 %	7.92 %	5.74 %	2.0138	0.0440	Female

Appendix 5. Detailed view of QCA results regarding gender promotion gap by within-group gender balance ratio

Group	Count	Proportion of women	Promotion rate	Promotion rate women	Promotion rate men	z-statistic	p-value	Gender in favor
1	11260	9.10 %	12.24 %	14.54 %	12.01 %	2.3553	0.0185	Female
2	6522	28.73 %	8.20 %	10.46 %	7.29 %	4.2156	0.0000	Female
3	4408	47.19 %	8.80 %	9.33 %	8.33 %	1.1623	0.2451	Equal
4	2476	64.78 %	10.78 %	9.54 %	13.07 %	-2.7086	0.0068	Male
5	971	86.20 %	6.08 %	5.85 %	7.46 %	-0.7236	0.4693	Equal

Appendix 6. Detailed view of QCA results regarding gender resignation gap by all conditions

Job Family	Employee Category	Tenure over median	Age over median	Count	% of women	Resignation rate	Resignation rate women	Resignation rate men	z-statistic	p-value	likely to
N	3	0	0	424	21.23 %	9.91 %	2.22 %	11.98 %	-2.7491	0.0060	Male
B	3	0	0	1496	22.93 %	10.49 %	7.29 %	11.45 %	-2.2068	0.0273	Male
O	2	0	0	154	74.68 %	1.95 %	0.87 %	5.13 %	-1.6629	0.0963	Equal
K	3	0	0	680	35.00 %	12.50 %	9.66 %	14.03 %	-1.6410	0.1008	Equal
I	3	0	0	358	43.30 %	7.82 %	5.16 %	9.85 %	-1.6379	0.1014	Equal
B	3	1	1	679	15.32 %	1.77 %	0.00 %	2.09 %	-1.4864	0.1372	Equal
B	3	0	1	483	10.97 %	9.32 %	3.77 %	10.00 %	-1.4714	0.1412	Equal
D	2	0	0	192	47.92 %	4.17 %	2.17 %	6.00 %	-1.3254	0.1850	Equal
E	3	0	1	127	41.73 %	8.66 %	5.66 %	10.81 %	-1.0176	0.3089	Equal
I	3	1	1	228	23.25 %	1.32 %	0.00 %	1.71 %	-0.9595	0.3373	Equal
F	3	1	1	427	29.98 %	0.47 %	0.00 %	0.67 %	-0.9275	0.3537	Equal
M	3	0	0	309	45.31 %	2.27 %	1.43 %	2.96 %	-0.8998	0.3682	Equal
M	2	1	1	490	70.00 %	0.82 %	0.58 %	1.36 %	-0.8765	0.3808	Equal
L	2	1	1	177	36.16 %	0.56 %	0.00 %	0.88 %	-0.7547	0.4504	Equal
L	2	0	0	121	28.93 %	4.96 %	2.86 %	5.81 %	-0.6793	0.4969	Equal
D	3	1	1	391	34.27 %	1.28 %	0.75 %	1.56 %	-0.6767	0.4986	Equal

C	2	1	1	414	7.25 %	1.21 %	0.00 %	1.30 %	-0.6288	0.5295	Equal
D	3	0	0	391	31.97 %	9.21 %	8.00 %	9.77 %	-0.5660	0.5714	Equal
P	3	1	1	171	20.47 %	0.58 %	0.00 %	0.74 %	-0.5088	0.6109	Equal
Q	3	1	1	90	66.67 %	2.22 %	1.67 %	3.33 %	-0.5056	0.6131	Equal
P	1	0	0	1710	7.43 %	3.04 %	2.36 %	3.10 %	-0.4630	0.6434	Equal
P	3	0	0	230	31.30 %	6.52 %	5.56 %	6.96 %	-0.4006	0.6887	Equal
R	3	0	0	422	49.76 %	7.11 %	6.67 %	7.55 %	-0.3519	0.7249	Equal
I	2	0	0	71	43.66 %	7.04 %	6.45 %	7.50 %	-0.1712	0.8640	Equal
F	3	0	0	386	33.16 %	5.70 %	5.47 %	5.81 %	-0.1377	0.8905	Equal
I	3	0	1	153	36.60 %	5.23 %	5.36 %	5.15 %	0.0542	0.9568	Equal
I	3	1	0	125	29.60 %	2.40 %	2.70 %	2.27 %	0.1434	0.8860	Equal
P	3	1	0	181	22.10 %	4.42 %	5.00 %	4.26 %	0.2022	0.8397	Equal
K	3	0	1	301	13.95 %	8.64 %	9.52 %	8.49 %	0.2203	0.8256	Equal
J	3	0	1	136	45.59 %	7.35 %	8.06 %	6.76 %	0.2910	0.7710	Equal
M	3	0	1	154	51.30 %	4.55 %	5.06 %	4.00 %	0.3166	0.7515	Equal
D	3	1	0	167	32.34 %	4.79 %	5.56 %	4.42 %	0.3201	0.7489	Equal
J	3	1	0	107	42.99 %	7.48 %	8.70 %	6.56 %	0.4163	0.6772	Equal
Q	3	0	0	156	66.67 %	7.05 %	7.69 %	5.77 %	0.4423	0.6583	Equal
R	3	0	1	153	67.32 %	5.23 %	5.83 %	4.00 %	0.4757	0.6343	Equal
P	1	1	0	976	5.64 %	1.02 %	1.82 %	0.98 %	0.6016	0.5474	Equal
F	3	1	0	166	27.71 %	3.01 %	4.35 %	2.50 %	0.6234	0.5330	Equal
K	3	1	0	121	34.71 %	3.31 %	4.76 %	2.53 %	0.6532	0.5136	Equal
R	3	1	0	103	52.43 %	5.83 %	7.41 %	4.08 %	0.7197	0.4717	Equal
K	2	0	0	89	64.04 %	1.12 %	1.75 %	0.00 %	0.7535	0.4511	Equal
B	3	1	0	262	30.92 %	4.58 %	6.17 %	3.87 %	0.8249	0.4094	Equal
D	3	0	1	231	24.68 %	4.76 %	7.02 %	4.02 %	0.9214	0.3568	Equal
A	3	0	0	227	49.34 %	4.85 %	6.25 %	3.48 %	0.9723	0.3309	Equal
A	3	1	1	148	51.35 %	0.68 %	1.32 %	0.00 %	0.9766	0.3288	Equal
E	3	1	1	292	38.36 %	1.71 %	2.68 %	1.11 %	1.1939	0.3154	Equal
R	3	1	1	290	65.17 %	0.69 %	1.06 %	0.00 %	1.0374	0.2995	Equal
F	3	0	1	169	39.05 %	5.33 %	7.58 %	3.88 %	1.0429	0.2970	Equal

M	3	1	1	288	44.44 %	0.35 %	0.78 %	0.00 %	1.1200	0.2627	Equal
J	3	1	1	396	17.93 %	0.51 %	1.41 %	0.31 %	1.1854	0.2359	Equal
K	3	1	1	386	13.21 %	1.81 %	3.92 %	1.49 %	1.2111	0.2259	Equal
E	3	0	0	231	45.02 %	5.63 %	7.69 %	3.94 %	1.2322	0.2179	Equal
J	3	0	0	218	27.98 %	7.80 %	11.48 %	6.37 %	1.2621	0.2069	Equal
M	2	0	0	192	55.21 %	2.60 %	4.72 %	0.00 %	2.0409	0.0413	Female
C	1	1	1	506	7.31 %	0.40 %	2.70 %	0.21 %	2.3235	0.0202	Female
P	1	1	1	1733	5.02 %	0.52 %	2.30 %	0.43 %	2.3695	0.0178	Female

Appendix 7. Detailed view of QCA results regarding gender resignation gap by experience variables

| Is Manager	Tenure over median	Age over median	Count	% of women	Resignation rate	Resignation rate women	Resignation rate men	z-statistic	p-value	to resig
0	0	1	2871	29.68 %	5.40 %	3.99 %	5.99 %	-2.1689	0.0301	Male
1	1	1	1597	26.24 %	1.19 %	0.24 %	1.53 %	-2.0906	0.0366	Male
0	0	0	9086	28.22 %	6.52 %	5.69 %	6.84 %	-1.9889	0.0467	Male
0	1	1	8656	28.71 %	0.79 %	0.80 %	0.78 %	0.1287	0.8976	Equal
1	0	1	913	31.43 %	5.70 %	5.92 %	5.59 %	0.2011	0.8406	Equal
1	0	0	947	26.50 %	6.86 %	7.17 %	6.75 %	0.2248	0.8221	Equal
1	1	0	702	19.23 %	2.71 %	4.44 %	2.29 %	1.3846	0.1662	Equal
0	1	0	3225	25.24 %	2.26 %	3.07 %	1.99 %	1.7918	0.0732	Equal

Appendix 8. Detailed view of QCA results regarding gender resignation gap by within-group gender balance ratio

| Group	Count	% of women	Resignation rate	Resignation rate women	Resignation rate men	z-statistic	p-value	to resig
1	11985	8.33 %	2.62 %	2.91 %	2.59 %	0.5905	0.5548	Equal
2	10650	31.21 %	5.50 %	4.51 %	5.95 %	-3.0171	0.0026	Male
3	2001	54.22 %	1.65 %	1.75 %	1.53 %	0.3898	0.6967	Equal
4	2317	65.52 %	3.93 %	3.69 %	4.38 %	-0.8144	0.4154	Equal
5	1044	84.48 %	1.82 %	1.47 %	3.70 %	-1.9515	0.0510	Equal

Appendix 9. Monte carlo simulation: parameter inputs and descriptions

Monte Carlo simulation: Parameter inputs and descriptions

Variable descriptions
Term N = Number of terminations
Rec N = Number of new hires
Term GBR = The proportion of women in terminations
Rec GBR = The proportion of women in terminations
Headcount = Number of employees
Turnover = Number of terminations (y_t) / Headcount (y_{t-1})

| Parameter	Input data + time period	Description
Term N y_t	Turnover $[y_{t-11}, y_{t-1}]$, headcount y_{t-1}	Simulate average turnover using "simulation logic", and multiply the result by last year's headcount
Rec N y_t	Headcount $[y_{t-11}, y_{t-1}]$, Term N y_t	Simulate headcount using "simulation logic", and calculate the number of new hires based on last year's headcount, the simulated headcount for year **t** and the already simulated number of terminations
Term GBR y_t	Term GBR $[y_{t-11}, y_{t-1}]$	Simulate the share of women in terminations using "simulation logic"
Rec GBR y_t	Rec GBR $[y_{t-11}, y_{t-1}]$	Simulate the share of women in new hires using "simulation logic"

Appendix 10. The proportion of women by 2030 in Model 2

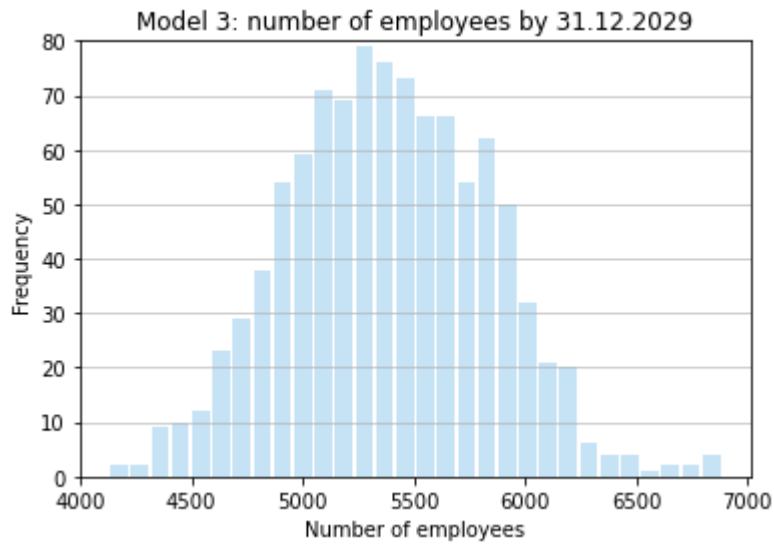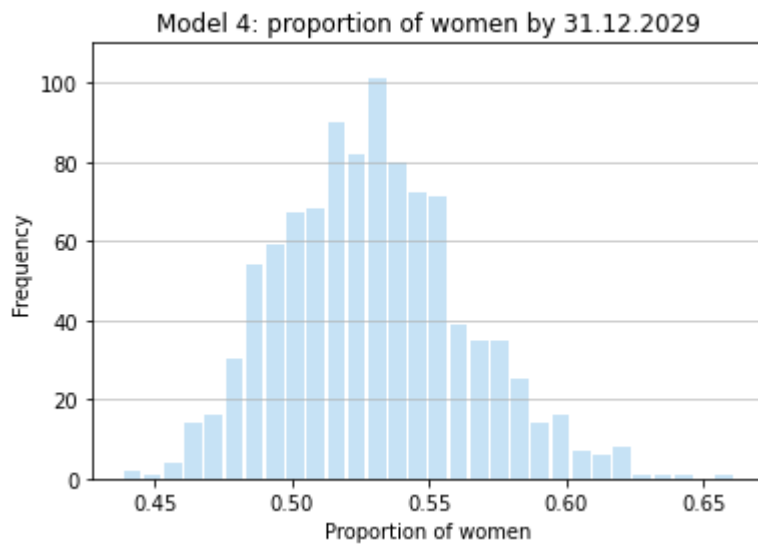Model 2: proportion of women by 31.12.2029
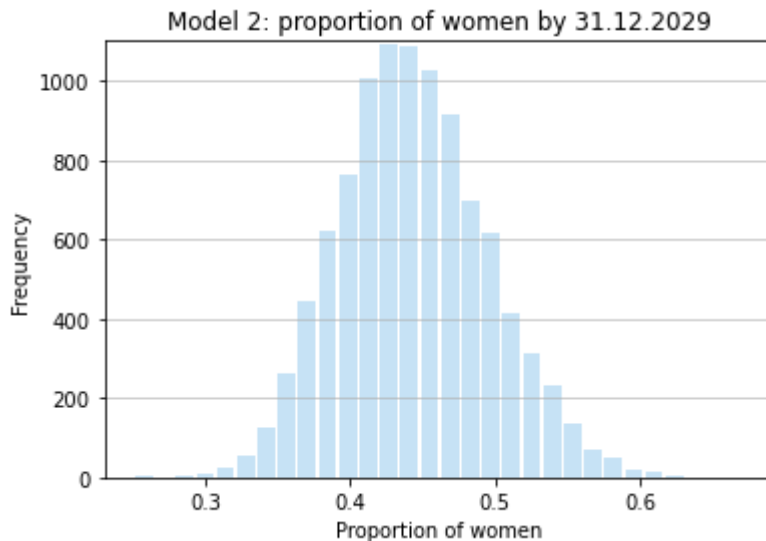
Appendix 11. Total headcount by 2030 in Model 2
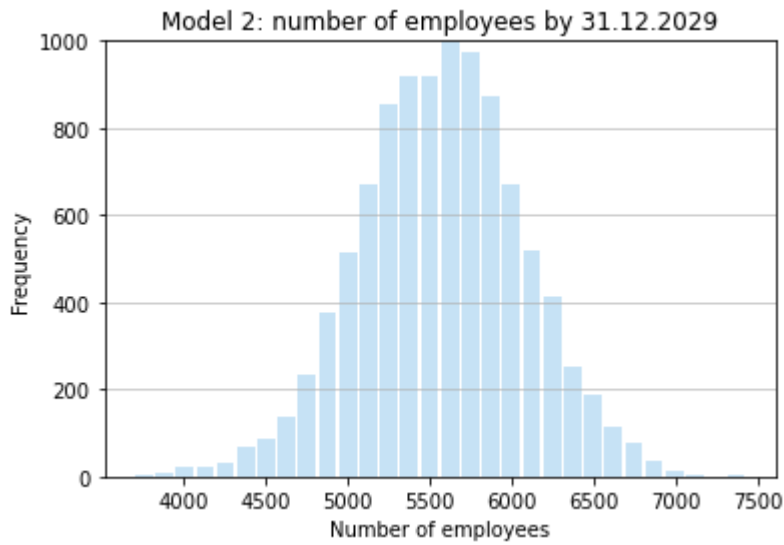
Appendix 12. The proportion of women by 2030 in Model 3
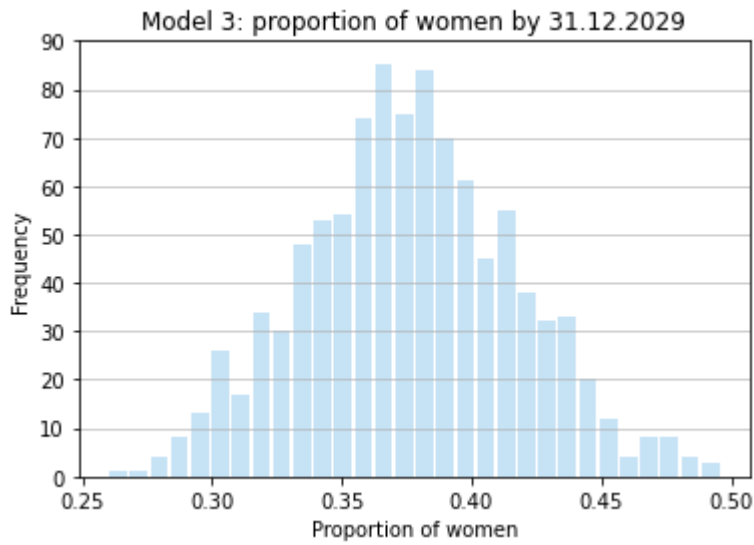
Appendix 13. Total headcount by 2030 in Model 3

Model 3: number of employees by 31.12.2029

Appendix 14. The proportion of women by 2030 in Model 4

Model 4: proportion of women by 31.12.2029

Appendix 15. Total headcount by 2030 in Model 4

Model 4: number of employees by 31.12.2029
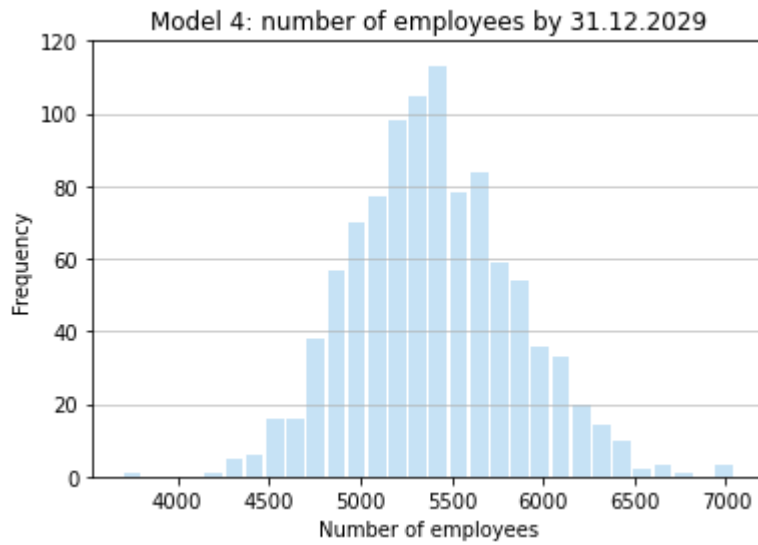
Appendix 16. The proportion of women by 2030 in Model 5

Model 5: proportion of women by 31.12.2029
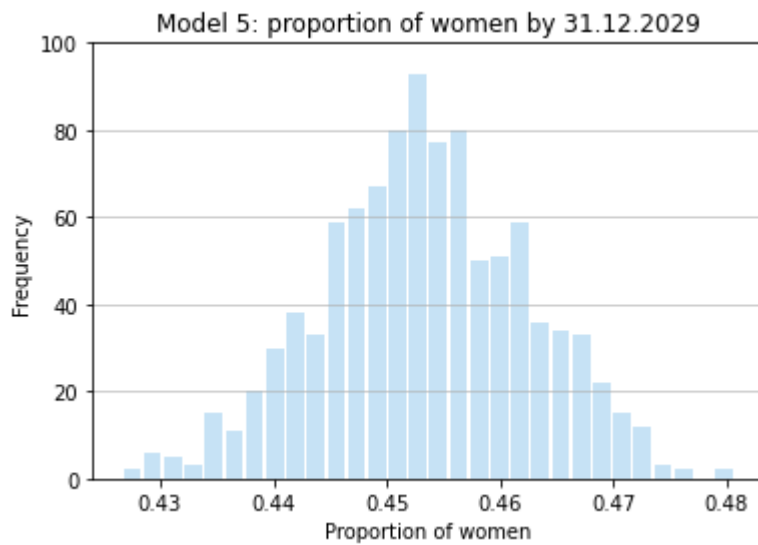
Appendix 17. Total headcount by 2030 in Model 5

Model 5: number of employees by 31.12.2029
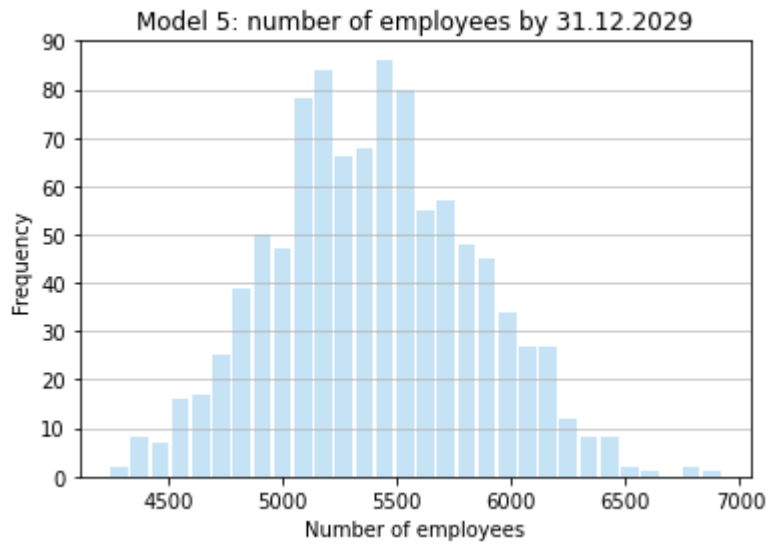
Appendix 18. Monte Carlo simulation results for Model 1 by function

Function	Parameter	State on	Average	Median	Min	Max
A						
	Proportion of women	49.28 %	59.59 %	59.31 %	27.58 %	95.47 %
	Headcount	489	751	746	347	1162
B						
	Proportion of women	10.77 %	11.99 %	12.08 %	0.00 %	32.65 %
	Headcount	1189	783	769	204	1939
C						
	Proportion of women	53.03 %	28.88 %	29.71 %	0.00 %	49.21 %
	Headcount	379	378	379	191	574
D						
	Proportion of women	43.20 %	53.27 %	53.26 %	27.43 %	83.53 %
	Headcount	375	429	439	177	705
E						
	Proportion of women	69.52 %	65.34 %	65.81 %	0.00 %	100.00 %
	Headcount	105	160	159	61	252
F						
	Proportion of women	30.24 %	33.87 %	33.06 %	0.00 %	100.00 %
	Headcount	906	1693	1686	696	2969
G						
	Proportion of women	65.75 %	67.55 %	67.77 %	13.87 %	100.00 %
	Headcount	219	295	299	141	458
H						
	Proportion of women	29.49 %	39.06 %	37.66 %	14.68 %	85.26 %
	Headcount	841	849	853	222	1517
I						
	Proportion of women	36.84 %	58.44 %	56.50 %	5.42 %	100.00 %
	Headcount	19	18	19	9	26
J						
	Proportion of women	75.00 %	71.59 %	73.78 %	0.00 %	100.00 %
	Headcount	28	45	45	19	74

Appendix 19. Monte Carlo simulation results for Model 2 by employee category

Employee Category	Parameter	State on 31.12.2021	Average	Median	Min	Max
Blue-collars						
	Proportion of women	5.47 %	2.59 %	1.47 %	0.00 %	19.19 %
	Headcount	987	955	906	213	1740
White-collars						
	Proportion of women	44.85 %	54.22 %	54.72 %	14.09 %	97.36 %
	Headcount	1019	1202	1200	882	1520
Upper white-collars						
	Proportion of women	39.31 %	53.04 %	52.24 %	34.40 %	81.20 %
	Headcount	2437	3270	3270	1628	4899
Top Management						
	Proportion of women	28.04 %	40.06 %	38.87 %	18.78 %	94.60 %
	Headcount	107	141	141	94	191