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Gender and Misallocation in the Labor Market

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Dissertation Summary:

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Firms play a key role in generating labor market inequality (Abowd et al., 1999, Card et al.). However, while an emerging body of evidence has documented that firms' wage policies represent an important determinant of earnings disparities, less is known about how other typical features of firm policies, such as their promotion practices, affect worker outcomes and the allocation of talent in the labor market. In my dissertation, I collect a unique dataset from the personnel records of a large multinational firm in order to examine how firms' organizational design contributes to gender disparities in labor market outcomes. As a manufacturer, the firm I study employs over 200,000 workers in more than 200 occupations, allowing me to analyze how men and women differ in their career progression across a broad range of different work environments. For my main analysis, I focus on the firm's biggest internal labor market, which includes the over 30,000 white-collar and management employees who are based in Germany.

All three single-authored chapters of this dissertation draw on the new dataset I assemble, which combines twenty years of detailed personnel records and payroll data with managers' private and public evaluations of worker talent, as recorded in the firm's talent management system. I link these records to the universe of application and hiring decisions at the firm from 2015 to 2019, allowing me to separate workers' labor supply decisions (i.e. applications for internal job switches) from the firm's labor demand decisions (i.e. hiring decisions). The application data also contain information on each of the over 16,000 job vacancies at the firm from 2015 to 2019, including the original job posting as well as information on the over 300,000 internal and external applicants who apply to these vacancies. To provide new insights on the impediments women perceive with respect to their career progression, I augment the administrative data by conducting two large-scale surveys to which all employees in my sample were invited to and which both received a 50% response rate.

Chapter 1 of my dissertation documents the important role that managers play for workers' career progression by providing the first empirical evidence on the scope and negative consequences of talent hoarding in organizations. I show that because women react more to managerial talent hoarding than men, talent hoarding deters high-quality women from applying for promotions which they would have likely landed and in which they would have performed well in. My findings document that talent hoarding not only leads to misallocation of talent in the firm, but also exacerbates gender inequality in representation and pay, highlighting the important role that firms' organizational design plays for gender disparities in the labor market. The results in this chapter suggest

that policies that increase application rates while deterring managers from retaliating against workers, for instance by insuring full confidentiality for applicants, represent effective tools to improve the representation of women in higher-level positions.

Understanding the key root causes of female underrepresentation is critical for identifying effective policy remedies. Chapter 2 therefore investigates when gender differences in representation first occur in employees' careers. In the past, attention has been mostly devoted to the fact that women are less likely to hold top leadership positions than men, likely because of data limitations. This chapter introduces a new hierarchy measure that allows me to assess female representation *along* the leadership hierarchy. I find that a key bottleneck for women's career progression arises early on, at the transition to the first leadership level, and that this bottleneck is driven by gender differences in promotions, not by differential entry to or exit from the firm. In stark contrast to the common notion of a glass ceiling at higher-level leadership positions, there appear to be no large bottlenecks at higher levels. To that end, the results in this chapter indicate that policies that target women in lower-level positions may be particularly effective to combat the gender gap.

Chapter 3 builds on the findings from Chapter 2 and investigates what may be driving the gender gap at the first leadership level. I find that women are not less likely to learn about job openings at the firm and do not experience lower hiring likelihoods than male applicants. Instead, gender differences in preferences for leading a team account for women's lower propensities to apply for and ultimately attain first-level leadership positions. Two large-scale surveys of employees at the firm corroborate these findings and point to differences in perceptions of and preferences over job characteristics associated with leadership positions as key underlying mechanisms. My results further suggest that policies that alter the design of leadership positions, for instance by reducing the number of direct reports, and policies that provide better information about team leadership, for instance through job shadowing, represent effective tools to increase female representation in leadership positions.

Chapter 1. Talent Hoarding in Organizations

Firms must continually decide how to allocate workers to jobs, a process which has critical implications for productivity (Rosen, 1982, Holmstrom and Tirole, 1989). Because it is difficult to perfectly observe worker ability, most firms rely on managers to identify talented workers who can be promoted to higher-level positions. However, when a talented worker leaves their team for a promotion, team performance suffers. Since managers are rewarded based on team performance and firms cannot perfectly monitor manager actions, the conflicting interests of manager and firm create the potential for moral hazard (Holmstrom, 1979). A growing body of evidence documents that workers in high-level positions have large impacts on firm performance (Bloom and Van Reenen, 2007, Lazear et al., 2015), implying that managers may create significant efficiency costs if they hoard talented workers rather than promote them. In addition, if female workers place more value on managers' approval when making application decisions, talent hoarding may have a disproport-

tionate impact along gender lines and perpetuate existing gender inequality in the labor market.¹

Ample anecdotal and survey evidence points to widespread talent hoarding in organizations. In a global survey, half of organizations report that managers hoard talent by discouraging worker mobility (i4cp, 2016). A US-based survey finds that workers in one-third of firms feel the need to keep internal applications secret from their managers out of fear of retaliation (KornFerry, 2015). In Germany, 83% of the top publicly listed companies cite managerial talent hoarding as a key friction in their organization (hkp, 2021). Despite the apparent prevalence of talent hoarding and its likely detrimental consequences, very little empirical evidence on talent hoarding exists in economics. Studying talent hoarding empirically is challenging. Managers often hoard talent through hidden actions that are difficult to observe, even in rich datasets. Furthermore, identifying the causal impacts of talent hoarding requires plausibly exogenous variation in hoarding.

This chapter provides the first empirical evidence on talent hoarding and its negative impacts on the efficient allocation of talent in organizations. I test for talent hoarding by drawing on several key advantages of the new dataset I assembled. First, by combining personnel records with the universe of application and hiring decisions at the firm, I am able to assess the extent to which talent hoarding deters applications that would have been successful. Second, two novel measures of worker visibility constructed from the firm’s internal HR databases allow me to infer managers’ propensities to hoard talent by measuring the extent to which they systematically suppress the visibility of workers on their team. Without such data, directly measuring talent hoarding is empirically challenging, because by definition hoarding involves hidden actions. Third, I use a granular measure of internal job hierarchy to test whether talent hoarding causes misallocation of talent by evaluating whether high-quality workers are deterred from moving to higher-level positions in which they would have been more productive.

To empirically test for talent hoarding, I develop a new identification strategy that leverages quasi-random variation in worker exposure to talent hoarding. When managers learn that they will move to a new position on a different team, they no longer have an incentive to hoard workers on their current team. Thus, manager rotations create a temporary window of time for workers in which they will not be subject to talent hoarding. Empirically, rotation effects are large, effectively doubling worker applications in the same quarter. I demonstrate that these effects can be interpreted as reflecting the causal effect of a manager leaving her team. A placebo test shows that manager applications for job rotations only increase worker applications if managers are successful and actually leave the team.

This increase in applications is consistent with a series of predictions on talent hoarding that follow from my conceptual framework. I first show that rotations have larger effects on workers who were previously subject to greater levels of talent hoarding, as captured by three dimensions of heterogeneity: worker quality, the costliness of worker departure, and managers’ propensities to hoard talent. I then leverage the rich job application data and show that manager rotations

¹Gender differences in preferences and behavioral attributes (Bertrand, 2011) motivate that men and women might react differently to talent hoarding.

disproportionally increase applications that under talent hoarding carry a greater risk of retaliation, either because managers are likely to find out about the application or because applications are unlikely to be successful. Moreover, I document that manager rotations only affect internal job transitions within the firm that are subject to talent hoarding, but not external job transitions out of the firm, which managers are not able to influence.

A potential threat to the interpretation of the impacts of manager rotations as representing the impacts of talent hoarding is that manager rotations may affect worker applications through additional channels. For instance, workers may refrain from applying for a new position because of loyalty towards their manager or because manager-worker-specific match effects make their current position particularly appealing. In addition, worker applications may result from team-level shocks that are correlated with manager rotations, such as unpleasant working conditions, bad news about the future outlook of the team, or the completion of a major milestone. In a series of tests, I find that these channels alone are not able to account for the observed rotation effects, suggesting that talent hoarding does play a role in deterring worker applications.

My findings indicate that talent hoarding causes misallocation of talent by reducing the quality and performance of promoted workers. To analyze misallocation, I focus on major promotions, such as transitions from individual contributors to team leader positions, that reflect meaningful changes in job responsibility. Manager rotations increase worker applications for major promotions by 123%, indicating that talent hoarding deters a large group of workers from applying for promotions. To quantify how successful deterred applications would have been, I instrument for workers' applications with manager rotations. Marginal applicants, who would not have applied in absence of a manager rotation, are similarly likely as average applicants to land a promotion and are likely to subsequently outperform their teams in higher-level positions. A complier analysis finds that marginal applicants are positively selected in terms of their educational qualifications and past performance. These findings suggest that in addition to reducing the number and the quality of applicants for higher-level positions, talent hoarding lowers team performance at these levels.

I find that talent hoarding has disparate impacts by gender. Talent hoarding deters a larger share of female applicants from applying for major promotions compared to men. Female marginal applicants are twice as likely to land a major promotion than males, implying that talent hoarding is more consequential for women's career progression. Conditional on landing a promotion, women are almost three times as likely as their male counterparts to perform well in their new positions, suggesting that the firm may be failing to realize potential productivity gains by not enabling talented women to progress to higher-level positions. Female marginal applicants are much more qualified than males in terms of their educational qualifications and past performance, indicating that talent hoarding affects women at a higher part of the quality distribution compared to men.

Talent hoarding exacerbates gender inequality in representation and pay. When comparing potential outcomes for marginal applicants, I find that increasing applications through manager rotations is much more beneficial for women than for men, reducing the gender representation gap by 91% and the gender pay gap by 77% within one year. The disparate impacts of talent hoarding

by gender are not driven by differential treatment by managers. Rather, a survey of the firm’s employees suggests that male and female workers react differently to talent hoarding. In line with the literature on gender differences in preferences (Bertrand, 2011), the survey finds that women in the firm place more value on preserving a good relationship with their manager and rely more on managers’ career guidance when making application decisions.

Because talent hoarding arises due to misaligned incentives, a natural solution would be to more closely align the incentives of managers with those of the firm. Surveys of German firms suggest that accomplishing this realignment through financial incentives is infeasible (hkp, 2021). However, policies that increase application rates — such as implementing regular application schedules and having other organizational agents, such as the HR department, directly invite workers to apply for positions — could reduce the scope for managers to engage in talent hoarding. The employee survey I conduct shows that for such policies to be effective, the firm must be able to deter managers from retaliating against workers, for instance by assuring full confidentiality for applicants. While the costs of these policies are likely to be non-negligible, their potential benefits are substantial given the potential gains for firms. In addition to talent misallocation, the employee survey suggests that talent hoarding has additional efficiency costs through other channels, such as underinvestment in human capital. In addition, workers who report being subject to talent hoarding are 30% more likely to report having searched for external jobs, indicating that talent hoarding may create unwanted turnover of high-quality workers the firm would like to retain.

Chapter 2. The Broken Rung: Gender and the Leadership Gap

Much attention has been devoted to the fact that women are less likely to hold top leadership positions than men. While 47% of S&P 500 workers are female, women only make up 6% of CEOs (Catalyst, 2021). Accordingly, most attempts to increase female leadership have focused on the very top of the job ladder, as exemplified by the increasing number of countries that have established female quotas for corporate boards. However, recent work indicates that increased representation in top positions does not necessarily trickle down to lower rungs of the job ladder (Bertrand et al., 2018, Maida and Weber, 2020), bringing into question whether addressing representation in top positions is sufficient to increase gender equality throughout the leadership hierarchy.

Despite the first-order importance of identifying the key impediments for women’s underrepresentation in leadership positions, remarkably little empirical evidence exists on when gender gaps in career progression first emerge in the leadership hierarchy. Answering this question requires the ability to distinguish between different levels of leadership. However, most datasets only contain coarse measures of job hierarchy.

The difficulty of measuring complex job hierarchies has represented a key impediment for previous research, leading researchers to focus on relatively narrow settings to study gender differences in career progression, such as supermarket workers (Ransom and Oaxaca, 2005), lawyers (Azmat and Ferrer, 2017), central bankers (Hospido et al., 2019), and academics (Bosquet et al., 2019).

Focusing on a narrow setting has the advantage of circumventing the need to define a consistent job hierarchy measure that tracks leadership levels across many different occupations and functional areas, but precludes a broader analysis of job mobility.² In my data, 15% of promotions occur across functional areas (e.g. HR to IT), and multiple career paths exist within each functional area (e.g. recruiters vs. talent management specialists in HR), indicating that a broader analysis of job mobility is necessary to fully capture employees' career progression.

The first contribution of this chapter is the construction of a new and granular measure of job hierarchy that can be used to compare leadership levels along the job ladder and across different career paths. To construct this hierarchy ranking, I leverage detailed personnel records to combine three key dimensions of leadership responsibility that directly capture employees' authority and autonomy over decision-making and which are also comparable across occupations: the cumulative number of direct reports, the reporting distance to the CEO, and the extent of managerial autonomy. My hierarchy ranking is the first principal component of these three dimensions, providing a consistent ordering of all positions at the firm. The resulting hierarchy ranking offers the key advantages of being granular, independent of pay, and comparable across different career paths. Another advantage is that the three inputs represent common elements of firms' internal personnel records and are available in many firms. In addition, a large-scale survey of the employees in my sample corroborates that the three inputs I use represent salient features of leadership positions.

The rich dataset I collected allows me to conduct several tests to validate the hierarchy ranking. I find that the hierarchy ranking is strongly correlated with earnings, but that it is much more effective at discerning between hierarchy levels at the bottom of the hierarchy relative to pay, highlighting that pay-based measures are not well-suited to studying differences at lower-levels of the hierarchy. I also show that hierarchy levels differ substantially in terms of characteristics not used to construct the hierarchy ranking, such as bonus payments or employees' work experience and educational qualifications. A transition matrix of employees' internal transitions documents that increases in hierarchy levels represent typical steps in the job ladder.

The continuous hierarchy ranking allows me to identify points along the leadership hierarchy that represent bottlenecks for female representation, providing new evidence that points towards a broken rung rather than a glass ceiling as key impediment for women's career progression. Female shares drop substantially around the transition to first-level leadership positions, from 22% to 12%. In stark contrast to the common notion of a glass ceiling at higher-level leadership positions, there appear to be no large bottlenecks at higher levels. Female representation falls only modestly after the transition to first-level leadership positions, from 12% to 7% at the highest levels. Another advantage of my setting is that I am able to assess gender differences exists across a broad range

²In the literature on internal labor markets, a common approach is to infer the job hierarchy from flows between position titles when focusing on small labor markets with few different occupations (Baker et al., 1994, Huitfeldt et al., 2021). Given the complex structure of the internal labor market at the large manufacturer I study, such approaches may not be well suited to studying larger labor markets. In addition, 26% of employees in my sample share a position title with either their supervisor or their supervisor's supervisor. Assigning them the same measure of job hierarchy would underestimate differences in leadership responsibility and likely leads to biased estimates of the gender leadership gap.

of work environments. I find that first-level leadership positions represent the key bottleneck for female representation both in male-dominated areas (e.g. engineering, IT) and in female-dominated areas (e.g. HR, marketing), suggesting that the gender composition of the work environment alone cannot account for my findings.

To identify the drivers of the bottleneck at first-level leadership positions, I assess gender differences in internal promotions, entry to and exit from the firm. Women at lower-levels of the hierarchy are 68% less likely to move to first-level leadership positions. This promotion gap persists across different employee groups and cannot be fully explained by differences in hours worked, family demands, or educational qualifications. Relative to men, women who transition to first-level leadership positions are highly positively selected in terms of their educational qualifications and past performance at the firm, suggesting that men and women sort differently into higher-level positions, with a large share of qualified women remaining at lower levels compared to men. Employees who make it to first-level leadership positions, however, do not exhibit gender differences in subsequent promotions.

Given that firm tenures tend to be long, these findings underscore the key role that the gender promotion gap plays for overall gender inequality in the labor market.³ In contrast to internal promotions, however, differential entry to and exit from the firm do not play critical roles in explaining female underrepresentation at higher levels. Even though women are more likely than men to enter the firm at higher hierarchy levels, the vast majority of positions at the firm are filled by internal candidates, highlighting the importance of internal promotions. In addition, women are less likely than observationally similar men to exit the firm.

While previous research has almost exclusively focused on the possibility that a glass ceiling at higher levels is a key determinant of gender differences (Blau and Kahn, 2017), my findings echo a growing narrative among practitioners that a broken rung at the beginning of the career ladder represents a major impediment for women’s career progression (McKinsey and LeanIn.Org, 2021). This finding highlights the importance of focusing on gender differences that arise early on in the leadership pipeline. Policies that provide early exposure to leadership and encourage women to try out first-level leadership, such as job rotations or mentoring programs, could be effective tools to bridge the leadership gap. Responses to the large-scale employee survey document that among women at lower-level positions, access to mentorship is a common request in order to collect information about what leadership positions entail.

Chapter 3. Gender, Leadership, and Differences in Job Applications

Why are women less likely to advance to first-level leadership positions? A growing body of evidence has documented large gender differences in preferences and attitudes (Bertrand, 2011), hypothesizing that labor supply is a key channel through which female underrepresentation manifests. However, direct evidence from real-world decisions in the workplace is scarce. In addition, inferring the drivers

³In my sample, the average male (female) employee has worked at the firm for 13.6 (12.2) years. In the United States, more than a third of mid-career workers have worked at their firm for at least 10 years (BLS 2020).

of female underrepresentation from equilibrium outcomes is difficult, because differences can arise due to both labor supply and labor demand factors. Moreover, taking on first leadership positions typically comes with several changes in job characteristics and work environments, making it difficult to pin down what exactly it is that makes leadership positions less appealing to women.

When studying gender differences in preferences for such job characteristics, previous research has mostly focused on characteristics that are easily measurable, such as pay or working hours (Mas and Pallais, 2017, Wiswall and Zafar, 2018). Responsibility over a team, which is a very common feature of first-level leadership positions, however, has been understudied, likely because of a lack of available data. If women have lower preferences for or more negative perceptions of team leadership, significant efficiency costs could arise if talented women remain at lower-levels instead of getting promoted (Bloom and Van Reenen, 2007, Lazear et al., 2015).

This chapter provides the first empirical evidence that large gender differences in preferences for team leadership exist and that these differences translate into large application differences for promotions and subsequently female underrepresentation in leadership positions. To analyze employees' labor supply decisions separately from the firm's labor demand decisions, I take advantage of the fact that the firm I study, as many other large firms, requires employees to actively apply in order to make internal job transitions. I collect the universe of application and hiring decisions from 2015 to 2019, capturing each of the over 16,000 job openings at the firm, as well as each vacancy's original job posting and information about the over 300,000 internal and external applicants.

I find that women at lower-level positions are substantially less likely to apply for promotions to first leadership levels, even when accounting for employee demographics, detailed position characteristics, and performance. In contrast to applications for promotions, women are not less likely to apply for lateral transitions than men, even if these require switching divisions, functional areas, or locations. This pattern suggests that women in lower-level positions are not generally averse to applying for positions that cause a substantial change in their work environment. In addition, I find no evidence that women are less likely than men to get hired for internal job openings, conditional on applying, echoing a recent focus in economics on supply-side factors as determinants of gender gaps (Bertrand, 2018).

Responses to a large-scale survey of the firm's employees suggest that responsibility for a team is a particularly salient dimension of leadership that is less appealing to women in lower-level positions. When asked where employees would like to see themselves with respect to their career progression, women at low levels are 33% less likely to report preferences for leading a team. This gender gap exists across key employee groups, such as employees working full-time or employees without children, and is not explained by other factors, such as risk preferences, willingness to compete, or confidence. Differences in preferences for team leadership translate into differences in applications. Employees who state preferences for leading a team are twice as likely to have applied for a team leadership position in the past 12 months. In contrast, men and women who already hold leadership positions do not differ in their reported preferences for leading a team. These results mirror the finding that gender gaps in promotions and applications are absent for employees who already hold

leadership positions.

To formally test the hypothesis that responsibility for a team is a key determinant of the gender gap in applications, I estimate employees' revealed preferences for leading a team. I leverage a unique feature of my data, which is that I observe all vacancies to which employees could potentially apply. I construct a dataset at the employee-by-vacancy level that allows me to control for detailed job features of both employees' current position as well as those of every job opening in employees' application choice set. Since not all first-level leadership positions involve responsibility for a team, I am able to estimate the extent to which gender differences in revealed preferences for team responsibility explain the gender gap in applications.

The requirement to assume responsibility for a team can explain the entire gap in applications for promotions to first-level leadership positions. Controlling for a broad range of job and employee characteristics, men are 88.9% more likely to apply for first-level leadership positions if they require leading a team; however, leading a team does not make women more likely to apply. The effect of team leadership is not explained by alternative channels, such as stated job flexibility, how selective the job opening appears, or the female composition of coworkers. Moreover, male and female survey respondents are equally informed about job postings. Together, these findings imply the existence of a gender gap in employees' revealed preferences for leading a team.

How can female representation in leadership positions be increased? Responses from the employee survey suggest that women and men differ substantially in their preferences for job characteristics that are typically associated with leading a team, such as the size of the team, the likelihood of negative interactions that lead to resistance by the team, and the likelihood of unpredictable events that cause overtime. Using the responses of current team leaders as factual benchmark, I also find that women at lower-level positions have more negative perceptions of team leadership. In contrast, perceptions of differential treatment with respect to getting hired into a leadership position and treatment as a leader do not seem to play an important role for the gender gap in preferences for leadership.

The results in this chapter highlight that firms' job architecture plays a key role for women's underrepresentation in leadership positions. Policies that increase the share of first-level leadership positions that require only limited responsibility for a team can likely help to reduce the bottleneck in women's career progression. Similarly, policies that provide early exposure to leadership and encourage women to try out first-level leadership, such as job rotations or mentoring programs, may be effective tools to bridge the leadership gap by providing more accurate information about team leadership.

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